STUDIES ON GASTROINTESTINAL HELMINTHS PARASITISM IN DAIRY ANIMALS AT NAGPUR.

THESIS

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INTRODUCTION

The dairy sector has been recognized as important occupation of farmers in our country. Among the world, India stands the second largest producer of milk. The production figures are expected to reach 78 million tons per annum by the end of century (Noras 1996; Vyas and Siddi 1996).

Gastrointestinal helminth infections have a significant role amongst parasitic diseases of dairy animals in all over the world. In India, this constraint is increasing day by day with the advancement of development programmes in the field of dairy industry (Alam et al., 1994). The helminth parasitism does not cause increased mortality but affect the efficacy of production by way of morbidity and lead to a constant loss to the farmers. Gastrointestinal helminth infection in cattle appears in subclinical form, apparently animal appears normal but their growth rate and weight gain is retarded. This effect is attributed to reduction in intake and digestibility of food, (Sykes, 1978). The helminth infection reduces the absorption of nutrients, damages the gastrointestinal tract and liver resulting clinical symptoms of diarrhoea, severe dehydration, toxemia and coma (Barught et al., 1979).

The work on prevalence of gastrointestinal helminth parasitism in dairy cattle in Vidharbha region is relatively meagre. A report on helminthiasis along with arthropods and protozoans in domestic animals indicate that the prevalence is very high at Nagpur (Maske et al., 1990). The systematic study on epidemiological picture of helminth parasitism in dairy animals in orange city of Vidharbha region is lacking. This prompted the University Department of Parasitology to tackle the menace.

With a view to get information on various aspects of helminthiasis in dairy animals the research project was undertaken with the following objectives:

1. To study population dynamics of gastrointestinal helminths in dairy animals at Nagpur.
2. To study seasonal prevalence of gastrointestinal helminths.
3. To study haematological observations in naturally infected animals.
4. To study the efficacy of some indigenous anthelmintic drugs.
REVIEW OF LITERATURE

Gastrointestinal helminthiasis in cattle is one of the major cause of economic losses to dairy industry mainly in terms of morbidity. The present research is carried out to find out gastrointestinal helminth infection in dairy animals at ‘Nagpur’, a city noted as subcapital place of Maharashtra State.

The literature reviewed here have been grouped in the following three categories:

1) Prevalence of gastrointestinal helminth infection in dairy cattle, in India and abroad.
2) Haematology in naturally infected helminthiasis.
3) Anthelmintic Drug therapy.

Prevalence:

Work done in Abroad – Bremner (1970) reported the pathogenic factors in experimental Oesophagostomiasis in calves at Queensland and found that the intestinal haemorrhage as the prime cause of anemia associated with *O. radiatum*.

Sykes (1978) reported that in subclinical infections animal appear normal but their growth rate and weight gain become poor because of reduction in intake and digestibility of food.

Barughet et al., (1979) reported that the helminth was a major component which reduces the absorption of nutrients, damaging the gastrointestinal tract and liver, showing the clinical symptoms of diarrhoea, severe dehydration, toxemia and coma.

Saad et al., (1980) reported the clinical pathological effects of *Schistosoma bovis* in Sudan (Kosti). They further observed that the diseases was characterised by diarrhoea, weight loss, anemia, serum protein changes and eosinophilia.

ITO (1985) reported that parasitic nematodes in faeces were fewer in cows 6 to 8 years old than those of any other age group in 49 farms in Hokkaido.

Bouvry and Raai (1986) examined seventeen dairy herds in Quebec and found that egg passage was low or absent in spring and summer but rose in autumn to reach a peak in winter, than subsequently returned to low levels.

Vercruysse et al., (1986) examined abomasum of 157 dairy cows from March 1984 to
April 1985 in East Flanders (Belgium) and found 75% of cows having moderate worm burden, 13.5% of cows having high worm burden (>10,000) and 11.5% having no worm burden of nematode infection.

Al-Hadethi and Al-Saffar (1988) reported 64.8% of helminth infection in North Iraq (Musal area).

Nikitin and Parlasek (1988) reported 46.7% and 100% of Strongylus and coccidia infection, respectively, on industrial farms of USSR.

Nowosad et al. (1988) reported the prevalence and intensities of gastrointestinal nematodes infection. The infection was higher in summer than in winter of heifers on an industrial farm in the Opale region of Poland.

Harding and Threlfall (1989) reported that 55% of adult dairy cattle on 10 farms in the St John's area were positive for helminth eggs. The mean egg count of faeces in Canada was 1.2 epg of faeces in Canada.

Cox and Lemiski (1989) examined faecal samples collected in July and August 1984 from 566 grazing dairy replacement heifers on 34 farms in Western Canada. The overall mean farm faecal egg count was 16.0 epg faeces (range 0.7-78.1 epg), gastrointestinal nematodes prevalence was 93.3%.

Campos et al. (1990) conducted survey during October and November 1989 on the gastrointestinal nematodes in the cattle from production units of different areas of the state of Morelos, Mexico. 65%, (213) of the 328 cows were shedding nematode eggs, and larvae of Cooperia Sp., Oestertagia Sp., Haemonchus Sp., Oesophagostomum Sp., Trichostrongylus Sp. and Strongyloides papillosus were identified by McGerster and Coproculture techniques.

