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EDITOR'S LETTER

Welcome to Volume XII of the Digital Journal of the Universidad Autónoma de Chiapas: *Espacio I+D, Innovación más Desarrollo*. As usual, we appreciate you reading, collaborating, and accompanying us for another year, which undoubtedly looks complex; but after the pandemic plateau in which we find ourselves, it has been a pleasure to return being face-to-face and to a social life that benefits us so much.

This volume opens with the publication of issue 32, and today when we witness the imprint of Artificial Intelligence, we pose new challenges facing the future of research and the ethical dilemmas that surely must be generated around intellectual property and plagiarism. Meanwhile, we will continue to adhere to what the indexes and databases establish to guarantee truthful and quality content generated in strict adherence to the academy-mandated rules.

This issue presents various materials reflecting our interdisciplinary studies, among them the following articles: *Mexican banana at risk!... The main quarantine threats to Musaceae*, *The ratio of Mezzanine Distortion in Steel Buildings with a new Earthquake Damage Potential Index*, *Psychological needs in caregivers of patients undergoing hemodialysis treatment*, *Shared meanings of the school culture's symbolic universe in the merging of preschool, elementary, and middle school scenarios*, *Political clientelism and print media in Mexico: budget reduction in government advertising as a catalyst in the change of editorial line in the country's main newspapers*, *Adsorption of Pb²⁺ ions using biogenic CaCO₃ in aqueous solutions*, *Analysis of Stress, depression, and coping resources in Post-confinement COVID-19 university students*, and *Phytotoxicity of plant extracts on seed germination and initial development of mono and dicotyledonous plants*.

Likewise, we included two academic documents: *Trading Platforms and Apps in the Mexican Financial Environment* and *a Theoretical description of the civil religious actor category and the constituent concepts*.

In this issue, we also take the opportunity to reflect on the work of the *Fundación UNACH* as a cross-cutting support to the substantive functions of the University through a report in which it gives an account of its job within our institution for the enrichment of university life.

We start this year with optimism, waiting to continue contributing to the enrichment of knowledge for the benefit of society.

Enjoy this Space of Innovation! 

"Por la conciencia de la necesidad de servir"
Universidad Autónoma de Chiapas

The editors

A R T I C L E S

Mexican banana at risk!... The main quarantine threats to Musaceae

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— Abstract —

The objective of this study was to show the phytosanitary status in a spatial context of the main quarantine threats to Mexican bananas. The characteristics and phytosanitary status of Fusariosis of Musaceae (FocR₄T), Banana Bacterial Wilt (BXW), and Banana Bunchy Top (BBTV), as priority diseases identified by the National Service of Health, Safety and Agrifood Quality (SENASICA), were considered. Under the approach of "Tobler's Second Law", the area/production of bananas in the world was analyzed, the phytosanitary status (present) of the quarantine threats for the Mexican Republic and, on a larger scale (at the municipal level), the spatial condition of the area sowed and the banana production in Mexico was demonstrated. A scenario of the productive condition of the banana-producing countries (planted area and production) was obtained. On a regional scale, the existence of two territories close to Mexico with the presence of FocR₄T at 1,800 and 2,500 km of distance was determined, and a third one with BBTV official status present at 4,200 km was determined. In addition, the spatial distribution of municipalities with the presence of economically important hosts was obtained. It is concluded that Mexico maintains technically and scientifically supported preventive activities against the possible entry of FocR₄T, BXW, and BTTV, through the Phytosanitary Epidemiological Surveillance Program for banana quarantine pests. The results allow us to place the phytosanitary risk posed by quarantine threats to the banana product system on a spatial and current level and are considered an input that allows us to assist in strategic decision-making in the face of phytosanitary risks such as the pathogens described above.

Keywords:

Banana; Mexico; Quarantine threats.

Bananas (*Musa paradisiaca*) are a crop of economic and social importance in Mexico, even, according to García-Mata *et al* (2013), due to their high level of consumption they can be considered a necessary good. The banana product system is under the latent threat of different pests of quarantine interest. According to the National Service of Health, Safety and Agrifood Quality (SENASICA), the main threats are Fusariosis of Musaceae (*Fusarium oxysporum* f. sp. *cubense* (E.F. Sm.) W.C. Snyder & H.N. Hansen Raza 4 Tropical) (FocR4T) (SENASICA. 2019a), Banana Bacterial Wilt (*Xanthomonas vasicola* pv. *musacearum* (Yirgou & Bradbury, 1968; Dye 1978) (BXW) (SENASICA. 2019b) and Banana Bunchy Top Virus (BBTV) (SENASICA. 2019c).

In Mexico, these diseases have an absent categorization of quarantine pests; since there are no records of their presence in the country, however, according to the International Standard for Phytosanitary Measures No. 5 (FAO-IPPC-NIMF, 2009), can potentially cause economic losses in host crops. They are considered phytosanitary risks with the potential to cause significant reductions in the crops' national production since they are considered "devastating pests"; providing direct effects on the fourth most important food in the world, after rice, wheat, and corn (Shankar & Mondal, 2016). Plantains are viewed as one of the most important products for food security, as well as an important source of job creation (García-Bastidas *et al*, 2020).

The spatial condition involves the interrelationship between elements that develop in a context defined by geographical entities. That is, the spatial properties are established through division relationships and proximity measurements, which allows quantifying the distance between disjoint parts of the related geographic objects (Nedas *et al*, 2007), in this case: Phytosanitary status "present" vs. plantain farming areas in Mexico. Theoretically, this association process was based on the approach of the Second Geographical Law proposed by Tobler (1999), which states that "every phenomenon external to an area affects what happens inside", which allows highlighting the interaction between the events that occur in a certain space that can affect other nearby or distant territories. Therefore, the study's objective was to demonstrate the main quarantine threats' phytosanitary condition in a spatial context to the cultivation of Mexican bananas, supported by a review of specialized literature.

THE BANANA CROPS CONTEXT IN THE WORLD

During 2020 there was a planted area of 5,493,932 hectares of banana crops in the world, distributed in 123 countries, of which a production of 113,212,452 tons of the crop was obtained. The countries that reported the largest area destined for banana cultivation were: India (846,000 ha), followed

by Brazil, Tanzania, the Philippines, and the People's Republic of China which have more than 430 thousand banana hectares each, it should be noted that Mexico was positioned in 15th place, with a planted area of 78,322 ha of banana crops (Figure 1a).

In addition, when considering banana production, countries like India stand out with 25.72% of production, followed by China with 11.77%, Indonesia (6.19%), Ecuador (5.77%), and Philipines (5.15%), the rest of the countries have less than 3.42% each, it is relevant to highlight that Mexico was considered 12th place with 2,384,778 tons equivalent to 2.11% of the registered production in the referenced year (Figure 1b).

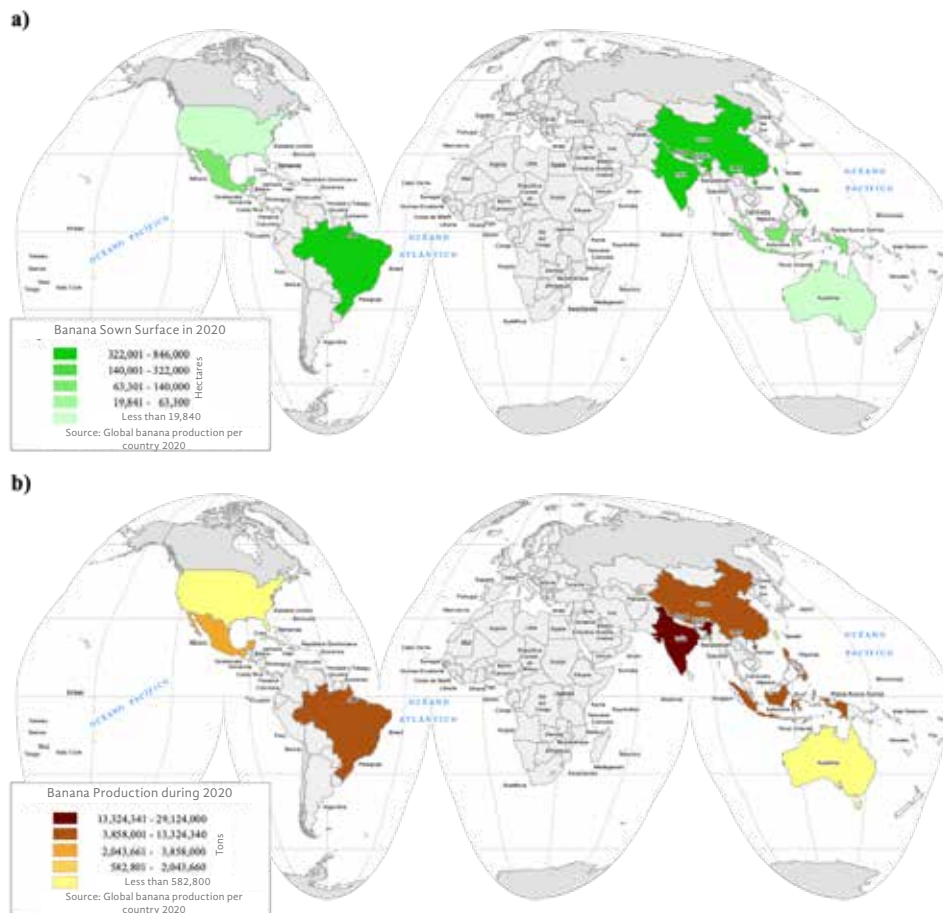


Figure 1. Global outlook for banana cultivation. a) Surface planted with bananas per country and b) Banana production per country. Source: <https://www.atlasbig.com/es-es/paises-por-produccion-de-banano>

PRIORITY QUARANTINE THREATS TO MEXICAN BANANA CULTIVATION

Banana or plantain crops are susceptible to phytosanitary problems caused by pathogens such as FocR₄T, BXW, and BTTV, which, according to the National Service of Health, Safety and Agrifood Quality SENASICA, are considered of quarantine interest. The dispersion and possible effects of these diseases depend to a large extent on the mobilization of infected or diseased vegetative material (seedlings, horns, offspring, etc.) however, there are some epidemic peculiarities specific to each pathogen that are listed below:

- I. FocR₄T is considered an extremely severe pathogen with the potential to affect a considerable group of Musaceae varieties of importance for food security (not only the Cavendish variety); that is, it can affect strategic crops for food security with repercussions for the generation of economic income in banana-producing regions (Dita *et al*, 2018).


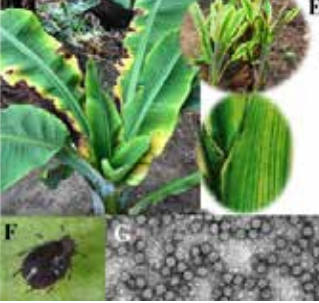

The causative agent of Fusariosis Musaceae is a soil fungus, and there are references that it can survive for up to more than 30 years in its resistance structures (mycelia and chlamydospores) (Stover, 1962). In Southeast Asia, there have been considerable effects, even, though it is present in large areas where it has caused millionaire losses with a high cost in management measures (OIRSA. 2020). FocR₄T affects the root, stem, and other structures of the *Musa* genus, however, the fruit is not a carrier of the fungus, and there is no risk when consuming the fruit (ICA. 2021). Some characteristics of the pathogen can be seen in Table 1a.

- II. BXW is considered the most devastating banana disease in the Great Lakes region of Central and East Africa, where it caused total losses in the yield of infected plants (Ssekiowoko *et al*, 2006 & Tripathi *et al*, 2009). In sub-Saharan Africa, it is considered a highly limiting pathogen in the production of banana clusters, with estimated damage between 70% and 90% in affected areas (Kumar *et al*, 2015). This disease can infect all genotypes of bananas, so it is convenient to maintain a clear control measure, that is, restrict the movement of plant material from the territories where it is present since it spreads quickly and generally, field tools facilitate its transfer (Manzo-Sánchez *et al*, 2014). Its characteristics are shown in Table 1b.
- III. BTTV In East Africa, in the Great Lakes region, it has destroyed entire plantations where losses are estimated at between 2000 billion and 8000 billion over a decade (Fresh-Plaza, 2021). Its control implies quarantine actions to avoid entry into free territories,

complemented by the eradication of infected plants that serve as a source of inoculum (Thomas, *et al*, 2000), its characteristics in culture are shown in Table 1c.

Table 1

Characteristics of the main quarantine threats to the Mexican banana. a) Fusariosis of Musaceae (Fusarium oxysporum f. sp. cuban (EF) Sm.) W.C. Snyder & H.N. Hansen Race 4 Tropical), b) Banana Bacterial Wilt (Xanthomonas vasicola pv. musacearum (Yirgou & Bradbury 1968; Dye 1978) and c) Banana Bunchy Top Virus

	a) FocR4T	b) BTTV	c) BXW
Culture Appearance	 <p>Image: García-Bastidas, 2020</p> <p>(A) External symptoms with extensive foliar yellowing, as well as the collapse of the pseudostem and cracking of the pseudostem; (B-C) internal symptoms showing redness of the vascular bundles in the pseudostem and corm. (Photos: García-Bastidas, 2020).</p>	 <p>Image: Betancourt Vásquez, 2020</p> <p>(D) Infected banana and virus symptoms in foliage. (E) Banana thumb vector of the BTTV virus in bananas and (F) Babuvirus (Family Nanoviridae) (Betancourt Vásquez, 2020).</p>	 <p>Image: Guy Blomme, 2021</p> <p>(H) Yellowing and wilting on the leaves, (I) Premature ripening of the fruit and (J) Bacterial exudate (Guy Blomme, 2021).</p>
Dispersion media	<p>Infected plant material, contaminated water, and tools/machinery with infested soil are the main means to disperse the pathogen (García-Bastidas, 2020).</p>	<p>It can propagate vegetatively through pacifiers or crop plants of infected tissues, causing a reduction in crop yield which triggers a barrier to international exchange (Kumar <i>et al</i>, 2015).</p>	<p>It is dispersed by mobilization of infected plant material and contaminated tools, and some insects favor dispersal (Family: Apidae), fruit flies (Family: Tephritidae) and grass flies (Family: Chloropidae) (SENASICA, 2019b).</p>

Source: Adapted according to the indicated references

THE SITUATION OF THE BANANA PRODUCT SYSTEM IN MEXICO

According to the Agricultural and Fisheries Information Service (SIAP) in 2020, the Mexican Republic had 80,546.74 hectares of the planted area. with bananas distributed in 16 states, it should be noted that Chiapas, Veracruz, and Tabasco contributed the largest estimated territorial extension with

63.45% of the sown area, which is equivalent to 51,112 ha. In addition, the states of Quintana Roo, Yucatan, Campeche, Mexico, Hidalgo, and Morelos only contributed 1,183 ha; overall, this represented 1.46% of the national banana area in Mexico (Figure 2).

At the municipal level, the largest area planted with bananas was grouped into Teapa, Tabasco (7,439 ha); Suchiate, Chiapas (5,503); Coahuayana, Michoacán (4,589 ha); and Tecomán, Colima (4,158 ha) which together contributed 26.92% of the national planted area. In addition and with the smallest extensions are Atenango del Río, Guerrero; Malinalco, Mexico; Huetamo, Michoacán; Soledad Doblado, Veracruz and Muna and Cantamayec in the state of Yucatán, with an extension of fewer than two hectares of sown area each (Figure 2).



Figure 2. Sown area of the banana product system in Mexico, 2020. Source: Agricultural and Fisheries Information Service, SIAP-AGRICULTURA. 2020

In addition, Mexican banana production relies upon the states of Chiapas with 701,501 tons, Tabasco with 601,608 tons, Veracruz with 324,733 tons, and Colima with 207,433 tons, which altogether represent 74.47% of the crop's national production (SIAP, 2020). On the contrary, the states of Quintana Roo (9,881 tons), Yucatán (1,474 tons), Campeche (1,249 tons),

Morelos (277 tons), México (225 tons), and Hidalgo (56 tons) altogether contribute only to 0.53%, which corresponds to 13,163 tons (Figure 3).

The main municipal producers consolidate 50.88% of the banana national production, out of which Teapa, Tabasco with 453,612 tons; Suchiate, Chiapas with 205,605 tons; Coahuayana, Michoacán with 142,747 tons; Tecomán, Colima with 137,024 ton; Cihuatlán, Jalisco with 128,251 ton; Tapachula, Chiapas with 96,416 ton; and San Rafael, Veracruz with 90,132 tons stand out. It should be noted that 63 municipalities had a production lower than 200 tons each and together contribute only 0.27% of the total banana production (SIAP. 2020).

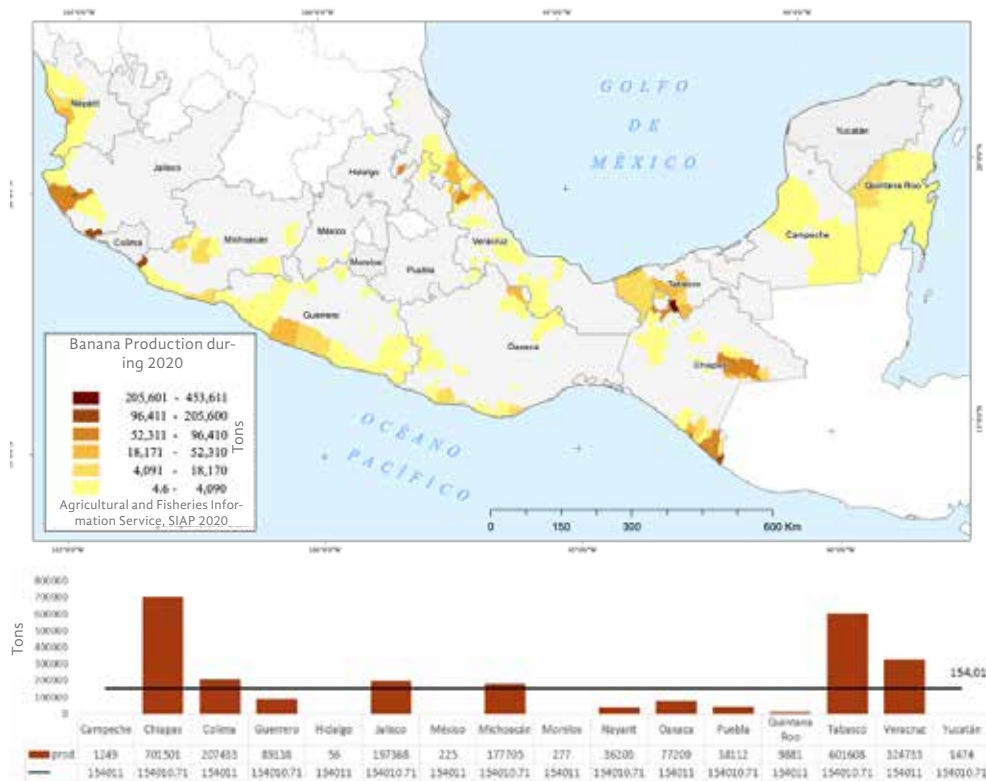


Figure 3. Banana production in Mexico, 2020. Source: Agricultural and Fisheries Information Service, SIAP-AGRICULTURA. 2020

The spatial representation of the sown area and the banana production (Figures 2 and 3, respectfully) allow obtaining spatial distribution patterns of the main FocR4T, BTTV, and BXW hosts, which allows creating scenarios that make it possible to direct preventive actions before the possible entry of any of the pathogens analyzed, that is, the regions where the largest/smallest banana producers in the country are concentrated.

PREVENTION CULTURE IN MEXICO

Mexico holds preventive strategies against bananas quarantine pests in NOM-010-FITO-1995 (DOF. 1995) "*establishing preventive guidelines for the introduction, establishment, and dissemination of banana quarantine pests to national territory*" through so-called surveillance routes, sentinel plots, and exploration areas. Likewise, the culture of prevention is implemented in the mobilization of plant material legally based on the Mexican Official Standard NOM-008-FITO-1995 "*laying down phytosanitary requirements and specifications for fresh fruits and vegetables import.*"

In addition, the National Plant Protection Organization, through the General Directorate of Plant Health, maintains the Phytosanitary Epidemiological Surveillance Programme, which operates with active surveillance in agricultural, wild, marginal, and urban areas (SENASICA. 2020). The active surveillance of quarantine pests is carried out in areas of potential risk before the possible entry of exotic pests such as FocR4T, BTTV, and BXW into Mexican territory (SENASICA, 2020a).

Currently, in Mexico, phytosanitary epidemiological surveillance is carried out through robust operational strategies such as surveillance routes in risk areas (backyards, tourist areas, collection centers, nurseries, and storage centers), the establishment of sentinel plots at-risk sites, as well as exploration in the production area. Derived from these actions FocR4T, BTTV, and BXW, maintain a phytosanitary status absent in Mexico, since there are no records of the pest's presence, as indicated by NIMF No. 8 (2017).

Finally, it is pertinent to note that according to the Mexican National Plant Protection Organization, the highest phytosanitary authority, through the "Directorate of Phytosanitary Regulation -SENASICA" in 2009, an amendment was made to the NOM-FITO-010-1995 Single Article (point 4.1's paragraph "Absolute quarantine products") stating that "*The introduction of fresh bananas, banana plants, and parts thereof and their packaging originating in or consigned from the countries concerned by the presence of banana pests of quarantine importance for the country is prohibited*" and only transit is allowed (no opening of containers). In addition, recently in 2019, as a result of the recent detections of FocR4T in Colombia, the "*Import of propagative plant material "In Vitro" of the genus Musa spp and Heliconia spp*" (Cueto-Espinoza, 2021) was suspended. That is, nowadays, as a preventive measure in Mexico, the import of propagative material, fruits, and by-products derived from bananas is prohibited, and transit through the national territory is only allowed under controlled or very specific conditions according to specifications of the National plant health regulation and its counterpart in trade negotiations.

SPATIAL CONDITION OF THE PRIMARY BANANA QUARANTINE THREATS FOR MEXICO

The spatial condition was based on the assumption that there is a phytosanitary risk for the production of Mexican bananas when considering the proximity to the countries/states that maintain the presence of at least one of the banana quarantine diseases (FocR4T, BTTV, or BXW).

The main phytosanitary risk was associated with Fusariosis of Musaceae that was detected in 2019 in the American continent: in the banana production area in the Las Flores and Pelucha roads located in Dibulla and Riohacha, La Guajira, Colombia (ICA, 2019), 1,800 km away. There is another priority area in the production area of the Querecotillo district, in the Sullana province, department of Piura, Peru (SENASA, 2021), located just over 2,500 km away from the Mexican Republic. And in third place, by geographical proximity, approximately 4,200 km away, is Hawaii USA, where they have a phytosanitary status present to the Banana Bunchy Top (Figure 4).

Globally, in Asia, Africa, and Australia, there are territories with the presence of at least one of the three diseases (FocR4T, BTTV, or BXW); however, not because they are in other continents does it mean that they do not represent a phytosanitary risk for banana producing countries in the Americas. Derived from the processes of globalization, such as commercial exchange, tourism, and human migration, the phytosanitary risk associated with banana quarantine pests continues to be a latent threat to the plantations of economic importance existing in 34 countries of the American continent, which together contributed 21.60% of the world's planted area of banana cultivation, which represents 24.9% of the 2020 production (Figure 4).

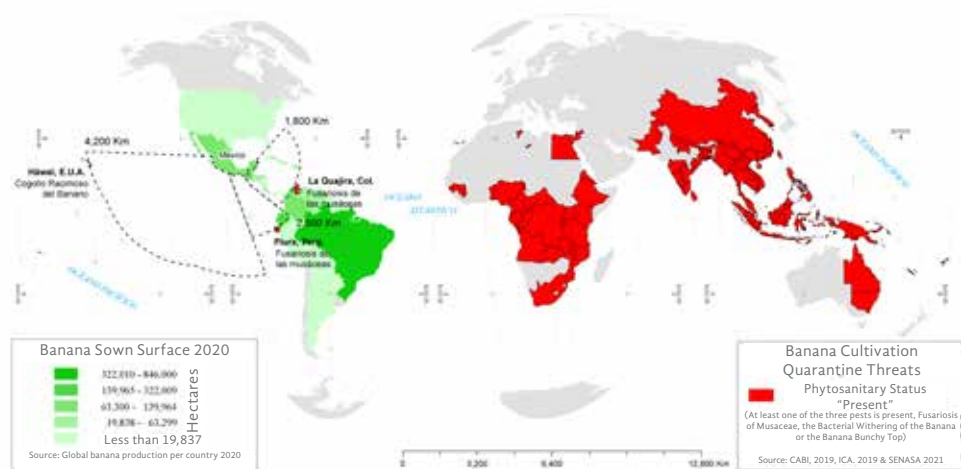


Figure 4. Spatial condition of the main quarantine threats to the banana system in Mexico. Source: CABI, 2019, EPPO, 2019, ICA, 2019 and SENASA 2020

CONCLUSIONS

The spatial diagnosis of the banana quarantine threats (FocR4T, BXW, and BBTV) based on a review of specialized literature, allows us to verify that we are facing priority regional phytosanitary risks and not only of risk for Mexico but for the 33 countries of the American continent where bananas are grown. Even the distance as a spatial condition of the presence of pathogens in other countries or continents does not represent an obstacle to its mobilization in our country since it is proven that the intercontinental distance did not impede the occurrence of two detections in different territories in America and with different temporality (Colombia and Peru).

In 2019, there was a first warning to strengthen epidemiological surveillance strategies with the first detection of FocR4T in the Americas, which implied restructuring the strategic plans for monitoring, acting, and containing banana pests, under a preventive approach. In this regard, it is important to strengthen phytosanitary research with trans and multidisciplinary approaches to strengthen national and regional phytosanitary epidemiology surveillance programs for banana quarantine pests, as well as to implement preventive actions jointly between phytosanitary protection agencies, research centers, producers, and final consumers. Today we all know the implications of health problems with a pandemic potential "*thanks to Covid-19*". Since, without a doubt, the pandemic potential associated with the Fusariosis of Musaceae, the Banana Bacterial Wilt or the Banana Bunchy Top is latent with direct implications for the fourth most important food in the world.

This type of analysis that involves the territorial component through the inclusion of spatial data, allows for territorialize of the phytosanitary risk and has the potential to be considered an essential input for decision-makers, since, although it can be considered a very brief analysis, it allows to identify locations or territories where it is feasible to perform a more robust geospatial analysis or modeling that integrates essential variables (environmental, epidemic, anthropic, economic, etc...) that favor the pathogen and its potential hosts (of economic and wild importance), which allows to obtain results with a greater spatial resolution (greater detail in the territory) to redirect risk mitigation strategies on the identified surfaces and, with this, give scientific technical support to the decision-makers.

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Psychological needs in caregivers of patients undergoing hemodialysis treatment

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— Abstract —

The conditions of the kidney patient on hemodialysis demand the actions of a caregiver. The assumption of the role implies conflicts, lack of personal interests, frustrations, negative emotional states, overload, and dissatisfaction with needs. The objective was to describe the psychological needs of patients with kidney disease caregivers undergoing hemodialysis treatment. A multiple case study was used as the research design. The research was carried out during the first quarter of 2020 in Cuba. A qualitative instruments system was used, the sociodemographic data questionnaire, RAMDI, and in-depth interview. A non-probabilistic intentional sampling of type cases was carried out for the selection of twenty caregivers. The use of Atlas.ti for data processing and organization facilitated content analysis. Psychological needs are identified in the caregivers of hemodialysis patients associated with leisure and recreation, delayed by the lack of social, family, and institutional support. There is evidence of a high hierarchy of needs related to health, family duty, and well-being. Needs related to the well-being of their family member were also verified, combined with other needs of an individual type for the satisfaction of their own interests. It is concluded that the psychological needs of caregivers guide their role, assumed as a family duty that mobilizes their daily behavior. It is emphasized that to guarantee the quality of life of patients on hemodialysis, their goals, aspirations, and life projects are relegated.

Keywords:

Needs; caregivers; kidney disease; hemodialysis.

Hemodialysis is one way to treat advanced kidney failure, especially when a transplant is not available. In Cuba, the service is offered in provincial hospitals three times a week in sessions of three to five hours each. It intends to prolong the life of the patient, however, it may involve other conditions such as hypotension, hypertension, anemia, itching, infections, exhaustion, sleep disorders, depression, and anxiety. The invalidating nature of hemodialytic treatment demands a caregiver who offers instrumental and emotionally supportive care (Martínez *et al*, 2017; Grau *et al*, 2019).

The primary caregiver is distinguished by his or her dedication to the custody, temporary or permanent protection of a family member due to lack or loss of physical, mental or intellectual autonomy, need for assistance or help to perform ordinary tasks of daily life and, in particular, those related to personal care (Rosell, 2016). The caregiver is the person in charge of helping with the basic and instrumental needs of the patient guaranteeing the reorganization, maintenance, and cohesion of the family and, therefore, holds most of the physical and emotional overload of care (Vásquez & Vercely, 2015; Aguilera *et al*, 2016; Zenteno *et al*, 2019).

The patient's care in hemodialysis is a complex and demanding activity that threatens the emotional balance, freedom, intimacy, social activities, and leisure of the family member who assumes the task of caring (Martínez *et al*, 2019). Faced with these conditions, multiple physical, psychological, and psychosocial needs appear and fail to be fully satisfied. The assumption of the role implies conflicts, lack of personal interests, frustrations, negative emotional states, overload, as well as dissatisfaction with material or spiritual needs (Martínez *et al*, 2019).

Necessity as a psychological category is defined as the personality's stable quality, carrier of a constant emotional content, which guides the subject in a stable direction of their behavior (González-Rey, 1989). The psychological process of seeking satisfaction integrates into itself moments of dissatisfaction, which, although contradictory, in turn, represents the dynamism of human behavior (Fernández-Ruiz, 2005). Necessity is an active-passive state, active because it implies the aspiration to its satisfaction, and passive because it reveals the dependence of the individual on the object. It is a characterological property of the personality that manifests itself in states, processes, and psychic reflexes that express the subject's interaction with their environment (González-Serra, 2008).

At the international level, multiple studies are identified that explore or describe the needs of the caregiver population (Basilio, 2017; Huérfano *et al*, 2018; Rada *et al*, 2019; García, 2020). Some of these needs are oriented toward the promotion of adaptation and coping, information and education, monitoring and retraining, decision-making capacity, and narrow links with

the health team (Huérfano *et al*, 2018). In addition, other needs related to the patient and family's health are expressed, knowledge about the treatment, emotional stability, self-care actions, and economic and work support (Martínez & Grau, 2017).

The analysis of needs in caregivers allows us to understand the meaning of such experiences and the personal reality of the caregiver. Because of this, this work aims to describe the psychological needs of caregivers of patients with kidney disease under treatment for hemodialysis.

METHODS

Design and Participants

The multiple case study was used as a research design to address the research problem, integrating the information collected in each case (Hernández-Sampieri *et al*, 2014). Per the criteria of convenience and accessibility, the Hemodialysis Service of the "Arnaldo Milián Castro" Hospital in Santa Clara, Cuba, was chosen as the study context. The fieldwork was carried out from January to March 2020. The following selection criteria were considered:

Inclusion criteria:

- A person who acts as the primary caregiver for the patient undergoing hemodialysis treatment.
- Assistance in the daytime treatment schedule.
- Offer their voluntary participation in the research through informed consent.

Exclusion criteria:

- Intellectual Disability.
- A person or relative who fulfills the companionship functions to the treatment.

Exit criteria:

- Abandonment of research.
- Caregiver whose relative stops hemodialysis treatment; dies, or receives a transplant during the investigation.

The sample selection was intentional of typical cases due to the richness, depth, and quality of the information it allows to obtain. The sample was confirmed with twenty primary caregivers as described in Table 1.

Table 1
Description of the sample's sociodemographic variables

Participant	Age	Gender	Background	Previous experience in care	Time as a caregiver	Kinship
C ₁	72	Woman	Ranchuelo	Yes	2 years	Children
C ₂	67	Woman	Santa Clara	Yes	3 years	Spouse
C ₃	76	Woman	Manicaragua	No	6 years	Children
C ₄	50	Man	Manicaragua	No	6 years	Spouse
C ₅	60	Woman	Santa Clara	No	10 years	Spouse
C ₆	71	Woman	Santa Clara	No	4 years	Other
C ₇	54	Woman	Ranchuelo	Yes	6 years	Spouse
C ₈	32	Woman	Ranchuelo	No	11 years	Other
C ₉	17	Man	Santa Clara	No	6 years	Other
C ₁₀	69	Woman	Ranchuelo	Yes	1 year	Spouse
C ₁₁	54	Woman	Manicaragua	No	10 years	Children
C ₁₂	38	Woman	Santa Clara	Yes	5 years	Children
C ₁₃	68	Woman	Santa Clara	Yes	6 years	Spouse
C ₁₄	62	Woman	Manicaragua	No	14 years	Children
C ₁₅	39	Woman	Santo Domingo	No	17 years	Spouse
C ₁₆	64	Woman	Santa Clara	No	1 year	Spouse
C ₁₇	78	Man	Santa Clara	No	10 years	Children
C ₁₈	62	Woman	Santa Clara	Yes	5 years	Spouse
C ₁₉	36	Woman	Placetas	No	2 years	Other
C ₂₀	48	Man	Santa Clara	No	7 years	Children

Source: Own elaboration

The sociodemographic profile of the sample reveals that 80% are women who assume the role of caregivers. The average age was 56 years. High school level predominated with 30% of the sample, while the elementary level had 15%, basic middle school 15%, technical middle school 20%, and university degree 20%. 55% are married, kinship to the family member that predominated was marital (45%) and children (35%). 75% have no working relationship, of which five caregivers left their jobs long before assuming the role, while ten caregivers were required to leave their work activity after their relative started treatment and because of the care's demands.

Instruments

An agreement was established with the hospital for access to the context and participants. The data were collected through the following instruments:

Sociodemographic variables questionnaire: An instrument that collects in an organized manner the indicators of the units of analysis involved as the object of study. It summarizes the general data of the participants to access a general characterization of the sample studied.

