Reception: **May 2, 2024** | Acceptance: **May 12, 2025** | Publication: **June 1, 2025**

Prevalence and factors associated with bovine gastrointestinal parasitosis in the municipality of Mapastepec, Chiapas

—

Horacio León Velasco
horacio.leon@unach.mx
ORCID: 0009-0001-1759-3856

Lizbeth Priscila Cruz Pérez
f180029@unach.mx
ORCID: 0009-0005-5983-0687

Guadalupe Zavala López
f180037@unach.mx

Hubercein Ramírez Barrios
hubercein.ramirez@unach.mx
ORCID: 0009-0000-5921-5223

Gerardo Uriel Bautista Trujillo
gerardo.trujillo@unach.mx
ORCID: 0000-0001-5685-509X

Facultad de Medicina Veterinaria y Zootecnia, Universidad Autónoma de Chiapas, Tuxtla Gutiérrez Chiapas, México

To quote this article:

León Velasco, H., Cruz Pérez, L. P., Zavala López, G., Ramírez Barrios, H., & Bautista Trujillo, G. U. Prevalencia y factores asociados a la parasitosis gastrointestinal bovina en el municipio de Mapastepec, Chiapas. *Espacio I+D, Innovación más Desarrollo, 14*(41). https://doi.org/10.31644/IMASD.41.2025.a01

— Abstract—

The objective of this research was to determine the prevalence and factors associated with gastrointestinal nematodosis in cattle in the municipality of Mapastepec, Chiapas. Gastrointestinal nematodosis in cattle affects livestock health and productivity, causing great economic losses that impact the profitability of the production system. The research was descriptive and transversal. The coprological analysis of 420 samples of cattle was carried out during September - October (2023), using the flotation and McMaster technique. Non-probabilistic convenience sampling, 2x2 contingency tables, and the Chi Square test ($P<0.05$) of the SPSS IBM Statistics version 25 software were used. During this investigation, the following genera of nematodes were identified: Trichostrongylus spp., Ostertagia spp., Cooperia spp., Chabertia spp., Haemonchus spp., Strongylus spp, and Trichuris spp. Concerning the number of animals sampled, a prevalence of nematodes of 62% was found. Regarding the age groups, young cattle had a greater parasitic infestation (70.7%); Cooperia spp., being the genus with the greatest presence in young and adult animals, while in old cattle, the nematode Trichostrongylus spp was identified. The degree of parasitosis infestation in young animals was 378.3 ± 73.3 HPGH, and in adults, 219.5 ± 58.1 HPGH, being a moderate parasitosis, and in old animals, this disease was mild with 153.6 ± 10.3 HPGH. The factors associated with significant gastrointestinal nematodes in this study were: geographical area, exploitation system, breed, age, body condition, sex, animals in coexistence, and food ($P<0.05$), provided on the ranches.

Keywords:

Prevalence; gastrointestinal parasites; associated factors.

Gastrointestinal nematodosis in cattle is a multi-etiological disease caused by different genera of parasites such as Trichostrongylus spp., Haemonchus spp., Ostertagia spp., Cooperia spp., Trichuris spp., Chabertia spp., and Strongylus spp., which are worms that inhabit the digestive tract and are characterized by the following clinical signs: inappetence, anemia, edema, diarrhea, decreased production, and even death of the animal. It should be noted that the frequency of these parasites depends on various factors such as climate, management system, age, race, and nutritional status (Angulo, 2005; Quiroz, 2011).

In Mexico, the economic impact of the presence of gastrointestinal nematodes in cattle has reached economic losses of up to $445.10 million (Reyes-Guerrero et al., 2021). In this sense, cattle farming in Chiapas develops in 83.4% of the territory, and considering that cattle is one of the animal species with the greatest susceptibility to gastrointestinal parasites, it is important to study parasitosis in this municipality because this disease could cause great economic losses (González & Santiz, 2010; CEIEG, 2018).

Currently, gastrointestinal parasitosis in cattle is one of the main animal health problems in the country. Therefore, it is necessary to carry out preventive medicine programs that control these conditions that have an impact on the productive efficiency of the livestock herd. Therefore, the collection of this information in the state is relevant, mainly in the municipality of Mapastepec, Chiapas, where livestock is the main socio-economic activity, so it is necessary to know the degree of infestation of these parasites in cattle.

Therefore, the objective of this study was to determine the prevalence and factors associated with gastrointestinal nematodosis in cattle in the municipality of Mapastepec, Chiapas.

MATERIALS AND METHODS

Research area

This research work was carried out in the municipality of Mapastepec, Chiapas, located in region IX, known as Isthmus-Coast, in southern Chiapas, Mexico. The total area of this municipality is 1,085.60 km2, with a warm and humid climate from January to September and semi-warm from October to December. Rainfall occurs in September and October with a monthly average of 450 mm. Its economic activity is based on extensive and intensive cattle farming; it exports cattle on a large scale, which generates important income for the municipality, among other activities (Cardoso-Vázquez et al., 2006; Becerra, 2009; INEGI, 2010).

