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PARASITES AND ANTHELMINTIC RESISTANCE CONTROL MEASURES FOR SMALL RUMINANT GASTROINTESTINAL NEMATODES

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Abstract

The greatest prevalence of gastrointestinal nematode infection in the small holder sheep and goat flocks. Sheep and goat flocks in the Cuddalore area had a higher incidence of gastrointestinal nematode infection during the rainy season, notably during the north east monsoon, than at any other time of year. Haemonchus spp., Trichostrongylus spp., Oesophagostomum spp., and Bunostomum spp. were the most often found gastrointestinal nematodes in the small holder sheep and goat flocks in the Cuddalore area. In all the small holder sheep and goat flocks in the Cuddalore area, the mean faecal egg counts of gastrointestinal nematodes were found to be highest during the rainy season, followed by winter and summer.

Keywords: *Parasites, Anthelmintic, Resistance, Small Ruminant Gastrointestinal Nematodes.*

1. Introduction

People living in extreme poverty on little farms tend to raise small ruminants. The 2012 census found that there were 65.06 million sheep and 135.17 million goats in the nation. The sheep population has decreased by 9.07% and the goat population by 3.82% since 2007. Grazing on natural wastelands and semi-intensive stable grazing are the primary methods of management for sheep farms. Flock sizes typically range from 5 to 15 animals in southern India. For many small-scale farmers, raising sheep and goats is a crucial means of subsistence. The average net yearly return from keeping these tiny ruminants is about Rs. 250/-. On the other hand, these tiny ruminants contribute Rs. 66,109,000,000.00 yearly to the Indian economy. Parasitic illnesses, in particular, pose the greatest threat to the growth of the small ruminant business.[1-2]

Diseases are common in sheep and goats, the small ruminants involved here. Clinical symptoms of viral and bacterial infections affecting these organisms are readily identifiable. Production losses may be attributed in part to the fact that parasite illnesses are either

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detected at an early stage or show no clinical indications at all. Helminth infections have been linked to stunted development in small ruminants, as documented by Faizal et al., 1999. Herlich (1978) found that helminth parasites were responsible for 5- 10% of deaths and 10-20% of illnesses in small ruminants. Parasite infections in sheep and goats reduce their output. One of the biggest challenges to small ruminant production in the tropics is helminth infections. According to studies, up to 95% of tropical sheep and goats are infected with helminths, mostly belonging to the genera Haemonchus and Trichostrogylus. Herd mortality rates might go beyond 40% if animals lose 6-12 kg per year. However, the most costly losses are frequently the subtle ones, caused by subclinical or chronic diseases such as decreased feed intake and lower efficiency in feed utilisation. Numerous new species of helminths are found constantly, and it is believed that more than 300 species now parasitize the cattle in India.[3-4]

Helminth infection rates differ by age group, gender, time of year, and meteorological variables in the agricultural sector. Animals with the infection have a higher metabolic rate and less metabolic energy used on production. This is due to the parasites' consumption of the host's nutrition, which may lead to the dysfunction of important organs and make the host more vulnerable to other diseases.[5]

For decades, anthelmintics have been the main tool for managing these GINs. Consistent dosing with anthelmintics for GIN control has resulted in drug resistance in the parasite population. When a nematode develops resistance to one anthelmintic, it also develops resistance to other medications that employ a similar method of action, severely limiting their use.[6]

The worldwide spread of anthelmintic resistance in GINs is a major challenge for the livestock industries. This opposition has reached crisis proportions in several nations, forcing the liquidation of cattle businesses. Many farmers spray their sheep and goats with anthelmintic medications at regular intervals as a means of population control due to the lack of a clear alternative to chemotherapy. This causes nematode populations in sheep and goats to become resistant to drugs, notably benzimidazoles and imidazothiazoles. Farmers might lose money if they use anthelmintics too often on a population of GINs that has developed resistance to them.[7]

2. Literature review

Hobert and N. Bermard. (2020) studied the prevalence of ovine gastrointestinal nematodes (GINs) in a well-managed farm in Rajasthan. Studies of faeces showed that Trichostrongylus spp. were prevalent in the premonsoon months, whereas O. columbianum was most common in the summer and monsoon months. H. contortus was found to be the most common kind of worm in the abomasum. August had the highest worm count on record. It was shown that younger sheep were more likely to have worms than older ones.[8]