Duwel (1990) reported that there was no correlation between egg output and worm burden in older experimentally infected cattle or in naturally infected cattle of any age in Germany.

Maingi and Gichigi (1992) examined 116 faecal samples of cattle from 4 dairy farms in Nyandarua District, Kenya in July and August, 1990 and found larvae of Haemonchus Sp. and
Trichostrongylus Sp. for more than 41% and 32%, respectively. Cooperia, Oesophagostomum and Strongyloides were having 15.2%, 7.9% and 3.3% larvae, respectively.

Javed et al., (1993) examined a total of 3534 faecal samples from buffalo and cattle calves from Livestock Experimental Station, Pakistan and observed Cooperia sp. and Nematodirus sp. were only found in calves < one year of age with prevalence of 1.2% and 0.8%, respectively.

Ndao et al., (1995) observed that during the dry season, 14 constituted 44% of the Oesophagostomum radiatum population in April and 6.7% in February similarly, 14 constituted 8% of the Cooperia sp; Population in April and 34% in November.

Prasitirat et al., (1996) reported that the prevalence of q. mphistomes was higher in beef cattle than in dairy cattle in Thailand.

Aken-D-Van et al., (1998) reported the occurrence of strongyle eggs in the faeces of 2 months old calves. The egg counts peaked between 3-6 months later it steadily and significantly (P<0.001) declined.

**Work done in India**

Dutt (1978) reported 19 species belonging to 12 genera of q. mphistomes from the rumen of cattle and buffaloes from Jabalpur abattoir.

Tondan and Sharma (1981) reported 6 genera of q. mphistome founa of ruminants from Himachal Pradesh.

Pal and Balkrishnan (1987) examined 9820 faecal samples of cattle in Andaman Islands. In their studies percentage prevalence ranged from 23% with Fasciolota to 0.4% with Oesophagostomum, Paramphistome, Ascaris, Strongyloides, Trichurus, Coccidia, Ankylostoma and Haemonchus.

Jagannath et al., (1988) reported the occurrence of gastrointestinal parasites in dairy cattle and buffaloes from Karnataka. They further observed that the prevalence was more common in the 4-8 years age group and least frequent in the animals below one year of age.
D’souza et al., (1988) reported that no correlation was observed between prevalence and age among 4335 buffaloes in Mysore and Mandya districts in Karnataka, prevalence of Paramphistomidae was higher during the South-West and north-east monsoons.

Niphadkar et al., (1989) while conducting prevalence study of parasitic infections of zoo animals in Mumbai, reported 36.79% and 15.2% infection in carnivores and herbivores, respectively. The parasites encountered in carnivores were Toxocara, Hookworms, Spirometra, Gnathosoma and Isospora Sp. While herbivores harboured Strongylus, Amphistomes and Trichuris Sp.

Banerjee and Agrawal (1989) stated that the prevalence rate of hepatointestinal schistosomiasis differed from 20% to 54% in cattle and 13.3% to 60% in buffaloes.

Jagannath et al., (1989) reported 36.25% and 42.12% occurrence of gastrointestinal parasites in cattle and buffaloes from Karanataka they further found the infection rate was higher buffaloes than in cattle.

Krishna et al., (1989) while conducting prevalence study in ruminants from Himachal Pradesh during the period October 1984 and September 1987, reported that the percentage of Fasciola infection in cattle and buffaloes was 50% and 64%, respectively.

Maske et al., (1990) conducted prevalence studies of parasites in domesticated animals from Nagpur. They further reported that the occurrence of helminths, arthropods and protozoan was 72.99, 77.60 and 26.07 percent, respectively.

Sharma (1991) reported the occurrence of 19 general and 22 species of helminth parasites in cattle, goat, pig and dogs of Bermo-coal field area from Bihar.

Islam et al., (1991) reported the incidence of Homalagaster paloniæ infection in cattle and buffaloes from Assam-Arepost.

Roy and Tondan, (1990) reported 54.7% of amphistomes infection of 960 cattle during February 1986 to January 1987 in Meghalaya. They further observed to peak period of prevalence of which first between June and September and second one between January and February.
Pradhan et al., (1991), reported Parasitic infection at the rate of 84.8%, 3.24% and 1.6% by nematode, trematode and cestode infection, respectively in calves from Bihar. The parasites encountered were *Neoascaris vitulorum*, *Trichuris* and *Strongyloides*.

Sanyal et al., (1992), reported higher faecal egg counts in pure and crossbred cattle than native cattle and buffaloes in subtropical climate of Western India.

Verma and Malviya (1994), reported the occurrence of *Coenures cerebralis* in brain of a buffalo in private dairy owner from District Barielly.

Johal and Kaur-Panesare (1995), reported 245 faecal samples from (Bos indicus and Bubalis bubalis) collected from Patiyala city and its surrounding villages in Punjab, India for 40% gastrointestinal nematode infection in cattle from Patiyala. They further found that the species wise prevalence of *Strongyloides papillosus*, *Strongyles*, *Neoascaris vitulorum* and *Trichuris* was 18.7, 20.4, 6.1 and 1.2 per cent, respectively. The EPG level rang from 15,000-18,000 in calves.