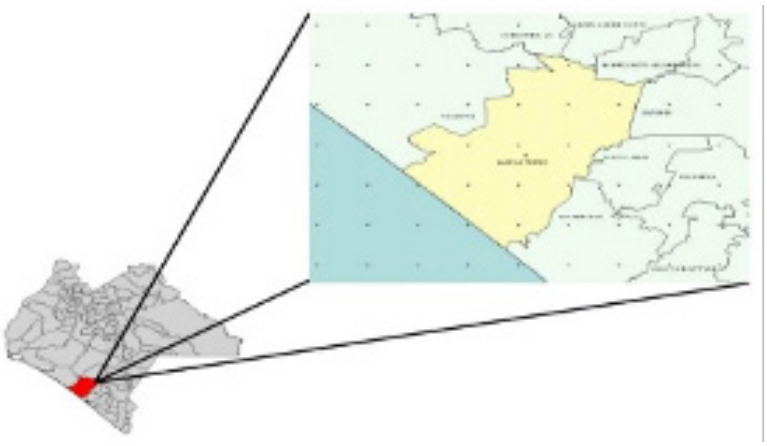

Figure 1. Localización geográfica del municipio de Mapastepec, Chiapas.
Source: Cardoso et al., 2006; GADM, 2018.

METHODOLOGY

This is a descriptive-cross-sectional research design that analyzes and describes the prevalence of gastrointestinal parasites, taking into account the variables: race, age, sex, and body condition.

A coprological sampling was carried out in the municipality of Mapastepec, Chiapas, taking into account the national livestock register, reported in 2021, which shows the existence of 2,290 livestock production units (UPP) with a livestock inventory of 158,330 head of cattle distributed in the different areas of this municipality.

For the determination of the samples, convenience sampling was used in 21 UPPs belonging to the Local Livestock Association of this municipality and cooperating producers. To carry out the determination of the finite sample size, the formula described by Aguilar (2005) was used.

$$n = \frac{N\,Z^2\,pq}{d^2\,(N-1) + Z^2\,pq}$$

n = sample size
N= 158,330 - population size
Z= 1.96 - confidence level
d= 0.05 - absolute accuracy level
p= 0.5 - proportion of the phenomenon under study in the population
q= 1 - p - proportion of the reference population that does not present the phenomenon under study

To obtain the sample size, a probability of occurrence of the phenomenon studied (p) of 50% was taken into account with a confidence level (Z) of 95% and absolute accuracy level (d) of 5% (Aguilar, 2005), resulting in 383 cattle. In this sense, due to the participation of cooperating producers, the number of samples was increased to 420 cattle from 21 UPPs. For this purpose, the number of animals that were sampled per ranch was 20 cattle, which it was divided into three age groups: young (35.7%), adult (24.8%), and old (39.5%).

Determination of prevalence

The Pinedo formula (2020) was taken as a reference to calculate the prevalence of gastrointestinal parasitosis.

$$P=\frac{\textit{Number of animals positive for gastrointestinal parasites}}{\textit{Total number of animals sampled}} \text{ X } 100$$

Inclusion criteria

- Age of cattle: young (0 to 12 months), adult (13 months to 24 months), and old (≥ 25 months)
- Body condition of cattle with scale 1.0 to 9.0. (1.0= very thin and 9.0= obese) This scale was taken into consideration as dual-purpose cattle (milk and meat) (Herd & Sprott, 1986)
- Health status (healthy)
- Cattle breed (all breeds)
- Sex of cattle (females and males)

Exclusion criteria:

- Freshly dewormed cattle
- Pregnant cattle
- Sick cattle

Elimination criteria

- Contaminated samples
- Loss of cold chain

Ethical and bioethical aspects in animal research:

During the development of this work, we took into account the considerations that mark the legislation and standards in the Law of Livestock Development and Sanitation for the State of Chiapas, the Official Mexican Standard NOM-062-ZOO-1999.

Interpretation of the results:

Morales et al. (2012) classify the degree of infestation of gastrointestinal parasites in large ruminants by Eggs Per Gram of Feces (HPGH):

- Mild infestation: 50-200 HPGH (+)
- Moderate infestation: >200-800 HPGH (++)
- High infestation: >800 HPGH (+++)

Statistical analysis

For the calculation of statistical significance, a 2x2 contingency table was used, using the Square Chi test ($P<0.05$). Simultaneously, the ratio of moments with a 95% confidence interval was calculated. Bivariate analysis was performed with the SPSS IBM Statistics version 25 software. (IBM Corp. © Copyright IBM Corporation 25.2017 version).

RESULTS

Prevalence of parasite infestation in the UPPs of Mapastepec, Chiapas.

Table 1 shows the prevalence results obtained concerning the determination of gastrointestinal nematodes, where 420 cattle were sampled, of which 262 animals (62%) were positive for gastrointestinal parasites and 158 (38%) animals were negative.