Berger, J. (2019) The prevalence of gastrointestinal parasites in cattle (18.22%), buffalo (20.85%), sheep (39.54%), and goats (46.12%) in the southern taluks of the central dry zone of Karnataka during the rought period was observed and reported. The most frequent nematode was a strongyle. Livestock infections with fasciola, amphistomes, moniezia, and entamoeba were negligible. Sheep, however, did not contract Fasciola. Sheep were more likely than goats to be infected with Eimeria. One bovine provided evidence of Gongylonema ova, whereas Strongyloides was only seen in sheep. Cattle, sheep, and goats showed a very low prevalence of Trichuris infection. During the southwest monsoon, strongyle infections were more common in animals.[9]

Khan and M. Qayyum. (2018)researchers in Kenya's Central Highlands looked on the prevalence of GIN parasite infections in sheep and goats maintained on small holder mixed farms and the variables that put them at risk. In the Central Highlands of Kenya, a total of 370 small ruminants were collected from 66 small holder mixed farms located in agro-ecological zones 1 (humid) and 3 (semi-humid). At each check-in, faeces samples were taken from each animal. To conduct faeces egg counts (FEC), we adapted the McMaster method. Goats (Capra hircus) were researched by Parajuli (2007) and it was discovered that of 222 samples taken from the Khasi market in Kalanki, Kathmandu, Nepal, 181 (81.53%) were positive for the presence of the intestinal helminth parasite.[10]

Beveridge and T.H. Brown. (2017)looked at how common ruminant helminthiasis was in a sprayed-down region in Pakistan's lower Punjab province. One hundred samples of faeces were taken from sheep, goats, cattle, and buffaloes for this study. Over half (51%) of cattle, 47% of buffaloes, 62% of sheep, and 52% of goats were infected with helminths; nematodes were the most frequent kind. In cattle, buffaloes, sheep, and goats, helminth infections were more common in young animals than in adults. Toxocara vitulorum was more common in calves than adults of both cattle and buffaloes, while the frequency of other helminth species

varied widely across age groups. Buffaloes and sheep, unlike cattle and goats, have a greater helminth frequency in males than females.[11]

Tritschler II and A.L. Schmidt. (2016) From 2007 to 2008, researchers in Ladakh, India, studied 581 small ruminants, including 313 sheep and 268 goats, to determine the frequency of helminth parasitism and the risk factors associated with it. They found a frequency of 69.70% throughout all livestock studied; in sheep, it was 68.37% and in goats, 71.26%. There was a statistically significant variation in the prevalence of helminth parasites between the wet and dry seasons, with a greater prevalence during the rainy season (76.50%) and a lower prevalence during the dry season (58.13%). [12]

3. Methodology

The purpose of this research was to use in vivo and in vitro assays to determine the prevalence of anthelmintic resistance in gastrointestinal nematodes (GINs) of sheep and goats in the flocks of small holder farmers in the Cuddalore District of Tamil Nadu. Sheep and goats in the Cuddalore area of Tamil Nadu were surveyed for GINs and parasite management methods.

3.1 Study area

Research was conducted on all sheep and goats owned by small holder farmers in the Cuddalore district's six taluks (administrative divisions): Chidambaram, Kattumannarkoil, Cuddalore, Panruti, Vridhachalam, and Tittakudi. Located between 11°11′ and 12°35′ North latitude and 78°38′ and 80° East longitude, the Cuddalore district is mostly an agricultural area. The area has an average elevation of 1 metre (3 feet) above sea level. There is one fishing port and five fish landing sites along its 57 km of coastline. Villupuram District to the north, the Bay of Bengal to the east, Nagapattinam District to the south, and Perambalur District to the west forms its borders.

3.2 Study animals

Each taluk's small holder sheep and goat flocks were chosen for the research. The flock size varied between 20 and 70 birds. The sole sheep breed kept was the Mecheri, but the Tellichery and non-descript goat varieties were also present. Sheep and goats on well-run farms were dewormed regularly and in rotation once every six months. It was said that the small holder dewormed his flocks once every year.