Mathur et al., (1996), while conducting study on monthly faecal egg count in native and crossbred cattle and buffaloes during September, 1992 to August 1993 in West-Bengal, revealed high risk period for nematode infection in calves and heifers between June to September. They do not observe the seasonality of infection in adult animals.

Jithendran and Bhat (1998), while conducting study the incidence of gastrointestinal parasites in dairy animals of Kangra valley (Himachal Pradesh) in two spells of five year (1986-1990 and 1993-1997), reported that *lukes* (*Fasciola*, *Amphistomes* and *Dicrocoelium*) and *Strongyles* were found to be the important parasitic infections throughout the year.

Pal et al., (1998), studied the prevalence of parasitic infection in different species of animals in Durg. They reported incidence of *ascariosis* in cow calves, *amphistomiasis* in cattle and buffaloes *Strongyllosis* in goat and mange in dog was 14.54, 23.61, 61.53, 28.26 and 30 per
Sreekrishnan et al. (1998) studied the prevalence of GI parasites of livestock and poultry in Pondicherry from October 1995 to September 1998. The highest incidence of Paramphistomes in cattle, strongyle in sheep and goats, Ancylostoma in dog, Raillietina in birds was 38.38, 21.43, 35.30 and 23.07 per cent, respectively.

Haematology :-

Leland (1960) observed an elevated packed cell red blood cell volume 1 to 6 week in lambs at Lexington, Kentucky as per infection but it drooped in to subnormal if animal survived beyond the 9th week post infection with T. axei.

Sinclair (1962) studied experimental ovine fascioliasis at Weybridge survey in which changes in the blood cell picture as a progressive eosinophilia which was restored to normal levels after treatment.

Viana (1971) examined 50 naturally infected gastrointestinal worms and uninfected calves and observed significant reduction in haemoglobin.

Viana (1971) stated significant reduction in haematocrit value in calves naturally infected with gastrointestinal worms.

Thakur and Mishra (1973) reported decrease in the percentage of haemoglobin, PCV in the calves having mixed infection of helminthic parasites.

Ogunsusi (1978) studied systematic blood changes in acute and chronic helminthiasis (Haemonchus and Trichostrongylus sp.) in sheep at Zaria, Nigeria. He reported in acute helminthiasis there was rapid decline in the volume of haemoglobin and in chronic cases slow and steady increase in helminth egg out put accompanied by low and steady fall in values of haemoglobin.

Panda and Misra (1980) reported reduction in haemoglobin count and eosinophilia in immature amphistomiasis infected buffaloes calves in Bhuvaneshwar.
Waghmare et al., (1993) indicated that there was decrease in haemoglobin concentration in mixed helminth infected buffaloes calves at Nagpur which was restored to normal after treatment. Gaur and Stephenson (1993) reported a slight increase in eosinophil count and slight decrease in neutrophil court in calves infected with mixed helminths at Nagpur.

**Anthemintic Drug Trial**

Pal _et al._, (1978) in Delhi treated cattle and buffaloes infected with _Fasciola hepatica_ with hexachlorophene at 15 mg./Kg. body weight orally on two successive days. They found that the _Fasciola_ eggs after 40 days after the treatment.

Uppal _et al._, (1981) reported the efficacy of panacur (fenbendazole) against naturally infected tapeworm infections under field conditions in sheep and goats at Avikanagar at the dose rate of each bolus of 250 mg showed 100% efficacy on 26th day.

Prasad (1985) reported the treatment of naturally infected calves with _N. vitulorum_ (1350-1550 epg faeces) at Yugoslavia. In the treatment with piperazine hexahydrate, tetramisole and fenbendazole, he found that faecal egg counts had been reduced by 96, 98 and 100 %, respectively after 17 days of treatment.

Misra _et al._, (1989) reported 100% efficacy of Valbazen (SK & F) in calves naturally infected with _Moniezia_ infection at Bhuvaneshwar.

Chopra _et al._, (1991) studied ayurvedic anthelmintic _viz_. _Butea monosperma_ (Palas), _Embelia-ribes_ (Vaivrang) and _Rottlera tinctoria_ (Kamala) inhibits acid and alkaline Phosphate activity in Paramphistome cervi infection.

Pradhan _et al._, (1992) conducted a therapeutic trial of _Punica granatum_ and _Cucurbita maxima_ in the treatment of natural cases of nematodiasis in calves at Ranchi. They further reported that the efficacy of _Punica granatum_ and _Cucurbita maxima_ was 78.2 and 40.6 per cent, respectively.

Sharma, (1993) while conducting efficacy trial with herbal preparation capsules “Jantana” to young calves and adult crossbred cattle was 100% effective against naturally occurring
gastrointestinal nematodes.

Bhaumik et al., (1995), reported the efficacy of Oxyclonamide (Hoechst) was 89.12 per cent in cattle naturally infected with Amphistomiasis in Tripura.