Table 1
Overall prevalence of gastrointestinal nematodes

Cases	Samples	Population	%
Positive	n	262	62
Negative	n	158	38
Sampled animals	n	420	100

Note: Own elaboration.

Of the gastrointestinal nematode positive cases by age group, 150 young animals were sampled, of which 70.7% (n=106) were bovine positive and 29.3% (n=44) were negative cases, while in the group of adult animals 104 animals were evaluated, resulting in 56.7% (n=59) of bovine positive and 43.3% (n=45) negative animals; finally, of 166 older animals 58.4% (n=97) were positive and 41.6% negative cases (n=69).

During this research, the classification of gastrointestinal nematodes was carried out in the 21 UPP evaluated, where the following genera were detected in 20 UPP: Trichostrongylus spp., Ostertagia spp., Cooperia spp., and Chabertia spp., with these four genera having the highest frequency (95.2%). The genus Haemonchus spp. was present in 19 UPP (90.5%), and the least frequent were the genera Strongylus spp. in 10 UPP (47.6%), and Trichuris spp. with six positive cases (28.6%).

According to the classification by age group, seven genera of parasites were detected in young cattle (Figure 2), of which the Cooperia spp genus represented the highest frequency (30.55%) and the Trichuris spp genus the lowest frequency (3.49%) of positive cases.

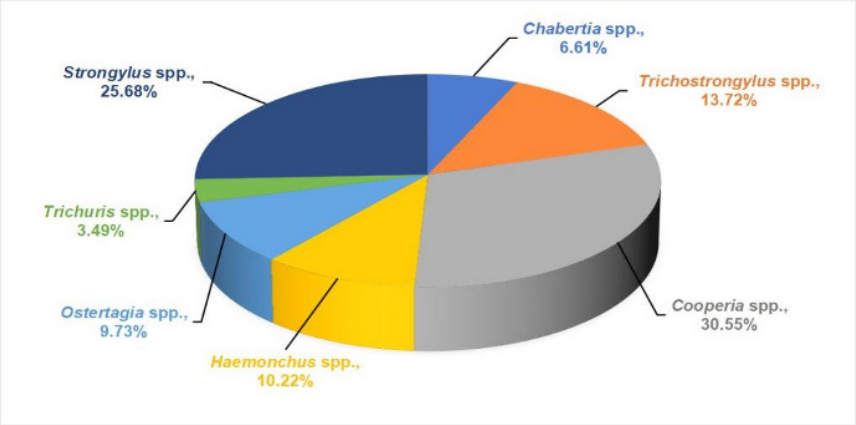

Figure 2. Gastrointestinal nematodes identified in young cattle

Figure 3 shows that the group of adult cattle presented infestations with the following genera: Cooperia spp (36%)., Trichostrongylus spp. (17%)., Strongylus spp. (15%)., Haemonchus spp. (13%)., Ostertagia spp. (10%)., Chabertia spp (7%), and the genus Trichuris spp (2%) were the ones with the lowest presence of positive cases.

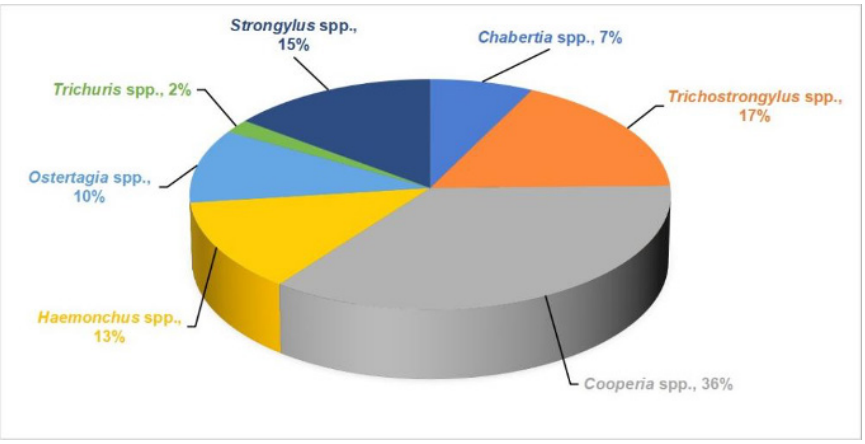

Figure 3. Gastrointestinal nematodes identified in adult cattle

With reference to old animals, the seven genera of nematodes above were identified. However, the genus Trichostrongylus spp. is the one with the highest presence, with 20.5%, in this population; on the other hand, the genus Trichuris spp. is the one with the lowest frequency, with 0.3% of positive cases (Figure 4).