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3.3 Epidemiology of gastrointestinal parasites

The research was conducted from October 2018 to September 2019. Every month, we collected 180 faeces samples from sheep and goats in the Cuddalore area. Sedimentation and flotation methods for helminth eggs allowed for a diagnosis of infection.

Temperature, relative humidity (RH), and precipitation totals were collected from the Meteorological Observatory at the Department of Agronomy in the Faculty of Agriculture at Annamalai University during the course of the research period.

3.3.1 Collection of faecal sample

For parasitological analyses, fresh faeces samples were taken from the rectum of sheep and goats. Faecal samples were collected and delivered to the lab in suitable containers, such as screw-capped wide-mouthed glass vials. Polythene bags and plastic bottles were also used sometimes. The rate at which eggs grow and hatch was minimized by making them as airtight as feasible. Each time, faeces samples weighing 10–15 g were taken for testing of nematode eggs.

3.3.2 Concentration methods

Two concentration procedures, sedimentation and flotation, were used to remove the parasites from the collected faeces.

3.3.3 Concentration by sedimentation technique

The faeces sample, which weighed around 4–5 g, was thoroughly mixed with 10–15 ml of water, and the resulting emulsion was filtered through a screen to remove the larger particles. The filtrate was transferred to a centrifuge tube and spun for five minutes at 1500 rpm. The sediment was inspected microscopically (10X) by depositing a drop of sediment on a slide and covering it with a coverslip after centrifugation. The supernatant was discarded.

3.8 Statistical analysis

RESO, PROBIT, and the Statistical Package for the Social Sciences (SPSS - 19) were used to evaluate the data from the in vivo and in vitro experiments.

4. Results

4.1 Faecal Sample Examination

From October 2018 to September 2019, Table 4.1 and Table 4.2 detail the incidence of gastrointestinal (GI) parasites in sheep and goats in six taluks of the Cuddalore district in Tamil Nadu.

Overall, 51.66 percent of sheep and 48.88 percent of goats in the samples from the Cuddalore area were infected with nematodes. When compared to other taluks in the Cuddalore district, Cuddalore taluk has the highest rate of parasitic infection among its sheep herds, at 56.66 percent. There are 41.66 percent infected sheep in Chidambaram, 53.33 percent infected sheep in Kattumannarkoil, 48.33 percent infected sheep in Panruti, 55.00 percent infected sheep in Vridhachalam, and 48.33 percent infected sheep in Tittakudi. Cuddalore taluk's goat flock has the highest infection rate (55.55 percent) compared to goat flocks from other taluks. Goats in the Chidambaram, Kattumannarkoil, Panruti, Vridhachalam, and Tittakudi taluks had a prevalence of GI parasite diseases of 38.33%, 49.44%, 47.00%, 51.66%, and 51.11%, respectively.

Table 4.3 displays data on the study area's climate gathered from the Meteorological Observatory of Annamalai University's School of Agriculture. This data includes temperature, relative humidity, and precipitation totals. During the winter, the highest average temperature was 28.7 degrees Celsius, and the relative humidity was 76.2%. The winter season saw a total of 545.7 mm of precipitation, 264.5 mm of which came courtesy of the north-east monsoon. At its peak, the rainy season sees an average high of 33.37 degrees Celsius and a relative humidity of 68.5%. The average summertime high was 34.3 degrees Celsius, the average summertime low was 24.3 degrees Celsius, and the average summertime rainfall was 276.2 millimetres.

Table 4.1: Parasite infection frequency in 15 sheep.

Month	ambaramtaluk	mannarkoiltaluk	ddaloretaluk	anrutitaluk	hachalamtaluk	ttakuditaluk	WholeDistrict
Oct2013	9	10	11	12	13	13	68[75.55%]b
Nov2013	10	13	12	11	12	12	70[77.77%]a
Dec2013	8	13	12	13	12	12	70[77.77%]a
Jan 2014	6	9	12	11	8	10	56[62.22%]c
Feb2014	6	9	7	8	8	12	50[55.55%]d

Mar2014	5	5	7	6	3	6	32[35.55%]g
Apr2014	3	4	5	2	2	3	19[21.11%]i
May2014	3	4	4	2	2	3	18[20.00%]j
Jun 2014	5	5	6	6	4	4	30[33.33%]h
Jul 2014	5	6	8	9	7	5	40 [44.44%]f
Aug2014	8	9	8	8	7	9	49 [54.44%]e
Sep2014	7	9	10	11	9	10	56[62.22%]c
Wholeyear	75	96	102	99	87	99	558[51.66%]
						C.D	0.59*

Table 4.2: Parasite infection frequency in 15 goats.