Sanyal and Singh (1995), reported that Fenbendazole in urea molasses block could effectively remove nematode parasites of dairy cattle with net gain of 0.57 litter milk per day at Anand.

Nguyen et al., (1996), in Vietnam while reporting treatment of the cattle infected with Fasciola gigantica with Triclabendazole. They found that the prevalence of Fasciola infection reduced to 26%.

Muralidharan et al., (1997), reported that Heemrich-II (Azadirachtin fraction of Neem seed), produced 100% mortality of Indoplanorbis exustus at 6 hours of exposure period.

Agarwal et al., (1997), reported 100% efficacy of CDRI compound 81-470 against Bovine and Bubaline natural gastrointestinal nematodiasis.

Sanyal (1998), studied the possible use of the self-medicating anthelmintic delivery device in the strategic use of liver fluke control programme in cattle and buffaloes at Anand.

Sanyal (1998), reported medicated urea molasses blocks and dewormer concentrate feed pellets as self-medicating anthelmintic release device in strategic control programme of gastrointestinal parasite management in dairy animals at Anand.

Eslami (1998), reported 100% efficacy of Ivermectin against Setaria digitata in cattle.

Sanyal (1998), reported biological control of parasitic gastroenteritis of ruminant livestock by predacious fungi at Anand.

Sangwan and Arun (1998), reported 90% efficacy of leaf extracts of Melia azedarach against Haemonchus contortus parasites in vitro.
MATERIALS AND METHODS

The present study was conducted to ascertain the prevalence, haematological changes and evaluation of anthelmintics against gastrointestinal helminth infection in dairy animals in Nagpur city from November, 1997 to October, 1998 in the University Department of Parasitology, Nagpur Veterinary College, Nagpur.

PREVALENCE :-

The prevalence of gastrointestinal helminth infection was mainly observed in dairy animals belonging to Cattle Breeding Farm (CBF), Nagpur Veterinary College, Nagpur, Agriculture College Dairy Farm, Ramdas Peth, Nagpur and Private Dairy farms located at Nagpur Viz., Telankhedi, Ravinagar, Ramnagar, Dhantoli, Kalameshwar, Gorewada, Hanuman Mandir, Surendragarh, Lakkadganj, Amravati Road, Cotten Market, Hazari Pahad, Nagpur. (Fig. 10-13.)

A total number of 683 dairy animals including cattle and buffaloes of different breed, age groups and of both sexes were examined. The following parameters were selected to ascertain the prevalence of gastrointestinal helminths in dairy animals.

I. Occurrence of gastrointestinal helminth parasites.
II. Haematology
III. Evaluation of anthelmintics.

1. Occurrence of gastrointestinal helminth parasites :-

Collection :- About 20 gm. fresh faecal samples per rectum from each dairy animal were collected by inserting a finger in separate clean, sterile 50ml capacity wide mouthed plastic bottles containing 10% formaline. The bottles were labeled and transported to the laboratory. At the time of collection care was taken to avoid intermixing and cross contamination of faecal sample with urine or bedding material. Hands were washed thoroughly after each collection. Fortnightly visits
Photograph of cattle of Private Dairy owners while drinking water near Telenkhedi at Nagpur

Photograph of cattle of Private dairy owners while grazing near Telenkhedi at Nagpur
were made for collection of samples.

Examination :

I. 1. **Qualitative examination**

I. 1.1 **Gross Examination**

The faecal samples collected were examined for the presence of large nematodes (*Toxocara*) and segments of tapeworm (*Moniezia*) if any.

I. 1.2 **Direct smear technique**

A small quantity of faecal material was taken on a glass slide with the help of laboratory glass rod and mixed with 3-4 drops of water and covered with cover slip and examined twice under 10x power of microscope to detect parasitic egg/larvae.

I. 1.3 **Sedimentation technique**

About 3-5 gm of faeces was emulsified with 20-30 ml of water in beaker. The emulsion was strained into a sedimentation conical flask (*Fig. 1*). The flask was filled up to its brim with tap water and allowed to stand for 15 minutes. The supernatant was thrown-off. This process was repeated until the supernatant is clear. After last sedimentation the supernatant discarded and 1-2 drops of sediment were taken the glass slide, covered with cover slip and examined under low power 10x of microscope to detect the presence of trematode/nematode eggs/larvae as described by Ruprah et al., (1996).

I. 1.4 **Floatation technique**

About 4-5 gm faeces was mixed with 30-40 ml of water in beaker. This mixture was strained through a tea strainer into a conical flask and allowed to stand for 20-30 minutes. The supernatant was discarded without disturbing the sediment and then about 15 ml of saturated Magnesium sulphate (*MgSO₄*) solution was added. The filtrate transferred into a floatation tubes, filled the tubes to its brim by saturated solution. A slide was placed on the top of floatation tube in contact with a liquid and allowed to stand for about 30 minutes. Later on a slide was gently removed in a vertical position, cover slip applied and examined under low power of microscope for the presence of nematode eggs/larvae.