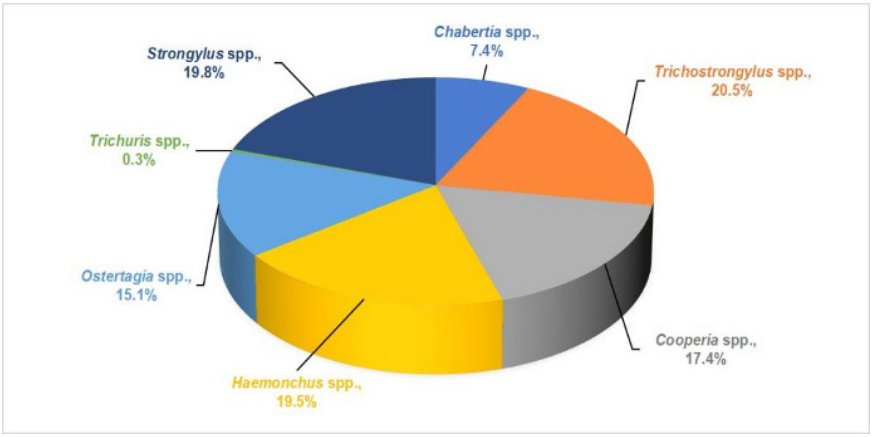

Figure 4. Gastrointestinal nematodes detected in old cattle

The results obtained according to the degree of infestation showed that young animals (378.3 ± 73.3 HPGH) and adults (219.5 ± 58.1 HPGH) presented a moderate degree of infestation, while old animals (153.6 ± 10.3 HPGH) presented mild cases. Therefore, the general average of the evaluated population manifested a moderate parasitosis of 250.50 ± 66.69 HPGH.

Regarding the sex of the animals, it was found that the 193 females evaluated showed a degree of mild infestation, while in the males, the infestation was moderate in 69 animals.

The overall result of positive animals was 262 for parasitosis. However, when classifying it by body condition of 1.0 (n=112), an infestation of 331.7 ± 72.9 HPGH was observed, while in the body condition of 3.0, there were 110 animals, both of which had a moderate infestation (212.3 ± 20.5 HPGH). In contrast, animals with a body condition of 5.0 (n=40) had a mild (182.5 ± 25.0 HPGH) presence of parasitosis.

As for the nine analyzed breeds of the sampled animals, the highest parasitic load was the Brahman breed (1950 HPGH) with an infestation considered as high; in contrast, the lowest parasitic load was the cross of Cebu x Cebu (62.5 HPGH) with an infestation considered as mild.

FACTORS ASSOCIATED WITH GASTROINTESTINAL PARASITOSIS IN CATTLE

In Table 2, the factors associated with the presence of gastrointestinal nematodes in cattle are mentioned. Regarding the Centro-Dulce location area of the municipality of Mapastepec, Chiapas, the genus Haemonchus spp reflected a value of 0.372 of Momios Ratio (RM), while in the Baja-Marítima area, the genus Ascaris spp showed a result of 0.454 RM ($P<0.01$). This represents a remarkable relationship in both variables with these gastrointestinal nematodes. On the other hand, the semi-intensive exploitation system detected the genus Ascaris spp, and in the extensive exploitation system, the genus Strongylus spp ($P<0.01$) with values of 0.375 RM and 0.305 RM, respectively.

Regarding the breed or cross, they manifested a significant association with the presence of parasitosis, reflected as follows: Cebu x Swiss with the presence of the genus Strongylus spp., (2.650 RM), and the Simbrah cattle breed had a relationship with the parasites Trichostrongylus spp (4.299 RM) and Trichuris spp (7.960 RM) ($P<0.01$). However, the cattle embedded between the Cebu x Cebu breeds presented the genus Cooperia spp (0.129 RM), ($P<0.01$). For its part, the Swiss American breed was associated with the nematode Strongylus spp with a value of 2.546 RM ($P<0.05$) and Ascaris spp of 21.500 RM ($P<0.01$). Finally, the Holando x Cebu cattle breed manifested the association with the nematode Haemonchus spp (1.864 RM) ($P<0.05$). Breeds such as Gyr, Guzerat, Brahman, and Black Sardinian did not show a significant association with gastrointestinal parasitosis ($P>0.05$).

Regarding the age of the animals, their relationship with the condition of parasitosis found that young cattle had the presence of the following more relevant genera, such as: Trichostrongylus spp (2.070 RM), Cooperia spp (2.179 RM), Chabertia spp (2.718 RM), Trichuris spp (5.743 RM) ($P<0.01$), and for Ascaris spp nematodes (0.232 RM), Haemonchus spp (1.644 RM) had lower values ($P<0.05$). The second age group was old animals, and a

relationship was found with the following genera: Cooperia spp (0.449 RM), Ascaris spp (7.706 RM) (P<0.01), and Trichuris spp (0.134 RM), Chabertia spp (0.508 RM) (P<0.05). In contrast, adult cattle had no relationship with the parasites detected (P>0.05).