Registration of activity and direct and indirect method (RAMDI) (González-Serra, 2008): Technique designed for the study of diversity and hierarchy of needs through its expression in activity, desires, and imagination. It is based on a classification of needs as 1) personally significant social needs (those of society and social groups that are incorporated into the personality as their own) and 2) individuals of social character (those based on individual organic and psychological requirements). It consists of four questionnaires: the direct method, the indirect method, the activity recording, and the general data questionnaire. The direct method tells the subject to express ten wishes. The indirect method suggests creating a story about a character and writing ten wishes of that character. The activity log gives them a list of activities so they can specify how often they do them. Finally, a brief questionnaire of general data is presented, in this case, it was replaced by the sociodemographic variables questionnaire described above. (Annex 1)

In-depth interview: A technique that is distinguished by a conversation between two people with a specific purpose and certain rules. The interview brings data about character objective and subjective based fundamentally on the self-observation made by the researcher. It allows one to inquire and know about the course of the current life of the subject, its self-assessment, and its needs.

Research procedure: In the first meeting, informed consent was requested individually, and the participants left a written record of their acceptance of the study. Subsequently, the sociodemographic variables questionnaire and the RAMDI were applied. We worked sequentially, giving way to in-depth interviews after coding and analyzing the data obtained in the RAMDI. To deepen the characterization of the caregivers' needs, the questions were focused on the circumstances of the beginning as a caregiver, care experience, meaning, exercise of role, fears, and concerns.

Data analysis and processing

For the organization and qualitative processing of the data, the computer program Atlas.ti was used. Content analysis was established as a methodological approach for data analysis using coding and categorization (Table 2)

Table 2
Categories classification proposed in RAMDI

Categories	Code	Meaning
Social	CL	Collectivism. Favorable wishes for us. Wishes for equality and justice.
	DH	Duty and humanitarianism. Favorable wishes to others unspecified.
	CP	Peers. Favorable wishes to co-workers or peers.
	TR	Work. Wishes for work, to fulfill the work undertaken.
	RV	Revolution. Favorable wishes for the Cuban Revolution and Cuba.
	ES	Study. Wishes to study, to pass this year; the current course.
	EF	Future studies. Wishes to study in the future (further than the current course).
	OP	Career and profession. Wishes to have or to study a career or profession.
	F1	Family duty first. Favorable wishes to parents, siblings, cousins, and uncles.
	F2	Family duty second. Favorable wishes to spouse and children, and relatives.
	DS	Rest Wishes to sleep, rest, be at peace, and be calm.
	SL	Health. Wishes for preservation and physical health, physical vigor, and healing.
	SX	Gender Wishes to be in touch with the opposite sex; a sex life.
	CM	Eating. Wishes to eat and have meals, to drink.
	OS	Other pleasure. Wishes for other pleasures not within the other categories.
	IT	Interests. Wishes to read, knowledge, to be informed, to have general knowledge.
	DI	Enjoyment. Wishes for entertainment, listening to the radio, watching TV.
	VJ	Traveling Wishes to travel within Cuba (outside the city) and abroad.
	AC	Activity. Wishes for physical or intellectual activity, sports, or arts.
DV	Enjoyment. Wishes for holidays, beach, walking, fun, dances, and hobbies.	
Individual	C1	Be in touch with family. Wishes for being in touch with parents, grandparents, siblings, uncles, cousins, and the family they were born into.
	C2	Being in touch with relatives. Wishes for being in touch with spouse, children, and spouse's family. Desire to get married, code C2-SX.
	C3	Being in touch with their girlfriend or any other affectionate, sexual relationship, outside of marriage.
	CN	Contact. Wishes to be in touch with friends, colleagues, or someone else.
	ID	Independence. Wishes to be independent, free, and not having assistance.
	AF	Affection. Wishes to be loved, for affection, understanding.
	VL	Being valued. Wishes for good self-evaluation or external evaluation.
	PR	Presence. Wishes for good physical presence, hygiene, good clothing, and beauty.
	EP	Physical balance Wishing to avoid sickness and mental issues.
	FL	Happiness. Wishes for a happy life, and current and future satisfaction.
	VV	Living. Wishes to avoid getting old and death, not die, to live, be young.
PS	Possession. Wishes to possess money or goods.	
AG	Violence. Wishing violence against others and oneself.	

Other categories	SM	Oneself. Wishing to have a certain personality. Self-image.
	RL	Realization. Wishes for success, to achieve something.
	RS	Self-reassurance. Wishing to achieve the ideal image of oneself.
	AP	Psychological assistance. Wishing for psychological treatment that helps deal with the situation.
	BF	Family well-being. Wishing for the family's well-being.
	BS	Social well-being. Wishing for a better society.
	BN	Well-being. Wishing for the well-being of the renal patient under their care.
	CM	Quality of medical service. Wishing to have the technical and professional qualifications needed to accomplish the best hemodialysis service.
	RG	Religion. Wish focused on religious beliefs.
	S2	Health 2. Wishing for good health for the renal patient and the family members.
Categories linked to care*	TP	Transplant. Wishing the renal patient receives a transplant and goes through the situation successfully.
	NC	Care. Wishing for a family member to take care of them when needed.
	AF	Family support. Wishing for family and friends' support to meet the care.
	AS	Social support. Wishing to count on society agents (social workers, coworkers, others).
	AI	Instrumental support. Wishes to have equipment that facilitates care.
	IS	Social integration. Wishes for the renal patient to join the society.
	LB	Freedom. Wishes to be free.
	AU	Self-care. Wishes to take care of their health to continue with their role.
		Care relative.

Source: González-Serra (2008)

Ethical considerations

At each stage of the investigation, ethical principles were respected. We began with the request and signature of informed consent at the institutional and personal levels. We guaranteed respect for the individuality and privacy of patients and their families. Permission was obtained by signing the informed consent for recording the interviews.

RESULTS

Analysis of needs expressed in the direct method (RAMDI)

The direct method revealed a predominance of individual needs associated with the role. The participants hierarchized the care of their family members with responsibility and satisfaction for the assumption of the role.

The first wish describes family care and well-being as motivation. In this regard, they express: C₂ "for my husband to be well", C₄ "all I want in this world is for my son to get well", C₅ "for my husband to recover", C₇ "for my

husband's wellbeing", C₁₀ "for my husband to remain stable", C₁₁ "for the day goe well", C₁₃ "for him to get well", C₁₄ "for my children to get well", C₁₅ "for my husband to feel good", C₁₆ "for him to get well", C₁₇ "for my son to be well", C₁₈ "for my husband to urinate well", C₁₉ "or him to improve" and C₂₀ "for my son to get well".

Family care and well-being were combined with second family duty and first family duty. The emergence of one category or another is expressed in correspondence with the type of relationship existing between the caregiver and his family member. A favorable relationship was required between the needs focused on the welfare of the sick family member and the duty they feel for the person under their care.

Participant C₁ manifested social need, work, have a good psychic balance (individual need) by expressing "continuing to get along with the elders of the nursing home where I work". This statement evidenced how C₁ gives great meaning to the performance of his professional work. C₃ expressed the need for possession in hierarchical order, he proposed "to build my house that is in poor condition". Other individual needs were described as future studies (C₉: "to be in the military") and happiness (C₁₂: "to be happy"). These individual needs reflect the presence of needs in this population, not only focused on their relative under care but on their interests.

In wish 2, the motivation for well-being and relative under care was highlighted. Self-care was revealed as a new need, associated with the need to preserve health and strength to continue with the family member's care. In this regard, C₁₀ expressed "wishing to be well to assist him" and C₁₃ "for me to get well". In these cases, the concern was related to being elder and the fear that it generates not being in the optimal conditions to provide care to dependent relatives.

Family's well-being (C₇ "for the family to be together") and need for care (C₁ "for a nephew or someone to be able to take care of me when I need it") showed the interest of the caregivers in the well-being of the patient and the whole family, as well as concern in the absence of a person who cares for them back.

The need for fulfillment was expressed, C₁₇ "that my daughter triumphs in the mission in Africa". Affection, living, revolution, and work occupied the second position of hierarchy among the participants.

Wish two results indicated favorable wishes towards the patient, while maintaining other motivations, both personal and focused on other family members, mainly from the role of parents.

When analyzing wish three, more individual than social needs were identified. From this hierarchical level, the variability was more noticeable. As individual needs happiness, health, being in touch with family, being in touch with second degree relatives, psychic balance, presence, and possession were

identified. While socials were *family duty first, family duty second, studies and work*. In the same way, other categories were expressed like *self-fulfillment and fulfillment*.

New needs were revealed such as *social support* (C_5 expressed “*having more support*”) and *instrumental support* (C_{19} referred to “*having the probe removed because it gives me a lot of work*”). In addition, in C_4 the need for *health two* was evidenced by stating “*I do not ask for anything more than health for my child, with that I will be happy*”. It differed from the health category because it alludes to wishes favorable to the *health* of another person.

Wish four showed individual *health needs, family contact first, affection, being valued, psychic balance, other satisfactions, happiness, and possession*. The need for *affection* arose repeatedly in the expression of desires. An example of this was found in C_9 when referring to “*for my mother to be proud of who I am*”. In this case, it coincides with the new category *recognition*, understood as the prevailing need to be loved, cared for, and cared for reciprocally.

Duty and humanitarianism, first family duty, and second family duty were expressed as social needs. The *relative under care* category was reiterated as a sign of its high significance. The *medical service quality* came up when C_{14} revealed “*for this place to always be in good condition*”. In addition, *peace and social well-being* were identified (C_{13} “*unity in the community*”), from which the existence of needs with a social scope is inferred.

Participants expressed in wish five individual needs for *possession and family support* as a sign of the need to receive family care assistance from other family members. *Family well-being, medical services quality, social support, welfare, health 2, and family care* continued to manifest, which gives them relevance in the study. Individual needs also predominated such as *second family contact, happiness, and health*. While, among the social ones, *family duty first, family duty second, work, and duty, and humanitarianism* were identified.

In wish six, the need for individual *possession* predominated. Social needs were expressed: *duty and humanitarianism, family duty first, family duty second, and work*. The needs for *psychic balance, other satisfactions, health, travel, happiness, and living*, manifested as individual categories; *quality of medical services, relative under care, health 2, family well-being, transplant, and well-being*, were revealed as new emerging categories in the study.

The need for *possession* was reiterated in wish seven, in this regard, C_1 wishes to “*have a washing machine that I have not been able to get*”, C_8 “*improving the economy*” and C_{17} “*having a motorcycle*”. There is evidence of the need to hold material goods that facilitate their daily work and complement well-being and their quality of life. The need for *quality medical services* is reiterated, manifested with a high constancy in most desires. An example of this is what C_3 stated “*for my daughter to be well cared for*” and C_5 “*for always having the*

resources" which indicate the caregivers needs regarding the conditions of the services as a support to maintain the life of their relatives. In addition, *psychological attention* need was revealed, this was verified in C₂ when expressing "to not have any more insomnia", a circumstance triggered by the situation that lives daily.

In wish eight, the needs for *psychological care* emerged (C₂ "to not have any more stress and anxiety"), well-being (C₅ "for him to remain stable"), and quality of medical services (C₃ "for the doctors' care to be good"). Individual needs were identified with less incidence: to be present, health, travel, family contact, enjoyment, and other satisfactions. As social needs, family duty first and family duty second were present. The rising needs in the study were relative under care, health 2, family well-being, and transplant.

In wish nine, the need to travel is shown more frequently. Other needs such as career and profession, revolution, peace, health, enjoyment, optimism, transplant, realization, health, family duty first, family duty second, and well-being can be seen.

Finally, wish ten of the direct method showed the need to live, relative under care, religion, and well-being as the most expressed among the participants. C₃ states "hoping to live many years until I reach 100", C₅ "for him to remain with us for many more years", C₆ "may we be like our Lord Jesus" and C₇ "for me to feel good enough to be able to take care of him". While in touch with relatives, health, revolution, health 2, self-realization, work, well-being, and possession got a medium frequency, and family duty second was expressed by the minority of caregivers.

The direct method revealed a wide range of individual and social needs. There is widespread recognition among the participants of the hierarchy of favorable wishes to their relatives around a good health state. It is observed that, as desires progress, motivations towards other spheres of life-related to their personal satisfaction are revealed among caregivers.

Analysis of needs expressed in the indirect method (RAMDI)

The indirect method revealed needs coincident with the direct method, which corroborated the presence of these needs in the study subjects.

Desire 1 corresponded to the actual executing activity. The need for well-being was expressed in statements such as C₆ "to be well treated", C₁₃ "for my child to be well" and C₁₅ "to be well". This is explained by the importance and meaning that caregivers attribute to their personal well-being, the well-being of the person they care for, and their loved ones. Other individual needs were identified such as gender, living, being valued, possession, being in touch with relatives, *being in touch with third-degree relatives*, and *health*. Social needs emerged like *family duty second*, *duty and humanitarianism*,

work, career, and profession. Realization was identified as belonging to the group of other categories.

The categories of *social integration*, *freedom*, and *relative under care* were revealed; the latter with a high frequency of appearance in the direct method, which gives it validity as the subjects' central axis for motivation. The need for *social integration* was noted in C₁₆ "for him to be in touch with the society". The need for *freedom* manifested itself in C₈ justified by the choice of a female prisoner as a character. It is inferred that the need for social integration occupies a high level of hierarchy for this subject: "to get out of prison", "to not be convicted again", "to go out", and "for time to go by faster."

The expressions of the participants in wish two were categorized as *duty and humanitarianism*, *family duty first*, *family duty second*, and *work and future studies*, belonging to the group of social categories. As individual categories prevailed: *health*, *sex*, *happiness*, *possession*, *being in touch with third-degree relatives*, *other satisfactions* and *fulfillment*, group member other categories.

The needs of *offspring* and *discipline* were revealed in expressions such as C₁₀ "to have children" and C₁₂ "for their students to be disciplined". Other categories were reiterated, such as *family welfare*, *quality of medical services*, *religion*, and the *well-being* of the relative under care.

Individual needs, *gender*, *happiness*, *work*, *being in touch with family*, *being in touch with second-degree relatives*, *being in touch with third-degree relatives*, *other satisfactions*, *health*, and *living*, were shown in wish three. Social needs like *occupation and profession*, *future studies*, *family duty first*, and *family duty second* were identified. The combination of categories focused on the family caregiver and those related to the personal satisfaction of their needs was corroborated.

The motivation to fulfill the tasks that correspond to them socially, as is the case of duty for work was present. In addition, other needs such as *well-being* social well-being, *family well-being affection*, and *social support* are reiterated.

Through the analysis of wish four it was found that the needs of *possession*, *happiness*, and *living*, presented a greater prevalence. From this desire, the expression of needs in the imagination does not necessarily correspond to the actual execution activity. *Affection*, *being in touch with third-degree relatives*, *occupation and profession*, *health*, *future studies*, *family duty first*, *family duty second*, *social support*, *duty*, *being in touch with family*, *enjoyment*, *work*, *family well-being*, *fulfillment*, and *well-being* were classified less frequently. The existence of a conflict between individual and social needs was inferred, and in its solution lies the need to successfully fulfill the caregiver role.

The need for happiness was present in wish five, C₁₄ "for him to enjoy life", C₉ "to be happy", C₁₁ "for him to be happy", and C₆ "to be happy and live in peace with my family". Other needs were expressed, such as *independence*, *self-care*, *psychic balance*, *career and profession*, *possession*, *travel*, *study*, *duty*,

being in touch with family, enjoyment, living, duty and humanitarianism, family duty second, work, family's well-being health, and family duty first. Individual and social categories were combined, the former having a higher incidence. As the hierarchical level decreases, the needs around personal satisfaction increase.

In wish six, the participants expressed the following individual needs: *living, health, being in touch with family, being in touch with third-degree relatives, psychic balance, possession, and happiness.* New categories came up, like *family support, presence, and well-being.* The only social category shown was the need for *duty and humanitarianism.* The statement about the increase in the expression of individual needs as desires increase is corroborated, even the new categories focus on the satisfaction of their own needs.

Travel and enjoyment needs predominated in wish seven, both of an individual nature and recognized by the subjects as the most limited activities in their daily lives for the time required by the work they perform.

The social need *study* corresponds to the need for *self-reassurance*, focused on desires for self-improvement and study, both for themselves and for a loved one (children); as described by the eighth place on the wish list. Social needs like *duty and humanitarianism, family duty first, and family duty second* were present. Individual needs such as *being in touch with family, being in touch with second-degree relatives, living, and health* were identified. *Family's well-being, quality of medical services, and well-being* were shown as the new categories.

In wish nine, other needs prevailed, *sex, being in touch with friends, being in touch with second-degree relatives, being in touch with third-degree relatives, travel, and enjoyment* as individual needs. *Study, revolution, and second family duty* are among the social categories. *Well-being, freedom, and religion* weren't as mentioned.

Finally, in wish ten, *happiness and duty and humanitarianism were more frequent needs. Family duty first, freedom, peace, self-fulfillment, possession, and well-being* were shown less frequently. The existence of a few categories in this last desire is inferred from the low expectations of satisfaction of their needs due to the assumption of the role, several cases did not complete wish ten.

As part of the indirect method, the analysis of the created character's particularities was relevant. Most of the participants did not refer to professions associated with them. The ages varied without being related to the actual age of the caregiver. In some cases, the gender corresponded to the actual gender of the subject. In the case of C₁ and C₁₀, they reported being doctors, although their wishes did not have points of agreement between both subjects. C₁ stated the well-being of his patients, his family, and the quality of services he provides as a professional. Meanwhile, C₁₀ wished for enjoyment, possession, and offspring.

C₆ built the character of a 53-year-old kidney patient with a desire to live, health, and well-being. He infers empathy with the relative under care and commitment to their role over their individual needs. Another significant case was C₉, because his character was a 19-year-old girl dependent on a store. *His wishes alluded to being in touch with third-degree relatives, sex, fulfillment, social support, happiness, independence, enjoyment, travel, and living.* This subject is a 17-year-old who takes care of his mother, all his motivations are relegated and expressed in the indirect method.

Although we carefully explained to them that they should respond from the character point of view, imagining that they were in the position described, the answers were expressed in the third person, without assuming them as their own. The method showed categories of a personal nature such as *happiness, living, work, possession, travel, and enjoyment.* Assuming the character's position allowed them to project their true needs and depersonalize from the role they assume, except in the case of C₆.

Hierarchical differentiation of needs according to gender

In the frequency analysis of the expressed needs (Table 3), the individual categories in both genders predominated. It was found that regardless of gender, caregivers prioritized attention to their family member's demands, to positively influence the health of the person under care. The motivation in both focused on the caregiver role to promote a better quality of life for their loved ones.

Table 3
Individual and social categories per gender description

	Individual Categories		Social categories		Categories linked to care		Other categories	
	Absolute	Row Relative	Absolute	Row Relative	Absolute	Row Relative	Absolute	Row Relative
Men	24	48.98%	10	20.41%	10	20.41%	5	10.20%
Women	155	41.89%	108	29.19%	92	24.86%	15	4.05%

Source: Own elaboration

Analysis of correspondence between needs and their behavioral expression in the activity

The RAMDI activity record showed that 55% of the participants slept less than eight hours at night. This situation can negatively influence the quality of life



and is fundamentally given by the time needed by the relative under their care. 60% do not work, and most caregivers quit their job after treating their family members. These figures frame the complex situation experienced by the caregiver in their daily work.

The set of activities they carry out daily focused on helping their family members, both the caregiver and the rest of the family members with whom they live. It was evident how the person who assumes the role of caregiver has other responsibilities associated with the performance of domestic activities: 55% help and care for their parents, 70% for their siblings and spouse, 30% for their grandparents and uncles, and 75% for their children. Activities related to leisure, fun, and recreation were not a priority anymore.

It was confirmed that the subjects' actions are aimed at care as their greatest responsibility, making it impossible to meet other needs. There was adequate correspondence between the desires of the direct method and the assumed duties, mainly in the first desires. The direct method showed no correspondence with the actual behavior, although wishes of well-being and health for the relative under care prevailed, other unmet needs prevailed in the activity. There was the dissatisfaction of individual needs to prioritize the proper fulfillment of the role. It was shown that, although they feel the duty to perform the task they assumed, they have other needs delayed by the unavailability of time and support, both social, familiar, and institutional, to fulfill them. From the discrepancy between the responses to the direct and indirect methods, it can be inferred that these indicate areas of conflict of motives, deprivation, or frustration of needs.

DISCUSSION

The sociodemographic profile of the caregiver agrees with that described by several authors in the predominance of the female sex, regardless of the culture or type of care provided is the woman who assumes the role (Martínez, Grau, & Rodríguez, 2017; Martínez, *et al*, 2018). Unlike Minzana and Arentana-Restrepo (2017), the mean age was represented by caregivers in the fifth decade of life (León, Ávila & González, 2020; Beers, *et al*, 2021).

The caregiver is forced to interrupt or modify their usual rhythms of life to accompany the activities of the renal patient, such as feeding, mobilizations, and cleaning, which may be of greater or lesser complexity according to the degree of disability or invalidity that the patient presents (Abate, 2017). Support needs are not met (Rosado *et al*, 2021), these are related to health status and medical care. The attribution of personal meaning to the role from the social, family, and personal commitment, is established as a means to compensate for and satisfy the needs of recognition, affection, acceptance, and self-assessment (Martínez & Grau, 2017). It was found that

the caregiver is the main source of emotional and social support for the patient. The creation of services to provide emotional and economic support for care and caregivers is relevant (Kehr *et al*, 2020).

The assumption of multiple roles in the home and the care, not only of the renal patient but of several family members, corresponds to an imminent sense of duty as a mobilizing element of the motivational sphere (Torres *et al*, 2021). Caregivers prioritize compliance with care to ensure the family member's quality of life in hemodialysis and stop prioritizing their goals, aspirations, and life project.

The results obtained using RAMDI allow the expression of needs to be contrasted by direct and indirect methods. In most cases, the desire referred to the welfare and health of the care relative was mentioned equally in both methods. This need is oriented to both reality and imagination, as well as actively and passively on a subjective plane. There is a possibility of satisfying the need in the middle (González-Serra, 2008). Corresponding to the activity record, the daily behavior of subjects focuses on the full-time care of the relative in hemodialysis.

Needs related to enjoyment, pleasure, and joy of life showed a greater incidence in the indirect method than in the direct one. These needs are oriented more toward the imagination than toward reality, that is, they are oriented more passively than actively. They have possibilities of satisfaction in the middle (González-Serra, 2008). However, they conflict with other key needs such as family care and support needs. That is why they are deferred to a passive plane.

Regarding the discrepancy between the responses to the direct and indirect methods, it can be inferred that they indicate areas of conflict of motives, deprivation, or frustration of needs (González-Serra, 2008). In correspondence, the study exhibits guidance for the care of the relative with a notable dissatisfaction with individual and social needs. The studies of González-Serra (2008) on psychological needs in different populations constitute an important reference for the present research, therefore, the relevance in the comparison of results.

In addition, another Cuban research shows dissatisfaction related to the breakdown of future projects, given the uncertainty of the duration of the disease, and care demands (Oria-Saavedra, Mastrapa & Aguirre-Raya, 2021; Labarca & Pérez, 2019). These aspects generate anxiety and loss of hope to meet their needs (Rodríguez, *et al*, 2021; Oria-Saavedra, Mastrapa & Aguirre-Raya, 2021; Martínez-Debs, Lorenzo & Llantá, 2021).

The above criteria confirm that caregivers present motivational guidance for the care of the family member with a notable dissatisfaction with individual and social needs. The study exhibits the act of caring for a sick relative as a condition that limits the enjoyment of life.

CONCLUSIONS

The caregivers of patients in hemodialysis direct their needs towards the proper fulfillment of the role assumed as family duty and in correspondence mobilize their daily behavior. They express both social and individual needs, giving greater hierarchy to those referred to the role of caregivers and relegating the needs focused on individual satisfaction. There is a link between both genders since the motivation in both is focused on the caregiver's role to promote a better quality of life for their loved ones. It is pertinent to conceive care as the central axis of social protection systems, which should be aimed at achieving intersectionality, approaching it from a gender perspective, and addressing individual needs.

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ANNEX 1

Activity record and direct and indirect method (RAMDI) questionnaire.

Direct Method

Read these instructions carefully:

Write below ten wishes of yours. Both what you want and what you don't want. You must be completely sincere. You don't need to think much to answer, write down the first thing that comes to mind after reading the sentences.

1. I wish for _____
2. I wish for _____
3. I wish for _____
4. I wish for _____
5. I wish for _____
6. I wish for _____
7. I wish for _____
8. I wish for _____
9. I wish for _____
10. I wish for _____

Indirect method

Please read these instructions carefully:

We ask you to invent a story about a person as if it were a character from a movie. Create a character.

How old is the person or character in your story? _____ years old.

What is their gender? Male _____ Female _____

What's their current situation? What do they do? _____
_____.

What does this person wish for? Write down ten wishes for this character. Both what they want and what they don't want.

1. He or she wishes for _____
2. He or she wishes for _____
3. He or she wishes for _____
4. He or she wishes for _____

5. He or she wishes for _____
6. He or she wishes for _____
7. He or she wishes for _____
8. He or she wishes for _____
9. He or she wishes for _____
10. He or she wishes for _____

Activity Log

How often do you carry out your activities in your daily life?

Below is a list of different activities. Indicate with the numbers 5 or 4 or 2 or 1 or 0, in the right margin of the sheet what activities you carry out in your current daily life (think about the last month) and how often you carry them out:

- 5 If you do this activity all or almost every day.
- 4 If you carry it out more than 15 days a month, but not almost every day.
- 3 If you do it between 15 days and 5, days at least.
- 2 If you do it 1, 2, 3, or 4 times a month.
- 1 If you never or rarely do it.
- 0 If in your current life there are no conditions or causes to carry out this activity

The most important thing is to be sincere. If, in addition to the activities indicated in the list, you carry out another that does not appear, write it at the end of the list indicating its frequency.

Activity list:

1. Sleeping eight hours a night.
2. Get less than eight hours of sleep at night.
3. Sleeping more than eight hours at night.
4. Bathing, washing.
5. Have breakfast.
6. Dressing or changing your clothes.
7. Go to the study center and attend classes.
8. Being on time for your classes.
9. Attend all the classes you have each day.
10. Working.
11. Meet the demands of your work promptly.
12. Have a snack.
13. Talking to coworkers or classmates.

14. Have lunch.
15. Visit or be visited by a coworker or classmate.
16. Talk to a neighbor or friend.
17. Visit or be visited by a friend or neighbor.
18. Help a neighbor, classmate, or friend. Do them a favor.
19. To carry out or participate in some activity of a political nature guided by political or mass organizations. Fulfill a political duty.
20. Study materials from your school that go to final or partial tests or perform jobs ordered by teachers.
21. Showering.
22. Eating.
23. Helping your parents, taking care of them, fulfilling a duty to them.
24. Helping your siblings. Fulfill a family duty to them.
25. Helping your grandparents or uncles. Fulfill a family duty to them.
26. Helping your spouse (husband or wife). Cooperate with him or her.
27. Helping your children. Treat them properly. Fulfill your duty as a parent.
28. Helping your spouse's family and children. Fulfill a family duty to them.
29. Fulfill your job's tasks, but outside of it, in your free time.
30. Seeing your girlfriend or boyfriend.
31. Being in the company of your wife or husband.
32. Establishing sexual relationships. Make love.
33. Spend time with a person that is not your wife or husband, girlfriend or boyfriend, or your love partner.
34. Helping your girlfriend or boyfriend, your love partner.
35. Helping your girlfriend or boyfriend's parents, or your love partner's parents.
36. Spending time with your girlfriend, boyfriend, or partner's parents.
37. Going to the doctors (visit, check-up, or treatment).
38. Taking or applying medication.
39. Rest or sleep during the day.
40. Drinking coffee.
41. Smoking.
42. Reading the newspaper or magazines.
43. Read novels or other books just for pleasure, interest, or entertainment and not for work, studies, or any other duty.
44. Listening to the radio.
45. Watching TV.
46. Going to the movies.
47. Going to a cultural, musical, or sports show.
48. Exercising, playing sports.
49. Carrying out an artistic activity: singing, playing an instrument, dancing, painting, modeling, writing, acting, etc...
50. Playing (hobby or game).

51. Going to the beach.
52. Partying.
53. Going out of town or city, like a trip or distraction.
54. Talking with your parents.
55. Talking with your siblings.
56. Talking with your uncles or grandparents.
57. Talking with your children.
58. Talking with your spouse's family and children.
59. Grocery shopping.
60. Going to the mall to buy clothes or other items.
61. Do some kind of management to acquire or recover personal property (clothes, articles, furniture, etc.).
62. Doing chores to your benefit or the benefit of other members of the family.
63. Doing chores just to your benefit.
64. Fixing something in the house or looking for someone to do it (painting, carpentry, electricity, etc...)
65. Meditate or make plans.
66. Drinking alcoholic drinks.
67. Another activity.

Shared meanings of the school culture's symbolic universe in the merging of preschool, elementary, and middle school scenarios

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— Abstract—

The present work addresses, which consequently has generated the pronouncement of the aims of education in the 21st century; challenges to the teaching and learning transformation process, its task is to provide learning so that it becomes meaningful, relevant, and useful knowledge for life. Each school is involved in the context that gives it its own culture; the content by the attitudes, values, beliefs, and habits and the form of the representations of association, characteristics of the school groups, and space of construction of their identity. These relationship spaces where the elements that structure a code of its own are established, giving rise to the legitimation of school culture, allow explaining the reproduction of teaching and learning in schools from their habitus that derives in a cultural baggage built. The objective is to analyze the observations at different times to obtain from the practices of preschool, elementary, and middle school teachers the social reality that builds the meanings that make up the school culture in the spaces shared between these scenarios. The selection of three basic education schools; one of preschool, one elementary, and one middle school contained the focus on three subjects: Mathematics, Geography, and Science II, all these of urban development, to investigate how the meanings that make up the school culture are constructed, the observations integrate the first data collection and analysis phase, the cases are selected for their similarities, then they are chosen for their differences. The social relations to understand this reality from ethnography are explained in this work, where the school culture sets its own goals under the position of the scope of its autonomy that it has configured, a consolidated space where the functioning of symbolic capital allows certain functions.

Keywords:

Elements of culture; symbolic capital; situated practice; social group; identity; changing environments.

Each school is immersed in its cultural space comprised of attitudes, values, beliefs, habits, and the exposed way in the representations of association, characteristic of the school groups where its identity is built, that is structured in its own symbolic capital.

These spaces of relationship, where the elements that structure a code that integrates its symbolic capital are established, integrated by the interactions that legitimize the teacher's practice in the classroom for the internalization of school culture, allow to explain the reproduction of teaching and learning in schools from their *habitus* that derives from a built cultural baggage, that is, their internalized dispositions of the perceptions and feelings of teachers that are built from the interaction in community.

The aims of 21st-century education allow the emergence of a paradigm where complexity, as a synonym of the challenge to the teaching and learning process transformation, establishes processes where students have the task of achieving learning for it to become significant, relevant, and useful knowledge for life, responding to a way of living, producing, consuming and relating to finding the definition of socialization; teaching and learning challenges, which allow them to face the situations that arise in life. In this unstable environment that determines the new trends in education, teaching practice is addressed in changing and diverse environments, where today, a variety of sources are proposed that must be selected from the students' needs for the information management, thus attracting creativity, pondering, the generation of flexible thinking, problem-solving, collaboration with others and the formation of personal goals and the design of strategies to achieve them, scenarios that have changed as a result of technological progress that changes the ways of thinking, feeling and relating.

Teaching practices based on their habits explain the reproduction of teaching in schools, where in this context, teaching practice requires transforming itself along with these new requirements necessary for the formation of citizens, schools show their resistance as an immediate response to uncertainty; objections derived from a built cultural baggage, *establishing their own goals* under the position of the scope of their autonomy that has been configured and that is manifested in its effects.

In this cultural context, the perception, evaluation, and performance of its participants give life to their social trajectory, actors who, with their thinking, inhabit them and keep them active, alive, and in force, associating their socially defined position as a school collective.

So, we should ask what are the elements that teaching practice has assimilated from the in situ school culture? How are the constituent elements of on-site school culture related in teaching practice at preschool, elementary, and middle school levels?

Aiming at the analysis of the observed preschool, elementary, and middle school teacher practices, highlighting the social reality where the meanings that make up the school culture are built and shared between both educational levels.

The issue of obtaining information through participant observation is selective, that is, social categories emerge from inductive processing, from the micro-ethnography that is carried out in the process of this work, and the interactive aspects are interpreted parallel to the construction of categories, allowing to classify the data collected according to units of content giving rise to a process of management and organization to connect the results obtained to a more extensive body of knowledge, interpret them and give them meaning.

The theoretical field has the purpose of focusing on the interactions where the elements of culture are manifested, forming a corpus for the understanding of socially constituted and shared by teachers as a social group.

METHODOLOGY

Three basic education schools were selected: one preschool, one elementary, and one middle school with three subjects: Mathematics, Geography, and Science II selectively where social categories emerge from inductive processing, the data collected allows to generate the connection between categories, focusing on the interactions where the elements of culture are manifested, forming a corpus for socially constituted and shared understanding, to investigate how the meanings that make up school culture is constructed; the observations integrate the first phase of data collection and analysis, the cases are distinguished by their similarities, subsequently they are chosen for their differences, the similarities allow the creation of categories, the differences make it possible to find particularities.

The ethnographic approach explains these social relationships to understand reality from the moment the data emerge (Glasser & Strauss, 1967).

The theoretical field that focuses on the elements of culture interaction forming in the *habitus*, finds its purpose in the understanding of socially constituted and shared with the group of teachers, where the identification, communication, and interaction of categories becomes possible (Glasser, 1992).

It is a micro-ethnographic work that takes three schools as a selective sample that collects the data of the empirical study, carried out from the interactions of the actors, starts from the idea of the basic elements of the school culture that constitute the relationships between the actors: the procedures, rituals, values, and norms considered as a part of the school culture because this is a condition that very powerfully influences the possibilities of changes in educational institutions and their orientation (Owens, 2001).

In this regard, Criado (2004: 82) expresses that the culture of schools is a thought that emerges from generating reproduction, "prefiguring concepts generated by actors, a process that explains the production of reproduction."

GUIDELINES CONSTITUTING THE SCHOOL ORDER

Below are descriptive cuts of the teaching practice generated by the teachers observed in various didactic ways that make up the symbolic structure manifested in the teaching actions, where the actors constitute a model that serves as a central element guide between these three indicated educational levels:

The teacher takes notes on her list:

Teacher: I'm going to cross it out because a girl has already passed.

One girl goes on to say something about February 14

Teacher: We also marched.

The teacher emphasizes what day it was:

Teacher: it was on the 14th.

Ma: Was it Friday?