Month	ambaramtaluk	mannarkoiltaluk	ddaloretaluk	anrutitaluk	hachalamtaluk	ttakuditaluk	WholeDistrict
Oct2013	9	11	12	10	13	11	66[73.33%]b
Nov2013	9	11	12	12	13	12	69[76.66%]a
Dec2013	9	11	12	10	12	11	65[72.22%]b
Jan 2014	5	9	9	10	10	9	52[57.77%]d
Feb2014	8	9	9	6	7	9	48[53.33%]e
Mar2014	4	5	4	3	4	4	24[26.66%]i
Apr2014	3	3	6	3	3	4	22[24.44%]j
May2014	1	3	4	3	2	3	16[17.77%]h
Jun 2014	3	4	5	6	4	3	26[28.88%]g
Jul 2014	5	6	7	6	6	6	36[40.00%]f
Aug2014	6	8	10	6	8	9	47[52.22%]e
Sep2014	7	9	10	10	11	11	58[64.44%]c

Wholey ear	69	89	100	85	93	92	528[48.88 %]
						C.D	1.23*

Table 4.3: Indicators of the Weather

Month/year	Temperature(°C)		RelativeHumidity	HBSS	WindVelocity	Rainfall		ET
	Max	Min	%	Hrs	Kmph	Mm	RD	Mm
Oct2013	32.9	24.5	72	6.2	3.3	120.4	6	3.7
Nov2013	29.1	22.9	80	6.4	3.9	289.9	10	3.2
Dec2013	28.0	21.1	78	5.7	4.0	222.8	4	2.9
Jan 2014	28.4	20.9	76	7.1	4.4	007.2	1	3.2
Feb2014	29.6	20.3	72	8.5	2.7	025.8	2	3.4
Mar2014	31.6	21.9	69	8.7	2.9	-	-	3.8
Apr2014	34.9	24.5	67	9.0	3.4	-	-	4.7
May2014	33.8	25.8	68	7.7	5.0	183.2	6	4.1
Jun 2014	37.2	26.8	67	6.9	5.8	067.2	3	4.9
Jul 2014	35.3	25.6	63	6.0	6.3	092.4	6	4.7
Aug2014	33.9	24.8	69	6.1	4.7	171.6	9	4.2
Sep2014	31.4	24.7	70	6.4	4.0	034.5	5	4.3
Average	32.15	23.65	70.92	7.05	4.2	121.5	5.2	3.925

Table 4.4 displays the mean faecal egg counts (FECs) of several sheep flocks throughout 6 taluks in the Cuddalore district during 2 years.

Sheep FECs varied from a low of 400 70.71 and a high of 540 103.68 during the summer to a high of 2300 103.04 and 2010 103.57 during the North East Monsoon. Summer FECs in Cuddalore and Panruti taluks sheep varied from 200 to 70.71 to 450 to 212.1; monsoon FECs increased to 1888 to 135.14 to 2011.11 to 168.11. Sheep FECs in Vridhachalam and Tittakudi taluks varied from summer lows of 350 212.13 and 466.66 147.19 to winter highs of 1812.5 139.14 and 1875 74.91.

The FEC of GINs in sheep herds varied significantly (P0.05) throughout the various climates of the Cuddalore area. It was clear from this that the north-east and south-west monsoons were more crucial than the summer months.