Table 2

Factors associated with the presence of parasitosis in cattle

Factor	Genus	RM	LCI	LCS	*P Value*
Geographical area					
Centro – Dulce	**Haemonchus spp**	0.372	0.219	0.631	P<0.01
Baja – Marítima	**Ascaris spp**	0.454	0.408	0.505	P<0.01
Exploitation system					
Extensive	**Strongylus spp**	0.375	0.198	0.710	P<0.01
Semi-intensive	**Ascaris spp**	0.305	0.263	0.354	P<0.01
Breed or crossbreed					
CxS	**Strongylus spp**	2.650	1.577	4.454	P<0.01
HxC	**Haemonchus spp**	1.864	0.999	3.478	P<0.05
SI	**Trichostrongylus spp**	4.299	1.350	13.691	P<0.01
	Trichuris spp	7.960	1.540	41.149	P<0.01
SA	**Strongylus spp**	2.546	1.046	6.196	P<0.05
	Ascaris spp	21.500	7.333	63.036	P<0.01
CxC	**Cooperia spp**	0.129	0.017	0.974	P<0.01
Age					
Young	**Haemonchus spp**	1.644	1.002	2.696	P<0.05
		2.070	1.271	3.370	P<0.01
		2.179	1.407	3.374	P<0.01
		5.743	1.530	21.552	P<0.01
		2.718	1.514	4.882	P<0.01
		0.232	0.052	1.030	P<0.05
Old	**Cooperia spp**	0.449	0.281	0.717	P<0.01
	Trichuris spp	0.134	0.017	1.047	P<0.05
	Chabertia spp	0.508	0.266	0.968	P<0.05
	Ascaris spp	7.706	2.179	27.252	P<0.01

Note: P<0.01= Highly meaningful
P<0.05= Meaningful
CxS: Cebú x Suizo, HxC: Holland x Cebu, SI: Simbrah, SA: American Swiss, CxC: Cebu x Cebu, RM: odds ratio, LCI: lower confidence limit, LCS: upper confidence limit

Table 3 shows the results of parasitosis related to the animals' body condition. An association was found with the parasite Strongylus spp, with a value of 2.226 RM (P<0.01) in the body condition of 1.0, and in the same case for the body condition of 3.0, the genus Strongylus spp reflected a value of 0.549 RM (P<0.05). Therefore, cattle with a body condition scale of 5.0 had no significant relationship with the genera of the parasites (P>0.05). According to the sex variable, females were associated with the manifestation of the following genera: Cooperia spp had a value of 0.557 RM (P<0.01), likewise, the genera Ostertagia spp with a value of 0.519 RM, and Trichostrongylus spp with 0.542 RM (P<0.05). However, male cattle showed no association with parasitosis (P>0.05).

Concerning cattle living with backyard hens, the genus Ascaris spp had a value of 0.355 RM (P<0.01), and in the case of sheep, the parasites Strongylus spp and Chabertia spp had values of 0.827 RM and 3.174 RM, respectively (P<0.01). As for pigs, the following genera were identified: Ascaris spp (0.057 RM), Cooperia spp (0.121 RM), Ostertagia spp (0.124 RM), Trichostrongylus spp (0.194 RM) (P<0.01), and Chabertia spp (0.162 RM) (P<0.05).

Finally, the variable of food supplementation by grains (corn) and poultry manure both showed a relationship with the same genera Ascaris spp having a value of 0.206 RM (P<0.01), Haemonchus spp with 0.505 RM and Chabertia spp of 0.371 RM (P<0.05), continuing with the corn cane the nematode Chabertia spp (2.217 RM) was visualized (P<0.05) and in the corn silage the parasite Strongylus spp (0.110 RM) and Ascaris spp (13.500 RM) (P<0.01) were observed.

Table 3
Associated factors and presentation of positive cases of parasitosis in cattle

Factor	Genus	RM	LCI	LCS	*P Value*
Body condition					
1.0	**Strongylus spp**	2.226	1.336	3.710	P<0.01
3.0	**Strongylus spp**	0.549	0.324	0.929	P<0.05
Sexo					
Female	**Trichostrongylus spp**	0.542	0.323	0.911	P<0.05
	Ostertagia spp	0.519	0.297	0.909	P<0.05
	Cooperia spp	0.557	0.348	0.892	P<0.01
Animals in cohabitation					
Backyard hens	**Ascaris spp**	0.355	0.311	0.405	P<0.01
Sheep	**Strongylus spp**	0.827	0.788	0.868	P<0.01
	Chabertia spp	3.174	1.631	6.177	P<0.01
Swine	**Trichostrongylus spp**	0.194	0.046	0.822	P<0.01
	Ostertagia spp	0.124	0.017	0.921	P<0.01
	Cooperia spp	0.121	0.029	0.511	P<0.01
	Chabertia spp	0.162	0.022	1.203	P<0.05
	Ascaris spp	0.057	0.038	0.085	P<0.01
Food					
Corn	**Haemonchus spp**	0.505	0.261	0.978	P<0.05
	Chabertia spp	0.371	0.154	0.895	P<0.05
	Ascaris spp	0.206	0.170	0.249	P<0.01
Poultry manure	**Haemonchus spp**	0.505	0.261	0.978	P<0.05
	Chabertia spp	0.371	0.154	0.895	P<0.05
	Ascaris spp	0.206	0.170	0.249	P<0.01
Corn cane	**Chabertia spp**	2.217	0.990	4.963	P<0.05
Corn silage	**Strongylus spp**	0.110	0.015	0.812	P<0.01
	Ascaris spp	13.500	4.866	37.45	P<0.01