I. 1.5 **Quantitative examination**

The faecal samples of heavily infected animals were taken up for quantitative examination to estimate Egg Per Gram (EPG) of faeces. The Stoll's technique as described by Soulsby, (1982) was used.
Sedimentation flask for separation of helminths eggs.
In this technique, 3 gm of faecal sample was taken in 100 ml glass beaker to which tap water was added to make volume 45ml. The solution was homogenized with the help of automatic magnetic homogenator. From this solution 0.15ml quantity was taken with the help of graduated pipette on glass slide. After putting a rectangular cover slip the slide examined under low power microscope and counted egg number.

Eggs Per Gram was calculated by multiplying the number of egg by dilution factor 100.

1.1.6 **Coproculture examination**

The faecal samples which were found positive for ova of nematodes were further taken to faecal culture technique. The isolation and identification of third stage larvae was done by method as described by Whitlock, (1960).

In this technique, about 50gm of faeces were mixed with charcoal and water using Pestal and Morter to get a pasty consistency and placed in petry dishes. The petry dishes were covered with a lid and kept at 25°C to 28°C in a incubator for 7 to 9 days.

The faecal material was kept moist by adding sufficient water on every alternate day. During the period the petry dishes were gently agitated and examined under Zoom microscope every day. For final examination the larvae were separated by Baermann’s technique (Fig.2). This technique consists of placing larger quantity of cultured faeces in a double layered muslin cloth suspended in a funnel. At narrow end of funnel a rubber tube about 5' length with a clamp fitted. The funnel filled with lukewarm water was placed over wooden stand. On next day the filtered material was collected in a test tube. The contents of tube were centrifuged. Drops of sediments were taken on slide to which equal drops of Gram's iodine were added and mixed to fix and stain the larvae. The infective third stage larvae were identified on the basis of keys given by Whitlock, (1960).
Baermann’s apparatus for separation of larvae from faecal material
Haematology of dairy animals heavily infected with gastrointestinal helminths were carried out before and after anthelmintic drug treatment.

The blood samples were collected from jugular vein with 18 Guage sterilized needle in sterilized vials containing 10 % Ethylene diamine tetra-acetate (EDTA) as an anticoagulant. Vials were sealed and labeled properly. At the same time thin blood smears were also prepared and fixed with methanol.

- Following blood parameters were studied in the laboratory -
  1. Haemoglobin (Hb) by Sahli's method.
  2. Packed cell volume (PCV) by Wintrobe hematocrit.
  3. Total Erythrocyte count (TEC) by using Neubur's slide method.
  4. Total Leucocyte count (TLC) by using Neubur's slide method.
  5. Differential Leucocyte count (DLC) by using Leishman's stain.

III. Estimation of Anthelmintics

The dairy animals naturally infected with mixed gastrointestinal helminths were used to assess the relative efficacy of two indigenous herbal anthelmintics "Jantana" and "Sonex". The composition of all drugs and their mode of administration is given in Annexure I. In this therapy, 27 dairy animals were used. The details of grouping are given in Annexure II.

To assess the efficacy of drugs the faecal samples of all cattle were examined daily with respect of reduction of eggs/larvae.
## Details of herbal anthelmintics under trial

### Design for the anthelmintic Therapy

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name and form of drug</th>
<th>Name and address of the Manufacturer</th>
<th>Composition</th>
<th>Dose rate</th>
<th>Mode of Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jantana (Powder form)</td>
<td>Mycon Pharma, 647, Kasba Peth, Pune-411011</td>
<td>Wavding - 2.325 gm, Mohri - 2.325 gm, Palas Beej - 2.325 gm, Kale Jire - 0.930 gm, Sonamukhi - 0.930 gm, Kirmani Owa - 0.930 gm, Morchud - 0.235 gm</td>
<td>10 gm/Animal</td>
<td>Orally</td>
</tr>
<tr>
<td>2</td>
<td>Sonex (Powder form)</td>
<td>Animal Research Centre, Chwara (Rajasthan)</td>
<td>Cuprum sulphas - 15%, Nikotina tabacum - 30%, Melotous philippineus - 15%, Embelia Ribes - 10%, Punica Granatum - 10%, Nomordica dioicaroct - 10%, Arecanut - 10%</td>
<td>20 gm/Animal</td>
<td>Orally</td>
</tr>
</tbody>
</table>
Annexure - II
Design for the anthelmintic Therapy

Total Number of Animal
(27)

Infected
(18)

Jantana
(9)

Sonex
(9)

Number of Animals used
Severity of Infection
1006.66  1033.33  1056.66  1113.33  946.66  1013.33
(3)  (3)  (3)  (3)  (3)  (3)

Infected Untreated control
(9)  1004.00

* Average Egg per gram of faces (EPG)
IV. **Collection of Meteorological data** :-

The meteorological data viz., the monthly maximum - minimum temperature, relative humidity was collected from the records of meteorological observatory, Agronomy Department, Agriculture College, Nagpur.

V. **Statistical Analysis of data** :-

The data regarding the effect of season on the natural infection were subjected to statistical analysis. Correlation between percentage of infection, temperature and relative humidity was worked out as per the method given by Snedecor and Cochran, (1967).
The prevalence of gastrointestinal helminth infection in dairy animals was investigated in and around Nagpur. The objectives of the prevalence of gastrointestinal helminths in this study were based on following parameters.