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Table 4.4:Seasonal variation in the mean number of nematode eggs per faeces sampled from sheep herds in the Cuddalore area, India

Sheepflocks	Oct 13	Nov 13	Dec13	Jan 14	Feb14	Mar 14	Apr14	May14	Jun14	Jul14	Aug14	Sep14	C.D
Chidambaramtaluk	1422.22^{d}± 108.65	2300^{a} ± 103.04	1687.5^{b}± 76.76	666.66^{i} ± 223.90	850^{g}± 83.66	740^{h} ± 115.10	500^{k}± 70.71	400^{l}± 70.71	580^{j}± 138.74	1060^{f} ± 103.68	1400^{e}± 92.58	1614.28^{c}± 86.37	12.26*
Kattumannarkoiltaluk	1977.77^{b}± 111.49	2010^{a} ± 103.57	1337.5^{e}± 94.62	816.66^{g} ± 77.02	683.33^{i} ± 59.99	800^{h} ± 79.05	466.66^{l}± 147.19	566.66^{j}± 147.19	540^{k}± 103.68	1060^{f} ± 120.41	1375^{d}± 96.36	1787.5^{c} ± 105.82	14.46*
Cuddaloretaluk	1888.88^{a}± 135.14	1700^{b} ± 88.88	1437.5^{d}± 78.08	966.66^{f} ± 73.02	933.33^{g}± 96.60	540^{i}± 101.41	800^{h} ± 141.42	200^{k}± 70.71	460^{j}± 75.82	960^{f}± 189.07	1060^{e}± 63.88	1475^{c}± 63.05	10.61*
Panrutitaluk	2011.11^{a}± 168.11	1930^{b} ± 91.69	1287.5^{d}± 97.80	1216.66^{d}± 118.03	983.33^{f} ± 103.60	900^{g} ± 79.05	550^{j}± 70.71	450^{k}± 212.13	620^{i} ±143.17	760^{h} ± 75.82	1362.5^{c} ±98.84	1275^{d}± 80.17	16.82*
Vridhachalamtaluk	1644.44^{c}± 95.34	1720^{b} ± 68.13	1487.5^{d}± 76.76	1083.33^{f}± 103.60	816.66^{h}± 65.82	1400^{e} ± 141.42	700^{j}± 141.42	350^{l}± 212.13	800^{i} ±105.40	680^{k} ± 96.17	1812.5^{a}± 139.14	1037.5^{g} ± 85.56	12.51*
Tittakuditaluk	1433.33^{c}± 127.47	1930^{a} ± 91.69	1387.5^{d}± 116.82	1050^{g}± 73.48	916.66^{h}± 77.02	880^{i}± 41.83	500^{k}± 141.42	466.66^{l}± 147.19	750^{j}± 74.53	1120^{f} ± 96.17	1875^{b}± 74.91	1337.5^{e} ± 139.87	15.61*

Table 4.5 displays the various methods used by sheep farmers in the Cuddalore region to combat parasite diseases. All of the sheep farmers in the Cuddalore area are aware of the GI parasite illness, and roughly 80% of them have claimed that the infection is more prevalent during the rainy season. Sheep farmers doused their flocks with anthelmintics more than twice a year to combat stomach parasites. Farmers in the regions of Chidambaram (46.63%), Kattumannarkoil (53.33%), Cuddalore (40%), Panruti (60%), Vridhachalam (33.33%), and Tittakudi (25.25%) raise sheep.

Table 4.5:Sheep farmers in the Cuddalore area (n = 120) used preventative measures against parasite diseases

Criteria		%Proportion(no.)						Mean±SE
		ambaramtaluk	mannarkoiltaluk	ddaloretaluk	anrutitaluk	hachalamtaluk	ttakuditaluk	uddaloredistrict
Perceptionof problem	Rainy	86.66 (104)	88.33 (106)	80.00 (96)	91.66 (110)	73.33 (88)	76.66 (92)	82.77±2.93
	Winter	10.00 (12)	06.66(8)	16.66	05.00(6	16.66 (20)	20.00	12.49±2.4

				(20)	)		(24)	9
	Summer	03.33(4)	05.00(6)	03.33(4)	03.33(4)	10.00 (12)	03.33(4)	4.72±1.09
Number ofdrenches peryear	1	20.00 (24)	13.33 (16)	20.00 (24)	6.66(8)	0	05.00(6)	10.83±3.38
	2	46.66 (56)	53.33 (64)	40.00 (48)	60.00 (72)	38.33 (46)	25.00 (30)	43.88±5.03
	3	30.00 (36)	33.33 (40)	33.33 (40)	30.00 (36)	61.66 (74)	63.33 (76)	41.94±6.53
	>3	03.33(4)	0	06.66(8)	03.33(4)	0	06.66(8)	3.33±1.21
Drenchingmonths	North eastmonsoon (Oct toDec)	33.33 (40)	31.66 (38)	26.66 (32)	35.00 (42)	16.66 (20)	25.00 (30)	28.05±2.76
	Winter (Janand Feb)	10.00 (12)	6.66(8)	16.66 (20)	5.00(6)	16.66 (20)	20.00 (24)	12.49±2.49
	Summer(Marto May)	03.33(4)	05.00(6)	03.33(4)	03.33(4)	10.00 (12)	03.33(4)	4.72±1.09
	South westmonsoon(JunetoSep)	53.33 (64)	56.66 (68)	53.33 (64)	53.33 (64)	56.66 (68)	51.66 (62)	54.16±0.83