DISCUSSION AND CONCLUSION

In the present study, 62% of positive cases (n=262) were due to gastrointestinal nematodes, and 38% of negative cases (n=158) were found. This contrasts with the results of Marmolejo et al. (2023) in a study carried out in Villaflores, Chiapas, who sampled 384 cattle, of which they detected 33% positive for parasites and 67% negative for the presence of gastrointestinal nematodes. However, López and Sánchez (2009), who conducted a study of identification and prevalence of gastrointestinal nematodes in cattle from the municipality of Pijijiapan, Chiapas, with a population of 120 animals, detected 56.66% of positive cases (n=68) of gastrointestinal parasites. The

authors Marmolejo et al. (2023) and López and Sánchez (2009) have values lower than the positive cases of this study, with respect to the negative cases both values are higher than those of this research, probably attributed to the population of animals at the place of study, time of year (June), and the research's duration.

Regarding the degree of parasitosis by age group, in this study, it was found that 70.7% of young animals with positive cases of parasitosis (n=106) and 58.4% of old animals, possibly representing the age group most susceptible to this condition (n=97). These results contrast with those of the author Marmolejo et al. (2023), where they found results for young animals of 41.61% positive for gastrointestinal nematodes, and for old animals, 36.11% positive for parasitosis. For its part, Cruz's study (2009) reported a prevalence of gastrointestinal parasitosis in young cattle of 50% (n=21) and adult cattle of 16% (n=7) due to gastrointestinal nematodes. This study was conducted in the municipality of Raudales Malpaso, Chiapas. Both results show values below those found in the present study, possibly related to the size of the sample, time of year (June), and location of the study area.

In the research work, seven genera of gastrointestinal nematodes were identified; *Trichostrongylus* spp., *Ostertagia* spp., *Cooperia* spp., and *Chabertia* spp., being the ones with the highest presence, with 95.2% each, Haemonchus spp. was 90.5% and the ones with the lowest presence were *Strongylus* spp. (47.6%) and Trichuris (28.6%). On the other hand, Colina et al. (2013), who worked on the prevalence of gastrointestinal parasitosis in cattle in the Province of Chepén – Peru with a warm climate, identified *Oesophagostomum* spp (40.2%), *Cooperia* spp (32.8%), *Haemonchus* spp (28.1%), *Ostertagia* spp (26%), *Trichostrongylus* spp (24.3%), and *Trichuris* (1.8%). There is a coincidence of five nematode genera that have an impact on the productivity of bovine livestock.

In a study conducted by González and Santiz (2010) in Ocotepec, Chiapas, they found nine genera of gastrointestinal nematodes, coinciding with the genera: *Trichuris* spp., *Cooperia* spp., *Trichostrongylus* spp., *Chabertia* spp, and *Haemonchus* spp with this research. However, in this study, the parasite *Trichuris* spp has the most presence (60%) and *Chabertia* spp the least (0.77%).

There are differences between the studies presented, due to the variation in the population number of animals sampled, age, different geographical areas that are related to climatic conditions, time of year, and finally, an unnoticed preventive medicine protocol in each livestock production unit for the control of these endoparasites.

In this study, it was detected that we mostly worked with the following livestock crossbreeds: Cebu x Swiss (CxS), Holando x Cebu (HxC), Simbrah (SI), American Swiss (SA), and Cebu x Cebu (CxC), and the genera most

commonly found were: *Strongylus* spp., *Trichostrongylus* spp., *Trichuris* spp., *Ascaris* spp., *Cooperia* spp. (P<0.01) and *Haemonchus* spp. (P<0.05). In this sense, Pinedo (2020), when conducting research in which he compared the parasitic load between races: Girolando, Simmental x Holstein, and Brahman, where they only agreed with two genera of parasites: *Cooperia* spp and *Trichuris* spp, no association was detected between gender and breed of cattle (P>0.05). On the other hand, García et al. (2018), when studying the prevalence and risk factors associated with gastrointestinal parasites relating to parasitosis and cattle breeds such as Holstein and Normandy, the only coincidence was with the following genera: *Trichuris* spp., *Chabertia* spp (P>0.05), and *Ostertagia* spp (P<0.01). There is a relationship with gastrointestinal nematodes, except for breeds that differ with the study conducted, region, study population number, and environmental temperature.

The sex factor is one of the factors that represented an association with bovine females with the following genera: *Trichostrongylus* spp., *Ostertagia* spp (P<0.05), and with the genera *Cooperia* spp and *Ascaris* spp (P<0.01). In contrast, Cornejo (2019) and Lagos and Lascano (2021) did not find any significant relationship between this factor. This may be due to the number of animals sampled, in this case, more females than males.