1. Population dynamics of helminths.
2. Occurrence of helminth parasites.
3. Haematology.

The monthwise distribution of dairy animals examined and found positive is shown in Fig 3 (Histogram column). The data regarding the percentage of infected animals, range of temperature and relative humidity for the months under study are presented in Table 1. Out of 683 dairy animals examined, 433 were found positive (63.39%). A variability was observed amongst the percentage of infected animal in each month. The range being a minimum of 42.66 percent in May to a maximum 82.81 percent in October. The data on prevalence on helminth parasitism in dairy animals in relation to climate prevailing at Nagpur was analysed statistically. The correlation-coefficient between natural gastrointestinal helminths and temperature, relative humidity is shown in Table 2. The meteorological observations in and around Nagpur during the year 1997-98 are presented in Fig. 3.

The prevalence of gastrointestinal helminths infection in dairy animals was studied in different localities as shown in Table 3. The percentage of prevalence being 64.86, 57.74 and 56.14 at private dairy farms, Veterinary College Dairy Farm and Agriculture College Dairy Farm, respectively.
<table>
<thead>
<tr>
<th>Month</th>
<th>Number examined</th>
<th>Number positive</th>
<th>Percentage</th>
<th>Temperature Min</th>
<th>Temperature Max</th>
<th>Relative Humidity Min</th>
<th>Relative Humidity Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov.</td>
<td>49</td>
<td>40</td>
<td>81.63</td>
<td>13.97</td>
<td>27.12</td>
<td>53.5</td>
<td>78.5</td>
</tr>
<tr>
<td>Dec.</td>
<td>52</td>
<td>29</td>
<td>55.76</td>
<td>16.72</td>
<td>32.95</td>
<td>30.75</td>
<td>58.50</td>
</tr>
<tr>
<td>Jan.</td>
<td>63</td>
<td>37</td>
<td>58.73</td>
<td>22.34</td>
<td>31.64</td>
<td>71.80</td>
<td>86.00</td>
</tr>
<tr>
<td>Feb.</td>
<td>57</td>
<td>38</td>
<td>66.66</td>
<td>21.98</td>
<td>32.22</td>
<td>56.80</td>
<td>75.80</td>
</tr>
<tr>
<td>March</td>
<td>61</td>
<td>34</td>
<td>55.73</td>
<td>24.48</td>
<td>33.5</td>
<td>62.8</td>
<td>80.20</td>
</tr>
<tr>
<td>April</td>
<td>54</td>
<td>29</td>
<td>53.70</td>
<td>22.12</td>
<td>39.26</td>
<td>25.80</td>
<td>47.00</td>
</tr>
<tr>
<td>May</td>
<td>60</td>
<td>25</td>
<td>41.66</td>
<td>26.6</td>
<td>42.90</td>
<td>23.5</td>
<td>41.75</td>
</tr>
<tr>
<td>June</td>
<td>58</td>
<td>29</td>
<td>50</td>
<td>27.82</td>
<td>40.5</td>
<td>37.5</td>
<td>52.5</td>
</tr>
<tr>
<td>July</td>
<td>56</td>
<td>40</td>
<td>71.42</td>
<td>14.02</td>
<td>29.62</td>
<td>45.25</td>
<td>74.25</td>
</tr>
<tr>
<td>August</td>
<td>61</td>
<td>43</td>
<td>70.49</td>
<td>23.32</td>
<td>32.07</td>
<td>71.00</td>
<td>87.25</td>
</tr>
<tr>
<td>Sept.</td>
<td>48</td>
<td>36</td>
<td>75.00</td>
<td>17.92</td>
<td>29.45</td>
<td>59</td>
<td>80</td>
</tr>
<tr>
<td>Oct.</td>
<td>64</td>
<td>53</td>
<td>82.81</td>
<td>15.82</td>
<td>24.62</td>
<td>70.25</td>
<td>88.25</td>
</tr>
<tr>
<td>TOTAL</td>
<td>683</td>
<td>433</td>
<td>63.39</td>
<td>247.11</td>
<td>395.85</td>
<td>607.95</td>
<td>850</td>
</tr>
</tbody>
</table>

Table 1: Prevalence of gastrointestinal helminthes in dairy animals at Nagpur during 1997-98
Histograph showing prevalence of gastrointestinal helminths infection of dairy animals at Nagpur.
Table 2
Correlation coefficient between natural gastro intestinal helminths and temperature, relative humidity