The essential basis of the pedagogical practice is questions and answers, the expectation of transversality emerges from the context, where it is addressed to make way for the objective that is pursued, thus generating a social construction as an institutionalized entity in this school culture.

In elementary education, the procedures are shown in the following description of the practice:

The teacher tells the group to take out their coins:

Teacher: those who brought their coins today, raise your hands so I can count you.

The teacher replies:

Teacher: that's ok, thank you.

The teacher indicates that the activity is going well:

Teacher: very well, very well.

The teacher points out the product and the coins with which she pays, and they must say how much left there is:

Teacher: Now we are doing this activity because we must see the amounts you need to complete a number, and you are going to tell me how much change you should give me.

The methodological procedures are guided by the teacher based on the instructions that boost the realization of the activities, as well as reasoning questions to find the results.

In middle school education Math class, the teacher starts the class by noting the subject title on the board:

Teacher: criteria of similarity of triangles.

This action is considered by teachers as a normative process to opening the classroom scenario:

Student: Three students at the front are waiting for the presentation to start.

The students wait for the teacher to give them directions to start the class presentation.

Teacher: Quiet! There will be teams of congruence and similarity, and you will win a point for your grade.

The teacher explains what the rules of participation will be, so the students start with the indications given by the teacher:

Student: begins to read the content of his sheet, referring to the criteria of similarity between the triangles to the students that are listening quietly, side-by-side criteria.

The teacher's instructions, and the establishment of the participation rules allow to define the teaching and learning process. The following methodological guidelines can be seen in the middle school Geography class:

The teacher starts by presenting three questions to the group that will be answered according to the movie:

Teacher: First question.

First question:

Teacher: What is the relationship between aquifers and the water cycle?

The teacher explains what the answer to the question should contain:

Teacher: How can you explain the earth's characteristics if it had another dimension?

Next question:

Teacher: Why is it important to know the temperature and climate, and what is it for?

Third question:

Teacher: What do you know about carnivorous plants?

The teacher encourages them to search for the answers to the questions:

Teacher: Ok, ready!

The class is based on questions that will be answered by watching the movie, which aims to guide the class process. In the middle school Science II class, the teacher, who explains to the students about the temperature, answers himself:

Teacher: -When I apply temperature to it, it is solid; then it is composed.

Students stand up to signal that they want to participate:

The teacher continues with the class.

A student answers the question:

Student: He says that by applying heat, the matter is transformed.

The teacher clarifies:

Teacher: There are three states of the matter

The class keeps the following normative guidelines: the teacher's prompts and approaches that lead to the answers.

Teaching practice describes a complex scenario by the interactions that are lived where they are taking place, they contrast to reach the answers reformulated by the teacher.

In the pedagogical practice of preschool, teacher guidance persists through questions and answers, as well as the approaches that students attract to their immediate context, knowledge of the social and cultural context is noticed, a process that presents the interaction rules (Barros, 2014: 15).

The theme that the teacher addresses on February 14 allows us to notice a cultural context *in situ*, where students live a moment of relationship with the surrounding environment, giving meaning to the didactic process, that is, continuing to carry out a certain action that requires order, procedure, succession.

Teaching actions include a space of practice based on norms and principles of school culture that are constituted in particular norms, which means that each school can have a common and own character (Bolívar, 1996).

These procedures are part of a learning environment, comprised of schemes that make a practice of the context, seen as a didactic of learning for students and forms of teaching for teachers, where these procedures are basic for learning, that is, an established social order that develops the solution of the problem. School culture affirms a theoretical production, giving a social configuration for teaching practice.

In the practice of the elementary teacher, conducting the class through the use of the coins that are exchanged between the students, where they add and subtract, allows for ensuring the understanding of these operations.

According to Martínez (2008), learning is something recurring in people's lives as well as the construction of ways of living by participating in coexistence with others. Therefore, education is a social experience, in which since their childhood, a person gets to know themselves, enrich their relationships with others, acquiring and renew the bases of theoretical and practical knowledge (Delors, 1996: 19).

In middle school classes, methodological procedures generate communication processes that are established in the group and integrate argumentation, conflict, negotiation, and consensus, where explanations, exhibitions, and questions to students from the school culture that are permanently interrelated with social actors with stories and contexts of their own lives, integrate into the construction of the classroom culture; habits shared by its members structuring a school culture, a system determined by the traditions, techniques, and values that permeate teaching practice (Gimeno, 1988).

The relationships between the actors of the process allow us to notice that the teacher and the students establish a relationship of dependence, a communication is established that guides and allows regulating the students, they seek to be included in the relationship of the teaching and learning process, the production of their practices incorporate their thoughts, forming a set of schemes of perception, *habitus* in which students develop, because these sets of relations, says Bourdieu "are structures that contribute to the construction of the world of objects, they construct in practice a world of objects built according to contextual structures making possible the reproduction of culture in schools" (1980, 129-130). In this actors in the process relationship, they establish an ability to influence others, where the power that the teacher exercises is legitimated institutionally, not only because of the relationship between the teacher and the students but also the structuring of the identity of the two actors (Jackson, 1992; Delamont, 1985).

Existing social relations involve power relations with the use of the mechanisms, techniques, and ways used to obtain power in a relationship (Foucault, 1992). The teacher, in the relationship with students, aims to guide, lead, and influence the behavior of others, so educational situations are elements that shape the state in which the learning process occurs in the school (Delamont, 1985).

The cultural elements of teaching practice structure their ways of promoting work with students and proposals that shape the relationship between participants, their discourses constitute the *habitus* that structures the culture of the actors, through a process that includes particular initiatives along with empirical adaptations and appropriations of theoretical and normative proposals, transmitted collectively.

These representations of teachers and students have common aspects, a context where teachers are generating a school space in which students are integrated into rules of participation relationship regulated by the rules, this relationship between the actors in the process allows learning because the strength of this relationship is the essence of the pedagogical process (Delors, 1996).

In the case of the Sciences II subject in middle school, the teacher, at the beginning of the class reminds the students that he has asked them for the material, this relationship is manifested in a regulation constituted by learning environments where students anticipate the action and its consequences; that is to say, a *habitus* where the symbolic capital perceived by them as social agents whose categories of perception are such that they generate a normal daily space, where interaction conceived as a two-way process considers joint participation and active involvement of both participants, based not only on "a response to" but also on "an anticipation of". The two parties, therefore, intervene at the same time, externalizing their views, and manifesting the position of the other, which allows realities to be built that structure the way the class operates as a consequence of the interaction.

The pedagogical culture is organized according to value frames so that the management of the preschool group manifests ideas, emotions, acts, and attitudes because they possess qualities under which they are appreciated, desired, or recommended; students, especially at the stage of the socialization process, are led, consciously or unconsciously, by a didactic situation considered as an internal process of the group.

In a communication framed by praise and respect for others, the indications of the teacher show the goal pursued in teaching actions in the presentation of school content, ie, a situation of school organization that has a meaning; further designates a way of being, a habitual state, a tendency, a propensity or an inclination. (Bourdieu & Passeron, cited in Tenti Fanfani, 1981: 261).

In the elementary group, students express their characteristics learned in the family; the teacher also promotes the generation of value by supporting their peers when they need to solve their exercises in which they manifest doubts, a prevalent action within a social group.

Students' opinions establish the relationship with the social environment from which they extract information to give meaning, through reconstruction and interpretation and from the dominant culture, to the values instilled by the school according to the social origin of the actors, therefore the success of the students is established, by its greater facility to incorporate the values of the legitimated culture in the school.

The presence that forms the school culture is regulated by norms where the normative barriers generate the immediate spaces; scenarios that comprise a physical, emotional, and interrelated environment that occurs between actors, where explicit and implicit rules for the regulation of school coexistence are manifested.

Social interactions are regulated through rules that regulate the interpersonal relations of the group.

According to Stenhouse (1974), the direction of the classroom consists in conducting a set of activities of the subject that corresponds to the school

curriculum, where the norm marked as a discipline appears as a reference to allow the control of the group, which aims at driving the learning objectives towards obtaining cognitive processes.

The rules are present at all times and in all the actions of the teacher and students because all social practices are always defined by rules and in it, attitudes and behaviors, knowledge and ignorance, affections, thoughts, beliefs, and ideologies are always manifested.

For Dewey (1998: 45), "control consists in focusing impulses acting at the same time on some specific purpose and introducing an order of continuity in the succession of acts; mandates, prohibitions, approvals, and disapproval come from those of influencing the acts of students", so they acquire control in their actions, and these are adapting to what others do; however, the power of the teacher, from a critical perspective, can create in their students ways of resistance, contexts that contribute to obedience without reflection, reproductive elements of symbolic production processes.

The context of receiving indications makes the class an instituted environment in which, for the students it is the teacher who carries the responsibility of participation, and they only limit themselves to obey. This environment regulated by obedience and respect for indications is a traditional reproduction process.

The teaching culture without reflection is ritualized because of the central belief of pedagogical processes, where the symbolic language of the school environment generated by repetitive actions, has a high symbolic value in a given cultural environment. In this regard, McLaren (1995) states that the pistons generated in the school by the repetition of actions routinely become rituals; students' acts acquire control in their actions, and these are adapting to what others do; that is, the hidden domain of school culture, however, the power of the teacher from this perspective of ritual can create resistance in the learning environment.

The school as a social organization creates ritualistic, hidden, and intangible elements that gain strength in pedagogical practice and socializing elements of school culture. In this regard, McLaren (1995) states that behind each ritual there is a myth that symbolizes a central belief in culture, hence the rite ends up being a practice, in this way the teacher takes responsibility telling the students how to do the activities.

The teacher, when asking, gives indications to move from one state to another according to the purpose that she pursues in this sense, generates changes from one activity to another. Van (1986) considers that a rite is a social vision where it is assumed to be a step from one state to another, therefore, the actions of the teacher could generate a ritualistic siege in the space of teaching practice.

The middle school mathematics teacher takes attendance doing a marked ritual that gives certainty to what is manifested as the meaning of attendance where the presence and expression of being present manifest the existence of rights and obligations granted by spaces symbolic of the classroom.

According to Terrence and Kennedy (1982: 67), rituals offer a sense of security and a common identity and give meaning to classroom activities.

The Geography teacher addresses it by saying "guys" to which they reply greeting. The teaching practice carried out among the various teachers of the educational levels is a socializing process, where the ritual is integrated, that is, the fulfillment of daily duties, gives rise to a traditional situation between both educational levels, where these allow teachers to formalize their action, a socializing element with forms of attachment to tradition and stable behavior, which integrate the formal teaching action, prescribed to hidden and intangible elements of pedagogical practice, giving security to the teacher.

These actions consolidate a certain sense of order that is taking the form of a ritual, according to Terrence and Allan (1982: 67), a sense of security and identity is assigned, generating a corporate culture based on a crossover of elements such as history, values, beliefs, rituals, ceremonies, stories, heroic figures, and an informal cultural network.

THE CORPORATE CULTURE CREATED FROM THE CLASSROOM RITUALS

The culture created is a product of the appropriations and empirical adaptations contained in a corporate teaching practice, where teachers put into play the teaching process where they have been linked to the search for learning results. The complex world of school involves teaching practice in a culture, through a process that includes particular initiatives, appropriations, and empirical adaptations of theoretical and normative proposals and transmitted in a corporate way (Fraile, 2015).

The practice carried out in preschool, elementary and middle school, on top of starting from instructions, questions, and answers as a way to process information, is teachers' work as social actors who contribute to the reproduction and perpetuation of traditions that become rituals that are permeated in the school culture, which allows putting into play its professional symbolic capital, where the personality of the teacher establishes the relationship between the actors of the process; "cultural capital as known and recognized" (Bourdieu; 1987, 160).

The categories of perception are to receive the indications and adhere to them, to follow the forms that the group maintains to show that it has learned, ie a series of meanings that allow the construction of those realities of school culture, where practice supports the relational concepts of the

habitus necessary for entry into a particular cultural field. They are considered mental and practical schemes, resulting from the incorporation of objective social visions and divisions that configure principles of difference and belonging to certain fields (Bourdieu & Wacquant, 1995).

This aural space, with all its forms of relationship of social actors, allows giving meaning to the perceptions of students and teachers where traditional patterns give security to their practice, actions that concretize the symbolic capital of the classroom, giving value to these categories of perception (Bourdieu, 1994d).

The list of actors is linked to the classroom strategies that include all practices aimed at the production and reproduction of the students' life, where the strategies of social reproduction in this regard (Bourdieu, 2006, 122) expresses that this is "a [...] a set of phenomenally different practices through which students and teachers consciously or unconsciously tend to preserve or increase their heritage and correlatively maintain or improve their position in the structure of class relations".

McLaren (1995) states that the classroom rituals, instruction rituals, have the consistency of individual classes that take place daily in classrooms in which tasks and attendance have multiple meanings, to obtain a note generated by the transmission of the cultural capital (Bourdieu, 2006).

McLaren (1995) says in this regard that classroom practice is associated with motivation and school performance; where the rituals of intensification, are emotionally reinforced by adding to these actions the teacher's authority where the mediated decisions of the activities to be carried out, how and when they will be carried out, use some subtle procedures to sanction behavior that is inappropriate for the teacher.

As for the rules, each school presents a culture where its methods and practices shape the practice of teachers who define its *habitus*-generating practices and differentiated ways of perceiving others.

The "cultural consciousness" according to Cohen (1982), expresses a recognition of us, this is the first statement of school culture, a product of a historical past where invented traditions appear that are a series of practices normally governed by rules accepted in an explicit way and of a ritual or symbolic nature that aims to inculcate certain values and norms of behavior through repetition (Habsbanw, 1983: 1).

The school within its classrooms aims to become spaces in which silence dominates, administered by a figure of authority focused on the teacher, who has ownership and power over the classroom. The school is shown as an organization anchored in tradition, which feels comfortable and safe when supported by ritualistic practices that recognize that they have worked to control the group. Elements that have been generated in teaching practice and that have been amalgamated giving life to school culture

and that we have analyzed here, which are: Procedures, values, norms, and rituals, these belong to a field, according to Bourdieu (2003), is a system of social positions that are related, that is in this field.

It allows the interaction of some elements that depend on others, they interact with each other, they are not isolated from each other, according to Runge, Klaus, Gaviria, and Alejandro (2010), the field is dynamic, flexible, social, and historical, therefore a field is "[...] a particular system of objective relations that can be of alliance or conflict, of concurrence or cooperation between different positions, socially defined and instituted, independent of the physical existence of the agents that occupy it" (Moreno, 2003: 16).

This allows focusing the elements of culture, that is, they belong to a field forming a structure because this is the arrangement and order of the parts within a whole. It is also understood as a system of coherent linked concepts, whose objective is to clarify the essence of the object of study (Hernández, 2012).

The elements of culture, as procedures that make up the teaching practice that is required to promote learning, are actions that are considered valuable classroom outcomes, structured institutionally, therefore, they become the center of the pedagogical culture in these schools.

In this context, the teaching practice imposes the rituals that in each school are established as a pattern of behavior reinforced by the actors of the school processes, that is to say, a series of customs that mark the practice of how things are done that are settled and naturalized. Another element of culture are the rules that go hand in hand with the central process and that are confused with procedures and norms in which the procedures come to an end, continue the covert elements of the procedures as are the values, which refer to what they should do according to the teacher's instructions and what they should not do to achieve through the procedures, the aims that are pursued, that is, what the teacher believes is "good", "correct" or "desirable". They reflect, as (Fullan & Hargreaves, 1999) says.

In this dynamic, processes, values, norms, and rituals make up a terrain, Bourdieu's theory of fields (2003) allows for reconstructing the frames and configurations of the production of knowledge, in other words, the disciplinary and professional field of pedagogy becomes its own (Runge & Muñoz, 2012).

The above highlights the theory of fields as a space for the construction and reconstruction of pedagogical knowledge; therefore, the school is a mediating element between culture and the learning processes, recognizing the spaces of socialization, construction, and development of traditional knowledge.

García (1999: 83) points out that identity is understood as a link of qualities, experiences, signs, and situations of the social environment that allow a subject to differentiate a particular individual or a particular social

group because culture is the informal code that states "how we do things here" (Bower, 1966).

The school's organization is a culture, understood as a system of meanings and the result of social interactions between actors because it represents the identity of the actors (Smircich, 1983: 347-348).

Therefore, the pedagogical field is; "[...] the discipline that conceptualizes, applies, and experiences the knowledge related to the teaching of the sciences exhibition, as well as to the exercise of knowledge in the interiority of a culture" (Zuluaga *et al.* 2003: 111).

So, what is done in schools and that shapes the school culture is an anthropological phenomenon generated by praxis as human and transformative, to approach the understanding of formative educational practice as a basic aspect within the context of joint human and social praxis (Benner, 1996).

Therefore, the elements of culture presented here are a field shaped as human praxis, which is fed back by school culture, the result of the corporatist formation of the social context.

CONCLUSIONS

The goals of education of the 21st century are presented as spaces for resistance because schools form a school culture where its elements are pedagogical methodologies, relationships between actors, rituals, and norms, integrate the identity that surrounds the social environment where culture forms the system of meanings resulting from social interactions between the actors that drive a field shaping a structure of arrangement and order of the parts within a whole.

The observations made allow us to construct this theoretical approach where it is explained that schools have as a resistant shell to the attacks of the aims of education, the culture they have built, and that explains the way of doing their practice in their reproductive function within their scenarios where their symbolic capital operates built by the plots and configurations of the production of a culture integrated to a field of its own.

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The ratio of Mezzanine Distortion in Steel Buildings with a new Earthquake Damage Potential Index

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— Abstract —

The expected earthquake damage in the buildings can be determined with the maximum mezzanine distortion (θ_{\max}) and depends on the building type and the earthquake characteristics. In this research, a new earthquake damage potential index ($\text{DPI}_{\text{SaT}_1\text{-I}_A\text{-}\Delta\text{I}_A}$) is presented based on its Arias intensity (I_A), its significant duration (Δ_{I_A}), and the spectral acceleration for the fundamental period of the building (SaT_1). In addition, predictive equations are developed to determine the θ_{\max} as a function of the new index. Two 2D buildings, with 3 and 7 stories, are used, and Oaxaca City, Mexico, is considered the study area. Forty-six accelerograms of horizontal components of real strong ground motion records are used. For these accelerograms set based on a spectral matching method, accelerograms with spectral response compatible with the design spectrum of the Mexican seismic standard from the city studied are generated. The seismic response of the buildings is obtained by the incremental non-linear dynamic analysis. The results show a good correlation between θ_{\max} with the SA_{T_1} and I_A in the analyzed set of compatible accelerograms. The $\text{DPI}_{\text{SaT}_1\text{-I}_A\text{-}\Delta\text{I}_A}$ proposed has a better correlation with θ_{\max} than SA_{T_1} and I_A , for real and compatible accelerograms in the two buildings studied. Therefore, it can be a better alternative to measure the destructiveness potential of seismic action. Finally, the predictive equations were developed to allow the new index to correctly relate to the θ_{\max} for compatible seismic actions in steel buildings.

Keywords:

Inter-story drift; significant duration; spectral acceleration for the fundamental mode; steel frames; destructive potential of earthquakes.

As a learning of the different seismic events that occurred in recent decades, it has been demonstrated that the damage that occurs in buildings during these events is related to the lateral displacements that occur on the floors of the buildings (Barbat *et al.*, 2010; Kostinakis *et al.*, 2014; Perrault & Guéguen, 2015). To ensure proper behavior of buildings in the face of seismic actions, current regulations in the world, such as ASCE 7-16 in the United States (ASCE/SEI 7-16, 2016), the Civil Works Design Manual of the Federal Electricity Commission of Mexico (MDOC-CFE, 2015), Eurocode 8 (CEN, 2019), establish the lateral displacements allowed for the different structural systems. This is done by limiting the maximum difference between the lateral displacements of consecutive floors produced by seismic forces, divided by the mezzanine's height; this value is called "maximum mezzanine distortion" (θ_{\max}). For the θ_{\max} estimated in a seismic evaluation to be adequate, it is vital to make a correct definition of the seismic threat of the study area. In the field of seismic engineering, the two most accepted ways to characterize the seismic threat of a site are accelerograms and response spectra. Accelerograms are temporary records of the site at ground acceleration values measured in two orthogonal horizontal directions (North-South [N-S] and East-West [E-W] component) and one vertical occurring during the seismic event. The use of accelerograms in a non-linear dynamic analysis (ADNL) of a building in its incremental dynamic analysis (IDA) mode (Vamvatsikos & Cornell, 2002) allows estimating the temporal evolution of the maximum response of the structure in terms of forces, displacements, etc., depending on the increased variable that, generally, is the intensity of the seismic action. In this way, the possible expected consequences (damage) in the buildings are adequately obtained (Díaz *et al.*, 2018; Kazantzi *et al.*, 2014; Vamvatsikos, 2014; Vargas *et al.*, 2018). On the other hand, the respective "acceleration response spectrum (Sa)" can be obtained through the accelerograms; the same that represents the expected maximum of soil acceleration and the respective spectral accelerations for different structural periods (Newmark & Hall, 1982). In the seismic regulations in a simplified way, the seismic threat is characterized based on the so-called "design spectra (Sa design)"; obtained as an envelope of the seismic response spectra of a site or as a result of a seismic hazard study, where the influence of all possible seismic sources, their historical seismicity (or frequency with which earthquakes occur) and their intensity are contemplated; in addition to the means of propagation of seismic waves from the hypocenters of the earthquakes to the site under study (attenuation laws depending on the magnitude and distance) (McGuire, 2004; Pérez *et al.*, 2015). Thus, for the fundamental period of oscillation (T_1) of each building within the design spectrum, the spectral acceleration defining the design seismic forces for the building is determined.

The structural system of the building (reinforced concrete, steel, masonry, etc.) and the characteristics of the seismic actions (intensity, duration, peak ground acceleration (PGA), spectral response, etc.) play a fundamental role in estimating the degree of damage that a building could have (Bojórquez *et al.*, 2017; Bhanu *et al.*, 2019; Martineau *et al.*, 2020; Pinzón *et al.*, 2020). Therefore, it will be of interest to find the ratio between the potential for damage or destructive potential of a seismic action due to its characteristics with the maximum mezzanine distortion, θ_{\max} , that can occur in the building. This can be useful for selecting the seismic actions with the greatest potential for damage when you have a set of accelerograms. For example, in a seismic directionality analysis in buildings, where 360 seismic actions are used, obtained from the vector combination by rotating the two horizontal components of a seismic register from 1° to 360° (Vargas *et al.*, 2018; Pinzón *et al.*, 2019).

In this research, a new index ($\text{DPIS}_{\text{SaT}_1\text{-I}_A\text{-}\Delta\text{I}_A}$) is developed to define the probable damage potential of an earthquake; considering in this indicator, its Arias intensity (I_A), its significant duration (Δ_{I_A}) and the spectral acceleration for the fundamental period of the building (Sa_{T_1}). Additionally, predictive equations are developed for steel buildings, which relate this new indicator to the θ_{\max} . For this, we analyze two 3 and 7 stories 2D steel buildings, located in the city of Oaxaca, Mexico. The seismic threat of the city is defined by 23 real seismic records in its two horizontal components (46 real accelerograms). In addition, using these actions in a spectral adjustment technique in the SeismoMatch program (Seismosoft, 2018a) 46 accelerograms compatible with the seismic threat defined by the design spectrum for the city of Oaxaca are generated by the Manual of Civil Works Design of the Federal Electricity Commission of Mexico (MDOC-CFE) (2015). The assessment of the building's seismic response is performed using incremental non-linear dynamic analysis (ADNL-IDA), where the PGA of real and compatible accelerograms is used as an incremental variable.

BUILDINGS PROTOTYPE

3-story and 7-story steel buildings in two dimensions (2-D) are evaluated in this research. The buildings have a structural system of resistant moment frames with metal profiles type W, creep resistance (f_y) of 50 ksi. The connections are considered fully rigid (FR prequalified connections defined in ANSI/AISC 358-16 (2016)) and with recessed supports at the bases of the columns. For the structural design, it is considered a dead load (CM) and live load (CV) for the mezzanines of 6.5 kN/m^2 and 2.5 kN/m^2 (CV corresponding to the office use according to the NTC-RSEE-CD (2017)) respectively; while for the roof the dead load and live load was 5.5 kN/m^2 and 1 kN/m^2 and (CV corresponding to the roof use according to the NTC-RSEE-

CD (2017)) respectively. To linearize the load on the frames, a tributary width of 6 m, and the weight of the structural elements was considered. The earthquake-resistant design was carried out with the ECOgcW3 program (GC Ingeniería y Diseño S.C., 2020), following the specifications of the *Load and Resistance Factor Design* (LRFD) of the ANSI/AISC 360-16 (2016) and for the modified design spectrum of the city of Oaxaca defined in the MDOC-CFE (2015) and the PRODISISv4.1 (INEEL-CFE, 2015). The conditions of soft soil and the ductility factors values ($Q=3$), on-resistance ($R_o=2$), redundancy ($r=1$), and irregularity ($\alpha=1$) were considered, based on the characteristics of the buildings.

Figure 1 shows the 2-D geometry and frame profiles of each building obtained from the structural design. From the spectral modal analysis of each frame of the buildings, it is obtained that its fundamental period, T_1 , is 0.50 seconds for the 3-story and 0.86 seconds for the 7-story.

The ADNL-IDA of the frames of the buildings is carried out in the SeismoStruct program (Seismosoft, 2018b). The loads considered in these analyses followed the combination of 1.0 CM +0.2 CV, based on the recommendation of PEER/ATC 72-12 (2010), to perform non-linear analyses. The beams and columns were modeled as non-linear stress-strain elements based on a uniaxial analysis of individual steel fibers. Where, the stress-strain diagram of steel was defined by a bilinear hysteresis model with hardening (Seismosoft, 2018b). In this way, it is ensured that the evaluation of the non-linear behavior is carried out along the entire length of the structural elements and across their entire cross-section. Two performance criteria were used, both based on the unitary uniaxial deformation (ϵ) of the steel fibers; one to consider the creep ($\epsilon_y=0.0025$) and another for its fracture ($\epsilon_f=0.06$) (Seismosoft, 2018b).

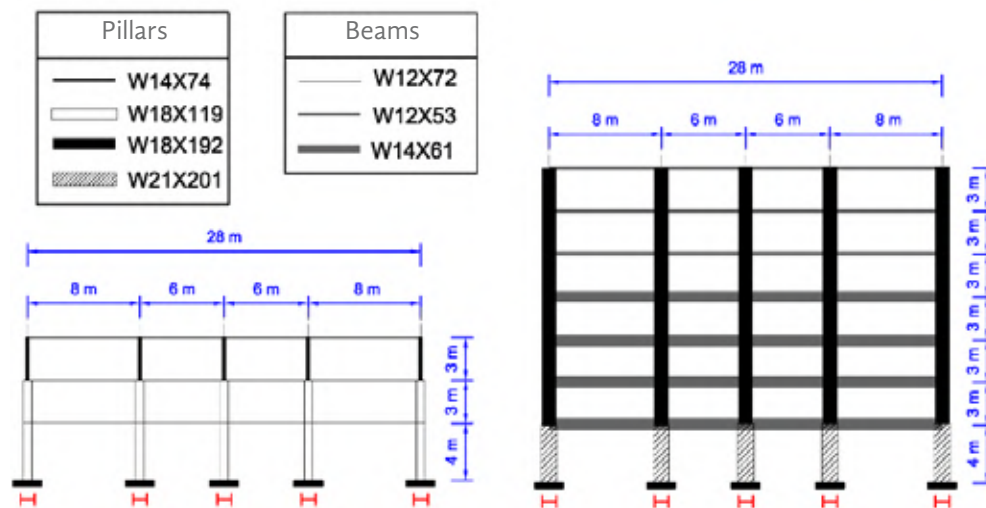


Figure 1. The geometry of the 2-D buildings used in the evaluation. Source: Own elaboration

SEISMIC ACTIONS

This research considers as a study area the city of Oaxaca, Oaxaca, Mexico; which due to its location on the Pacific Ocean coast is subject to significant seismic activity, due to the convergences of the Cocos and North American tectonic plates (Vladimir & Pacheco, 1999). To characterize the dangerousness of this city, 23 records of real accelerations are used in its two horizontal components, East-West (E-O) and North-South (N-S) (46 real accelerograms). The seismic data were provided by the Accelerographic Network of the Institute of Engineering of the UNAM (RAII-UNAM, 2020), a product of the instrumentation and processing work of the Seismic Instrumentation Unit. The data were distributed through the Accelerographic Database System on the website: <https://aplicaciones.iingen.unam.mx/AcelerogramasRSM/>

Using a spectral adjustment technique in the SeismoMatch program (Seismosoft, 2018a) and considering as a target spectrum the modified design spectrum for the city of Oaxaca (MDOC-CFE, 2015) used in the structural design of buildings; 46 compatible accelerograms are generated. Figure 2 shows the spectra of the set of real and compatible accelerograms, in addition to the target design spectrum. The main characteristics of the set of real and compatible accelerograms are shown in Table 1; these are the register's name; epicenter distance (D_{Epi}); Azimuth station – epicenter ($AZ_{Est-Epi}$); moment magnitude (M_w) of the earthquake recorded; total duration (Δ_r); *Peak ground acceleration*, PGA, the spectral acceleration for the fundamental period of the 3-story building ($Sa_{T_1-3 \text{ story}}$) and 7-story ($Sa_{T_1-7 \text{ story}}$); the Arias intensity (I_A) and its respective significant duration (Δ_{IA}).

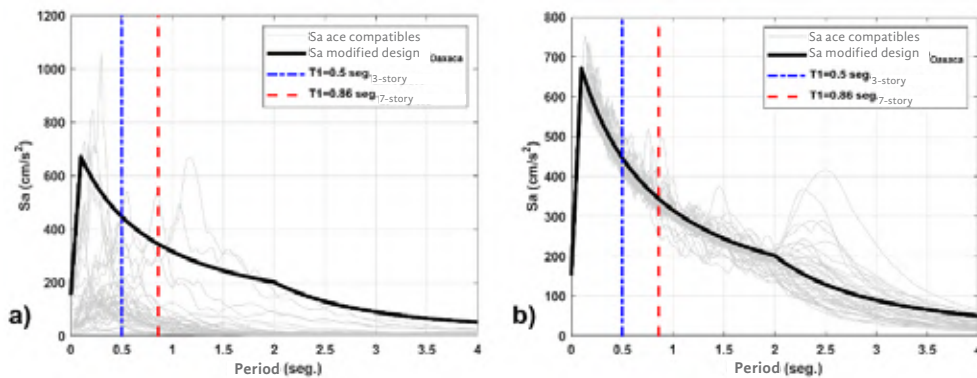


Figure 2. Response spectra of the set of a) real and b) compatible accelerograms with the modified design spectrum for the city of Oaxaca, used in the structural design of buildings. Source: Own elaboration

In this research, one of the most used indicators of the destructive potential of a seismic action in the world was used; the Arias Intensity (AI) (Arias, 1970), defined by the following equation:

$$I_A = \frac{\pi}{2g} \int_{t_i}^{t_f} (a(t))^2 \cdot dt \quad (1)$$

Where g is the acceleration due to gravity, t_i is the beginning of the accelerogram, t_f is the total duration of the accelerogram and $a(t)$ represents the history of the acceleration time of the register component. Thus, significant duration (Δ_{IA}) is based on energy accumulation and is defined as the interval during which 5% to 95% Arias intensity accumulates. This interval is considered the strong phase of an earthquake (Bommer & Martínez-Pereira, 1999; Trifunac & Brady, 1975). As seen in Table 1, the 23 actual records used from the study area are varied in duration (in a range of 9.9 seconds to 229.99 seconds) and with significant destructive potential (with a moment magnitude (M_w) greater than 5.3° up to 8.2° and peak ground acceleration, greater than 10 cm/s^2 up to 370.34 cm/s^2). In this way, we have an adequate characterization of the seismic threat to the city of Oaxaca.