According to the results obtained, in this research, the age variable found a relationship in young animals (0-12 months) with parasites: *Trichostrongylus* spp., *Cooperia* spp., *Trichuris* spp., *Chabertia* spp (P<0.01), and *Haemonchus* spp., *Ascaris* spp (P<0.05), while in old animals (≥ 25 months) the following genera were found: *Cooperia* spp., *Ascaris* spp (P<0.01), and *Trichuris* spp., *Chabertia* spp (P<0.05). Pinedo (2020) found a relationship with age in six groups of productive stages: bull, cow, heifer, turkey, beef, and calf, where they did find an association with age (P<0.002) and included the parasitic load of the genera found: *Eimeria* spp., *Monezia* sp., *Cooperia* sp., *Trichuris* sp., *Paramphistomidae*, and Protozoa.

In contrast, Armijos (2023) performed an age classification: calf, bull, heifer, and adult; however, they did not find an association with the identification of the following genera: *Eimeria* spp., *Haemonchus* spp., *Oesophagostomum* spp., *Cooperia* spp., *Moniezia benedeni*, and *Trichostrongylus* spp (P>0.05).

In the present research, we detected an association of some parasites with the age factor; similar results were found by Pinedo (2020), and coincide at the same time of year and the sampling of the animals. While Armijos (2023) differs with the results of these works because the diagnosis of parasitism was in temperate weather.

As for the farming system factor, it was classified as extensive with the *Strongylus* spp genus and semi-intensive with the *Ascaris* spp genus (P<0.01). Lagos and Lascano (2021) analyzed the extensive production

system, identifying the following genera: *Eimeria* spp., *Haemonchus contortus*, *Oesophagostomum* spp., *Ostertagia* spp., *Taenia* spp., *Trichuris* spp, and *Trichuris strongylus* spp, where they showed a relation with the farming system (P<0.01). Definitely, the farming system is a critical point in preventive medicine programs and, as a consequence, the health of the animals.

Ludeña (2023) in evaluating the comparison to extensive and intensive farming systems did not detect any association between the parasite loads of the genera *Entamoeba coli*, *Ancylostoma* spp., *Ascaris* spp., *Trichostrongylus* spp., *Lagochilascaris* spp., *Strongyloides* spp, and *Fasciola hepatica* in relation to farming system (P>0.05).

According to Lagos and Lascano (2021), there was only a relationship with the extensive system in the present research since both coincide with the warm-humid climate, although they do not have the same genera identified. While Ludeña (2023) did not observe any association between this factor, detecting only the genus *Ascaris* spp, although they do not belong to the same cattle exploitation system.

Regarding the factor of cohabiting animals, an association with cases of parasites was found with backyard chickens with the parasite *Ascaris* spp (P<0.01), sheep with the genera *Strongylus* spp and *Chabertia* spp (P< 0.01), and swine with the parasites *Trichostrongylus* spp., *Ostertagia* spp., *Cooperia* spp., *Ascaris* spp (P<0.01), and *Chabertia* spp (P<0.05). As opposed to Cornejo (2019) and Armijos (2023), who mention that there is no relationship to the presence of gastrointestinal parasites. Perhaps the differences between the two studies were that in the present research, there is a close interrelationship in the animals' pens, water, feed, and common spaces in the production units.

REFERENCES

Aguilar, B. S. (2005). *Fórmulas para el cálculo de la muestra en investigaciones de salud*. https://www.redalyc.org/pdf/487/48711206.pdf

Angulo, F. J. (2005). *Nematodosis Gastrointestinales. En manual: Manual de Ganadería Doble Propósito*. https://www.researchgate.net/profile/Judith-Petit-Aldana/publication/329197437_Manual_de_ganaderia_doble_proposito-_Capitulo_11/links/5bfc6ad5a6fdcc76e722aafd/Manual-de-ganaderia-doble-proposito-Capitulo-11.pdf

Armijos, P. Y. (2023). *Determinación de la presencia de parásitos gastrointestinales en bovinos en la parroquia San Antonio de Cumbe del cantón Saraguro*. https://dspace.unl.edu.ec/jspui/bitstream/123456789/26650/3/YessicaMarisol_ArmijosPineda..pdf

Becerra, A. (2009). *Estado Soconusco*. http://estadosoconusco.blogspot.com/2009/01/mapastepec.html

Cardoso-Vázquez, E. A., Torres Ramírez, M., Díaz Jerónimo, R., Ávila Ramos, F. J., y Gutiérrez Popoca, J. C. (2006). *Proyecto de estudios de peligros naturales en municipios de la planicie costera del estado de Chiapas*. https://www.ceieg.chiapas.gob.mx/productos/files/RPRYPCHIS/PELIGROS_MAPASTEPEC.pdf

CEIEG, C. E. (2018). *La ganadería en los terrenos rurales de Chiapas.* https://www.ceieg.chiapas.gob.mx/productos/files/SPAF/La_ganaderia_en_los_terrenos_rurales_en_Chiapas.pdf