Vridhachalam farmers soaked their flocks an average of three times per year, whereas Tittakudi farmers drenched theirs an average of three and a half times each year. Half of the farmers in the region soaked their livestock during the south west monsoon (June–September), but just a third did so during the north east monsoon (October–February).

Table 4.6 displays the commonalities and variations in anthelmintic choice across Cuddalore district's sheep producers. The deworming medications used by sheep farmers are chosen depending on the farmers' prior experience and the recommendations of the local veterinarian. Seventy percent of farmers in Kattumannarkoil, Panruti, and Vridhachalam taluks make their medicine choices based on personal experience. Forty percent of farmers in Chidambaram and Cuddalore taluks use the veterinarian-recommended medicine for deworming. When soaking sheep with medication, the dose is often determined by the animal's weight. Ninety percent of farmers in the cuddalore area provide medication depending on the weight of each animal.

Table 4.6: Sheep farmers in the Cuddalore area (n = 120): selection patterns and practises while choosing anthelmintics

	%Proportion(no.)	**Mean±SE**

Criteria		ambaram taluk	mannarkoiltaluk	ddaloretaluk	anrutitaluk	hachalam taluk	ttakuditaluk	uddaloredistrict
Base of DrugSelection	No	0	0	0	0	0	0	0
	Ownexperience	53.33 (64)	70.00 (84)	58.33 (70)	75.00 (90)	70.00 (84)	60.00 (72)	64.44±3.43
	AdviceofChemist	6.66(8)	0	3.33(4)	0	10.00 (12)	6.66(8)	4.44±1.64
	Adviceofveterinarian	40.00 (48)	30.00 (36)	38.33 (46)	25.00 (30)	20.00 (24)	33.33 (40)	31.11±3.15
Base of dosecalculation	No	0	0	0	0	0	0	0
	Bodyweight	86.66 (104)	80.00 (96)	91.66 (110)	90.00 (108)	96.66 (116)	95.00 (114)	89.99±2.47
	Chemist/Literature	13.33 (16)	20.00 (24)	08.33 (10)	10.00 (12)	03.33(4)	05.00(6)	9.99±2.47
Type ofAnthelmintic used	OnlyFBZ	73.33 (88)	63.33 (76)	68.33 (82)	83.33 (100)	75.00 (90)	65.00 (78)	71.38±3.02
	OnlyLEV	13.33 (16)	20.00 (24)	15.00 (18)	6.66(8)	13.33 (16)	20.00 (24)	14.72±2.03
	OnlyIVM	03.33(4)	08.33 (10)	06.66(8)	03.33(4)	05.00(6)	03.33(4)	4.99±0.86
	FBZ+ LEV	10.00 (12)	08.33 (10)	10.00 (12)	06.66(8)	06.66(8)	11.66 (14)	8.88±0.82
Perceptionforbestdrug	FBZ	73.33 (88)	63.33 (76)	68.33 (82)	83.33 (100)	75.00 (90)	65.00 (78)	71.38±3.02
	LEV	13.33 (16)	20.00 (24)	15.00 (18)	06.66(8)	13.33 (16)	20.00 (24)	14.72±2.03
	IVM	03.33(4)	08.33 (10)	06.66(8)	03.33(4)	05.00(6)	03.33(4)	4.99±0.86
	Others	10.00 (12)	08.33 (10)	10.00 (12)	06.66(4)	06.66(8)	11.66 (14)	8.88±0.82

Table 4.7 displays the typical procedure and pattern followed by goat farmers in Cuddalore region while choosing an anthelmintic. For goat deworming, between 48.33 and 70 percent of farmers in the Cuddalore region rely on their own knowledge and experience, while the remaining 28.33 to 41.66 percent consult a local veterinarian for guidance.