Table 1
Main characteristics of the set of accelerograms used in ADNL-IDA

#	Recording (RAII-UNAM, 2020)	D_{Epi} (km)	AZ_{Epi} (°)	Mw	Δ_T (seg.)	Comp.	PGA (cm/s ²)	Real Accelerogram Spectra				Real Accelerogram Spectra				
								Sa_{T1-3} Story (cm/s ²)	Sa_{T1-7} Story (cm/s ²)	I_A (seg.)	Δ_{IA} (seg.)	PGA (cm/s ²)	Sa_{T1-3} Story (cm/s ²)	Sa_{T1-7} Story (cm/s ²)	I_A (seg.)	Δ_{IA} (seg.)
1	OAXM7811.292	149.78	184.56	5.3	9.9	E-O	37.84	41.97	9.84	0.0171	7.36	228.23	501.56	352.86	0.9604	8.76
						N-S	57.22	46.03	10.43	0.0217	7.16	275.48	421.58	470.37	0.7189	7.64
2	OAXM7811.291	120.44	178.54	7.8	14.94	E-O	146.91	101.38	52.45	0.2325	7.61	265.83	430.67	313.59	0.9936	11.72
						N-S	217.10	190.93	78.18	0.5436	7.74	219.04	482.14	356.73	0.9227	11.53
3	OAXM7207.081	143.92	200.51	6.1	18.12	E-O	40.67	13.03	5.54	0.0074	7.14	239.64	421.78	316.42	0.7388	10.00
						N-S	36.12	12.29	9.67	0.0071	9.32	255.68	415.14	327.38	0.8976	13.73
4	OAXM8010.241	197.08	302.54	7	33.9	E-O	162.61	34.55	14.10	0.0991	15.36	275.23	445.79	329.72	0.9320	18.74
						N-S	116.35	53.31	22.73	0.0917	18.46	259.23	413.13	320.93	1.3081	19.63
5	OAXM7308.281	137.22	11.93	6.8	40.41	E-O	163.58	176.97	57.48	0.5821	14.58	235.83	416.71	334.32	1.3739	20.35
						N-S	199.03	336.87	86.00	0.8449	16.15	248.80	416.66	322.93	1.8062	23.76
6	OAXM9802.031	159.28	166.44	6.4	52.63	E-O	71.02	74.91	51.78	0.0451	27.48	231.85	453.49	322.24	1.2704	21.59
						N-S	45.69	65.09	29.95	0.0414	26.15	268.34	423.17	320.87	1.6259	30.36
7	OAXM0401.132	129.92	200.79	5.7	61	E-O	56.22	172.01	59.10	0.0340	11.60	287.87	428.87	330.68	0.9130	23.28
						N-S	42.96	137.50	38.61	0.0295	14.14	230.97	460.10	343.66	1.0672	19.77
8	OAXM0408.181	191.59	119.06	5.7	71	E-O	49.31	122.89	48.63	0.0446	14.37	252.89	412.76	379.62	1.3395	23.13
						N-S	38.92	155.38	52.61	0.0330	16.43	245.46	404.47	302.64	0.9696	17.21
9	OAXM0408.071	137.04	91.34	5.9	80	E-O	45.22	120.12	37.98	0.0581	22.73	298.88	499.86	324.33	1.4640	24.22
						N-S	48.14	122.19	42.53	0.0468	29.58	243.06	461.39	348.30	1.0282	19.43
10	OAXM0206.072	133.13	191.65	5.6	84	E-O	29.96	87.97	39.01	0.0171	18.97	243.31	463.52	327.62	1.0590	20.72
						N-S	26.41	85.60	38.60	0.0149	22.04	220.13	421.45	349.57	1.4753	40.24
11	OXT00408.071	139.72	91.10	5.9	104	E-O	34.07	69.25	69.14	0.0277	30.77	255.11	410.67	324.54	1.2239	31.50
						N-S	28.22	49.39	66.63	0.0276	24.73	240.91	415.26	330.65	1.1384	27.92
12	OXPC1405.211	175.81	87.63	5.8	112	E-O	10.07	26.07	5.05	0.0017	22.97	228.56	447.90	323.37	1.9400	53.53
						N-S	12.70	34.77	10.58	0.0017	25.85	271.80	424.68	326.17	1.5316	37.99
13	OAXM9909.301	130.26	194.80	7.6	112.8	E-O	370.34	355.88	108.99	3.2614	19.49	239.52	466.78	333.01	2.2472	32.31
						N-S	352.60	342.93	74.39	2.8233	17.95	203.13	403.50	323.31	1.4493	23.65
14	OXCUI511.281	8.22	263.18	4.6	122.89	E-O	16.33	54.99	39.41	0.0103	27.19	294.21	414.53	367.74	1.5430	34.85
						N-S	20.40	56.41	40.31	0.0129	20.89	235.00	429.20	327.17	1.4667	32.52
15	OXPC1802.161	165.76	236.20	7.2	122.89	E-O	16.33	54.99	39.41	0.0103	27.19	294.21	414.53	367.74	1.5430	34.85
						N-S	20.40	56.41	40.31	0.0129	20.89	235.00	429.20	327.17	1.4667	32.52
16	OXCUI807.191	138.50	302.82	5.9	156.99	E-O	32.62	73.35	77.22	0.0257	27.57	220.33	438.27	248.40	0.7870	24.76
						N-S	34.84	61.87	106.54	0.0300	25.34	252.89	449.81	328.02	1.0362	28.38
17	OXPC1407.291	136.59	57.95	6.4	167	E-O	40.50	127.07	20.98	0.0490	33.10	222.43	482.97	326.71	1.6993	49.76
						N-S	48.47	103.92	26.01	0.0454	36.50	223.71	427.58	342.99	1.3203	42.62
18	OAXM1709.232	179.69	111.06	6.1	178.99	E-O	43.85	129.16	58.32	0.0358	20.65	300.12	416.80	318.86	1.2643	24.51
						N-S	43.85	129.16	58.32	0.0358	20.65	300.12	416.80	318.86	1.2643	24.51
19	OXAEO802.121	249.37	110.90	6.6	181.13	E-O	38.44	110.10	40.32	0.0367	44.53	227.25	502.84	329.83	1.2192	34.85
						N-S	30.14	96.24	54.18	0.0356	23.20	260.99	436.03	314.38	1.5198	38.56
20	OAXM1102.251	175.51	65.57	6	195.99	E-O	35.60	71.98	34.85	0.0262	39.11	255.41	426.60	356.12	1.3228	39.27
						N-S	36.77	101.86	27.48	0.0314	37.92	248.89	431.52	338.86	1.0816	37.89
21	OAXM1407.291	134.37	59.12	6.4	207	E-O	87.49	224.53	122.46	0.2253	29.34	219.84	410.98	274.00	0.9965	28.23
						N-S	98.23	415.33	104.25	0.2912	27.56	220.78	437.41	344.15	1.5029	37.70
22	OXCUI802.161	166.47	236.48	7.2	225.99	E-O	86.34	207.81	295.29	0.2832	28.41	293.95	416.20	313.73	1.5261	36.46
						N-S	100.74	202.89	523.54	0.3539	31.14	235.97	420.58	309.17	1.6972	40.91
23	OXPC1709.081	378.59	131.90	8.2	229.99	E-O	173.63	453.84	281.86	1.0618	39.50	233.15	494.08	334.82	1.7265	50.20
						N-S	143.38	391.97	315.68	1.0709	38.55	247.15	498.72	334.57	2.2974	48.38

Source: Own elaboration

INCREMENTAL NONLINEAR DYNAMIC ANALYSIS

This section shows the evaluation of the seismic response of the buildings, obtaining as an output variable the maximum mezzanine distortion (θ_{max}). For this, incremental non-linear dynamic analyses (ADNL-IDA) are carried out, considering the Peak ground acceleration (PGA) of the set of real and incrementally compatible accelerograms until the buildings collapse. Figures 3 and 4 show the results obtained from the θ_{max} ratio with the Arias intensity (I_A) of each accelerogram and its respective spectral acceleration for the building period (Sa_{T1}). It can be seen in Figures 3 and 4 that the results of the analysis of the buildings for the set of real accelerograms present a greater dispersion compared to the results for the set of compatible accelerograms;



this is due to the randomness that the real seismic actions present since they do not have a spectral adjustment (see Figure 2).

Table 2 shows the correlations between θ_{max} with I_A and Sa_{T1} . It is observed that by using compatible accelerograms in the analyses, it is possible to obtain a better correlation between the output response (θ_{max} which represents the damage in the building) with the characteristics of the seismic actions used (I_A and Sa_{T1}). The Sa_{T1} has the best correlation for both 3 and 7-story buildings, as well as for real and compatible accelerograms.

Table 2
Correlation between $\theta_{max} - I_A - Sa_{T1}$, obtained from the results of the ADNL-IDA analyses

Building	Real accelerograms			Compatible accelerograms		
	Variable	Sa_{T1}	I_A	Variable	Sa_{T1}	I_A
3 story	θ_{max}	0.72	0.40	θ_{max}	0.89	0.85
7 story	θ_{max}	0.65	0.39	θ_{max}	0.90	0.86

Source: Own elaboration

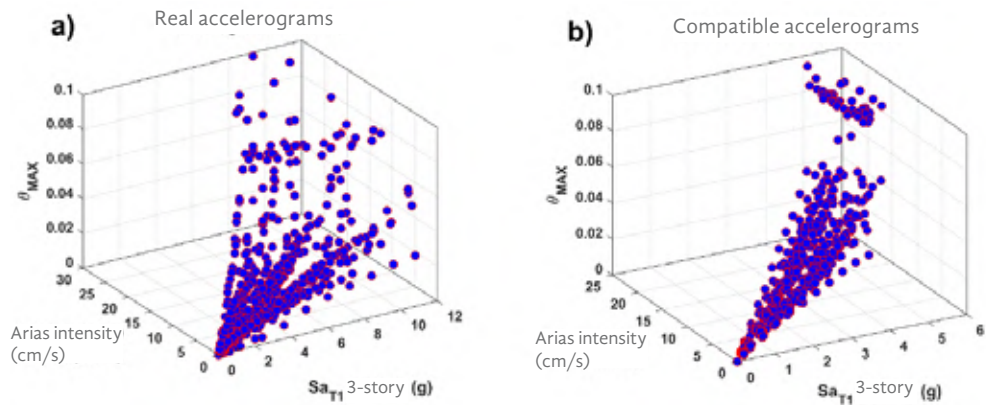


Figure 3. $\theta_{max} - I_A - Sa_{T1}$ ratio obtained from the ADNL-IDA for the 3-story building and the a) Real and b) Compatible accelerograms. Source: Own elaboration

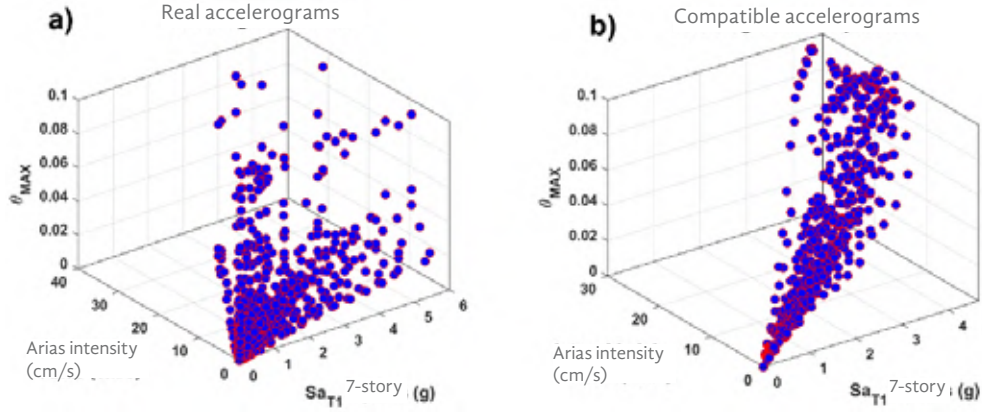


Figure 4. $\theta_{max} - I_A - Sa_{T1}$ ratio obtained from the ADNL-IDA for the 7-story building and for the a) Real and b) Compatible accelerograms. Source: Own elaboration

NEW DAMAGE POTENTIAL INDEX OF A SEISMIC ACTION

The correlations obtained between θ_{max} with I_A and Sa_{T1} can be considered acceptable (especially when compatible accelerograms are used and if we consider Sa_{T1}) to predict the destructive potential that a seismic action could have to cause damage to the structure. However, it is considered that these can be improved if we raise a new damage potential index (DPI) of a seismic action according to several of its characteristics. For this research, a DPI based on three characteristics is presented: 1) Sa_{T1} ; 2) I_A and 3) Δ_{IA} . The following equation shows the proposed $DPI_{SaT1-IA-\Delta IA}$:

$$IPD_{SaT1-IA-\Delta IA} = Sa_{T1}^\alpha \left(\frac{I_A}{\Delta_{IA}} \right)^\beta \quad (2)$$

Where α and β are calibration factors. In this DPI, it is observed it has two parts; the first is the influence of Sa_{T1}^α , which as it was obtained in the ADNL-IDA of the buildings was the variable with the best correlation with the θ_{max} . The second term $(I_A/\Delta_{IA})^\beta$ considers the influence of the energy accumulation of the seismic action for a significant duration.

The second term of equation (2) allows the condition that a short-duration seismic action represents a greater destructive potential than a long-duration seismic action to be evaluated in the proposed index if both have the same Arias intensity (accumulated energy). For the development of this new DPI, a calibration process was carried out with the results of the buildings' ADNL-IDA, to determine the optimal values of α and β . The values obtained for each case are presented in Table 3.

Table 3

Values α and β were used in the calibration of the $DPI_{SaT1-IA-\Delta IA}$

Building	Real accelerograms		Compatible accelerograms	
	α	β	α	β
3 story	0.80	0.10	1.35	0.10
7 story	0.75	0.15	1.55	0.10

Fuente: Elaboración propia

Figures 5 and 6 show the θ_{max} ratio with the $DPI_{SaT1-IA-\Delta IA}$ for the 3 and 7-story buildings and the set of real and compatible accelerograms. Table 4 shows the correlations of θ_{max} with the $DPI_{SaT1-IA-\Delta IA}$ of each case. Note that these increased for both buildings and both sets of accelerograms if we compare them with the correlations obtained in Table 2 for $\theta_{max} - I_A - Sa_{T1}$.

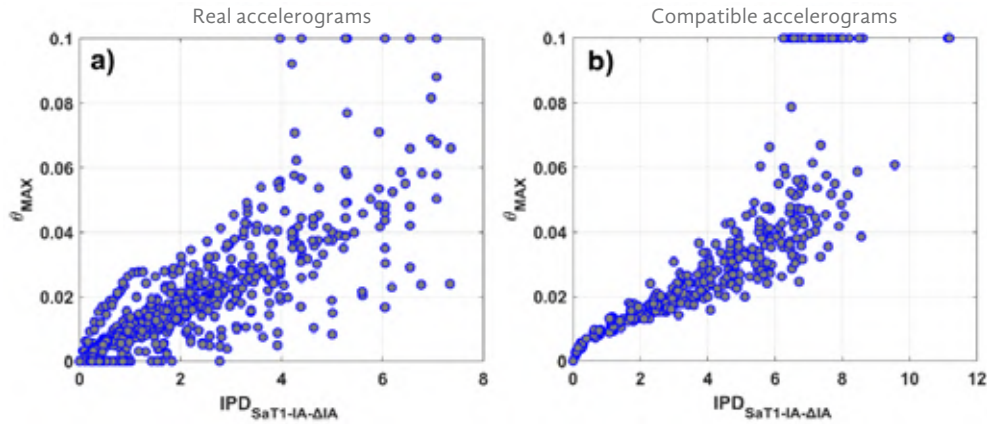


Figure 5. $\theta_{max} - DPI_{SaT1-IA-\Delta IA}$ ratio for the 3-story building and the a) real accelerograms and b) compatible accelerograms. Source: Own elaboration

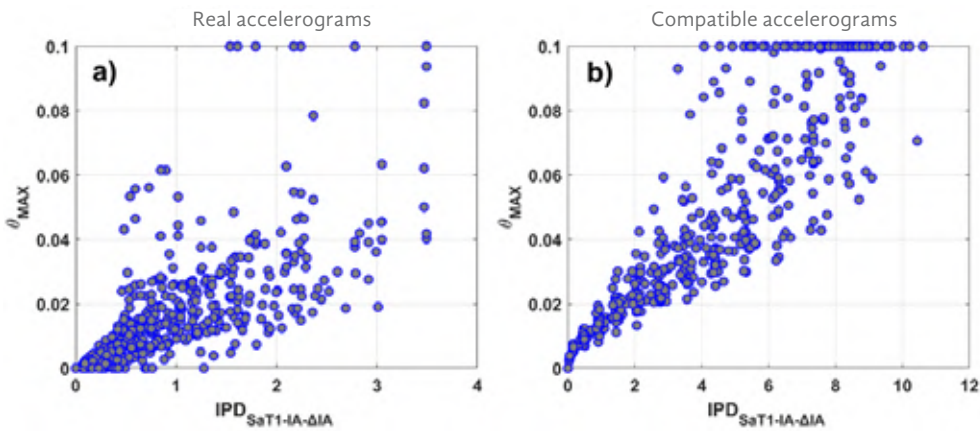


Figure 6. $\theta_{max} - DPI_{SaT1-IA-\Delta IA}$ ratio for the 7-story building and for the a) real accelerograms and b) compatible accelerograms. Source: Own elaboration

Table 4
Correlation between $\theta_{max} - DPIs_{SaT1-IA-\Delta IA}$

Building	Real accelerograms		Compatible accelerograms	
	Variable	IPD _{SaT1-IA-ΔIA}	Variable	IPD _{SaT1-IA-ΔIA}
3 story	θ_{max}	0.72	θ_{max}	0.89
7 story	θ_{max}	0.65	θ_{max}	0.90

Source: Own elaboration

PREDICTIVE EQUATIONS

Because the proposed $DPIs_{SaT1-IA-\Delta I}$ may be an alternative for measuring the destructive or damage potential likely to be caused by a seismic action. This last section presents a proposal of predictive equations to relate this new index with the output variable that determines the damage in a building, the θ_{max} . The best settings were presented for analyses of the 3 and 7-story buildings with the set of compatible accelerograms. While with the set of real accelerograms, the adjustments were not shown to be adequate to be considered predictive. Figure 7 shows the adjustments and predictive equations for the 3-story buildings (Ec. 3) and 7-story (Ec. 4) with compatible accelerograms. A suitable fit was achieved for these cases, being useful in future steel building investigations.

$$\theta_{max} = 0.0063(IPD_{SaT1-IA-\Delta IA} + 0.0023), \text{ for 3-story buildings} \tag{3}$$

$$\theta_{max} = 0.0063(IPD_{SaT1-IA-\Delta IA} + 0.0023), \text{ for 7-story buildings} \tag{4}$$

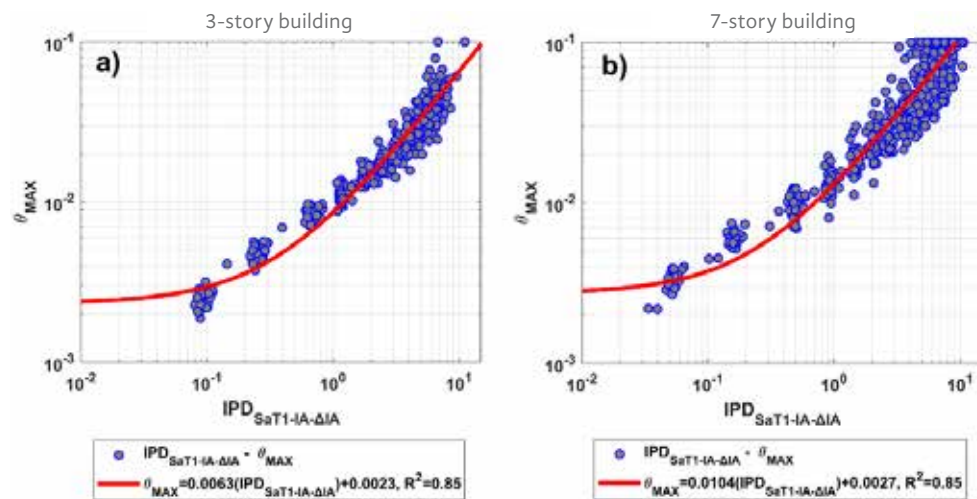


Figure 7. Linear equation adjustment for $\theta_{max} - DPIs_{SaT1-IA-\Delta IA}$ ratio in a) 3-story and b) 7-story buildings for compatible accelerograms. Source: own elaboration

CONCLUSIONS

This research aimed to present a new earthquake potential index, referred to in this article as the $DPI_{SaT_1-I_A-\Delta I_A}$. Name given as a function of three characteristics of the symbolic actions: 1) the spectral acceleration for the fundamental period of the building (Sa_{T_1}) the Arias intensity (I_A), and 3) its respective significant duration (ΔI_A). Predictive equations were also shown to determine the maximum mezzanine distortion (θ_{max}) based on this new index. For this, incremental non-linear dynamic analysis (ADNL-IDA) was performed on 2D 3-story and 7-story steel buildings and for real and adjusted seismic actions to the design spectrum of Oaxaca city. Several relevant conclusions obtained are presented below: i) The values obtained of θ_{max} for both buildings show a lower dispersion for the set of compatible accelerograms compared to those obtained for the actual accelerograms. This is to be expected since the real accelerograms are very varied in their spectral accelerations, and with spectral adjustment, these become similar and of the order of the ordinates of the design spectrum. ii) The correlation of θ_{max} with Sa_{T_1} e I_A of seismic actions is good in the analyses with the set of compatible accelerograms. The $DPI_{SaT_1-I_A-\Delta I_A}$ proposed achieves a better correlation with θ_{max} compared to using only Sa_{T_1} or I_A separately; both for the set of real and compatible accelerograms, as well as for the two buildings studied. iii) The presented predictive equations correctly relate the new damage potential index to θ_{max} for seismic actions compatible with particular cases of low and medium-height steel buildings.

From the above, it is concluded that $DPI_{SaT_1-I_A-\Delta I_A}$ represents a good alternative to measure the destructive potential of seismic actions. So, if you have a wide set of accelerograms that you want to use, you can select only seismic actions that based on their $DPI_{SaT_1-I_A-\Delta I_A}$ represent a greater damage potential to the structure you want to analyze. Moreover, the proposed equations allow us to obtain a rapid estimate of the expected value in the θ_{max} for each seismic action in buildings of the typologies studied here.

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Adsorption of Pb^{2+} ions using biogenic $CaCO_3$ in aqueous solutions

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— Abstract—

In the state of Tabasco, the oyster *Crassostrea Virginica* is cultivated, this production makes it an important economic activity and adversely a source of infection by the waste of the inedible part. However, these leaflets are composed of $CaCO_3$ with potential application as adsorbents for heavy metals dissolved in water and thus improve their quality. In this research, a $CaCO_3$ adsorbent obtained from oyster shells was used to remove lead (Pb^{2+}) from water. The shells were washed and dried in the sun, later they were crushed with a hammer to enter them in a high-energy mill and reduce their size. The powders were sieved in meshes #100, and #200, and what happens to #200 and the pH values of the lead solution were adjusted according to the metal species diagram to keep it in solution and identify the best experimental conditions. The best results were obtained under conditions of pH=5 and particle sizes of the order of 0.074 mm. With these conditions, the adsorption isotherms were obtained and maximum adsorption capacities of 44 mgg⁻¹ of the Pb^{2+} ion were obtained.

Keywords:

Adsorption; Metal ions; Calcium carbonate; Biogenic.

Water pollution by organic and inorganic compounds is an environmental problem that requires immediate attention, due to population growth and industrialization (Mensah *et al.*, 2022). Heavy metals according to the World Health Organization and the International Programs on Chemical Safety, are dispersed in the environment and are biologically important, since they present a high-risk toxicological profile with lethal and bioaccumulative characteristics that directly affect the environment and public health through the consumption of contaminated food and water (Igberase & Osifo, 2019; Kupeta *et al.*, 2018).

Wastewater from the semiconductor industry, battery manufacturing, plating, and painting, is perhaps the most important sources of pollution due to the high concentrations of discarded heavy metals dumped into effluents. In particular, lead (Pb^{2+}), cadmium (Cd^{2+}), and copper (Cu^{2+}) are harmful metals to health. WHO recommends that adults with a level of ten micrograms per deciliter ($10 \mu g d L^{-1}$) and children with five micrograms per deciliter ($5 \mu g d L^{-1}$) of blood lead require immediate action (CDC, Center for Disease Control and Prevention, Atlanta, GA) as symptoms such as tiredness, poor ability to pay attention, agitation, lack of appetite, constipation, headaches, sudden change in behavior, vomiting and hearing loss can occur and even cause death by poisoning (Caravanos *et al.*, 2016). In addition to the above, science has been given the task of creating processes that are able to reduce the impact of these pollutants on the environment through novel methods of high efficiency and low cost.

Various treatment systems have been developed to remove these metal contaminants from water; among them are flocculation, coagulation, chemical oxidation, chemical precipitation, ozonation, membrane filtration, reverse osmosis method, and adsorption (Gupta *et al.*, 2021; Wahyuni *et al.*, 2022). The latter is considered one of the most effective and economically viable techniques for the treatment of wastewater contaminated by toxic organic and inorganic compounds, including heavy metal ions if the appropriate adsorbent is used (Hernandez-Eudave *et al.*, 2016; Reynel-Avila *et al.*, 2015).

Natural materials and wastes from industrial or agricultural operations that are available in large quantities may have the potential as low-cost adsorbents to improve water quality. Today, proposals have been presented for adsorbents for the removal of metals such as clays, zeolites, rice husk, textile industry waste, and oyster shells, among others (Ahmad *et al.*, 2012; Mendoza-Castillo *et al.*, 2015). Oyster shells are composed mainly of calcium carbonate ($CaCO_3$), silicon oxide (SiO_2), proteins, and polysaccharides, are widely available in the environment, and were used in this research as a proposal of low-cost adsorbent for the removal of metal ions from water.

Muhammad Shafiq *et al.* (2021) used sawdust from *Eucalyptus camdulensis* for the production of a bio adsorbent for the removal of Ni^{2+} and

Pb^{2+} from wastewater; in their research, they used pyrolysis to obtain a carbonaceous material with adsorption results of 54 and 200 $mg\ g^{-1}$ respectively (Muhammad Shafiq, 2021). Donhatai Sruamsiri *et al.* (2022) employed an alkaline titanate ($Cs_2Ti_5O_{11}$) for the removal of Pb^{2+} from a solution of lead acetate trihydrate. The adsorption isotherm reported was H-type, indicating a strong interaction between titanate and Pb^{2+} . The maximum amount of Pb^{2+} adsorbed was 1.27 mmol $Pb/gCs_2Ti_5O_{11}$, which corresponded to 86% of the cation exchange capacity (2,94 meq/g) of $Cs_2Ti_5O_{11}$. The adsorption isotherm obtained was fitted with the Langmuir equation with a high correlation coefficient ($R^2 = 0.9997$), suggesting a high affinity between the titanate surface and Pb^{2+} (Sruamsiri & Ogawa, 2022). Yang Zhou *et al.* (2017) prepared nanostructured hydroxyapatite from pig bone materials by mineralization. The obtained nanostructured bone was much better compared to the bone without nanostructure to remove Pb^{2+} . Their research was conducted under different conditions, including adsorbate and adsorbent contact time, initial Pb^{2+} concentration, and the pH of the solution. The pseudo-second-order kinetic model and the Langmuir isothermal model were best suited to describe the adsorption process. In addition, the maximum adsorption capacities of nanostructured bone and bone without nanostructure were 312.5 and 96.1 $mg\ g^{-1}$, respectively. Overall, the advantages of excellent simple adsorption and mineralization capacity coupled with low cost make nanostructured bone an attractive material for the removal of Pb^{2+} from an aqueous solution (Zhou *et al.*, 2017).

The adsorption process is suitable for removing those compounds of low concentration or high toxicity, which are not easily treated by biological processes. Based on its mode of operation, adsorption is classified into static adsorption and dynamic adsorption. Static or batch adsorption occurs in a closed system containing an amount of adsorbent in contact with a certain volume of adsorbate solution. Whereas dynamic adsorption occurs in an open system, where the adsorbate solution passes continuously through an adsorbent-filled column (Vo *et al.*, 2020). The aim of this research was to evaluate the adsorption capacity of nanostructured biogenic $CaCO_3$ as lead ion adsorbent (Pb^{2+}) in aqueous solutions in batch systems, and the isotherms were analyzed using Langmuir and Freundlich models.

METHODOLOGY

Adsorbent preparation

Samples of oyster shells were collected in the coastal areas of the municipalities of Comalcalco and Paraíso, Tabasco. Remains of organic matter and impurities were removed from the leaflets with washes in plenty of water

and a sponge and dried in the sun for 48 h. Once dried the leaflets were subjected to spraying treatments in a high-energy mill and sieved into #10, 20, 40, 50, 100, and 200 meshes and what passes through #200; in total seven particle sizes. After sieving, the obtained powders were washed in beakers with deionized water on grills with constant stirring for 24 h. The powders were separated from the water by decantation and the pH values of the supernatants were measured, setting the constant pH reading as the cleaning parameter. Finally, the obtained powders were dried in an oven at 50°C for times of 2 h.

Adsorption experiments

Synthetic solutions were prepared from lead nitrate salts (PbNO₃) with deionized water with initial concentrations between 10 and 500 mgL⁻¹. All initial solutions were adjusted to pH=5 by adding NaOH and HNO₃ 1N solutions. The batch experiments consisted of mixing 50 mL of each solution with 0.1 g of the adsorbent; they were placed on grills at room temperature and with constant stirring for 14 h. Subsequently, the metal solution CaCO₃ powders were decanted. The pH changes of the solutions after the experiments were measured and diluted with deionized water adjusted to pH=3 to measure the final concentration by Atomic Absorption. Experiments were replicated for confirmation of results.

Adsorption isotherm models

The adsorption capacities of the CaCO₃ powders were obtained under the following mass balance:

$$q_e(\text{mgg}^{-1}) = \frac{V(C_i - C_e)}{W} \quad (1)$$

Where C_i is the initial concentration of the metal solution in (mgL⁻¹), V is the volume in L, and W is the mass of the adsorbent in g.

On the other hand, to correlate the data of the Pb²⁺ isotherms, the mathematical models of Langmuir and Freundlich were considered. In the first instance, the Langmuir model assumes that adsorption occurs in a monolayer where the active sites are identical and energetically equivalent; this expression is given by:

$$q_e = \frac{K_L q_m C_e}{1 + K_L C_e} \quad (2)$$

Where q_e and C_e are the adsorption capacity in mgg^{-1} and the equilibrium concentration in mgL^{-1} , respectively; q_m is the theoretical maximum adsorption capacity in mgg^{-1} and K_L in Lmg^{-1} represents the Langmuir equilibrium constant. Both q_m and K_L are obtained from the correlation of the adsorption data.

Alternatively, the Freundlich model is an empirical model, the expression of which is used to describe a heterogeneous system, which is defined as:

$$q_e = K_f C_e^{\frac{1}{n_1}} \tag{3}$$

Where K_f ($\text{mg}^{1-1/n_1} \text{L}^{1/n_1} \text{g}^{-1}$) and n_1 are characteristic parameters of the adsorbate-adsorbent system; these values are obtained from the correlation of the adsorption data.

For the adjustments of the experimental data with the mathematical models of proposed isotherms, a non-linear regression approximation was used based on the minimization of the error of the experimental data and those calculated with the objective function:

$$F_{obj} = \sum_{i=1}^{N_{dat}} \left(\frac{q_e^{exp} - q_e^{cal}}{q_e^{exp}} \right)_i^2 \tag{4}$$

Where q_e^{exp} and q_e^{cal} are the experimental and calculated adsorption capacities, respectively, and n_{dat} is the number of experimental data analyzed.

RESULTS

Figure 1 shows the interaction of pH factors of the initial solution and particle size in the Pb²⁺ adsorption process of water. Non-parallel lines on the graph indicate the effects of interaction between particle size and pH of the solution. This interaction effect indicates that the relationship between particle size and adsorption capacity depends on the pH of the initial metal solution. It is observed that for all cases the green line corresponding to group 3 of pH=5 is the one that has the greatest capacity of removing the metal from the solution by the adsorbent, this trend continues as the particle size decreases, group 7 according to our nomenclature, corresponds to those sieved in mesh #200, with sizes on the order of 0.074 mm.

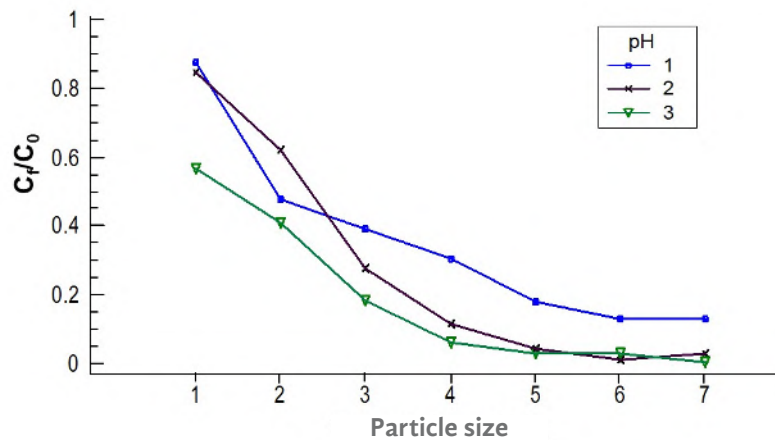


Figure 1. Interaction of Means of Particle Size and Solution pH Factors on Removal of Pb^{2+} from Water.
Source: Own elaboration

The full analysis demonstrates that there is no significant difference in the adsorption capacity results of particle size groups 5, 6, and 7, these sizes corresponding to 0.149, 0.074, and <0.074 mm respectively. The results of the statistical analyses for the pH values showed that the adsorption capacity is not favored in acidic environments and for the case of lead adsorption a pH=5 is recommended. Finally, by analyzing the interaction graph of both factors, it is recommended to use level 3 of pH=5 and level 7 of the mesh number (<0.074 mm).

The adsorption processes depend on the structure and characteristics of the adsorbent and the nature of the substance to be recovered from the medium (adsorbate). If the adsorbate is considered to be metal, the adsorption process depends on experimental conditions such as pH, metal and adsorbent concentration, competition with other ions, and particle size. The results of the experiments showed that the maximum experimental adsorption capacities for Pb^{2+} were 44 mgg^{-1} . These values obtained compared to other adsorbents such as zeolites, activated carbons, and hydroxyapatite offer advantages due to their high availability in the environment and because their preparation methods are simple and do not require complicated synthesis processes, which reduces production costs. The shape of the adsorption isotherms depends on factors such as pH and the initial concentration of the solutions and is not always linear. According to the classification of isotherm types, the curve type presented in Figure 2 is H-type, which results in high adsorption as a result of the strong adsorbate-adsorbent interaction.

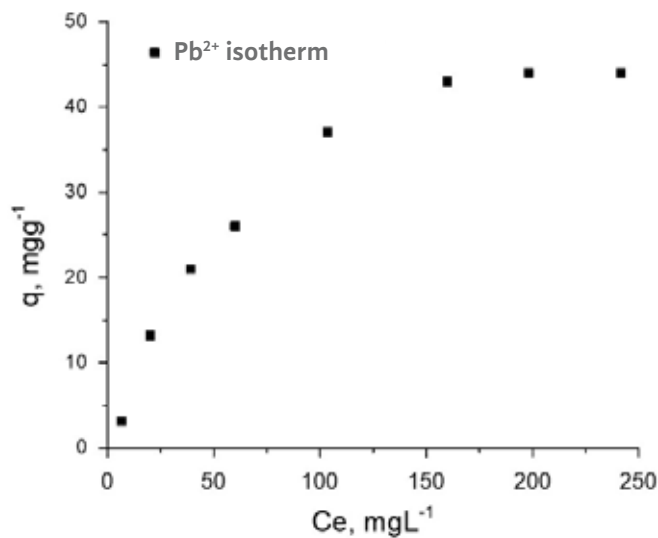


Figure 2. Ion Pb^{2+} adsorption isotherm. Initial conditions: 50 mL of metal solution with 0.1 g of adsorbent at 30 °C and pH=5. Concentrations between 10 and 500 mgL⁻¹. Source: Own elaboration

The results of the model adjustments indicate that the Langmuir isotherm model offers the best correlation coefficient with an R^2 of 0.97 suggesting homogeneous adsorption at each adsorber active site. The results of the models are presented in Table 1, and for illustrative purposes, the fit of the models with respect to the experimentally obtained isotherm is presented in Figure 3.