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Month</th>
<th>Percentage of infection</th>
<th>Temperature o C</th>
<th>Relative Humidity ( % )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>November</td>
<td>81.63</td>
<td>13.97</td>
<td>27.12</td>
</tr>
<tr>
<td>2</td>
<td>December</td>
<td>55.76</td>
<td>16.72</td>
<td>32.95</td>
</tr>
<tr>
<td>3</td>
<td>January</td>
<td>58.73</td>
<td>22.34</td>
<td>31.64</td>
</tr>
<tr>
<td>4</td>
<td>February</td>
<td>66.66</td>
<td>21.98</td>
<td>32.22</td>
</tr>
<tr>
<td>5</td>
<td>March</td>
<td>55.73</td>
<td>24.48</td>
<td>33.5</td>
</tr>
<tr>
<td>6</td>
<td>April</td>
<td>53.70</td>
<td>22.12</td>
<td>39.26</td>
</tr>
<tr>
<td>7</td>
<td>May</td>
<td>41.66</td>
<td>26.6</td>
<td>42.90</td>
</tr>
<tr>
<td>8</td>
<td>June</td>
<td>50.00</td>
<td>27.82</td>
<td>40.5</td>
</tr>
<tr>
<td>9</td>
<td>July</td>
<td>71.42</td>
<td>14.02</td>
<td>29.62</td>
</tr>
<tr>
<td>10</td>
<td>August</td>
<td>70.49</td>
<td>23.32</td>
<td>32.07</td>
</tr>
<tr>
<td>11</td>
<td>September</td>
<td>75.00</td>
<td>17.92</td>
<td>29.45</td>
</tr>
<tr>
<td>12</td>
<td>October</td>
<td>82.81</td>
<td>15.82</td>
<td>24.52</td>
</tr>
</tbody>
</table>

For
\[
r_1 = 0.927, \text{ where } x_i = \text{ % of infection } \quad y_i = \text{ Temp. Min.}
\]
\[
r_2 = 0.769, \text{ where } x_i = \text{ % of infection } \quad y_i = \text{ Temp. Max.}
\]
The values \( r_1 \) and \( r_2 \) obtained were significant at 5 percent level, while statistical value \( r_3 \) was non-significant (\( p>0.05 \)).
Table 3

Prevalance of gastrointestinal helminth infection in dairy animals of different localities at Nagpur during 1997 - 98.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Localities</th>
<th>No. examined</th>
<th>No. positive</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Private Dairy Farms, Nagpur</td>
<td>555</td>
<td>360</td>
<td>64.86</td>
</tr>
<tr>
<td>2</td>
<td>Vety. College Cattle Breeding Farm, Nagpur</td>
<td>71</td>
<td>41</td>
<td>57.74</td>
</tr>
<tr>
<td>3</td>
<td>Agriculture College Dairy Farm, Nagpur</td>
<td>57</td>
<td>32</td>
<td>56.14</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>683</strong></td>
<td><strong>433</strong></td>
<td><strong>63.39</strong></td>
</tr>
</tbody>
</table>

In order to determine the effect of sex on the occurrence of infection, a total of 321 female, 127 male cattle and 167 female, 68 male buffaloes were examined during the year. Out of which 198 female cattle (68.68%) and 71 male cattle (53.90%) and 118 female buffaloes (70.65%) and 46 male buffaloes (67.64%) were found positive for gastrointestinal helminth infection (Table 6).

The severity of infection in different age groups of dairy animals viz., below five years, between 5-8 years and above 8 years were also worked out (Table 6). The rate of infection were 47.22, 57.28, 63.01 and 66.14 per cent in cattle, respectively and 59.52, 65.51, 71.42 and 80.39 per cent in buffaloes, respectively.
The effect of season on the intensity of gastrointestinal helminths infection was studied during the year 1997-98. A total number of dairy animals examined and found positive in different seasons are given in Table 4 & Fig 4. The rate of infection in monsoon, post monsoon, winter and summer season was 72.12, 82.30, 60.46 and 50.21 per cent, respectively. The seasonal variation of the occurrence was found significant (P < 0.05) indicating the significance of different season in respect of prevalence of infection.

The prevalence of gastrointestinal helminth parasites was studied in different breeds of dairy animals as shown in Table 5 & Fig. 5. The percentage of infection being 61.34 and 58.57 in crossbred and local cattle, respectively, while the percentage of infection in Murrah and Nagpuri buffaloes was 71.42 and 68.29, respectively.

In order to determine the effect of sex on the occurrence of infection, a total of 321 female, 127 male cattle and 167 female, 68 male buffaloes were examined during the year. Out of which 198 female cattle (61.68%), 71 male cattle (55.90%) and 118 female buffalo (70.65%) and 46 male buffaloes (67.64%) were found positive for gastrointestinal helminth infection (Table 6).

The severity of infection in different age groups of dairy animals viz., below two years, between 2-4 years, between 4-8 years and above 8 years were also worked out (Table 7 and 8). The rate of infection were 47.22, 57.28, 63.01 and 66.14 per cent in cattle, respectively and 59.52, 65.51, 71.42 and 80.39 per cent in buffaloes, respectively.