Colina, J. C., Mendoza, G. A., y Jara, C. A. (2013). *Prevalencia e intensidad del parasitismo gastrointestinal por nematodos en bovinos, Bos taurus, del Distrito Pacanga (La Libertad, Perú).* https://revistas.unitru.edu.pe/index.php/facccbiol/article/view/559/522

Cornejo, S. D. (2019). *Factores epidemiológicos asociados a la prevalencia de parásitos gastrointestinales en bovinos (Bos taurus) de la raza Holstein, en los meses de agosto – noviembre del 2018 en el distrito de Polobaya Provincia de Arequipa.* https://repositorio.unsa.edu.pe/server/api/core/bitstreams/cbd7d502-a9d8-4bc9-af4b-a867f7735af4/content

Cruz, V. L. (2009). *Prevalencia, cuantificación e identificación de géneros parasitarios en bovinos de doble propósito en proceso de transición orgánica en Raudales Malpaso municipio de Tecpatán, Chiapas*.

GADM. (2018). *Mapastepec is a municipio (municipality) of Chiapas, México*. https://gadm.org/maps/MEX/chiapas/mapastepec.html#google_vignette

García, C. D., Díaz Anaya, A. M., y Pulido Medellín, M. O. (2018). *Prevalencia y factores de riesgo asociados a la presencia de parásitos gastrointestinales en bovinos del municipio de Ventaquemada (Boyacá)*. http://infometrica.org/index.php/syh/article/view/16/13

González, P. C., y Santiz Sánchez , R. (2010). *Prevalencia de nematodos gastroentéricos en bovinos de la Asociación Ganadera Local*

del Municipio de Ocotepec, Chiapas. https://drive.google.com/file/d/1V_GuWy2ePY1JWWkFgW4OZqfpL3c8bsNZ/view

Herd, D. B., y Sprott , L. R. (1986). *Body Condition, Nutrition and Reproduction of Beef Cows*. https://oaktrust.library.tamu.edu/bitstream/handle/1969.1/199640/nutrition_body_condition_nutrition.pdf?sequence=1&isAllowed=y

INEGI. (2010). *Compendio de información geográfica municipal 2010 Mapastepec, Chiapas.* https://www.inegi.org.mx/contenidos/app/mexicocifras/datos_geograficos/07/07051.pdf

Lagos, M. G., y Lascano Rivera, S. E. (2021). *Prevalencia de parásitos gastrointestinales en bovinos de 12 a 36 meses de edad en la parroquia La Belleza, Cantón Francisco de Orellana*. http://dspace.espoch.edu.ec/bitstream/123456789/16275/1/17T01690.pdf

López, C. J., y Sánchez Reyes, R. C. (2009). *Identificación y prevalencia de nematodos gastrointestinales en ganado bovino del Rancho "Santa Rosa" municipio de Pijijiapan, Chiapas.*

Ludeña, A. M. (2023). *Prevalencia y factores de riesgo de helmintos gastrointestinales en ganado bovinos de tres comunidades del distrito de San Pablo - provincia de Ramón Castilla - Loreto - 2022*. https://repositorio.unapiquitos.edu.pe/bitstream/handle/20.500.12737/9257/Milagros_Tesis_Titulo_2023.pdf?sequence=1&isAllowed=y

Marmolejo, B. E., Meza Rodríguez, L. A., Ramírez Barrios, H., León Velasco, H., y Maza Santiago, C. (2023). *Determinación de nematodos gastrointestinales en el ganado bovino del municipio de Villaflores, Chiapas - México*. https://spaunach.mx/wp-publicaciones/RevistaUNyCONo.3nov.23.pdf

Morales, G., Pino, L. A., Sandoval, E., Jiménez, D., y Morales, J. (2012). *Relación entre la condición corporal y el nivel de infestación parasitaria en bovinos a pastoreo como criterio para el tratamiento antihelmíntico selectivo*. http://www.scielo.org.pe/scielo.php?script=sci_arttext&pid=S1609-91172012000100010

Pinedo, A. C. (2020). *Prevalencia de parásitos gastrointestinales en bovinos del distrito de Jepelacio, provincia de Moyobamba, región de San Martín - 2019*. https://repositorio.unsm.edu.pe/bitstream/11458/4214/1/MED.%20VETERINARIA%20-%20Charlin%20Eduardo%20Pinedo%20Amacifu%C3%A9n.pdf

Quiroz, R. H. (2011). *Epidemiología y control de nematodos gastrointestinales en bovino con énfasis en México*. https://www.gob.mx/cms/uploads/attachment/file/848424/8381_T_1_S_1_-_Epidemiologia_de_enfermedades_parasitarias-compressed.pdf

Reyes-Guerrero, D. E., Olmedo Juárez, A., y Mendoza de Gives, P. (2021). *Control y prevención de nematodosis en pequeños rumiantes: antecedentes, retos y perspectivas en México*. Https://cienciaspecuarias.inifap.gob.mx/index.php/Pecuarias/article/download/5840/4587.