In terms of the Langmuir isotherm, adsorption occurs when a free adsorbate (Pb^{2+}) molecule collides with an unoccupied adsorption site ($CaCO_3$ active sites), and each adsorbed molecule has the same percentage of desorption.

Table 1
Data of the adjustments of the Langmuir and Freundlich isotherm models of the experimental results of Pb²⁺ ion adsorption capacity

		Parameter	Calculated value
		Metal	Pb ²⁺
		pH	5
Langmuir $q_e = \frac{K_L q_m C_e}{1 + K_L C_e}$		q_m (mgg ⁻¹)	72.5
		K_L (Lmg ⁻¹)	0.008
		R^2	0.97
		F_{obj}	0.12
Freundlich $q_e = K_f C_e^{\frac{1}{n_1}}$		K_f	1.37
		$1/n_1$	0.68
		R^2	0.91
		F_{obj}	0.54

Nomenclature: q_e and C_e are the adsorption capacity and equilibrium concentration, respectively; q_m is the theoretical maximum adsorption capacity, and K_L is the Langmuir equilibrium constant. K_f (mg^{1-1/n₁}L^{1/n₁}g⁻¹) and n_1 are characteristic parameters of the adsorbate-adsorbent system.

Source: Own elaboration

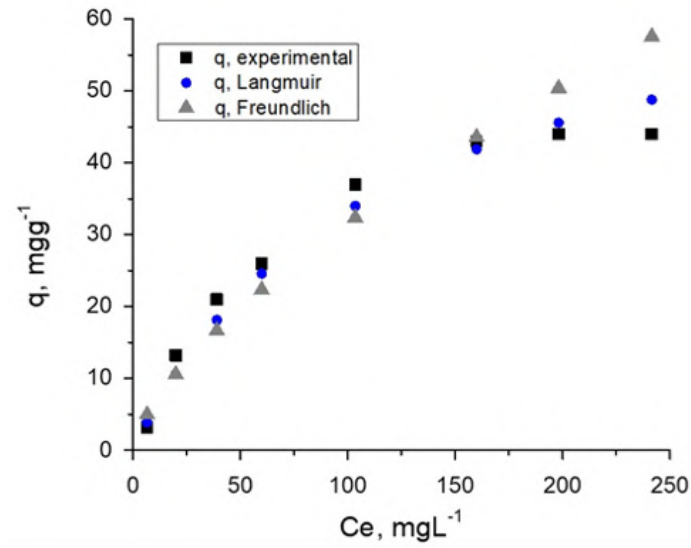


Figure 3. Comparison of experimental data settings with Langmuir and Freundlich isotherm models of Pb²⁺ isotherm. Source: Own elaboration

CONCLUSIONS

The results of the adsorption capacity of the biogenic CaCO₃ in the natural state for the Pb²⁺ ion was 44 mgg⁻¹ and with isotherm representative of a high adsorbate-adsorbent affinity. The adsorption process was shown to

be highly dependent on the pH and nature of the adsorbent. With these results, oyster shell powders in their natural state are proposed as an effective low-cost adsorbent alternative for the removal of Pb^{2+} from water. In addition to giving added value to a waste product for the benefit of oyster producers and the population. The evaluation of the adsorption process in packed columns and its analysis by means of mass transfer models is proposed for its escalation to real situations.

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Political clientelism and print media
in Mexico: budget reduction in
government advertising as a catalyst
in the change of editorial line in the
country's main newspapers

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— Abstract—

From the 50 percent reduction of the government budget in terms of official advertising, different newspapers in Mexico that used to have an editorial stance loyal to the government in turn, decided to take another direction, beginning to carry out critical journalistic work and denounce both towards the presidential figure as well as characters of the newly established political party in power, Morena. The historical clientelistic practices, accompanied by the understanding of how the print media have been related to power in Mexico, function as a linchpin to argue how their cancellation or mutation has made newspapers like *El Universal*, *Excelsior*, or *Reforma*, now they are assumed as counterweights to political power. Meanwhile, this essay serves as a contextual and theoretical approach to how the phenomenon could be approached empirically.

Keywords:

Political clientelism; Press; Journalism.

Traditionally in Mexico, since the middle of the last century to the present, there has been a close union between the media and political power. Despite the socio-historical changes that have occurred during this period, the media have been adapting to the situation that arises to subsist and enjoy economic or symbolic privileges provided by the governmental leadership. This essay focuses on analyzing the connections that have been given between the two actors, limiting the analysis specifically to the relationship built between the government in turn and the printed media to, in this way, understand what has led the main newspapers of the country, regardless of the platform, to distance themselves from the current administration.

Below, a series of arguments are presented to demonstrate why the most important print media, since the arrival of the new government, have begun to transform their editorial lines from being daily newspapers with a servile tendency to practice a style of critical and tenacious journalism against the government led by Andrés Manuel López Obrador (AMLO). In that sense, different studies within the academic literature demonstrate how the newspapers, since their origin, have served as a propaganda arm of both the government in turn and opposition political factions, offering their editorial line as a bargaining chip, either to consecrate the positive image of certain administrations or discredit opposing groups.

One of the most recurrent practices that political power has used to control the editorial line of different printed media is political clientelism. Through large budget allocations in government propaganda¹, newspapers of national circulation have managed to survive in the face of changes in the global media configuration, which continues with a growing trend towards the consumption of information through the network (Benaissa 2019), and, in that sense, Mexico has not been the exception.

Meanwhile, within the framework of the Republican austerity strategy that the National Regeneration Movement (MORENA) outlined for its period in power, so far, the government budget in advertising matters, compared to past administrations, has been reduced by 75 percent², an action that has not been well received by newspapers of historical tradition such as *El Universal*, *Excelsior*, or *Reforma*, among others. In this way, the trial will try to show evidence that confirms the change of route that these media have taken in the absence of resources from the State, currently exercising a "watchdog" role towards the government in turn.

1 <https://www.nytimes.com/es/2017/12/25/espanol/con-su-enorme-presupuesto-de-publicidad-el-gobierno-mexicano-controla-los-medios-de-comunicacion-pri-pena-nieto.html>

2 <https://www.animalpolitico.com/2022/08/gobierno-amlo-gasta-menos-publicidad-oficial-malas-practicas/>

Although newspaper reading habits have changed since the technological development and the emergence of social-digital networks, historically Mexican newspapers have remained in a constant battle against electronic media, as consumption levels differ by millions between viewers and press readers. Given this scenario, Mexican newspapers have had to adopt different business models such as belonging to larger media conglomerates, government propaganda (at the local or state level), or the turn to sensationalism as a hook to attract consumers (Lago, 2019), among others.

PRINTED MEDIA AND POLITICAL POWER IN MEXICO

To explain the collusion between the mass media and the government apparatus, it is necessary to go back to the emergence of the first commercial newspaper that appeared in Mexico City, *El Imparcial*. This newspaper, with roots in the porfiriato of the late nineteenth century, began with the model of subordination to political power that would characterize the history of the hegemonic media of twentieth-century Mexico (Sánchez, 2005).

The prevailing trend in Mexico, governed by the Institutional Revolutionary Party (PRI), was that of a consistent pairing between the government in turn and the media in exchange for the granting of radio frequencies for electronic media or the ease of acquiring paper through the government subsidiary, Productora e Importadora de Papel Sociedad Anónima (PIPSA), offered their editorial line as an irrefutable propaganda arm and magnifier of the policies implemented by the government.

In this way, although it has not been possible to verify empirically, the PRI governments for decades marked the pattern between what could be published and what could not in the printed media since "State intervention in this matter was requested by the printed media industrialists themselves, to ensure a stable level in paper prices, guaranteed by state arbitration in the administration of the circulation of this input in the country" (Zacarías, 1996).

It should be mentioned that after the inauguration of the new PIPSA plant in 1954, the loyalty of Mexican newspapers to the government was confirmed, specifically with the presidential image. Adolfo Ruíz Cortines, who led the opening of the plant, made clear to media companies the relationship that would be maintained over the next three decades, expressing that the Mexican government would respect freedom of speech as long as journalists served with respect and responsibility to the homeland (Fuentes Berain, 2001), a speech that could be interpreted as a message of subordination to the national project that the PRI intended to implement in media matters.

Print media, specifically newspapers, had a different development than radio and television. Through the consolidation of Televisa, after Mexico's Independent Television and Mexican Telesystem merged in 1973, the presi-

dential state advocated for the monopolization of Mexican television, with Televisa being the only relevant actor within broadcasting. On the other hand, at the press level, different businessmen had the opportunity to put their newspapers on the market, who, for the most part, except for publications such as *Unomasuno* or *Proceso*, among others, remained with an editorial line loyal to the presidential state (Fuentes Berain, 2001).

As time went by and with the establishment of the neoliberal economic model worldwide, the role of the State was reduced, a situation that resulted in the privatization of different state companies, within which some broadcasting companies were also located. Unlike the electronic media, in the early nineties, the written press began to have certain tints of autonomy and, accompanied by the relative democratization of public life in Mexico, the professionalization of communicators led Mexican journalism to gradually free itself from the PRI government trap (Hughes, 2009).

This transition did not ensure that the old practices of mutual benefit ended, however, new actors such as *La Jornada*, *Grupo Reforma*, or *Milenio* bet on these financing models (Hernández, 2010). Although they did not achieve absolute financial independence, they began to set the tone for what would be the leap from a press dependent on government propaganda to media companies with relative economic autonomy, which would be subject to the investment of private advertisers and the consolidation of both synergies and journalistic franchises.

When analyzing the contemporary situation of newspapers in the country, with the main obstacle being the low consumption of written press, they could not afford to dispense with official propaganda.

The most aberrant form of subsidy has been the unregulated supply of official advertising, which has become the guarantee of subsistence for many print media, even for those who have no readers and whose circulation does not go beyond the press offices. This economic dependence on official advertising has been difficult to avoid for most newspapers due to the low revenues from the sale of copies and private advertising that characterize the industry (Hernández, 2010).

With the arrival of the political alternation in 2000, when the candidate of the National Action Party (PAN), Vicente Fox, was elected, the incipient emergence of a critical and active civil society in the political field was confirmed. Certainly, this social effervescence permeated the journalistic field in the same way, which began to exercise, at the direct request of the population, Watchdog journalism (Mellado, 2014). This information model is characterized by the active participation of communicators,

appealing to the practice of a critical journalistic exercise and in constant questioning of the established powers.

On the other hand, Hallin and Mancini (2009) propose that there are three media models in the Western world, the Polarized Pluralist, developed in the southern European countries, the Corporate Democratic, belonging to the northern countries and the Liberal, coined by the Anglo-Saxon States and the United States. Due to the cultural and historical closeness that Mexico keeps with Spain, we could deduce that the media model that has prevailed in Mexico is the Polarized Pluralist.

This is characterized by the closeness between the media and political power, a relationship that has endured due to the late transition to democracy in Mediterranean Europe. Likewise, the historical absolutist system that ruled in that region built a dynamic of complicity on the part of society before power, so the press has positioned itself as a window of the political class.

However, in recent years, the country has entered a process of hybridization since, with the entry into force of free trade, liberal practices such as the State's withdrawal in the operation of radio frequencies or the supposed free competition in the field of media, could indicate that the Liberal model operates in Mexico. However, according to Márquez and Guerrero (2015), in Mexico and Latin America the *Captured Liberal Model* has been developed, a media system that legally aims to be liberal and attached to the free market of content for this dynamic to reinforce journalistic quality, however, different regional conditions such as violence, high business concentration, and political interference in the media, among others, has captured the autonomy of both communication companies and journalists at all hierarchical levels.

Once we have reviewed the financial and political situation in which the written press is located in Mexico, we can conclude that, due to the socio-cultural conditions of the country, the printed media need to exchange editorial autonomy for methods of economic subsistence such as government propaganda or advertising investments of private entities who, in cases such as Reforma or El Universal, dictate the editorial line (Hernández, 2010). Likewise, framing the essay in the concept of clientelism, we will be able to argue why print media that had historically been accomplices of past governments, currently, following the considerable cut in the government budget for advertising, have distanced themselves from the current administration.

POLITICAL CLIENTELISM IN THE MEDIA

The massive poverty that has characterized Mexico during its recent history has led political parties to take advantage of this situation to generate an exchange relationship between marginalized communities and political actors.

These practices were developed since its inception by the PRI, a party that for much of the twentieth century took advantage of the government budget to distribute different types of gifts to determine in its favor the vote of the people benefiting from both social programs and other types of subsidies. In this sense, currently, Morena also exercises clientelistic practices based on the direct distribution of resources to young people, older adults, and people with disabilities, among others. However, the press-power relationship has had a substantial change in the current administration.

It should be clarified that there is a great difference between the purchase of votes and political clientelism since the latter is difficult to frame within the legal framework, making visibility and therefore punishment more difficult to identify. Hagene (2015) mentions that this practice is not completely undemocratic, since its legitimacy is based on the fact that it does not necessarily depend on the application of force or coercive methods and it is not even essential to make use of the public budget to consolidate these relations, a circumstance that facilitates its execution, especially in electoral times. On the concept of political clientelism Zapata Osorno (2016) states:

The definitions are constructed from the characteristics' indication, the basic structure, and types of exchange in its relations with the environment, but it retains a "fundamental element": it is an asymmetrical relationship of exchange between someone who gives benefits and favors, receiving in return votes and political support that allows them to remain in power.

Likewise, the dynamics that occur between a hegemonic entity and a subordinate one through clientelism seek to consolidate loyalty relationships between both actors with asymmetric characteristics. Through connections based on trust, interactions, and the exchange of favors or gifts, it is intended to generate an environment of advantage over the political opposition that, although it is also part of the clientele network, the political actor with the greatest amount of resources will have a favorable position.

Having reviewed the concept of political clientelism from the approach of Political Science, it is pertinent to point out that the characteristics that frame the concept are equally visible between political power and the media. Even though the system of ownership of media in Mexico requires that the analytical treatment be different, starting from the level of concentration that differentiates Television from Radio or print media, client practices through different methods are present on all platforms.

Any discussion of the media situation in Mexico must begin by recognizing the lack of journalistic autonomy as a result of different variables such as violence against communicators or censorship through coercion (Márquez-

Ramírez, 2015). However, there are more subtle methods to make the editorial line of a medium adapt to the needs of both factual and established powers. As mentioned above, the flimsy financial conditions of media companies make government advertising one of the main sources of revenue.

Meanwhile, assuming that the discretionary allocation of public funds in political propaganda occurs in environments of opacity and without clear and precise rules. Governments have taken advantage of the conjuncture to influence news coverage and shape the broad media landscape or editorial lines of specific media outlets or journalists through a biased allocation of government advertising; state and government subsidies to the media; and other similar financial instruments (WAN-IFRA, 2014).

Many print media, being led to accept patronage pacts with the government leadership, leave their editorial line in a vulnerable state for its interests, in such a way that they comply with the loss of sale of copies as a direct cost of editorial manipulation by power groups (Salazar, 2017). In this regard, there is evidence that the main revenues in newspapers come from government advertising, a situation that sometimes leads some newspapers to raise the costs of advertising spaces for government propaganda.

On the other hand, it is pertinent to clarify that there are different types of clientelism in the press-power relationship. So far we have analyzed the phenomenon taking into account only the subsidies that both local governments and the federal government grant to the owners of the media. However, thanks to the precarious conditions in which communicators operate in the country's newspapers, *envelope journalism* is another recurrent practice among governments and reporters. In this sense, Salazar (2017) argues that "the low profitability of newspapers as a commercial company is transferred to the working conditions of reporters, who become easy prey for clientelistic strategies."

Different studies by Salazar (2017, 2018) show that government advertising in the states of the country is not decisive to be able to control the critical posture in regional newspapers. Therefore, she argues that political heterogeneity in local congresses has made opposition parties also function as practicing clientelism actors, concluding that the greater the parliamentary opposition in an entity, the less loyalty the media will have to the executive branch since the approval of the government budget for official advertising naturally has to pass the approval of the local congress.

Clientelism is a game that is played under the cover of the complicity of the media themselves. Therefore, even in its least contingent manifestations - paid inserts, commissioned columns, or official advertising contracts - it is difficult to accurately calculate the actual intensity of exchanges, and the effectiveness

of deals. The only ones who know them are those involved, and for the rest, everything is uncertain (Salazar, 2018).

Taking into account that counterweights work as a brake so that clientelistic practices do not develop successfully, we could assume that media competition, coupled with the emergence of new digital media, has caused information consumers to fragment. This phenomenon has caused the income of the media to decrease substantially, so that not only regional newspapers depend on official propaganda, but also newspapers of national circulation.

With the arrival of new technologies and the migration of the media to the digital environment, there is no accurate information on the level of consumption of newspapers on digital platforms, however, the circulation of the newspapers with the highest circulation in Mexico does not exceed 300 thousand copies a day. According to the National Catalogue of Printed Media and Internet published by the National Electoral Institute in 2022, the newspapers with the largest circulation in the country are El Grafico with 285,558, followed by La Prensa with 219,800, and in third position the Metro, of Grupo Reforma, with 200,499 copies.

Once we have seen the circulation of the different newspapers in Mexico, we can glimpse an uncertain future for the main newspapers in the country, since the newspapers of greater relevance and hierarchy do not pull more than 140 thousand copies a day³, a situation that has put into question their continuity in the market of printed media.

PRINT MEDIA AND THE NEED TO SURVIVE IN THE FACE OF BUDGET CUTS

In all periods of the government of both PAN and PRI, congress has approved different budgets for the media. However, none of them has been fully respected. The administration of Enrique Peña Nieto, during its exercise in 2017, spent 11 thousand 240 million Mexican pesos on official advertising⁴, when in reality congress had only approved a total of 4 thousand 365 million.

Likewise, in recent years, the different administrations have exercised, at their discretion, the budget approved by the legislative branch, with 2017 being the year in which a greater increase in government spending on advertising can be observed⁵. Meanwhile, with the seventy-five percent cut implemented by the current management, print media that at one time had

3 <https://repositoriodocumental.ine.mx/xmlui/bitstream/handle/123456789/131525/JGEor202203-24-ap-4-2-a.pdf>

4 Final figures provided by the Social Communication System (ComSoc)

5 <https://vanguardia.com.mx/noticias/nacional/el-gasto-de-pena-en-publicidad-rompe-record-10725-millones-en-2017-200-mas-de-lo-autorizado-CMVG3408381>

economic crises such as *Excelsior*, *Reforma*, *El Universal*, and even *Milenio Diario*, are in an uncomfortable situation, which has forced them to naturally distance themselves from the party in power (Morena).

I consider it pertinent to clarify that López Obrador's speech, since his appearance in the national political sphere, was always against the hegemonic powers in Mexico, which are largely composed of the media. Likewise, the media concentration that characterizes the region has made the most powerful media in the country have as the single owner who, irrefutably, immersed in the logic of the market, will always see for the benefit of himself and the media company.

On the other hand, given the digital convergence that has occurred during the last decades, together with the change in information consumption habits, newspapers have had to adapt to the new panorama, digital platforms being an escape valve against low levels of consumption in the printed format. Comparing the copies that are printed daily with the followers that each newspaper has on social networks such as Twitter and Facebook, it can be glimpsed that the present and the future are on these platforms, however, the advertising business model in cyberspace has not yet been consolidated, so that said media are in a constant battle to acquire advertisers or, in some cases, begin to employ the subscription model (Palacio, 2018).

With 7 million 5 thousand followers on Twitter and 5 million 495 thousand on Facebook, *El Universal* is the Mexican newspaper with the largest presence on digital platforms, followed by the journal *Milenio*, with a total of 5 million 531 thousand and 2 million 569 thousand. Likewise, media such as *Excelsior* or *Reforma* exceed 2 million followers on Twitter. Therefore, to some extent, Mexican newspapers still have a great influence on public opinion, at least in a quantitative way, a situation that has allowed the power relationship between the new government and the former to be in dispute.

Post-Marxist literature based on new technologies has attempted to demonstrate that cyberspace did not function as a place where capitalist structures crumbled and, in turn, has demonstrated that the capitalist system successfully migrated into virtual space. In this sense, McChesney (2013) states that the digital revolution, which initially offered an encouraging scenario in which it was expected to provide more competitive markets, as well as the decrease in high levels of concentration, failed. And the same structures and dynamics that were observed during the last decades in the physical space moved to digital platforms.

These postulates can be perfectly inserted in the print media in Mexico, who, despite presenting an evident crisis in their printed format, managed to cross the digital barrier and position themselves, as they did in the past, as the newspapers with the highest number of followers on social networks. Likewise, the power of media companies has not diminished in the face

of the digital revolution, since in political matters no opinion leader or information portal with ideas other than the hegemonic media has managed to capture such a level of users. Intellectuals and journalists considered to be leftists, such as Lorenzo Meyer or Julio Hernández, do not exceed 900 followers on Twitter, while opinion leaders such as Carlos Loret de Mola or Joaquín López Dóriga, historically related to past regimes⁶, exceed 8 and a half million followers on that platform.

In this way, we can observe that the media that have managed to migrate to the digital space or cyberspace still retain some political capital that makes them remain in force in public opinion. Strictly speaking about models of financing through the network, Christian Fuchs (2014) argues that the emancipatory environment of social networks has declined since, although they are not yet consolidated, the ways of marketing and inserting digital content in the capitalist dynamic can be given even more easily than in traditional forms.

For example, when only analog media existed, the way of marketing was measured through the number of readers or audiences, and despite the advertiser finding some section within a newspaper or some schedule in electronic media, the commercial product was always susceptible to people who did not belong to the target niche sneaking among the recipients, however, social networks, through the information provided by their users, offer the possibility to advertisers that the public can be segmented into users with the characteristics defined for a certain product, a possibility that traditional media could never offer.

This phenomenon opens a wide possibility for new business managers to begin to see cyberspace and social networks as a new ecosystem with wide marketing possibilities, adapting the traditional business dynamics and capital accumulation, within the new spaces through the network.

As we can see, the reduction of the government budget for official advertising has reduced the revenues of the media in general, but especially the printed ones. In the first three years of AMLO's government, 8 thousand 648 million pesos have been spent on official advertising, 26 billion pesos less than that exercised in the first half of Enrique Peña Nieto's six-year term⁷. The government, in turn, has proposed total transparency in spending to avoid the opacity with which the government budget was exercised in the past. Although, as can be seen, the funds allocated to the media have been reduced considerably, the preference of the current government for some

6 <https://www.forbes.com.mx/confirman-pagos-millonarios-a-periodistas-en-sexenio-de-pena-nieto/>

7 <https://contralinea.com.mx/noticias/amlo-ahorra-26-mil-millones-en-publicidad-oficial-fundar-y-articulo-19/>

media companies such as La Jornada, Tv Azteca, and Televisa, is evident, concentrating 28.6% of spending on the matter⁸.

Another way to analyze how the press-power relationship occurs in Mexico and understand one of the main factors by which the most important newspapers in the country changed their editorial line for the political party in power, is the legal environment in which the media are developed. Unlike radio or television, which operate through the allocation of government-provided concessions, print media operate as businesses with a higher level of autonomy, as they are not legally dependent on government policies. That is, the control over radio and television is much greater than that which can be exercised over the press because they are managed under the regime of concessions where the government is the one that grants them, in a discretionary way, which gives it the same right to withdraw or not renew them. This is not the case with the written press, where legislation does not grant the government any privilege over it (Riva Palacio, 1996).

However, as I have argued throughout the essay, the governments of both the PAN and PRI, at the federal level, created new ways of negotiating with the press based on clientelistic practices in the allocation of advertising budget. The World Association of News Papers and News Publishers, WAN-IFRA, (2014) has documented that the distribution of the government budget is discretionary and arbitrary since, for example, during the administration of Vicente Fox, the government considerably reduced official resources to the magazine *Proceso*, which had published negative information about the president. The magazine provided evidence of this situation and, having a circulation of 74,792 copies per week, only disseminated 5.16 pages of ads from the federal government, while a smaller magazine such as *Vertigo*, with 40,000 copies, obtained 166.42 front pages. That is, the federal government announced itself 32 times more in *Vertigo* than in *Process*⁹.

However, it can be corroborated by "the use of the state power to allocate public resources to reward the media condescending to the authorities and punish the independent or critical media. Some public officials understand that the publicity that the State must hire to fulfill its obligations has the purpose of ensuring the loyalty of the media" (Cuna, 2008).

Since we have reviewed the importance of government advertising in the media, but especially in the print media for their subsistence, we can infer that one of the main reasons why the written press has distanced itself considerably from the party in power is due to the lack of official resources.

8 <https://www.animalpolitico.com/2021/08/disparidad-publicidad-oficial-televisa-azteca-jornada/>

9 Pérez, E. C. Medios de comunicación y democracia en México. Hacia una evaluación de los medios en el desarrollo de la sociedad democrática

Regardless of what the purpose of newspapers such as Milenio, El Universal, or Reforma is, by attacking so strongly the actions of the current administration, these media companies, with the reduction and greater distribution of the advertising budget, will face some economic crises that we can better evaluate over time.

Currently, there is no systematic study with which we can clarify if the written press has turned against AMLO, however, in his "morning" lectures, López Obrador usually says that he is the most attacked president since Francisco I. Madero¹⁰. As the press-power relationship has been presented in Mexico, it would not be a surprise to observe a clear tendency to show the current administration negatively, since journalistic companies usually save the interests of their advertisers and attack those who do not provide them with profits and those who have taken it away.

CONCLUSION

The battle between the current government and the print media will continue until either López Obrador's administration ends or a budget deal is reached with the country's major newspapers. Even though during the six-year term of Enrique Peña Nieto, more than 60 billion pesos were spent on official advertising¹¹, public opinion mostly disapproved of the administration of the president of the republic. Such information forces us to reflect on the role of public spending on government propaganda since, if it does not fulfill the function of raising the image and reputation of the administration in turn, the only beneficiaries before the millionaire allocation of public budget are the owners of the media, excluding citizens.

Meanwhile, although audiences have fragmented with the emergence of new digital platforms, newspapers still set the new standard in Mexico, since traditionally, these are the ones that publish "serious" information regarding political issues or national importance, so they continue to be taken as a journalistic reference when evaluating the performance of a government. On the other hand, it would be naive to assume that the budget cut is the only factor that encourages the resounding change of editorial lines in media such as El Universal, Reforma, Milenio, or Excelsior, among others. There are also market, journalistic, or ideological reasons that traditionally place them at a significant distance from the current president.

Tuchman (1978) states that journalistic companies position and circulate knowledge and ideologies through public space. Also, through the simple

10 <https://www.diariodemexico.com/mi-nacion/dice-amlo-ser-el-presidente-mas-atacado-desde-madero>

11 Data provided by Artículo 19 México

question: "Why is it worth publishing some events and not others?" the author indicates that before the note comes to light, it has to go through a series of hierarchical filters, which maintain constant communication with each other. Such a dynamic helps us understand why, apart from the main thesis, the nationally circulated print media has embarked on a campaign of political lynching towards the current president.

Likewise, one of the directions that the current government seeks to take is to distribute advertising spending more equitably, so that any media that meets the requirements of the federal government, can become a creditor to ensure a greater and "better" distribution of the public budget. In this way, we are faced with a press-power relationship never seen before, in which the most important newspapers in the country remain critical actors in the current administration, unlike previous presidencies.

As mentioned above, there are no rigorous studies with which the change in the editorial line of the most important newspapers in the country could be generalized empirically. However, incipient studies have emerged that demonstrate that criticism and even disqualification towards the actions of 4T have been the dominant discursive action during the first year of government (Valles, 2021). Such results begin to open a space to understand the behavior of the written press and its relationship with the government in turn.

Throughout the twentieth century and the first two decades of the twenty-first, the print media and political power, through different tactics and strategies, had a relationship of mutual interest, in which the Mexican press accepted any kind of subsidy, either directly from the federal government in the form of budget allocations for official advertising or the practice *par excellence* that was developed to limit the opinion of some specific journalists, envelope journalism.

This essay is not intended to allude to the unquestionable transparency of the current president, since the links or relations that the ruling party may have created with electronic media such as radio or television have not yet been explored academically. However, the most important newspapers in the country have shown a sudden change of editorial line since the arrival of the Morena party to power.

All of the claims made in the essay could be empirically verified through a grueling content analysis, which takes into account a certain period and examines the information notes or newspaper headlines in question when reporting on government action. In addition, the approach provided in this work can function as a preliminary study that serves as a context or theoretical anchor, taking into account political clientelism, through official advertising, as a determining variable in the editorial line of national newspapers.

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Phytotoxicity of plant extracts on seed germination and initial development of mono and dicotyledonous plants

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— Abstract—

Weed control is an important factor in crop production, but it is necessary to generate less polluting and more sustainable alternatives, for which exploratory research was proposed to determine the phytotoxic activity of plant extracts of *Rosmarinus officinalis*, *Raphanus sativus*, *Origanum vulgare*, *Capsicum annuum* and *Allium sativum* in seed and plant germination of monocots (*Zea mays*) and dicots (*Phaseolus vulgaris*) species; two forms of extraction (liquefied and pressurized) were used with each plant. In the first stage, all the extracts were evaluated at concentrations of 100% and 50% v/v, in *Z. mays* and *P. vulgaris*, and the percentage of germination, healthy seeds, and seedling growth were quantified. The best treatments were evaluated in a second stage on plants, and the following were quantified: degree of phytotoxicity (Rochecouste scale), fresh and dry weight, and root and foliar growth. The design was completely randomized, and a control (water) was included in both stages, analysis of variance and comparisons of Tukey's means ($P \leq 0.05$) were performed. The results indicate that the extract of *R. officinalis* liquefied at 100% achieved nine on the Rochecouste phytotoxicity scale, as well as the lowest value of dry weight in *Z. mays*, and *R. officinalis* pressurized at 100% and 50%, *C. annuum* liquefied and pressurized at 100% and *O. vulgare* pressurized at 100%, also had a phytotoxic effect greater than 4.8 and a reduction in the dry weight of plants by more than 50%, being potential herbicide products in monocots plants. The extract of *A. sativum* liquefied at 100% achieved ten on the Rochecouste scale and the lowest weight in *P. vulgare* plants, being *A. sativum* pressurized at 100 and 50%, and *O. vulgare* liquefied at 100%, extracts with herbicide potential in dicots plants.

Keywords:

Weeds, sustainable agriculture, Allium sativum, Origanum vulgare, Rosmarinus officinalis, Capsicum annuum.

For years the use of chemical or synthetic herbicides has been part of the work routine of many producers in the agricultural sector, mainly when carrying out cleaning activities or preparing the land to combat arvenses (weeds). According to García (2013), synthetic herbicides have been used indiscriminately in 47 countries for 50 years for weed control, resulting in the development of resistance in more than 235 arvenses species.

This type of vegetation represents various problems for crops, affecting the development of seedlings by the competition for water, light, territory, and nutrients, decreasing the production capacity, while they can behave as hosts of pests and diseases. In addition, the inappropriate and irrational use of herbicides to combat arvenses has caused environmental impacts such as the loss of soil fertility, contamination of surface and groundwater, causing the decrease of species such as fish, birds, insects, and even human losses due to intoxication in their mismanagement.

Méndez (2019) states that the biggest challenge for organic agriculture is weed management due to the lack of effective natural herbicide products for its control. The allelopathic characteristics exhibited by some plant species could become an important tool to combat the challenges of environmental pollution and the development of herbicide resistance in weeds. In this regard, a relatively unexplored alternative is the use of allelopathic plants. Allelopathy is the science that studies the interrelationships between plants, through the relationships of regulation or repulsion between them and other organisms, having established that many plants produce chemicals capable of repelling other plants, fungi, bacteria, nematodes, viruses, and insects, so they represent a very effective natural control that would avoid the use of pesticides, herbicides, or fungicides (Ormaza, 2017).

In a search for more sustainable solutions, "extracts derived from vegetables have turned out to be an interesting alternative. That is why its use has gained relevance in recent times since they are an economic, renewable, and safer resource for the environment." (Abdullah, 2011; Delbianco & collaborators, 2020) This is because the bioactive compounds extracted from plant organs (leaves, roots, flowers, stems, and seeds) present a phytotoxic potential, which makes them candidates for bioherbicides (Cruz & Flores, 2021). Mexico has a great deal of unexplored plant diversity; according to Diaz *et al.* (2017) research on plants with phytotoxic (*in vitro*) and allelopathic (in soil) properties has been poorly developed due to the small number of plant species that have been studied.

The present exploratory research aimed to: determine the phytotoxic activity of plant extracts of *Rosmarinus officinalis L.*, *Raphanus sativus*, *Origanum vulgare L.*, *Capsicum annum L.* and *Allium sativum* in the germination of seeds and plants of monocotyledonous (*Zea mays*) and dicotyledonous (*Phaseolus vulgaris*) species; to explore sustainable alternatives in

the management of arvense plants in crops, which allow local resources to be used and which can contribute to the reduction of the negative effects of herbicides on the environment.

MATERIALS AND METHODS

Collection of plant material

For the two stages of development of this research work, plant material was collected from five species: rosemary (*Rosmarinus officinalis L.*), oregano (*Origanum vulgare L.*), white chili (*Capsicum annuum L.*), radish (*Raphanus sativus L.*), and garlic (*Allium sativum L.*) in March 2021, in the municipality of Berriozábal, state of Chiapas, Mexico, which was free of pests, diseases, and without physical damage.

Extracts preparation

The plant extracts were prepared by two extraction means, hot and cold, through the methods of liquefaction and pressurization, according to the methodology described by Ramírez (2013), for which *R. officinalis* and *O. vulgare* leaves, *C. annuum* fruits, *A. sativum* bulbs, and *R. sativus* root were weighed and crushed.

The pressurization method (P) is an extraction process that consists of cooking the plant material in a pressure cooker to obtain vegetable broth. So 300 g of fresh plant material finely chopped in 1 liter of solvent consisting of a distilled water solution placed into a pressure cooker. It was sealed and subjected to heat for 15 minutes without allowing steam to escape, allowed to cool without removing the lid, and subsequently filtered. For the liquefaction method (L), the plant material was subjected in the same proportion as the previous extraction method to a cold extraction process using a blender for this purpose, leaving the plant material well crushed, to then be filtered; the two processes were carried out under aseptic conditions to avoid contamination.