Farmers in the Cuddalore area gave their goat's individualised doses of deworming medication depending on their estimated body weight.

According to a survey of goat farmers in the Cuddalore district, 83.33 percent of those living in Panruti taluk, 60 percent of those living in Vridhachalam taluk, 46.66 percent of those living in Tittakudi taluk, and 48.33 percent of those living in Cuddalore taluk believed that Benzimidazole compounds were the best drugs for deworming goats. Chidambaram had the highest percentage of farmers (36.66%) who dewormed their goats using levamisole, followed by Kattumannarkoil (30%), Cuddalore (35%), Panruti (6.66%), Vridhachalam

(20%), and Tittakudi (26.66%). Drenching with ivermectin was utilised by roughly 10% of goat farmers in the Cuddalore region, whereas 6% of farmers used a combination of medications.

Table 4.8: Goat farmers in the Cuddalore region (n = 120) were surveyed about their anthelmintic drug choosing habits

Criteria		%Proportion(no.)						Mean±SE
		ambaram taluk	mannarkoil taluk	ddaloret aluk	anrutit aluk	hachalam taluk	ttakudit aluk	uddaloredi strict
ase of DrugSelection	No	0	0	0	0	0	0	0
	Ownexper ience	60.00 (72)	63.33 (76)	61.66 (74)	70.00 (84)	53.33 (64)	48.33 (58)	59.44±3.12
	Advice ofChemist	06.66(8)	08.33 (10)	05.00(6)	0	05.00(6)	10.00 (12)	5.83±1.41
	Advice ofveterina rian	33.33 (40)	28.33 (34)	33.33 (40)	30.00 (36)	41.66 (50)	41.66 (50)	34.71±2.33
Base of dosecalculation	No	0	0	0	0	0	0	0
	Bodyweig ht	96.66 (116)	86.66 (104)	96.66 (116)	90.00 (108)	81.66 (98)	91.66 (110)	90.55±2.38
	Chemist /Literature	03.33(4)	13.33 (16)	03.33(4)	10.00 (12)	18.33 (22)	08.33 (10)	9.44±2.38
Type ofAnthelmintic used	OnlyFBZ	46.66 (56)	51.66 (62)	48.33 (58)	83.33 (100)	60.00 (72)	46.66 (56)	56.1±5.81
	OnlyLEV	36.66 (44)	30.00 (36)	35.00 (42)	06.66(8)	20.00 (24)	26.66 (32)	25.83±4.54
	OnlyIVM	10.00 (12)	10.00 (12)	13.33 (16)	03.33(4)	16.66 (20)	20.00 (24)	12.22±2.38
	FBZ+ LEV	06.66(8)	08.33 (10)	03.33(4)	06.66(8)	03.33(4)	06.66(8)	5.82±0.83
Perceptionfor bestdrug	FBZ	46.66 (56)	51.66 (62)	48.33 (58)	83.33 (100)	60.00 (72)	46.66 (56)	56.1±5.81
	LEV	36.66 (44)	30.00 (36)	35.00 (42)	06.66(8)	20.00 (24)	26.66 (32)	25.83±4.54
	IVM	10.00 (12)	10.00 (12)	13.33 (16)	03.33(4)	16.66 (20)	20.00 (24)	12.22±2.38
	Others	06.66(8)	08.33 (10)	03.33(4)	06.66(8)	03.33(4)	06.66(8)	5.82±0.83

5. Conclusion

Intestinal nematode infections in sheep and goats were successfully treated with ivermectin. In the Cuddalore area, small holder sheep and goat flocks faced a serious health risk from gastrointestinal nematode infection. The most common nematode found in sheep and goats was Haemonchus spp., the parasitic worms responsible for haemonchosis and parasitic gastro

enteritis. Both in vivo and in vitro methods indicated that all of the sheep and goat flocks tested were resistant to the anthelmintic fenbendazole. Resistance of GINs to conventional treatments like benzimidazole has increased in part because farmers are not aware of the problem or are not taking enough preventative steps.

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