PHYTOTOXICITY BIOASSAY

Stage 1. Germination tests

In an attempt to have models representing families of the two taxonomic classes of plants (mono- and dicotyledonous) for the development of a reproducible bioassay, the use of seeds from cultivated species was chosen for plants monocotyledonous corn seeds were used (*Zea mays*) provided

by the ejido San Isidro in the municipality of Berriozábal, Chiapas and for dicotyledonous: bean seeds variety “verdín” (line SEN-70) (*Phaseolus vulgaris*), obtained from the National Institute of Agricultural and Livestock Forestry Research (INIFAP) headquarters Ocozocoautla, Chiapas. For this test, a completely randomized experimental design was used, using the five plant extracts with the two forms of extraction (pressurization and blending), each at two concentrations: 100 and 50% volume/volume (v/v), and control with water was counted for a total of 21 treatments, and five repetitions; for each species. The experimental unit consisted of ten seeds placed in a 20 x 15 cm uncel tray, in which an absorbent paper base was placed, and 10 ml of a solution of the plant extracts at the respective concentrations was added (Table 1), subsequently covered with a vinyl paper film.

Table 1
Treatments evaluated in seed germination

No.	Treatments	Extraction method	Concentration
1	<i>Raphanus sativus</i>	Liquefied	100% (v:v)
2	<i>Raphanus sativus</i>	Liquefied	50% (v: v)
3	<i>Raphanus sativus</i>	Pressurized	100% (v:v)
4	<i>Raphanus sativus</i>	Pressurized	50% (v:v)
5	<i>Capsicum annum</i>	Liquefied	100% (v:v)
6	<i>Capsicum annum</i>	Liquefied	50% (v:v)
7	<i>Capsicum annum</i>	Pressurized	100% (v:v)
8	<i>Capsicum annum</i>	Pressurized	50% (v:v)
9	<i>Rosmarinus officinalis</i>	Liquefied	100% (v:v)
10	<i>Rosmarinus officinalis</i>	Liquefied	50% (v:v)
11	<i>Rosmarinus officinalis</i>	Pressurized	100% (v:v)
12	<i>Rosmarinus officinalis</i>	Pressurized	50% (v:v)
13	<i>Origanum vulgare</i>	Liquefied	100% (v:v)
14	<i>Origanum vulgare</i>	Liquefied	50% (v:v)
15	<i>Origanum vulgare</i>	Pressurized	100% (v:v)
16	<i>Origanum vulgare</i>	Pressurized	50% (v:v)
17	<i>Allium sativum</i>	Liquefied	100% (v:v)
18	<i>Allium sativum</i>	Liquefied	50% (v:v)
19	<i>Allium sativum</i>	Pressurized	100% (v:v)
20	<i>Allium sativum</i>	Pressurized	50% (v:v)
21	<i>Water indicator</i>	N/A	N/A

Source: Own elaboration

For the quantification of the *germination percentage* variable, the data were recorded every 24 hours, counting the number of germinated seeds per

experimental unit, as well as the number of healthy seeds, eleven days for *Z. mays* and nine for *P. vulgaris*.

To evaluate the vigor of the seedlings, the root length and leaf development of those from the seeds that managed to germinate were measured. For both variables a single measurement was performed, expressing the results in millimeters (mm) on day eleven for *Z. mays* seeds and the ninth day for *P. vulgaris*' seeds.

Stage 2. Phytotoxic effect on plants

Based on the results of the previous trial, the treatments that were most effective in reducing the germination and development of *Z. mays* and *P. vulgaris* were evaluated in the second stage. For this, plastic cups with a capacity of 3 ounces perforated at the bottom were used, filled with a substrate (sand:earth), previously solarized for ten days, and a seed was placed in the center.

A completely random design was employed, with nine treatments for *Z. mays* and eight for *P. vulgaris* (see Tables 2 and 3), 12 replicates were counted for each treatment, and one control with water was contemplated for each. In the case of *Z. mays* was counted with 108 experimental units and *P. vulgaris* of 96. For the application of treatments, a manual atomizer was used, performing a foliar spray on each plant on day 23 of planting, after five days the first evaluation was carried out, and on the tenth day, the second, applying the Rochecouste phytotoxicity scale (table 4) according to Chaila (1986).

Table 2

Treatments evaluated in Z. mays plants

No.	Treatments for <i>Z. mays</i>	Concentration
1	<i>Capsicum annuum</i> L. Liquefied	100% (v:v)
2	<i>Capsicum annuum</i> L. Liquefied	50% (v:v)
3	<i>Capsicum annuum</i> L. Pressurized	100% (v:v)
4	<i>Capsicum annuum</i> L. Pressurized	50% (v:v)
5	<i>Rosmarinus officinalis</i> L. Liquefied	100% (v:v)
6	<i>Rosmarinus officinalis</i> L. Pressurized	100% (v:v)
7	<i>Rosmarinus officinalis</i> L. Pressurized	50% (v:v)
8	<i>Origanum vulgare</i> L. Pressurized	100% (v:v)
9	Control - Water	NA

Source: Own elaboration

Table 3
Treatments evaluated in P. vulgaris plants vulgaris

No.	Tratamientos for <i>P. vulgaris</i>	Concentration
1	<i>Rosmarinus officinalis</i> Pressurized	100% (v:v)
2	<i>Rosmarinus officinalis</i> L. Pressurized	50% (v:v)
3	<i>Allium sativum</i> Liquefied	100% (v:v)
4	<i>Allium sativum</i> Liquefied	50% (v:v)
5	<i>Allium sativum</i> Pressurized	100% (v:v)
6	<i>Allium sativum</i> Pressurized	50% (v:v)
7	<i>Origanum vulgare</i> Pressurized	100% (v:v)
8	Control - water	NA

Source: Own elaboration

Table 4
Escala Rochecouste para la evaluación de fitotoxicidad

Rochecouste Phytotoxicity Scale	
Effects	Score
No visible effect	0
Slight caustic action on leaves	1
Chlorotic Leaves	2
Moderate caustic action on leaves	3
Moderate caustic action on leaves and stems	4
Slight damage to leaves and stems	5
Slight damage, and death in young outbreaks	6
Dead stems 25%	7
Dead stems 50%	8
Dead stems 75%	9
Total Death	10

Source: Chaila, 1986

In addition, at the end of the phytotoxicity evaluations, fresh and dry weights per plant were determined as response variables. For fresh weight determination, it was recorded by fully weighing the plant on a gram scale. To determine the dry weight of each treatment, the plants were exposed to the sun for 15 days until a constant weight was obtained with these values determining the percentage reduction of dry weight, relative to the control with water.

Statistical analysis

In both trials, a completely randomized experimental design was performed, with five repetitions for the first stage and 12 repetitions for the second stage, for each of the treatments. The data obtained were processed through an analysis of variance (ANOVA), and for those who presented significant differences, the Tukey means comparison test ($P \leq 0.05$) was performed with the SPSS version 17 program.

RESULTS AND DISCUSSION

Extracts effects on Z. mays seeds germination

The results of the treatments' effect on *Z. mays* seeds germination can be seen in Table 5, in which the daily number of germinated seeds for 11 days is presented; the ANOVA performed for each day indicated the existence of statistical differences between the treatments for every day, it is appreciated as from day 2, the control treatment, to which only water was applied, recorded the highest values starting with 4.4 and at the end of day 11 was 9, recording according to the Tukey test difference with the other treatments. It is appreciated that from day 2 to 11 of treatment with *R. officinalis* 100% pressurized, its germination values were low (0.2 to 3), followed by the same plant and extraction form but at an application concentration of 50% (v:v), with values of 0.8 to 6.6 of germinated seeds, followed by the treatment of *C. annuum* 100% pressurized with values ranging from 1.2 to 6; for evaluation day 11 only treatment *R. officinalis* 100% pressurized, with 30% germination, registered statistical difference with the water control, which presented 90% germination.

Table 6 presents the data on the number of healthy seeds for each of the treatments, as well as their germination percentage. The ANOVA practice indicated statistical differences between the treatments in the first days of evaluation, being *R. sativus* 100% pressurized and *A. sativus* 100% liquefied, the only treatments that recorded 100% healthy seeds at the end of the evaluation days, the water control recorded 90% healthy seeds at the end of the 11 days of evaluation.

In the case of the dicotyledonous (*P. vulgaris*), the ANOVA practiced at the number of germinated seeds, indicates differences between treatments on each of the nine days of evaluation, the data are presented in Table 7, where it can be seen that *A. sativum* 100% pressurized, recorded the values of zero germinated seeds until day 7, and ended on day 9 with 1.4, recording statistical differences with the water control, which recorded the highest value with 60% germination. Other treatments that allowed low germination

were *A. sativum* 100% liquefied, *R. officinalis* 100 and 50% pressurized, *O. vulgare* 100% liquefied, *R. officinalis* 100% liquefied, with values between 24 and 30% of germination, at the end of the evaluations.

Regarding the number of healthy seeds, it can be seen in Table 8, when practicing the ANOVA only recorded differences between the treatments for day 3; at the end of the evaluations, the percentage of healthy seeds was between 52 and 72%, with 60% water control, the lowest values being those recorded in the treatments with *R. officinalis* 50% Liquefied with 46%, *O. vulgare* 100% Liquefied and *C. annuum* pressurized to 50% with 48% healthy seeds.

The results allowed us to observe the gradual decrease in the percentage of germination in corn and bean seeds. For the case of pressurized extract *R. officinalis* at a concentration of 100% could be observed to act in both seeds as a major growth inhibitor in monocots (narrow leaf) and dicotyledonous (broad leaves). According to research conducted by Sancho (2011), the herbicidal potential of *R. officinalis* essential oil was evaluated, and tested *in vitro* on *P. oleracea* (purslane) and *C. canadensis* (horsetail). It could be concluded that *C. canadensis* revealed increased phytotoxic activity, as the three highest concentrations (0.25, 0.5, and 1 $\mu\text{l/ml}$) significantly inhibited its germination, by 40.4, 70.2, and 97.9% respectively. So, it might be possible to use extract *R. officinalis* as a natural herbicide in arvenses in activities before crop preparation.

Table 5
Plant extracts application effects on the Z. mays germination

Treatments	Number of sprouted seeds of <i>Zea mays</i> Germination days										Percentage germination day 11
	2	3	4	5	6	7	8	9	10	11	
<i>R. sativus</i> 100% Liquefied	0.2a	0.8a	5.6c	8.8e	9e	9.8h	9.8d	9.8b	9.8b	9.8b	98
<i>R. sativus</i> 50% Liquefied	0a	0.6a	2.4ab	3.8cd	4.6bc	7.2fgh	9cd	9.2b	9.2b	9.2b	92
<i>R. sativus</i> 100% Pressurized	0a	0a	0a	1.2abc	1.2ab	3.8abcdefg	6.2abcd	8.8b	8.8b	9.6b	96
<i>R. sativus</i> 50% Pressurized	0.4a	1a	1ab	0.8abc	0.8a	3abcdef	6.6abcd	8.6b	8.6b	8.6b	86
<i>C. annuum</i> 100% Liquefied	0a	0a	0a	0a	0a	2.8abcdef	6.2abcd	8.6b	8.6b	9b	90
<i>C. annuum</i> 50% Liquefied	0a	0a	0a	0a	0a	0.8ab	3.4ab	7ab	7ab	7.4b	74
<i>C. annuum</i> 100% Pressurized	1.2a	1.2a	1.2ab	1.2abc	1.2ab	1.6abc	4.4abc	6ab	6ab	6ab	60
<i>C. annuum</i> 50% Pressurized	1a	1.6a	1.6ab	1.6abc	1.6ab	3abcdef	5.6abcd	7.2ab	7.2ab	7.8b	78
<i>R. officinalis</i> 100% Liquefied	1.4a	1.4a	1.8ab	2abc	2.2abc	3.2abcdef	6.4abcd	7.2ab	7.2ab	7.4b	74
<i>R. officinalis</i> 50% Liquefied	2ab	2a	2ab	2abc	2.4abc	5bcdefg	5.8abcd	8b	8b	8.2b	82
<i>R. officinalis</i> 100% Pressurized	0.2a	0.2a	0.2a	0.2ab	0.2a	0.2a	2a	3a	3a	3a	30
<i>R. officinalis</i> 50% Pressurized	0.8a	0.8a	0.8ab	0.8abc	0.8a	1ab	4.6abc	6.6ab	6.6ab	6.6ab	66
<i>O. vulgare</i> 100% Liquefied	1a	1a	1ab	1abc	4.4bc	7efgh	7.4bcd	9.4b	9.4b	9.4b	94
<i>O. vulgare</i> 50% Liquefied	0.4a	0.4a	0.4a	0.4abc	1.4ab	2.4abcd	6.4abcd	8.6b	8.6b	8.6b	86
<i>O. vulgare</i> 100% Pressurized	0.8a	0.8a	3.6bc	3.6bcd	5.2cd	6.6defgh	7bcd	8.6b	8.6b	8.6b	86
<i>O. vulgare</i> 50% Pressurized	1a	1a	1ab	1abc	1.6ab	4abcdefg	7.6bcd	8.2b	8.2b	8.6b	86
<i>A. sativum</i> 100% Liquefied	0a	0a	0a	0a	0.6a	3.2abcdef	7.4bcd	8.6b	8.6b	8.8b	88
<i>A. sativum</i> 50% Liquefied	0.8a	0.8a	0.4a	0.4abc	0.6a	2.6abcde	4.4abc	9.4b	9.4b	9.4b	94
<i>A. sativum</i> 100% Pressurized	0.4a	0.4a	0.4a	0.4abc	0.6a	2.8abcdef	5.4abcd	8b	8b	8.4b	84
<i>A. sativum</i> 50% Pressurized	0.8a	0.8a	0.8ab	0.8abc	1.6ab	5.8cdefgh	7.8bcd	9.6b	9.6b	9.6b	96
Water indicator	4.4b	5.6b	6c	6de	8.6de	8.2gh	8.8cd	9b	9b	9b	90

Averages with the same letter in the same column present no statistically significant difference for the Tukey test ($P \leq 0.05$).

Source: Own elaboration

Table 6
Plant extracts application effects on the number of Z. mays healthy seeds

Treatments	Number of healthy <i>Zea mays</i> seeds										Percentage of healthy seeds day 11
	2	3	4	5	6	7	8	9	10	11	
<i>R. sativus</i> 100% Liquefied	10c	10c	9.8c	9.8bc	9.8b	9.8b	9.8b	9.6b	9.6b	9.6bc	96
<i>R. sativus</i> 50% Liquefied	10c	9.8c	9.8c	9.6bc	9.4ab	9.4b	9.4b	9.2b	9.2b	8.6abc	86
<i>R. sativus</i> 100% Pressurized	10c	10c	10c	10c	10b	10b	10b	19b	10b	10c	100
<i>R. sativus</i> 50% Pressurized	10c	10c	9.8c	9.2abc	9.2ab	9.2ab	9ab	9ab	9ab	9abc	90
<i>C. annuum</i> 100% Liquefied	10c	10c	9.8c	9.8bc	9.8b	9.4b	9.4b	9.4b	9.4b	9.2bc	92
<i>C. annuum</i> 50% Liquefied	10c	10c	10c	9.2abc	9ab	9ab	9ab	8.8ab	8.8ab	8.8abc	88
<i>C. annuum</i> 100% Pressurized	9.4bc	9.4bc	9.4abc	9.4bc	8.2ab	8.2ab	8.2ab	7.8ab	7.8ab	7.8abc	78
<i>C. annuum</i> 50% Pressurized	8abc	8.2abc	8.2abc	8.2abc	8.2ab	8.2ab	8.2ab	8ab	8ab	8abc	80
<i>R. officinalis</i> 100% Liquefied	8.6abc	8.6abc	8.4abc	8.4abc	8.4ab	8.2ab	8.2ab	8.2ab	8.2ab	8.2abc	82
<i>R. officinalis</i> 50% Liquefied	8.8abc	8.8abc	8.8abc	8.8abc	8.4ab	8.4ab	8.4ab	8.4ab	8.4ab	8.2abc	82
<i>R. officinalis</i> 100% Pressurized	6.8a	6.8a	6.8a	6.4a	6.4a	6a	6a	5.8a	5.8a	5.8a	58
<i>R. officinalis</i> 50% Pressurized	7ab	7ab	7ab	7ab	7ab	7ab	7ab	7ab	7ab	6.4ab	64
<i>O. vulgare</i> 100% Liquefied	9.6c	9.6c	9.6bc	9.6bc	9.6b	9.6b	9.6b	9.6b	9.6b	9.6bc	96
<i>O. vulgare</i> 50% Liquefied	9.6c	9.6c	9.6bc	9.6bc	9.6b	9.6b	9.6b	9.6b	9.6b	9.6bc	96
<i>O. vulgare</i> 100% Pressurized	9.8c	9.8c	9.8c	9.8bc	9.8b	9.8b	9.8b	9.6b	9.6b	9.2bc	92
<i>O. vulgare</i> 50% Pressurized	10c	10c	10c	10c	9.8b	9.8b	9.8b	9.8b	9.8b	9.6bc	96
<i>A. sativum</i> 100% Liquefied	10c	10c	10c	10c	10b	10b	10b	10b	10b	10c	100
<i>A. sativum</i> 50% Liquefied	9.6c	9.6c	9.6bc	9.6bc	9.6b	9.6b	9.6b	9.6b	9.6b	9.2bc	92
<i>A. sativum</i> 100% Pressurized	9.2abc	9.2abc	9.2abc	9.2abc	9.2ab	9ab	9ab	8.8ab	8.8ab	8.8abc	88
<i>A. sativum</i> 50% Pressurized	9.8c	9.8c	9.8c	9.8bc	9.8b	9.8b	9.8b	9.6b	9.6b	9.4bc	94
Water indicator	9.2abc	9.2abc	9.2abc	9.2abc	9.2ab	9.2ab	9.2b	9.2b	9.2b	9abc	90

Averages with the same letter in the same column present no statistically significant difference for the Tukey test ($P \leq 0.05$).

Source: Own elaboration

Table 7
Plant extracts application effect on P. vulgaris germination

Treatments	Days							Percentage germination day 11
	3	4	5	6	7	8	9	
<i>R. sativus</i> 100% Liquefied	0a	0a	1.8abc	2.2abcd	2.6abcd	3.8ab	4.2ab	42
<i>R. sativus</i> 50% Liquefied	0.6abc	1.8ab	4.4bcd	6cd	5.8cd	5.8b	5.4ab	54
<i>R. sativus</i> 100% Pressurized	0a	3b	4.4bcd	5.4bcd	5.6cd	5.8b	5.6ab	56
<i>R. sativus</i> 50% Pressurized	1.4abc	1.8ab	2.6abc	3.2abcd	3.6abcd	4.2ab	4.4ab	44
<i>C. annuum</i> 100% Liquefied	0a	2ab	3abcd	4.2abcd	4.8bcd	5.6b	5.6ab	56
<i>C. annuum</i> 50% Liquefied	2c	3.2b	4.6cd	6.2cd	6.4cd	5.8b	6.2b	62
<i>C. annuum</i> 100% Pressurized	0a	2.2ab	3.4abcd	4.6abcd	5.2cd	5ab	5.4ab	54
<i>C. annuum</i> 50% Pressurized	0.6abc	1.4ab	2.4abc	3.8abcd	4abcd	4.4ab	4.8ab	48
<i>R. officinalis</i> 100% Liquefied	0a	0.8ab	1abc	1.2ab	2.4abcd	3ab	3ab	30
<i>R. officinalis</i> 50% Liquefied	0a	1ab	1.4abc	2.6abcd	3abcd	3.6ab	3.6ab	36
<i>R. officinalis</i> 100% Pressurized	0a	0a	0a	0.4a	0.4ab	0.8a	2.6ab	26
<i>R. officinalis</i> 50% Pressurized	1.6bc	1.6ab	1.8abc	2.2abcd	2abc	2.2ab	2.8ab	28
<i>O. vulgare</i> 100% Liquefied	0a	0.8ab	0.8ab	1.8abc	2.4abcd	2.2ab	3ab	30
<i>O. vulgare</i> 50% Liquefied	0a	1.8ab	3abcd	4.2abcd	4.2abcd	3.8ab	4.2ab	42
<i>O. vulgare</i> 100% Pressurized	0a	0.6ab	1.6abc	2.8abcd	3.4abcd	3.4ab	4.6ab	46
<i>O. vulgare</i> 50% Pressurized	0a	0.6ab	1abc	4.2abcd	4.4abcd	3.6ab	4ab	40
<i>A. sativum</i> 100% Liquefied	0a	0a*	0.4a	1.6abc	2.4abcd	2.4ab	2.4ab	24
<i>A. sativum</i> 50% Liquefied	0a	0.8ab	2abc	3.2abcd	3.6abcd	3.4ab	4.4ab	44
<i>A. sativum</i> 100% Pressurized	0a	0a	0a	0a	0a	1.4ab	1.4a	14
<i>A. sativum</i> 50% Pressurized	0.2ab	1.8ab	3.2abcd	4.6abcd	4.8bcd	3.8ab	4ab	40
Water indicator	5d	6c	6.4d	6.8d	6.8d	5.4b	6b	60

Averages with the same letter in the same column present no statistically significant difference for the Tukey test ($P \leq 0.05$).

Source: own elaboration

Table 8
Plant extracts application effects on the number of healthy P. vulgaris seeds

Treatments	Number of healthy <i>P. vulgaris</i> seeds							Percentage of healthy seeds day 11
	3	4	5	6	7	8	9	
<i>R. sativus</i> 100% Liquefied	8.6ab	8.6a	7.4a	7.2a	7.2a	7.2a	6.4a	64
<i>R. sativus</i> 50% Liquefied	8.8ab	8.4a	7.2a	7.2a	7.2a	7.2a	6.4a	64
<i>R. sativus</i> 100% Pressurized	7.8ab	6.8a	6.8a	6.8a	6.8a	6.8a	6a	60
<i>R. sativus</i> 50% Pressurized	7.2ab	7a	5.8a	5.8a	5.8a	5.8a	5.8a	58
<i>C. annuum</i> 100% Liquefied	8ab	7.2a	7.2a	6.6a	6.6a	6.6a	5.6a	56
<i>C. annuum</i> 50% Liquefied	7.6ab	7a	7a	7a	7a	7a	6.4a	64
<i>C. annuum</i> 100% Pressurized	8.8ab	7.4a	7.2a	6.6a	6.6a	6.6a	6a	60
<i>C. annuum</i> 50% Pressurized	7a	5.8a	5.8a	5.8a	5.8a	5.8a	4.8a	48
<i>R. officinalis</i> 100% Liquefied	7.6ab	6.2a	6a	5.8a	5.4a	5.4a	5a	50
<i>R. officinalis</i> 50% Liquefied	7.8ab	6.6a	6.2a	4.6a	4.6a	4.6a	4.6a	46
<i>R. officinalis</i> 100% Pressurized	8ab	7.4a	7a	6.6a	6.4a	6a	5.2a	52
<i>R. officinalis</i> 50% Pressurized	7.8ab	7.8a	7.8a	7.8a	7.8a	7.8a	6.8a	68
<i>O. vulgare</i> 100% Liquefied	7.6ab	6.6a	6.4a	5.8a	5.8a	5.8a	4.8a	48
<i>O. vulgare</i> 50% Liquefied	9.2ab	8.6a	8.6a	8.6a	8.6a	8.6a	8.4a	84
<i>O. vulgare</i> 100% Pressurized	9ab	8a	8a	7.8a	7.6a	7.6a	6.6a	66
<i>O. vulgare</i> 50% Pressurized	8ab	7.4a	7.4a	6.4a	6.4a	6.4a	6a	60
<i>A. sativum</i> 100% Liquefied	10b	8.2a	7.8a	7.6a	7.6a	7.6a	6.4a	64
<i>A. sativum</i> 50% Liquefied	10b	9a	8a	8a	7.8a	7.6a	7.2a	72
<i>A. sativum</i> 100% Pressurized	9.4ab	8a	6.8a	6.4a	6.4a	6.4a	6a	60
<i>A. sativum</i> 50% Pressurized	9ab	6.6a	6.4a	6a	6a	6a	5.8a	58
Water indicator	6.8a	6.8a	6.8a	6.8a	6.8a	6.8a	6a	60

Averages with the same letter in the same column present no statistically significant difference for the Tukey test ($P \leq 0.05$).

Source: Own elaboration

Extracts effects on seedling growth

Table 9 shows the effect of plant extracts on root length growth and foliar development of seeds that managed to germinate in *Z. mays*; we can see that all extracts inhibited the development of both the radicle and the hypocotyl, which according to the ANOVA practiced there are statistical differences between treatments. The highest root growth values were for the control (water) with 133.67 mm, which according to the Tukey test recorded differences with almost all treatments, except with *R. sativus* 100% liquefied, achieving the highest percentage of inhibition extracts: *R. officinalis* pressurized to 100%, *R. officinalis* 100% liquefied, and *C. annuum* liquefied to 50% with

84.69, 73.44 and 72.37 %, respectively, concerning the control water; the other treatments also inhibited the development of the root between 67.88 and 9.08%.

Table 9
Plant extracts effects on Z. mays seedling growth

TREATMENT	Growth (mm)		Inhibition percentage for control	
	Root	Hypocotyl	Root	Hypocotyl
<i>R. officinalis</i> P 100%	20.47a	11.7a	84.69	90.10
<i>R. officinalis</i> L 100%	35.5ab	25.6abc	73.44	78.35
<i>C. annuum</i> L 50%	36.93ab	11.43a	72.37	90.33
<i>R. officinalis</i> P 50%	42.93abc	23.07abc	67.88	80.49
<i>O. vulgare</i> P 100%	45.37abc	20.2abc	66.06	82.91
<i>C. annuum</i> P 50%	45.97abc	21.87abc	65.61	81.50
<i>C. annuum</i> P 100%	52.43bcd	19.77ab	60.78	83.28
<i>R. sativus</i> P 50%	52.5bcd	21.73abc	60.72	81.62
<i>A. sativum</i> L 100%	53.8bcd	30.93abc	59.75	73.84
<i>A. sativum</i> P 100%	54.87bcde	32.33abcd	58.95	72.65
<i>C. annuum</i> L 100%	58.07bcde	24.7abc	56.56	79.11
<i>O. vulgare</i> P 50%	58.57bcde	25.97abc	56.18	78.03
<i>A. sativum</i> L 50%	58.83bcde	39bcde	55.99	67.01
<i>O. vulgare</i> L 100%	66.8cde	38.43bcde	50.03	67.50
<i>R. officinalis</i> L 50%	69.67cdef	44.73bcde	47.88	62.17
<i>A. sativum</i> P 50%	77.87def	59.13e	41.74	49.99
<i>R. sativus</i> P 100%	81.22ef	45.47cde	39.24	61.54
<i>O. vulgare</i> L 50%	81.37ef	40.2bcde	39.13	66.00
<i>R. sativus</i> L 50%	95.3fg	56.77	28.71	51.98
<i>R. sativus</i> L 100%	121.53gh	98.1f	9.08	17.03
Water indicator	133.67h	118.23f	0.00	0.00

Averages with the same letter in the same column present no statistically significant difference for the Tukey test ($P \leq 0.05$).

Source: Own elaboration

Regarding the development of the hypocotyl, the highest value was presented with the control (water) with 118.23 mm, being the extract of *R. sativus* liquefied to 100% which allowed the greatest development, while the rest of the treatments achieved an inhibition in their development of more than 51%; the ANOVA practiced recorded statistical differences between the treatments. *C. officinalis* 50% liquefied, and *R. sativus* pressurized to 100%, recorded the lowest growths with 11.43 and 11.7 mm respectively, which according to the Tukey test, recorded statistical differences with the control (water), being the greatest inhibitions with 90.33 and 90.10%, regarding the witness.

The effect of the treatments application on the *P. vulgaris* seedlings growth, presented in Table 10, shows that the highest root growth occurred in the control (water), with 140.4 mm; according to the ANOVA carried out, differences were recorded between the treatments being *A. sativum* pressurized at 100%, which presented the lowest value with 3.93 mm, recording, according to the Tukey test, differences with all the treatments including the control (water); followed by treatments *R. officinalis* 50% pressurized, *A. sativum* 100% liquefied, *R. officinalis* 100% pressurized; *A. sativus* liquefied at 50%, *O. vulga* 100% liquefied, *R. officinalis* 50% liquefied; *C. annuum* 50% liquefied with a root growth inhibition range between 95.04 and 84.49%.

The growth of the hypocotyl, presented in Table 10, shows that the highest value was 8.3 mm in the control (water), and the vast majority of treatments completely inhibited its development. The ANOVA study showed statistical differences between treatments. The Tukey test points to statistical differences between the 12 treatments that inhibited the complement of the growth of the hypocotyl with the other treatments including the control (water), the treatment of *R. sativus* liquefied at 50% was the one that registered the highest growth value within the extracts evaluated with 5.77 mm.

There are several reports of the *A. sativum* effect on various organisms, such as fungicide on the growth of *Aspergillus parasitica* and *Aspergillus niger* (Juárez *et al.*, 2019); as an insecticide, on *Aphis gossypii*, Glover (Peña, *et al.*, 2013) and *Spodoptera frugiperda* (Figeroa, *et al.*, 2019), as well as a bactericide (García & Herrera 2007); however, no report was found on its possible use as an herbicide and that for the case of this research it resulted with potential for the control of dicotyledonous plants, possibly due to the presence of compounds which in the form of extraction (pressurized) and concentration used, resulted with a high potential to be used for this purpose.

Table 10
Plant extracts effects on the growth of *P. vulgaris* seedlings

TREATMENT	Growth (mm)		Inhibition percentage for control	
	Root	Hypocotyl	Root	Hypocotyl
<i>A. sativum</i> P 100%	3.93a	0a	97.20	100.00
<i>R. officinalis</i> P 50%	6.97ab	0a	95.04	100.00
<i>A. sativum</i> L 100%	8.73ab	0a	93.78	100.00
<i>R. officinalis</i> P 100%	10.17ab	0a	92.76	100.00
<i>A. sativum</i> L 50%	12.3ab	0a	91.24	100.00
<i>O. vulgare</i> L 100%	15.8ab	0a	88.75	100.00
<i>R. officinalis</i> L 50%	21.07ab	0a	84.99	100.00
<i>C. annuum</i> L 50%	21.77ab	0a	84.49	100.00
<i>A. sativum</i> P 50%	22.63ab	0a	83.88	100.00
<i>R. officinalis</i> L 100%	22.8ab	0a	83.76	100.00
<i>O. vulgare</i> P 100%	27.97abc	2.23ab	80.08	73.13
<i>O. vulgare</i> L 50%	28.23abc	1.37ab	79.89	83.49
<i>R. sativus</i> L 100%	33.57abc	0.37a	76.09	95.54
<i>R. sativus</i> P 50%	38.47abcd	1.03ab	72.60	87.59
<i>C. annuum</i> P 100%	38.77abcd	0a	72.39	100.00
<i>C. annuum</i> P 50%	39.2abcd	0a	72.08	100.00
<i>R. sativus</i> P 100%	48.53bcd	0a	65.43	100.00
<i>O. vulgare</i> P 50%	48.63bcd	3.1ab	65.36	62.65
<i>C. annuum</i> L 100%	68.03cd	1.7ab	51.55	79.52
<i>R. sativus</i> L 50%	79d	5.77bc	43.73	30.48
Water indicator	140.4e	8.3c	0.00	0.00

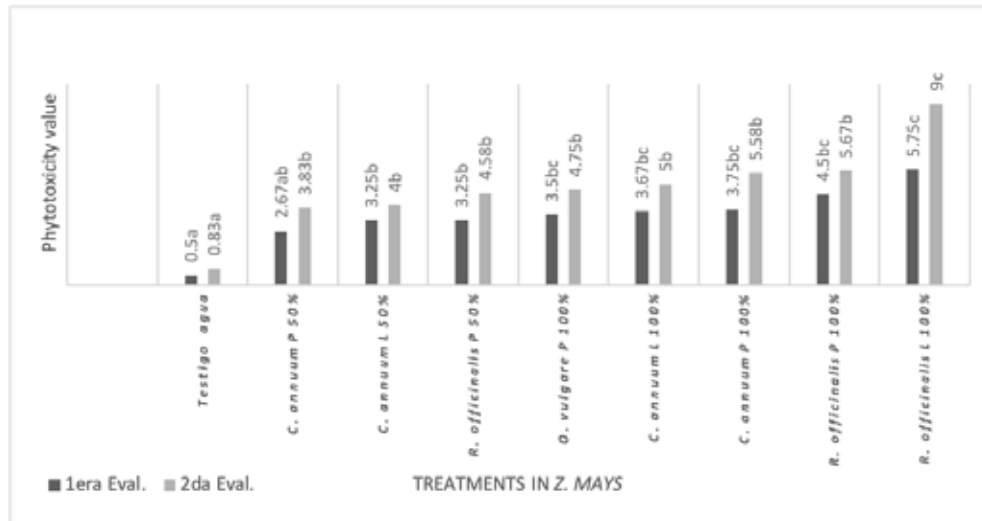
Averages with the same letter in the same column present no statistically significant difference for the Tukey test ($P \leq 0.05$).

Source: Own elaboration

Stage 2. Phytotoxic effect on plants

As can be seen in Figure 1, all the extracts presented different levels of phytotoxicity for both the first and second evaluation, the control water recorded the lowest value with 0.5 for the first and 0.83 for the second evaluation. According to the ANOVA practiced for the two evaluations, there is a statistical difference between the treatments. The treatments that in the first evaluation recorded the highest levels of phytotoxicity were *R. officinalis* 100% liquefied, *R. officinalis* 100% pressurized, *C. annuum* 100% pressurized, and *O. vulgare* 100% pressurized in a range of 5.75 and 3.7, which recorded according to Tukey's test statistical differences with the water witness.

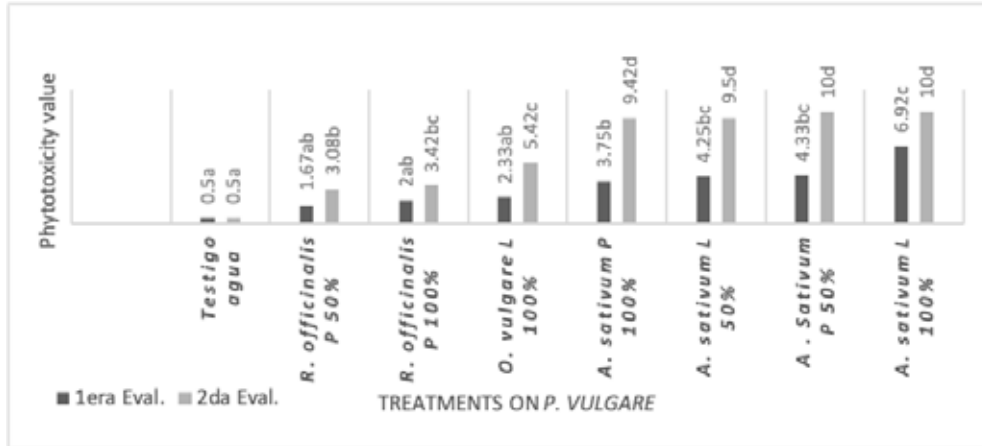
In the second evaluation, the phytotoxicity values increased for all treatments reaching 9 for *R. officinalis* 100% liquefied, which recorded statistical differences with all treatments, including the control with water, which had the lowest value of 0.83, likewise, the rest of the treatments recorded differences with the Control – water.



Averages with the same letter in the same column present no statistically significant difference for the Tukey test ($P \leq 0.05$).

Figure 1. Effect of the application of extracts on the phytotoxicity of *Z. mays* - Rochecouste scale.
Source: Own elaboration

Regarding the evaluation of dicotyledons (*P. vulgaris*), all extracts for both the first and second evaluations registered statistical differences, according to the ANOVA practice, the highest phytotoxicity was presented for *A. sativum* 100% liquefied *A. sativum* 50% pressurized with 10; *O. vulgare* 100% liquefied with 9.5 and *A. sativum* 100% pressurized with 9.42 on the Rochecouste scale, the other treatments also registered statistical difference according to the Tukey's Test with the water control, which registered the lowest value in the two evaluations with 0.5.



Averages with the same letter in the same column present no statistically significant difference for the Tukey test ($P \leq 0.05$).

Figure 2. Application of extracts effect on the phytotoxicity of *P. vulgare* - Rochecouste scale. Source: Own elaboration

EFFECTS OF EXTRACTS ON PLANT WEIGHT

Table 11 shows the fresh and dry weight results of the *Z. mays* plants sprinkled with the treatments, it is observed that the lowest weight in fresh and dry was for the extract of *R. officinalis* 100% liquefied, and dry weight was for *C. annuum* 100% liquefied, which recorded significant differences with all treatments including the water control, which managed to reduce dry weight by 47.5% compared to the control.

In the case of the dicotyledonous *P. vulgare* used, extracts of *A. sativum* and *O. vulgare* 100% liquefied, reduced dry weight by 76.9 and 64.61% concerning the control (water) and recorded statistical differences, according to the Tukey test practiced (Table 12).

Table 11
Influence of treatments on the weight of *Z. mays* plants

Treatments	Fresh weight (g)	Dry weight (g)
<i>Rosmarinus officinalis</i> Liquefied-100%	2.33a	0.53a
<i>Origanum vulgare</i> Pressurized-100%	3.83ab	0.89bc
<i>Capsicum annuum</i> Pressurized-50%	4bc	0.82abc
<i>Rosmarinus officinalis</i> Pressurized-100%	4bc	0.98c
<i>Capsicum annuum</i> Liquefied-100%	4.08bc	0.53a
<i>Capsicum annuum</i> Liquefied-50%	4.08bc	0.62ab
<i>Rosmarinus officinalis</i> Pressurized-50%	4.08bc	0.9bc
<i>Capsicum annuum</i> Pressurized-100%	5.58c	0.93bc
Water indicator	4.75bc	1.01c

Averages with the same letter in the same column present no statistically significant difference for the Tukey test ($P \leq 0.05$).

Source: Own elaboration

Table 12
Treatments' influence on the weight of *P. vulgaris* plants

Treatments	Fresh weight (g)	Dry weight (g)
<i>Allium sativum</i> Liquefied-100%	0.71a	0.15a
<i>Origanum vulgare</i> Liquefied-100%	1.04a	0.23a
<i>Allium sativum</i> Pressurized-50%	1.32ab	0.27a
<i>Rosmarinus officinalis</i> Pressurized-100%	1.87abc	0.51b
<i>Rosmarinus officinalis</i> Pressurized-50%	2.4bcd	0.61b
<i>Allium sativum</i> Liquefied-50%	2.46bcd	0.52b
<i>Allium sativum</i> Pressurized-100%	3.17d	0.51b
Water indicator	2.87cd	0.65b

Averages with the same letter in the same column present no statistically significant difference for the Tukey test ($P \leq 0.05$).

Source: Own elaboration

A phytotoxic effect is observed in the weight loss of all the extracts used, however, it is differential according to whether it is a monocotyledonous or dicotyledonous plant, which coincides with the higher phytotoxicity values evaluated with the Rochecouste scale, however, in the case of *O. vulgare* a phytotoxic effect is observed for the two species, but because the extraction form is different, the metabolites that exert the phytotoxic action may be different or in different concentrations, in this regard works carried out by Ramírez (2013), Tamayo *et al.* (2016), indicate that due to the amount and

form of extraction, the effect exerted on the target organisms varies, given the amount and diversity of metabolites extracted in the various extraction forms and the solvents used.

On the other hand, Joya *et al.* (2019) report that inhibition of maize seeds in plant extracts of *C. zeylanicum*, *A. indica* and *Z. officinale* to low concentrations stimulate root and aerial growth, and inhibit the growth of phytopathogenic fungi on seeds and roots at the time of sowing, while at 100% concentrations they inhibit the germination of *Z. mays* seeds, coinciding with the phytotoxic effect found in the present investigation with concentrations of the extracts at 100%, both for *Z. mays*, as for *P. vulgaris*, although differential, either for mono- or dicotyledonous plants and Duarte (2020), reports the acute toxicity of anise and rosemary essential oils in onion bulbs, producing a delay in the process of root elongation that affects the cell division of the root system, because the hydration of the onion bulbs was carried out in the presence of the essential oils in whose composition there is a strong presence of allelochemicals, causing an inhibitory effect on the normal growth of the roots with a genotoxicity effect against the cells of onion bulbs roots, being that of rosemary the one that presented a greater phytotoxic effect, however it did not present the same effect on other plants evaluated as those of tomato and cabbage.

The phytotoxic effect found both in the reduction of seed germination and in the initial development of *Z. mays* and *P. vulgare* plants, using local plants and simple forms of extraction, allows for to generate of a possible alternative for the control of arvenses plants, however, this study is exploratory and other research is required.

CONCLUSION

R. officinalis, *C. annuum*, and *O. vulgare* extractors possess metabolites of high phytotoxicity in monocotyledonous plants and *A. sativum*, *R. officinalis*, and *O. vulgare*, in dicotyledons, which through the appropriate form and concentration can exert an inhibitory effect on the germination and development of plants.

R. officinalis extracts, 100% liquefied, *R. officinalis* pressurized to 100% and 50%, *C. annuum* liquefied and pressurized to 100%, and *O. vulgare* 100% pressurized, achieved higher phytotoxicity, as well as the lowest value of dry weight in *Z. mays*, being potential herbicidal products in monocotyledonous plants.

Extracts with herbicidal potential in dicotyledonous plants are the extracts of *A. sativum* 100% liquefied *A. sativum* pressurized to 100 and 50%, and *O. vulgare* liquefied to 100% (v/v), by achieving high levels of phytotoxicity and low weight in *P. vulgare* plants.

It is possible to reduce the germination of monocotyledonous *Z. mays* seeds between the 66.6% and 26.6%, with the application of extracts of *R. officinalis* pressurized to 100% and 50% (v/v) and *C. annuum* pressurized to 100%; as well as in dicotyledons (*P. vulgaris*) between 76.6 to 50%, with the application of *A. stavius* pressurized and 100% liquefied sativus, *R. officinalis* pressurized and liquefied to 100% and *O. vulgare* liquefied to 100% (v/v), extracts that also inhibit the development of hypocotyl roots.

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Analysis of Stress, depression, and coping resources in Post-confinement COVID-19 university students

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— Abstract—

The present study was proposed as a mixed, cross-sectional, and analytical study. Its main objective was to identify the presence of stress and depression, in addition to the Coping Resources (CO) of university students after confinement by COVID-19. Coping resources allow us to adapt to different situations in the environment; they are elementary cognitive and behavioral processes in response to the presence of stress (Lazarus & Folkman, 1986), the latter, in university students, has been present for various reasons; but, in what ways has it been presented after confinement? The results obtained by a sample of 220 students show a greater presence of perceived stress (PE=2.404) than the perception of stress control (PCE=2.378), in addition to the presence of mild depression (BDI-2=8.1); a correct perception of CO was identified; but a weak use of these. Only stress finds evidence of a relationship with confinement.

Keywords:

Anxiety; students; Perceived Stress Scale; Beck Depression Inventory.

The COVID-19 pandemic generated a change in the modalities and structures of education at all levels, moving the ordinary classes from in-person modality to videoconferences and school file management platforms. This change had notable impacts on education, both by the process itself and the implications on the order of human relationships (Avendaño *et al.*, 2021). There are relationship data between symptoms of depression and anxiety during confinement and online classes in high school and college students (Velasategui-Mendoza *et al.*, 2022).

The objective of the present study was to identify the presence of stress, depression, and coping resources perceived and applied by university students after confinement due to COVID-19.

It is important to mention that the population of Chiapas, and even more so of the area Altos de Chiapas, has a wide cultural, ethnic, and linguistic diversity, and this reality can be seen reflected in the students who are enrolled in some degree program.

The importance of the psycho-emotional life of students in times of COVID-19 and the new normality is relevant to build better educational structures, in addition to being valuable information in terms of public mental health. This increases its importance when we talk about the search for improvement in the quality of life of human populations, in the improvement of human development indexes, and, specifically, in the improvement of education indexes.

STRESS, DEPRESSION, AND COPING RESOURCES

Anxiety is a feeling that comes from the emotion of fear. Giorgio Nardone (2004) defines it as an extension of the basic feeling of fear that invalidates a person's activities. Anxiety disorders are characterized by the recurrent presence of intense and/or persistent worries and fears about neutral situations, which give rise to somatomorphic symptoms, that is, physical symptoms related to emotional distress (Craske *et al.*, 2011). This group of disorders is more frequent in women than in men, with a 2:1 ratio (Alonso *et al.*, 2004).

Depression, on the other hand, is a complex psychopathology characterized by demotivation and lack of interest in the patient towards their daily activities, which results in a decrease in the energy and activity of the subject; in young people, feelings of anger, frustration, and comparison are also frequent (Arrivillaga *et al.*, 2003). The prevalence of depressive disorders in Mexico shows a significant gap since 2005, 5.8% of women and 2.5% of men presented this clinical picture (Belló *et al.*, 2005).

The relationship between these pathologies and online classes suggests the existence of other related factors. It has been brought up that social

isolation can cause the presence of depressive symptoms in the general population (Sánchez-Millán *et al.*, 2022; Sepúlveda *et al.*, 2020 and Vrito-Farfan *et al.*, 2021), in addition to the fact that prolonged isolation triggers feelings of deep loneliness, which turns into depressive conditions (Banerjee & Rai, 2020). As for the expressions of anxiety, the fear of contagion by SARS-CoV2 was the variable with the greatest relationship with anxiety disorders, the main one being agoraphobia, a disorder characterized by the temporary and isolated appearance of somatomorphic symptoms before the idea or presence of the open space other than the domestic one (APA, 2014 and Prieto-Molinaria *et al.*, 2020).

However, the relationships found focus on isolation and psychological symptoms, even though confinement has recently begun to decrease in most countries; rates of anxiety and depression have not declined at the same rate in young students (Fuentes, 2022 and Velástegui *et al.*, 2022). This opens the possibility of investigating the relationship of anxiety and depression with other variables.

Stress has been documented as a third problematic psychoemotional state in young students (Jiménez, 2022), which is a reaction of physical-cognitive demand to a stimulus considered dangerous (Gómez & Escobar, 2002). Both anxiety and depression have a direct relationship with stress, especially in adolescents and young university students (Lomelí & Martín del Campo, 2018).

The biological utility of stress has been widely discussed becoming a useful emotion for certain facts, but dysfunctional when triggering stimuli do not pose a real threat (Duval *et al.*, 2010). Negative overestimation of stress-causing stimuli often occurs in young people (Trucco, 2002).

The way of reacting to stressful events is known as a "coping response" (CO) (Vázquez *et al.*, 2000). These COs determine whether stress is expressed as distress or becomes a manageable stimulus for the subject. Functional RAs, that is, they avoid psychoemotional alterations, are characterized by the notion and use of internal and external resources of the person; on the contrary, dysfunctional RAs cause psychoemotional alterations due to the low visibility or ability to use these resources (Lega *et al.*, 2002).

For Remor *et al.* (2016), psychological resources are "psychological protection factors that are positively associated with health and well-being and that, in turn, allow to increase resistance to adversity". Those produced by a person's elements are internal, such as ideas, beliefs, education, or self-esteem; and those that are obtained from the environment such as relationships, physical spaces, and sound or visual stimuli, among others, are external.

In this order of ideas, psychological alterations related to distress can occur as a result of the real or imagined absence of external sources of support and internal resources of the individual. If the individual does not have the correct notion of his personal resources to face problems, he usually

considers these as too threatening stimuli; which can trigger depressive characteristics, since this disorder is characterized by pessimism towards one and others (Robles *et al.*, 2020).

Based on the above, it is important to know the relationship between internal resources and external supports, as well as the rates of stress and depression in students. If, as mentioned above, the social changes resulting from the covid-19 contingency are one of several variables involved in the permanence of depressive symptoms in students, internal and external resources may constitute other variables involved.

ALARM SIGNALS IN YOUNG UNIVERSITY STUDENTS

There have been multiple warnings of the negative effects of prolonged stress on humans. For example, quality of life and social relationships are impaired, generating psychological vulnerability in the person (Cumsille & Martínez, 1994), neuroplasticity and brain neurogenesis are seriously affected, which can have an impact on cognitive abilities (Zárate *et al.*, 2014), physical involvement is notorious, due to the alteration in the immune system that stress causes in the human body (Gómez & Escobar, 2006).

Adolescence and adult youth are important stages for the development of neuropsychological capacities, at which point, through learning, the habits and structures of thought that govern adult life are shaped; due to this, the health of young students is very important.

Stress is a risk factor for psycho-emotional health in young students, which has been studied on several occasions, and where it has been found that stress in students is related to self-perception and future thoughts (Cassaretto *et al.*, 2003). The amount of perceived stress is related to the degree (Celis *et al.*, 2001) and ongoing university career (Martín, 2007). Stress has also been found to be related to poor school performance (García-Ros *et al.*, 2012).

Based on the above, it is understood that stress is related to young students, affecting their quality of life and school performance, a factor that could generate other psychological problems that further impair their mental health.

MATERIALS AND METHODS

The study was carried out in an area of low human development index (HDI), the average municipal HDI in Chiapas, is 0.647 and is below the national average of 0.779 occupying the last place in HDI in Mexico. As for education, one of the components of the Human Development Index, Chiapas has an EI of 0.528 (UNDP, 2019).

The study is mixed, cross-sectional, and analytical. The variables depressive symptoms, perception of stress, and coping with difficulties were

operationalized using the Beck Depression Inventory adapted version (BDI-2), the Perceived Stress Scale (PES), and qualitative assessment questions of the present study, respectively.

The scales and questionnaires were applied online to students enrolled in undergraduate programs, the research was carried out in the period from November 2021 to March 2022, following the applicable ethics and data confidentiality criteria.

A sample of $n=220$ obtained through the snowball method was obtained, through which the participation of university-level students enrolled in a program of the educational offer in San Cristóbal de Las Casas, Chiapas, a medium city located in the Altos Tzeltal-Tsotsil Zone of Chiapas, Mexico.

Inclusion criteria: Students enrolled in undergraduate programs at universities located in San Cristóbal de Las Casas, Chiapas, Mexico.

Exclusion criteria: Students who are enrolled in undergraduate programs at universities outside San Cristóbal de Las Casas, Chiapas, Mexico.

Description of the instruments used: The EEP (Cohen *et al.*, 1983) consists of 14 items in its full version. The scale is validated for the Mexican university population with adequate reliability ($\alpha = 0.86$) and adequate adjustment (GFI=0.91, RMSEA=0.056, NFI=0.97, CFI=0.98, and IFI=0.98) (Brito-Ortíz *et al.*, 2019).

It is divided into two subscales: the stress perception subscale and the stress control subscale. With the information of both subscales, the perceived stress score and control tools are obtained, which expresses the degree of stress management; scores less than 0 indicate good stress control, and those equal to or greater than 0 indicate a greater perception of stress with lesser measures of coping.

For its part, BDI-2 has been multiplied, validated, and standardized for the Mexican population in general, with a high internal consistency (from $\alpha = 0.87$ to $=0.91$) (Moral de la Rubia, 2013 and Jurado *et al.*, 1998).

The test consists of 15 items that expose depressive symptoms, in which the user selects between 4 possible responses depending on the identification he has with the statement in the item. Finally, the average of the responses is contrasted with the correction factor, scores from 0 to 6 represent a minimum depression, from 7-13 mild, from 14 to 26 moderate, and greater than 27 severe depression.

The 3 qualitative assessment questions are: What is the greatest difficulty currently in your life? What resources do you have to deal with your greatest difficulty? Or do you have none? Do you have a routine or element to de-stress yourself from obligations? Which one?

The above questions were used to assess the perception of difficulties or challenges, the notion of favorable psychological and environmental resources,

and explore relaxation behaviors. These elements were treated with general and descriptive statistics based on principles of grouping by topic in the responses.

RESULTS

The average age of the young people participating in the study was 20.59 years, with a maximum of 40 years and a minimum of 17. Of the sample, 46.81% identified as female, 49.54% as male, and 2.72% as members of the LGBTQ+ community.

Regarding the EEP, the average perception of stress (PE) in the sample was 2.404, out of a possible total on a scale of 4; on the other hand, the perception of stress control (PCE) is 2.378, with the same possible total as the previous scale; based on this, the average scale score obtained by the sample is 0.025.

The items with the highest scores have been 3 (In the last month, how often have you felt nervous or stressed?) and 12 (in the last month, how often have you thought about the things you had left to do?).

On the BDI-2 the sample obtained a total net score of 1788, with an average sample score of 8.1, representing a mild depression according to the test correction factor.

Within the test, the items on discouragement are relevant, where 31.4% responded to feeling more discouraged about the future than before; the item of guilt feeling where 43.2% exposes feeling guilty for several things they have done or should have done; and the energy item where 39.1% report having less energy than before.

Finally, regarding open-ended questions, in the first question (what is the greatest difficulty currently in your life?), 26.36% answered elements regarding academic training, 25% positioned their difficulties in emotional problems, and 17.27% reported having no difficulty; the rest of the sample gave varied answers regarding relational questions.

Regarding whether participants consider having psycho-emotional and/or physical resources to face problems, 59.54% consider family and/or friends as the biggest support, 15.45% can not identify any resource, and 14.54% consider internal resources (emotions and abilities) as their resource for solving difficulties.

Participants expressed that 30% use exercise and/or sport as a routine to de-stress, 13.63% responded with activities of a musical nature; highlights that 37.27%, the highest percentage among the responses, expressed not having any activity or routine that helps them reduce stress levels. The remaining percentage of responses gathered elements such as family co-existence (11%), reading, video games or movies (19.08%), and drugs and alcohol use (4.45%).

DISCUSSION OF RESULTS AND CONCLUSIONS

In the present study, the sample presents a score in the EEP that represents a high PE and weak coping; this finds a second check on the values obtained in the subscales, being higher than the average score of the stress perception scale (2.404), than the control perception score of this (2.378).

Another study conducted in Mexico that applied the EEP to young students also found high levels of PE above PCE (Martín del Campo *et al.*, 2018). On the other hand, two studies (Halgrevez *et al.*, 2016, Silva-Ramos *et al.*, 2020) find an elevated perception of stress in students with variations between enrollment careers.

Studies done before 2019, when there was no COVID-19, find significant stress levels, but less elevated than the cited studies conducted after 2019.

In this regard, the higher scores in the individual items of the questionnaire reflect that the sample has noticed a high frequency of feelings of nervousness or stress and thoughts about future tasks. This may be related to the problem of greater presence in the sample, which are problems related to academic training.

The relationship of stress with the demand for activities in various careers has been documented previously, being related to the academic load and extra-class activities, as well as the responsibility coupled with the curriculum (Román & Hernández, 2011). Careers in health and engineering are mainly related to high levels of stress (Huaquín & Loaíza, 2004, Martín *et al.*, 2013).

In attention to the evaluation of depressive symptoms, the sample had an average in the BDI-2, an indicator of mild depression, results that contrast with other studies where the average of the samples represented minimal depression (Tangarife, 2021, and Prada *et al.*, 2021), and agrees with the study by Ochoa and team (2021), which finds mild depression in students in the health area.

A pre-pandemic study (Riveros *et al.*, 2007) found lower levels of depression in a sample of 500 students. On the other hand, another study conducted in 2008 (Agudelo *et al.*, 2008) states that a sample of Colombian students obtained an average score of 8.7 in the BDI-2, a result similar to that obtained in the sample of the present study (8.1).

These results may be related to perceived stress, as indicated by other studies (Arrieta *et al.*, 2013, Cabezas-Hereida *et al.*, 2021 and Gutiérrez *et al.*, 2010), which also indicate a greater presence of depression in people with a lower capacity to cope with stress.

In the stress-academic performance relationship, the presence of depressive symptoms may also be related to academic performance, consisting of a stress-depression-academic performance type feedback, with the possible influence of the COVID-19, situation, especially with the stress factor.

The sample presents high levels of perception of stress and mild depression, with few resources for coping with them. Based on the qualitative assessment questions of the method, it can be understood that university students have support elements for stress management, but do not have routines or methods of use for such support elements. This shifts research and application interest from resource visibility to effective usage mechanisms.

From the above, the results of the present study confirm that there is a high perception of stress, mild depression, and weak coping mechanisms on the part of university students; being that only stress finds evidence of relationship with confinement due to COVID-19, time in which students took online classes. Regarding depression, the previous and post-pandemic literature shows variable results, which do not allow determining whether the confinement situation is a significant variable in the presence of depression in students.

The most significant result of the present study is the existence of a lack of use of coping resources for stress and emotional problems by university students; even if they have adequate visibility of these resources.

It is important to continue with studies that reveal the direct factors related to the presence of stress, depression, and coping mechanisms as indispensable elements for the design of intervention projects from public health and university education.

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A C A D E M I C
P A P E R S

Trading Platforms and Apps in the Mexican Financial Environment

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— Abstract—

The Mexican financial system has taken a very important step forward, partly due to the COVID-19 pandemic, because, after experiencing such a critical situation as the crisis generated by the pandemic, people began to look for alternatives to increase their income, finding options such as trading platforms and applications. Having so much free time and with such a vast traffic of information, a great number of people have decided to start their way as investors, however, it is still of fundamental importance to continue with the promotion of these platforms since this would result in a beneficial situation not only for the population but also for the country and their economy.

Keywords:

Crisis; income; platforms; trading; apps

Nowadays we enjoy an era of technological development that advances at an astonishing speed; in the same way, financial services seek to break through in a society that is beginning to take an interest in using investment platforms and digital banking. The ecosystem that has been formed since the publication of the FinTech Law has brought innumerable benefits to the national economy, one of these benefits is trust in the financial system, an example of this could be the regulations to which a large number of apps and trading platforms are subjected to be able to operate better in the market, which creates a significant increase in the feeling of safety on the part of the public that seeks to invest time and money in them.

In addition to the aforementioned, the COVID-19 pandemic became a key point for the Mexican financial environment, unexpectedly and positively, since Mexico is considered one of the countries with the highest growth in the area of mobile financial apps in Latin America, these apps include aspects such as traditional banking, online banking, payments, investments, loans, and financial services. The biggest opportunity that the lockdown brought was the democratization of these investment channels because the population was forced to dabble further in a digitized environment.

This important "boom" has energized the Mexican FinTech industry to the point of showing extremely significant growth in recent years, an example of this is the fact that only from 2017 to 2019, there was a deployment of 145% in the use of financial applications (Hernández, 2020). If we take the above data and add it to the rigorous confinement to which we were subjected it would be logical to think that this figure would increase even more since numerous aspects of life have radically changed; one of these aspects is how to invest our money, a simple example is the fact that today financial intermediaries such as brokerage houses are no longer prioritized to decide where and when to invest money, since now the cell phone is the new auction floor. Previously there were some barriers and myths that kept people away from the investment environment, such as, for example, that exorbitant amounts of money were needed to invest; however, for a couple of years, this gap has been shortening, and now there are numerous platforms that allow you to invest from very accessible amounts. Remember that investments used to be carried out exclusively through intermediaries that charged their commissions, the sum of these amounts proved to be a strong limitation for the Mexican population, however, this situation has been reduced with the arrival of applications and financial platforms.

The advent of investment platforms has brought about a revolution for the public who want to be in control of their investments and intend to grow their savings. The possibility of entering the stock market and obtaining an attractive return, increasingly becomes a reality for many Mexicans given the

facilities provided by many of these platforms. "In Mexico, the Fintech sector is made up of approximately 400 companies, and although not all offer investment products, most of the short, medium, and long-term products are already available through digital channels; that is, you can invest from your cell phone or computer in Cetes, Promissory Notes, Shares and Bonds of companies listed in Mexico and thanks to the International Quotation System (SIC), in companies listed on other exchanges in the world. You can also invest in real estate, grant consumer loans and finance small and medium enterprises and you can even buy shares of companies with high growth potential (startups). Best of all, all these investment options are offered by Financial Institutions regulated by the CNBV and CONDUSEF and from small amounts." (Ratía, 2020) Since there are so many options, it is important to know their pros and cons. That is why this paper will analyze the advantages and disadvantages these investment platforms represent for the Mexican financial environment.

FINANCIAL OUTLOOK IN MEXICO

How investment platforms are affecting the economic ecosystem is an extremely important issue, since increasing the facilities to enter the stock market would be logical to assume that the number of users in that market increases, which would be an interesting scenario, this situation could be perceived as a great opportunity to show the Mexican people how beneficial this sector can be and society would be better informed to operate its finances with better tools, this would be significantly positive for the economy and the personal finances of Mexicans.

There are a huge number of investment platforms in the current panorama of Mexican society, these platforms are very varied even comparing them, since there are numerous strategies that can be carried out, different actions that can be taken by users to achieve personal objectives, in addition, there is the possibility of covering multiple areas and employing different investment approaches. The range is extremely wide, they can be made from person-to-person loans, crowdfunding, investment in foreign currencies, raw materials, and stocks, and large amounts are not necessary to make these investments. For this same reason, we must emphasize the type of platforms that will be addressed in this work, which will be those investment platforms focused on trading.

PLATFORMS

One of the main reasons to invest in the Stock Market is that this decision represents a fundamental part of financial planning and, in addition, it is

an excellent way to acquire additional income since you can obtain benefits from a specific amount of money that is not being used at that precise moment or even, the profits could be used to make some type of trip or saved to obtain a worthy retirement. Previously, the purchase and sale of investments and shares were done with a telephone call to a broker, who provided his services for a high price, which involved an expense for the investor in time and money, taking more time to do the stock transaction. Fortunately, with technological development, this situation has changed, and today investing is easier.

To choose an investment app or web platform, it is important to investigate its operations, in addition to its specific characteristics, if they have any necessary initial amount or if they charge commissions, what these amounts are, and in what periods the deposits are made. Also if their software is compatible with each individual's mobile devices, whether Android or iOS, another fundamental point to consider is to study and learn about the basics of investing or take some basic course so you can objectively compare the apps.

Every investment carries a significant risk due to the volatility of the markets, and this situation must always be kept in mind, in the same way, we must consider that it is better not to invest an amount of money greater than what one can afford to lose. All applications are useful, but if you plan to invest large amounts of money it is preferable to get very well-informed in this field by approaching a brokerage house or hiring prestigious brokers who can meet the needs of each investor.

As previously mentioned, there are several investment platforms and apps today, so, we will focus on those that operate more directly in the stock market in the national territory and that has the endorsement of the National Banking and Securities Commission (CNBV), which are listed below:

GBM+

“GBM is a 100% Mexican brokerage house that offers the investing public various financial products, being one of the main investment promoters nationwide. It has made efforts to promote financial inclusion and attract new investors to the market implemented innovation in its business, such as the GBMhomebroker app, today GBM plus; which has allowed them to be pioneers in this type of direct operation platforms, efforts that are reflected in the amount and growth of their operation.” (Corporate, 2021).

With the opening of a GBM+ account from 100 pesos, investments can be made in CETES, Mexican investment funds, with national and international strategies, national, and international actions, and ETFs. The application indicates that it is possible to make deposits through electronic banking at any time, and these transactions would be reflected in a maximum period of

10 minutes. The account will be backed by a team of advisors and professionals. The account will have a digital opening, you can have multiple accounts, and there will be no administrative costs, minimum balance, or penalties. The service is provided through a mobile app and digital advice can be provided. Likewise, there will be stock market information such as fundamental analysis, documents, comments from the investment team, and free real-time information. Operating costs, these commissions for securities operations are from 0.10% to 0.25%. In addition, GBM is regulated by the National Banking and Securities Commission (CNBV). The app is compatible with both Android and iOS. In addition, GBM has a website called "GMB Academy" in which it is possible to access basic courses to study and learn about the basics of investment to be able to compare apps and investment options more objectively.

Recently a new GBM+ investment service has been added which will allow the user to operate directly in the United States market, where you can invest in more than 4,000 investment instruments from 20 pesos, it is the investment in fractional shares, that is, the opportunity to invest in any company in the United States market, without the need to acquire a complete share.

Kuspit

Kuspit Casa de Bolsa S.A. de C.V. (Kuspit) is the first 100% online investment portal in Mexico. Kuspit is a Mexican company authorized by the Ministry of Finance and Public Credit, so it meets all the requirements required by the Securities Market Law and is under the supervision of the National Banking and Securities Commission (CNBV). Through the app, you can invest in stocks, mutual funds, CETES, ETFs, and FIBERS. Kuspit features mini-courses and an investment simulator. You can open a free account and start investing from 100 pesos online, and without intermediaries. The app is regulated and supervised by the CNBV, the Bank of Mexico, and CONDUSEF.

To open an account on Kuspit you only need to enter the portal and enter certain data required by the platform, at the end you can access all the sections of the portal (Learn, Invest, Inform, and Share), purchase and sale financial instruments with your portfolio of tests, it is also possible to open a real account. Opening an account on Kuspit is completely free. If you subsequently wish to carry out securities purchase operations, you may fund your account with a transfer (SPEI) from your account to an electronic bank for the amount you establish.

Kuspit does not charge commissions for purchases and sales of debt investment funds, equity investment funds, hedge funds, and index funds. It also does not charge any fees for the administration and custody of client

investments. However, the monthly cost of Real Portfolio Maintenance is calculated based on 0.99 percent per year of the average portfolio value. The commission for purchases and sales of shares is 0.40 percent per trade.

Kuspit is the first brokerage house in Mexico that necessarily links learning with investment. The "Learn" section is a map that presents the main investment instruments and describes their performance, risk, and liquidity characteristics. Each time you advance in a module of the "Learn" section, the system allows trades in the type of product whose characteristics you have just learned. Kuspit does not make any recommendations regarding the financial market, nor does it make any particular mention of any investment strategy; the "Learn" section does not offer or provide any investment advice, promotion, or marketing related to the nature, potential, value or profitability of any security, investment portfolio, operation, investment strategy or any other related. The app is compatible with both Android and iOS systems.

Flink

Flink is a peculiar Fintech, located between a neobank and a digital brokerage house. Through an application, the company offers a debit account, as well as digital transfers and payments; at the same time, it functions as a stock-broker that allows one to acquire fractions of shares for a price ranging from 30 pesos, which is much lower than that of full shares. Users can access all stocks traded on the New York Stock Exchange (NYSE), including exchange-traded funds (ETFs). Although since 2019, Flink began its registration process as an electronic payment fund with the CNBV as part of the so-called Fintech Law, currently the company and the regulatory authority are in the process of analyzing the category in which the startup with a stock market investment product will enter. (Requiélme, 2021).

Flink is the first platform in Mexico that allows you to invest in fractions of shares from 30 pesos without any commission. Its main objective is to make investing in financial markets much more accessible and intuitive, no matter how much experience you have in the subject. The systems supported by the app are Android, from version 6.0, and iOS from version 11.0. In addition to this, Flink has a blog and a podcast on Spotify called "Finanzas en órbita".

The opportunity to invest in fractional shares can be an excellent option for those people who begin to take an interest in the world of investments and trading, could be an enabler for a better understanding of how the world of investments really works, from a fairly accessible and modest amount, at the same time that you can get interesting returns. It is amazing how easily this situation could help the inclusion of new invest-

ment vehicles according to the budget of each individual since you could start investing in fractions of shares with the same amount of money with which you could buy a coffee in the morning.

Although Flink continues to expect a positive response from the National Banking and Securities Commission for operating as an Electronic Payment Fund Institution, Flink does have the regulation of MIFLINK ADVISORS INDEPENDENT, S.C, which is an entity regulated in Mexico by the CNBV found in the register of investment advisors with folio 30129, which generates a greater feeling of security and confidence for the platform, since, in this way, all the investment operations that will be carried out through the Flink application, will be safer and there will be a greater and better experience of use.

Bursanet

It is the online platform of Actinver Financial Group. It is possible to invest in more than 30 investment funds with different levels of volatility, as well as in local and global shares, promissory notes, CETES, reports, and bonds of the debt market, in national and international ETFs, fibers, and in currencies. Also, with Bursanet you can receive investment ideas, technical and market analysis, real-time trading opportunities, and relevant information directly on your phone. It has a minimum amount of 1,000 pesos. Bursanet, being part of Grupo Financiero Actinver, is both supervised and regulated by the CNBV and the SHCP. In addition, the deposits are protected by the IPAB. Bursanet is a stock house with more than 25 years of experience in the Mexican market. The broker works online with the possibility of investing in a personalized way but there is also the possibility of receiving investment advice.

It has free account opening and administration, no INDEVAL custody fees, banking services do not generate commissions, SPEI transfers are unlimited, and there is no minimum balance charge; however, the commissions for buying and selling shares range from 0.10% to 0.25%, depending on the operations carried out in a month. As for mutual funds, some charge between 0.5% and 1% entry fees, while others do not charge any commission. In Currency and Money Market does not apply the payment of any type of commission. Bursanet is an online platform of Actinver Financial Group. It also seeks to contribute to the training of investors, it has 1st place in the Rankia award for the best training service of the year 2020 and has a blog.

In addition to the benefits mentioned above, Bursanet has included banking services such as a VISA International debit card, the possibility of paying for services and credit cards, payroll portability at no additional cost, no collection of administrative commissions or penalties, no charge for opening or canceling or for managing the account, no annuity and no commissions for minimum balance.

Finally, it is possible to obtain extra cost guides and tutorials that will facilitate the use of the platform, in addition to master classes and webinars to know the new trends, and new products, which will allow the user to continuously forge his way to become an excellent investor. The account also includes real-time investment opportunities, news, analytics reports, and relevant information from the Actinver analytics team.

DISADVANTAGES

Financial institutions have younger customers every day, which is why they have to be constantly innovating and evolving to offer faster and simpler services. The greatest challenge for financial technologies lies precisely in themselves; they develop and evolve at a very rapid pace, even faster than the organizations and government agencies that establish laws related to this subject. The companies of these services will have to have a broad vision of the changes that the financial laws can provoke with the technological advances and services that are developed, in turn, lawyers specialized in the subject would be needed, to analyze the regularizations.

As mentioned above, one of the problems faced by Fintech companies is regulation. Although investment and interest in these new entities are still ongoing, and three years after the entry into force of the Law to regulate financial technology institutions, called "Fintech Law", there are still many points of view that the authority, financial institutions, financial services users and those interested in financial technology must analyze.

The challenges that they have to overcome are specifically legal, clear examples are complying with the provisions of CONDUSEF and the new transaction rules that SHCP implemented.

Being a branch of both technology and finance, they are developed and transformed in a very accelerated way, even at a faster pace than the same companies and the government agencies that regulate them and establish laws related to this subject, innovative companies of these services must have a broader vision about the changes they can cause in financial laws with the technological advances and services they develop.

"Another challenge they face is to promote joint work with lawyers specialized in the different areas covered by this topic to be able to be prepared in case of a controversy that may cause within the parameters of regularization, as well as with personnel in all areas of technological innovation, and expert personnel in the financial area." (García-Garza, Lanzagorta-Sánchez, & Ponce-González, 2020).

All this is aimed at providing confidence and security to users so that the products and services offered by Fintech companies are used by

Mexicans more frequently, understanding that they are already regulated by the government to show financial transparency, and clear and timely information, about the obligations and rights they possess.

On the other hand, there are the risks involved in the stock market itself, an excellent example could be the great controversy of Gamestop, where a group of Reddit users massively traded shares of the aforementioned company through the Robinhood mobile application, increasing the value of the share and causing various investment funds to incur millionaire losses since said investment funds had "short sale" positions with the bet that the price of the shares would continue to fall since the Gamestop company was not going through its best moment, it registered losses of US\$795 million in 2019 and probably lost several hundred million more in 2020, however, thanks to social networks and easy access to free and low-cost commercial platforms such as Robinhood, together with the excess of free time during the pandemic, it was easy for a group of people to organize themselves to raise the price of the share.

The stock market was the scene of a pitched battle between a group of young activists who during the pandemic developed a great ability to negotiate shares through applications and some recognized venture funds, led by professional investors.

Probably the biggest disadvantage is the misinformation and lack of preparation to use these applications since not all users are dedicated to learning and understanding how the financial and stock market environment works.

ADVANTAGES

The use of technology has brought with it several benefits such as the ease of opening investment accounts, processing operations, and security, which allows for streamlining services, reducing costs to companies, and accelerating financial inclusion. Recall that, in Mexico, only one percent of the adult population formally saves in investment funds, according to the National Report on Financial Inclusion 8 (Comisión Nacional Bancaria y de Valores, 2017). In that sense, it is important to make it known that people can find accessible services to invest in very low amounts thanks to the use of technology.

Nowadays it is very easy and immediate access to digital platforms and applications where you can buy and sell securities, in addition, the requirements to open an account are quite simple. Something that must be taken into account when choosing an application or platform is to evaluate how much it adapts to the user in question, coupled with this, it is important to open an investment account taking into account that it is regulated by the

National Securities Banking Commission (CNBV) or failing that, open this account with the guidance of an authorized financial intermediary.

The investment can be perceived similarly to a term saving and in the same way, you can have better control of the expenses and income, which will also allow a better scope to the objectives established in the particular case of each individual. Another advantage of investing is that you can follow normally in daily activities without major worries than constantly monitor the statements and stay aware of how the money works for the future and the objectives set to achieve these goals in a better way it is important to reinforce the knowledge that you have in finance and economy.

Technology is constantly evolving to facilitate day-to-day tasks and the stock market has also managed to adapt to the needs of investors. It is quite common to find that sometimes the lack of time does not make it permissible to approach a bank or a brokerage house to invest, however, there are currently digital options through which you can start investing almost immediately.

“Thanks to technology, it has been possible to demystify that access to investments is exclusive to high wealth, allowing the world of investments to be accessible to a greater number of people who need savings” (BBVA, C., 2020). In addition to the advantages mentioned above, we can highlight three very important aspects that technology brings to personal finance through investment, which are:

Opening accounts

One of the latest technologies used to facilitate account opening at a brokerage house or financial institution offering investment products is open banking. Through open banking, authorized institutions can consult the same information presented by a client when opening an account in a bank. In this way, the user does not have to re-fill very long forms or search and send thousands of documents to validate their identity.

Personalization of products

Through the exchange of financial information, brokerage houses or financial institutions may suggest investment products according to customers' needs since by consulting balances in bank accounts, consumption habits, and personal goals of the user, a more accurate profile can be generated. To do this, they can also rely on advisors, artificial intelligence, and machine learning. For example, if the financial institution identifies that in your bank account, the user has saved an emergency fund, makes voluntary contributions

to your Afore, and also has income to invest in the Stock Exchange in the long term; in a matter of minutes, the advisor can offer you products that provide the best benefits according to your goals.

Automation of operations

"By automating operations, the investor himself with or without an advisor can establish investment parameters so as not to be monitoring all the time the assets that interest him. That way, the user can schedule the purchase or sale of assets when the value suits him best. Therefore, the user has more control over their account and assets. On the other hand, automation has allowed transactions to be processed transparently and regardless of the amount of investment, which gives rise to a more democratic and non-discriminatory system. For example, the FIX protocol (Financial Information Exchange Protocol) allows you to consult quotes in real-time and, when processing an order, gives the same priority regardless of the amount of investment (Investopedia, 2019). FIX is used for automatic communication between participants, for the exchange of instruments, specifies how to create buy and sell orders, and consult the quotes of the instruments, among many other functions. It is used to communicate with virtually all financial markets electronically." (Alavez, M., 2021).

Today the cell phone is an auction floor and space for buying and selling: "While applications for small investors are not new, the confinement allowed to raise money and have a little extra time to those who maintained their work and worked from home, which, added to a digital ecosystem that increasingly facilitates and offers more options to enter the stock market, made Mexicans who flirted with the idea of investing, finally took the step they lacked to buy the shares of their favorite companies. The elements in which the Mexican public can invest are varied and can be found on different platforms." (Alavez, 2021)

Mexicans today want to make their own investment decisions, and witnessing this increase in people taking an interest in apps, which was driven by the coronavirus, is unprecedented, since, being more time at home, you can research more to make better decisions and have more time. The decrease in initial investment amounts likely was one of the triggers in the number of investors in Mexico.

Despite the most unfavorable economic circumstances brought by the pandemic, many people found an alternative to allocate their income, as were investments through financial platforms and apps, which resulted in better capital management, together with the interest in learning about issues related to investment and finance, and ended up leading to a positive aspect for the Mexican financial sector.

Added to this is the dissemination of information through conventional media, as well as online forums such as Reddit, where the controversial Gamestop phenomenon mentioned above arose. Electronic investment services have therefore encouraged self-service by clients in investment matters. The financial system must be like a tree, the stronger its roots, the better it can respond to economic shocks.

In conclusion, the technology has numerous advantages for the stock market, however, there are still political, regulatory, and even social issues to be resolved in the immediate present and the future concerning all these apps and investment platforms. Despite all that was mentioned, it is important to appreciate the great step that Mexican society is taking, either because of the circumstances that were experienced or some other factor that will enhance the approach, dissemination, knowledge, and use of these platforms and apps, this has generated a more inclusive and financially democratized reality.

CONCLUSIONS

Throughout this work, various issues have been addressed concerning access to investments through both mobile and web platforms and apps, demonstrating how Mexican society has taken a huge step towards the democratization of investments in recent years, whether hand in hand with the pandemic or not, it is important to highlight how much the financial environment has advanced, the financial ecosystem that has been created recently is extremely positive, participating in the stock market generates many advantages, not only for the individual in question, since he/she would have various alternatives to place his/her money compared to traditional options and could even obtain very interesting profits, in the same line, these capitals are destined to the financing of projects or companies, which in turn generates growth, development, and employment in the country, this represents great benefits for the Mexican economy.

It has been shown that to invest, it is only necessary to venture into it since the amounts have become extremely accessible, they are also within the reach of anyone who has a smartphone or a computer and a good internet connection, many of these platforms even provide courses, guides, and personalized advice to help investors who start in the stock market. Due to the COVID-19, pandemic, the quarantine generated a couple of positive aspects for apps and financial platforms, since those people who managed to maintain their jobs had a little more time and immediate information, important aspects to start investing.

Technology has played an extremely important role in the financial environment we find today, without the approval of the Fintech Law in 2018

all the facilities offered by financial platforms and investment apps would not be possible, continuous innovation and the improvement of digital tools have resulted in better options to invest. This is why financial inclusion is necessary for Mexican culture; it is important to disseminate all these issues since it never hurts to protect our capital from inflation, use investment as a medium and long-term savings vehicle, or start investing more actively to generate attractive profits and thus achieve different goals.

Investment has ceased to be that elitist activity reserved for people with impressive sums of money and has begun to be part of the daily life of Mexicans, with the right education this aspect can take new scales and form an even stronger and more important pillar for the national economy. It is interesting the speed with which this sector has grown, and it is expected that it will continue in the same way, having so many opportunities, facilities, and options it is not difficult to imagine how this could be a huge benefit in the future for Mexicans, since the services that offer us the possibility of investing would be in constant improvement and always facing innovation.

Through an analysis, we have reiterated the numerous advantages of trading applications and likewise their possible disadvantages, since there will always be both favorable and unfavorable situations, however, with the appropriate guidance and relevant financial education, quite satisfactory results can be achieved for each individual.

As mentioned, the foray into the financial environment and stock market is quite beneficial for both the institutions involved and for the individual investors, the ease in opening accounts and customizing products, makes the experience in this environment more attractive and intuitive, which greatly facilitates the goal of achieving financial freedom for each individual who decides to start investing. It has been exposed throughout this work as there are numerous ways to achieve the financial goals proposed by each individual, all that is needed is to venture into the financial and trading environment.

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Theoretical description of the civil religious actor category and the constituent concepts

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RESUMEN

The objective of this manuscript refers to elucidating the main characteristics or elements that explain the production of the category called a religious civil actor. The methodology that is established is qualitative in terms of the construction of concepts. The results lie in building a new category. The limitations refer to the fact that it was difficult to capture all the activities carried out by the churches. The value consists in knowing theoretically some social processes. The findings refer to sharing the category, while the conclusions refer to the fact that it is possible to elucidate social processes through concepts.

Keywords:

Believers; urban; dynamic; social; ecclesial; organizations.

Is it possible to establish links between ecclesial and non-ecclesial activities, say social, cultural, economic, and political, among other tasks that by logic are not reduced to the acts carried out within the congregation of non-Catholic churches? In this sense, the main problem that is framed concerns the development of activities that are not ecclesial on the part of parishioners and ministers of worship and that have become part of their daily life, of the dynamics of the city in which they develop apart from the congregation and that combine with the tasks of the ecclesiastical environment.

The action of the churches within the city of Guadalajara and its Metropolitan Area has become a catalyst that facilitates the obtaining of various material resources and even elements to build their own community, as has been the case of the church The Light of the World, which defines what type of population to choose (Uribe, 2021). In the case of the church House of Prayer, the issue lies in the expansion through the city and surrounding areas in the form of new temples or sub-sites, in which the main claim is the ascription of a greater number of settlers to the ranks of the church.

The main problem discussed here concerns the theoretical denomination of the urban social action of the churches mentioned. This involves answering the following question:

How to theoretically name the churches that develop and deploy a set of actions aimed at influencing the configuration and reconfiguration of the city, in this case, the municipality of Guadalajara?

To answer this question, an argument is presented to theoretically explain the specificity of the dynamics of two religious groups that reconstitute Guadalajara's shape, particularly the churches called The Light of the World and House of Prayer. These congregations have deployed an intense extra-ecclesial activity since at least twenty or thirty years ago. Thus, theoretically, employing the category called religious civil actor, which is a precedent of the "social actor" category, created by Alain Touraine (1995; 1997) and jointly to Touraine and Khosrokhavar (2000), with which it is intended to explain such dynamics.

PRESENTATION OF THE PROBLEM

The emergence of the Civil Religious Actor category has an empirical origin in an investigation developed in the Metropolitan Area of Guadalajara, Jalisco, in 2014. Derived from it came years of reflection about social, cultural, and economic dynamics, as well as rituals along with the traditional forms that characterize certain congregations. This has been of great use to reveal the dynamics of non-Catholic religious groups in Mexico in which, for this document, the region of the West, with the municipality of Guadalajara, stands out as a space in which the category for the mobilization of the religious associations, in which the House of Prayer has been the central

axis from which the analysis of all research has been based on. Also, there is the reference to the church The Light of the World which has exercised an important social activity and built a community where their ministers of worship and parishioners live. The two groups are examples of the activation of the aforementioned city dynamics.

The result of analyzing the dynamics of the House of Prayer and The Light of the World produced categories of empirical cut that account for the actions of religious groups while allowing the understanding of why activities are carried out that cross the boundaries of the ecclesiastical and settle in other areas of society.

In this sense, it is that the observation and analysis of the details of the activity of non-Catholic groups have given the foundations for the construction of the category that, as mentioned above, refers to the Civil Religious Actor. Therefore, this document proposes to theoretically review the social and urban dynamics of the groups to conceptualize the category of research named as the basis of the contribution that this document grants. In the case of the phenomenon of the mobilization of non-Catholic churches, the category that explains praxis is precisely the category of the Civil Religious Actor.

THE *THEORY OF THE SOCIAL ACTOR* AS AN ANTECEDENT OF A NEW CATEGORY

In *Configuration of Indigenous Organizations and Evangelical Leadership* (Uribe, 2014), the Theory of the Social Actor is exposed, a construct that has become one of the foundations of the French sociology of the twentieth century, classical European, and recent American sociology. Coined by the sociologist Alain Touraine (2000a, 2000b, 2006) in a context characterized by protest movements throughout Western Europe, in addition to pointing out the presence of shock groups to contain the mobilizations of medium and lower classes, the author saw the possibility of questioning the constant clashes between political factions and stressed that social movements are fundamental actors for the socio-political change of the old continent.

The author Bourdieu (1998, 2001) and Bourdieu and Wacquant (1995), similarly to Touraine, in their texts called *Counterfires I and II*, point out that it is necessary to review political action when they intend to establish social, economic, political, and cultural orders among others, which to a large extent are deployed by actors capable of transforming reality and instituting changes at all levels. This is fundamental to think that the dynamics of the actors are very important catalysts to implement fundamental transformations, which impact the various areas of the social fabric.

The elementary praxis of the Theory of the Social Actor lies in giving an account of the conforming conceptual elements. It is necessary to describe

the dynamics of the actor to understand the logic with which they operate, which is revealed according to their passage and the transformations that they achieve in the structure of society.

Touraine (2000b) exposes his Theory of the Social Actor in his work *The Production of Society* from the theoretical solution that he saw necessary to build for what according to him, was the main problem of European sociology in all times and ages past, present and future: The eternal problem of the social order.

The social order, the same one discussed in Bourdieu's work (1985), in his Theory of Social Reproduction, leads Touraine to wonder about the mechanisms for establishing social order. Establishing such a position goes against the anomie, as pointed out by Girola (2005), Durkheim (1998, quoted by López Fernández, 2009) in the specialized texts: *Anomia and individualism, Suicide* and "The concept of Durkheim anomie and subsequent theoretical contributions", which means an absence of norms as a product of null emotional regulation and pragmatic integration of individuals into societies, which, for the author, this phenomenon becomes known as suicide. On the other hand, the social actor would be the rescue of the individual who, in social groups, inclusively, can reverse his history of life to transform structures that do not allow their integration.

With the Theory of the Social Actor, Touraine (1995) produced an explanatory model where he clarifies that social change is the result of the collective action of social actors, who can be individuals or human groups, with abilities to transform the social environment that surrounds them. According to Melucci's logic (2001; 1999), social movements, in this case, the collectives of society and the associations that form the social fabric, reconfigure the social dynamics, the daily life of citizens, and the political conditions of nation-states. Individuals can change their situation. But with a touch of cordiality that turns its action into a set of experiences that do not conflict but are in harmony with the same social structure. The Social Actor does not violate the norms, principles, rules, or precepts that the social order issues but gives them fulfillment and provides elements for their transformation.

Unlike the theory of the agent built by Anthony Giddens (1985; 1991; 1995) in his famous book *The Constitution of Society* argues that individuals are always subject to the conditions of the social structure, regardless of whether they contribute ideas, attitudes or actions to change the conditions of the social environment. The Actor Theory conceives of individuals as being in "danger of extinction" -according to its interpretation-, and then gives way to the construction of historical subjects; actors become architects of their own destinies.

Historical subjects who construct their life stories reconfigure their daily activities and build a society with their discourses and practices (Touraine, 1997; 2000). By constructing their own definition of society, they face the power of social structures, which using their rules of action try to limit the initiative of the actor to condition him to be the one who builds the society he wants to establish, contrary to the notion of Social Actor (Bourdieu, 1985; 1988).

The clash occurs between forces that legitimize the ontological order of the social structure, actors who build these dispositions, and those of the subjects who, due to their hegemonic position, with their ideas and initiatives, give life to the transformation of their environment. The Social Actor directs his transformation toward a historical subject, where society tends to be the maximum historical subject. Thus, the Social Actor promotes their transformation that produces new procedures and new elements of the social structure through new relationships with other actors, always in fullness, that is, to erect themselves as free and conscious people, especially with the knowledge of their conditions that, although immersed in the social norms of institutions, autonomously determine their own lifestyle, thought and practice without transgressing the provisions of the social structure (Pleyers, 2006).

Being a social actor of a collective nature, without discarding individuals, means influencing the formation and elements that determine the social structure. It implies having the capacity to transform and be transformed, to go in continuous harmony with the historical law of the time, which leaves no one without a proposal for transformation, least of all societies, which are directly linked to history and memory.

The Social Actor category of Alain Touraine is a theoretical proposal that when analyzed and pieced together, arises other categories for the analysis of diverse contexts. When analyzing social movements, both Touraine and Bourdieu elaborated an extensive work of analysis for Europe and other latitudes of the world such as Africa. While, for the case of this work, the empirical analysis observes that the dynamics of non-Catholic ecclesial groups, build development through the category Civil Religious Actor, which in the following sections will take center stage.

ELEMENTS OF THE CIVIL RELIGIOUS ACTOR CATEGORY

The novel and unprecedented thing that the theoretical model called Civil Religious Actor shows is that the social action of the House of Prayer church does not infringe on the claims of other social groups regarding the eagerness of popular representation, nor does it attempt to supplant government action as a driver of public policies, much less take the role of manager of public

services, but try to be a body that contributes to the provision of public services.¹ According to the testimonial sources, in the case of the church The Light of the World there is no claim² to undermine the right of other denominations, missions, and religious congregations to establish themselves, attract parishioners and flourish economically, but to build community, that is, indirectly, it would stand as an actor representing the needs of his parishioners, which greatly facilitates attracting believers and increasing the number of its affiliation, to the detriment of other denominations.³ Both congregations raise their hands for the different needs of their parishioners.⁴ To collaborate, or at least that's what they intend, as social representatives of their congregation, transform the urban image and the conception of social, cultural, and urban development in the city of Guadalajara and other municipalities,⁵ without confronting the constitutive norms of the social order and the functions that each group deploys in society, including the government.⁶

This theoretically confirms what Touraine argues (1984, 1997, 1995, cited by Uribe, 2014; 2021) about the fact that individuals have a real aspiration to transform social conditions and their own human conditions. It seems that they become social actors, historical subjects who, without lacking the determinants of the social order, including in religious and political matters, shape their destiny.

They exercise their right to choose the elements that build their collective and individual environment to freedom of association, of religious self-determination, to choose their profession, partner, and friendships they want, to learn the aspects that life grants them, with full awareness of doing so without being pressured, coerced and forced by a third party. In other words, the social actor is completely under-summed in social structures (Touraine, 1997) but also completely motivated to configure in the way he/she prefers the will of their being, as expressed by Schopenhauer in his work *The World as Will and Representation* (2000).⁷

The category of the Civil Religious Actor is characterized by several characteristics: the first refers to allowing the investigation of reality around the category entitled Totality of the Socio-religious Action of the ecclesiastical groups in the city. The second is that it makes it possible to account

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- 1 Joel's testimony, Guadalajara, 2015
 - 2 Jaqueline's testimony, Guadalajara, 2015
 - 3 Juana's testimony, Guadalajara, 2015
 - 4 Joaquín's testimony, Guadalajara, 2015
 - 5 Juan's testimony, Zapopan, 2015.
 - 6 Francisco's testimony, Tlaquepaque, 2015.
 - 7 Commented on this: Darío's testimony, Guadalajara, 2015

for the category called Field of Interest, in that the characters involved are mobilized, which allows for establishing the general purposes and particulars of the organism.

The third characteristic is that the Civil Religious Actor is the same congregation, this refers to the daily action or activity that takes place within the framework of his image as a worship group, this gives way to the existence of the category of Organism of Religious and Civil Worship that acts as a social institution when organizing the municipalities' urban and social lives.

By the totality of socio-religious action, we must understand the complex environments in which the religious group is mobilized, whether political, economic, or cultural fields, among others, in which they develop, as well as the functions and activities that they carry out daily.

The collective action that comes from the Civil Religious Actor is divided into two points: 1) it contains ritual processes that are characteristic of it, typical of the lines of religious identities to which they belong, in the case of the House of Prayer, the non-evangelical biblical churches and Pentecostalism, and on the other hand, 2) it is manifested in activities which are typical of other social fields such as commerce, public service, and finance.

According to Uribe (2021), the thematic line that contains the category has precise characteristics that are in constant tension with the social fields because its function, as we said, is to provide salvation goods to believers, such as 1) The sacraments, 2) glossolalia, 3) ecstatic dance, 4) extreme anointing, 5) counseling, 6) emotional liberation and "malignant possession" among other aspects.

One category inherent in the idea of a Civil Religious Actor is that related to the activity of believers. This means that all actors leave the sphere of ecclesial activity to insert themselves in other social fields, so they have an essential characteristic: It is a dual category, that is, part of two natures of action: Civil and religious.

The non-evangelical Pentecostal and biblical churches represent the basis of general identity (Bastian, 1997; 2011). Both deploy a set of activities typical of these lines; let's talk, for example, of each of the rituals that take place there, and yet, also carry out civil activities because, with the stamp of a citizen entity, they mobilize between the different social areas entering into other non-religious lines of action (Uribe, 2014). The Civil Religious Actor category consists of three aspects essentially (Uribe, 2021):

- a) To influence the shaping of the urban image mainly contemplating the construction of more congregations that are scattered throughout the city.

- b) By building more congregations, they intend to increase the space of dominion of religious preferences, defined as the hoarding of ecclesial preferences, which consequently increases the parishioners' affiliation.
- c) By obtaining a considerable number of parishioners from other denominations, and even Catholicism, they lose adherents, thereby diminishing the Church's Competition for the Monopoly of the Religious Offering, a sociological category that is established to denote the struggle to win the preferences of potential parishioners. By winning the battle, the dominance of the space of preferences increases, they can establish more temples in other territories, the parishioners increases, as well as the collection of economic resources, with which a conceptual hegemony is glimpsed, which in this document is called a space of Civil Religious Preferences. The civic religious preference space is the number one place and target for which the Civil Religious Actor works. Dominating this space also legitimizes its civil function and its collective action, and, before government authorities, facilitates the establishment of arguments to demand public goods.

SPACING CATEGORIES: *DISTANCE AND PROXIMITY*

In this line of ideas, we agree with Uribe's analysis (2021), and the notions of Distance and Proximity take on great importance, both considered of great value by the leaders of the organism, especially as a mechanism of attendance control, as well as of collection of tithes and offerings⁸. The use of the notion of Distance (religious and urban) becomes relevant for leaders to observe the arrival of parishioners on days of worship, either by car, bus, or other means, in addition to the monetary amount offered, is a sign of the status the parishioner counts.

The above categories help leaders identify the characteristics of their congregants. For example frequency in attendance at services and important events such as anniversaries of the congregation, weddings, and collective baptisms, among others. Obtaining the predominance of the space of religious preferences is equivalent to identifying the origin of the parishioners in terms of kilometers traveled to reach the different centers of worship, less distance is better, it is also important the type of goods they hold, if they bring a car, what brand and model, as well as the professions, careers, and salaries that they have.⁹

8 Julián's testimony, Zapopan, 2015

9 Alfonso's testimony, Zapopan, 2015

They are, as we said, theoretical references of distance and social status that explain the socioeconomic condition and the range of the path existing between each center of worship and the home of each believer. It is considered far more than four kilometers and similarly close to less than that mileage. The budgets involving both categories of distance: Distance and Proximity are five according to some oral testimonies:

1. The domain of the space of religious preferences implies a distinctive treatment according to the needs that surround the parishioners immersed in one category and another, which implies differentiated attention by the leaders of each organization.¹⁰ By differentiated attention, we will have to understand the relationship between ministers of worship and parishioners, as well as the basic attention of problems, which develops in the function of the parishioner and his closeness to the congregation. The categories of Proximity and Distance work to identify the most important needs, lifestyle, as well as the form of care driven by the organization, according to their social status and the distance between both social spaces.
2. Also, as we said before, as the number of parishioners increases, the need to open more congregations or temples increases.¹¹ This raises the probability that they appear in other regions of the city and the state, which boosts the number of parishioners who join and adhere to the category of Distance.
3. It is not excluded that the number of parishioners in other congregations decreases. It is assumed that our type of Civil Religious Actor absorbs parishioners of other denominations. The increase in parishes directly affects the appropriation of the space of religious preferences, while facilitating the presence of the denomination throughout the city and the state.¹²
4. The categories of Spacing and Distance make it easy to visualize the evolution in terms of the believers' filiation, as well as the loss of enrollments. There has been a noticeable decline in the Catholic monopoly and the effective growth of non-Catholic denominations, especially Pentecostal churches such as the House of Prayer, also the church Assembly of God, and the church Ministerios de Miel y Azúcar of the Guatemalan leader Otoniel Ríos Paredes.

10 Medardo's testimony, Tlaquepaque, 2015

11 Alonso's testimony, Zapopan, 2015

12 Alexandra's testimony, Zapopan, 2015

In short, the category Civil Religious Actor is of great value for the elucidation of the activity of both churches. We reflect that the elements that surround this construct also make it possible to observe more acutely the details of the representation that make this Pentecostal denomination. In the same vein, a qualitative study was used (Hernández Sampieri, 2001; Dear & Moos, 1986) which consists of the spatial delimitation of the city of Guadalajara as the center from which the ecclesial action begins and extends to other territorial areas at the municipal and regional level, in a series of political-religious and cultural displays, that structure the actions of House of Prayer and of the Church Light of the World itself, whose leaders transcend their influences beyond their religious affiliation (Uribe, 2021). Methodologically, the Guadalajara Metropolitan Area was conceived as the center from which a network of alliances has been woven to found other sub-headquarters, at least fourteen which at the same time share a common history regarding their processes of ecclesial organization and social representation with regional and even state scope. On the understanding that the Civil Religious Actor is the main figure that builds his reality, thought, activity, and imagination it is necessary to ask ourselves about the scope that has as direct representative of the parishioners and congregants in Guadalajara. An exercise of questioning the participation of this actor was established through its activity of representing two types of parishioners: 1) Those living within a radius of four kilometers or less and 2) those residing in a space range greater than four kilometers, that is, those living far away from those living nearby.

Ipsa facto the analysis of public services is the main dimension that allows us to approach the vicissitudes of the complex link between religious leaders, parishes, and municipalities. Three fundamental links to explain and understand the collective action of the Religious Civil Actor. Therefore, the link between religious leaders, the dynamics in the municipality of Guadalajara, and the parishioners was analyzed. The speech presented here is framed on some fundamental assumptions that are presented below.

With the category of Home-Congregation Distance Proximity, it is understood that religious leaders develop two ways of representing parishioners. One of them, according to the category Home-Congregation Proximity, means that believers live within the range of four kilometers, the other corresponds to Home-Congregation Distance which includes believers who live beyond four kilometers.

The first is defined by the religious leaders' concern for the basic provision of the following utilities: Water, electricity, drainage, asphalt fencing, poles, and electrical wiring. It is reiterated that reference is made to parishioners living within a range of four kilometers or less.

This response to a double budget is economic and ecclesial. Religious ministers understand that the type of parishioner who lives beyond four kilometers of the congregation shows less attendance at the congregation than those who live in a range of four kilometers or less, therefore, they are not available to cooperate with resources, time or work when required. Believers who live beyond four kilometers of the congregation usually don't own a car, and arrive on foot to the congregation, plus they are regularly the people who least participate in the events.¹³

State services such as park and garden maintenance, street cleaning, building and house infrastructure, and building materials are provided for parishioners living within a radius of four kilometers. Among other reasons, because they have their own car, they either arrive by taxi or other means of transport. On behalf of the believing population, those who will be preachers and deacons and who will have some ministry and open other temples are chosen. They are considered important for initiating or continuing any function entrusted to them. Distance categories are elements that function as classifiers of the social (and ecclesial) status of parishioners.

Therefore:

- a. Home-Congregation Proximity is equivalent to the socioeconomic status of less structural advantage compared to other social strata (Rawls, 2000).
- b. Home-Congregation Distance equals a greater membership of economic resources of various kinds, monetary, land, houses, and businesses, among others.
- c. Both categories not only clarify the frequency of attendance and participation in ecclesial events but also point to the socio-economic conditions of the parishioners. A lower socioeconomic status does not favor the selection and participation of parishioners in ecclesial positions considered very important by the church. It is thought that people with greater resources can better support the activities of leaders. Donations or offerings are essential for the congregation to flourish.
- d. Eventually, it contradicts the spiritual dogma that emanates from the statutes of operation of the church, which says that the assistants' selection to form the ministerial bodies is done theologically, also called "revelation of the Holy Spirit", as the final choice is

13 Alejandra's testimony, Zapopan, 2015

established through a socioeconomic analysis and of the conceptual duality distance-travel attending to the aspects in terms of economic resources, belongings or properties, and availability to help in the functions of the congregation.

Proximity means fewer financial resources, less possibility of occupation of ministries, and similarly, less ability to obtain more complex public services. While the maintenance of parks and gardens, clean streets, the infrastructure of buildings and houses, materials for construction, and others are granted through representation activity with greater emphasis on parishioners living beyond four kilometers.

To understand the dynamics of representation of the Civil Religious Actor it is fundamental to explain the nexus between dimensions. The incidence and forms of representation as an ecclesial body with well-defined civil representation tactics are intended to represent the interests of the parishioners of the community attached to a church that performs civil functions in the city.

The collection of oral testimony was deployed, mainly, the dialogue with five fundamental participants of both churches, which have primary functions in the congregation and presumably participate in and influence urban mobilization. Building a socio-religious network of key informants was one of the primary yearnings for this research. The network constituted by the subjects who participate in the activities of the Civil Religious Actor is the main scheme with which the acts and speeches emanating from the leaders were analyzed.

It should be noted that the testimonies have served to approach the most significant actors and understand their activities, negotiation strategies, the search for municipal spaces, and forms of social representation. The population that is the subject of the analysis, the main unit of study is the Pentecostal congregation of the House of Prayer Church, the leaders, their helpers, supporters, and even opponents. Interesting gatherings are established with an open and receptive attitude to bring us all the necessary information and then classify it according to its importance.

Several useful tools were used such as structured and semi-structured interviews, we collected oral testimonies, official documentary sources, and primary and secondary sources.

The analysis of situations provides the similarities and differences in access to social spaces and the benefits that this generates. This has allowed us to make a comparison for the case of two types of parishioners through the Proximity-Distance category.

It has been essential to obtain the exact details of the role of the social representative of the House of Prayer to go to the place of events to observe

the activities of the main protagonists. We participated actively and entered, almost as anthropologists, the activities of the congregation. Fundamental details were obtained, and the meanings of the rituals, speeches, and the protagonists of the collective action of the Religious Civil Actor were captured. The collection of information has been developed based on an instrument for capturing and systematizing data, with which the contents and specificities are sorted while being interpreted and exposed to capture the details that account for the object of study.

CONCLUSIONS

The present document has set forth some fundamental questions for establishing the dynamics of non-Catholic creeds in Guadalajara, Jalisco. It has been fundamental to elucidate the urban and social dynamics of the non-Catholic ecclesial groups located in the west of Mexico, especially in terms of the construction of abstractions about the produced category called: civil religious actor. This paper was developed from Alain Touraine's social actor theory, as the precise antecedent to build the mentioned category.

It was very important to establish the characteristic elements of such a category those that indicate the affiliation of new parishioners, proximity, and distance. It seems that the affiliation of parishioners occurs within a distance, which means that there are more likely to be affiliations if the homes of the prospective parishioners are close to the congregation. It should also be noted that in the understanding that the farther the home or housing is, the conditions of arrival at the congregation become complex, is more difficult to attend, so it is to draw attention that, in the field of empirical evidence, it is constant, with a series of testimonies, that proximity and/or distance are factors that facilitate the arrival of people, of new parishioners to the congregation.

This document reports the construction of a category that would account for the dynamics that non-Catholic religious creeds establish in cities. This time, the city of Guadalajara was the urban entity that received the influence of the congregations House of Prayer and The Light of the World, which greatly influenced the configuration or reconfiguration of the urban scenario. In different ways, yes, but they influence in a very concise way the surrounding urban structures that make up the city of Guadalajara.

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