II. **Occurrence of Helminth Parasites**

The results of prevalence of gastrointestinal parasites in dairy animals during the study are presented in Table 9. Various gastrointestinal helminths egg and larvae examined are shown by Camera Lucida drawings in Fig. 6,7,8 & 9. Occurrence of gastrointestinal helminth eggs, larvae was either single with one type of infection or mixed having more than one type of gastrointestinal helminths in an individual animals. The prevalence of nematode during the year
Table - 4
Seasonal prevalence of gastrointestinal helminths infection of dairy animals at Nagpur during the year 1997 - 98.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Season</th>
<th>No. Examined</th>
<th>No. Positive</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Monsoon (July - Sept.)</td>
<td>165</td>
<td>119</td>
<td>72.12</td>
</tr>
<tr>
<td>2</td>
<td>Post Monsoon  (Oct - Nov.)</td>
<td>113</td>
<td>93</td>
<td>82.30</td>
</tr>
<tr>
<td>3</td>
<td>Winter (Dec. - Feb.)</td>
<td>172</td>
<td>104</td>
<td>60.46</td>
</tr>
<tr>
<td>4</td>
<td>Summer (March - June)</td>
<td>233</td>
<td>117</td>
<td>50.21</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>683</td>
<td>433</td>
<td>63.39</td>
</tr>
</tbody>
</table>

Histograph showing seasonal prevalence of gastrointestinal helminths infection of dairy animals at Nagpur.
Series 1 - No. of positive animals.
Series 2 - % of infection.
Table - 5
Prevalence of gastrointestinal helminths in different breeds of dairy animals at Nagpur during the year 1997 - 98.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Breeds</th>
<th>No. examined</th>
<th>No. positive</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cattle (Crossbred)</td>
<td>238</td>
<td>146</td>
<td>61.34</td>
</tr>
<tr>
<td>2</td>
<td>Cattle (Local)</td>
<td>210</td>
<td>123</td>
<td>58.57</td>
</tr>
<tr>
<td>3</td>
<td>Buffalo (Murrah)</td>
<td>112</td>
<td>80</td>
<td>71.42</td>
</tr>
<tr>
<td>4</td>
<td>Buffalo (Nagpuri)</td>
<td>123</td>
<td>84</td>
<td>68.29</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>683</td>
<td>433</td>
<td>63.39</td>
</tr>
</tbody>
</table>

![Histogram showing breedwise prevalence of gastrointestinal helminths infection of dairy animals at Nagpur.](image-url)
<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Sex</th>
<th>No. examined</th>
<th>No. positive</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Female Cattle</td>
<td>321</td>
<td>198</td>
<td>61.68</td>
</tr>
<tr>
<td>2</td>
<td>Male Cattle</td>
<td>127</td>
<td>71</td>
<td>55.90</td>
</tr>
<tr>
<td>3</td>
<td>Female Buffalo</td>
<td>167</td>
<td>118</td>
<td>70.65</td>
</tr>
<tr>
<td>4</td>
<td>Male Buffalo</td>
<td>68</td>
<td>46</td>
<td>67.64</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>683</td>
<td>433</td>
<td>63.39</td>
</tr>
</tbody>
</table>
Table - 7

Age wise prevalence of gastrointestinal helminths infection in cattle at Nagpur during the year 1997 - 98

<table>
<thead>
<tr>
<th>Age Group</th>
<th>No. examined</th>
<th>No. positive</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 2 years</td>
<td>72</td>
<td>34</td>
<td>47.22</td>
</tr>
<tr>
<td>Between 2 - 4 years</td>
<td>103</td>
<td>59</td>
<td>57.28</td>
</tr>
<tr>
<td>Between 4 - 8 years</td>
<td>146</td>
<td>92</td>
<td>63.01</td>
</tr>
<tr>
<td>Above 8 years</td>
<td>127</td>
<td>84</td>
<td>66.14</td>
</tr>
<tr>
<td>TOTAL</td>
<td>448</td>
<td>269</td>
<td>60.04</td>
</tr>
</tbody>
</table>
Table - 8

Agewise prevalence of gastrointestinal helminths infection in buffalos at Nagpur during the year 1997 - 98.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>No. examined</th>
<th>No. positive</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 2 years</td>
<td>42</td>
<td>25</td>
<td>59.52</td>
</tr>
<tr>
<td>Between 2 - 4 years</td>
<td>58</td>
<td>38</td>
<td>65.51</td>
</tr>
<tr>
<td>Between 4 - 8 years</td>
<td>84</td>
<td>60</td>
<td>71.42</td>
</tr>
<tr>
<td>Above 8 years</td>
<td>51</td>
<td>41</td>
<td>80.39</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>235</strong></td>
<td><strong>164</strong></td>
<td><strong>69.78</strong></td>
</tr>
</tbody>
</table>
Prevalence of gastrointestinal parasites in dairy animals at Nagpur during the year 1997 - 98.

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Month</th>
<th>Total examined</th>
<th>Total positive</th>
<th>Nematode</th>
<th>Trematode</th>
<th>Cestode</th>
<th>Mixed infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nov.</td>
<td>49</td>
<td>40</td>
<td>21 (52.5%)</td>
<td>5 (12.5%)</td>
<td>-</td>
<td>14 (35%)</td>
</tr>
<tr>
<td>2</td>
<td>Dec</td>
<td>52</td>
<td>29</td>
<td>10 (34.48%)</td>
<td>4 (13.79%)</td>
<td>-</td>
<td>15 (51.77%)</td>
</tr>
<tr>
<td>3</td>
<td>Jan</td>
<td>63</td>
<td>37</td>
<td>13 (35.13%)</td>
<td>4 (10.81%)</td>
<td>-</td>
<td>20 (54.05%)</td>
</tr>
<tr>
<td>4</td>
<td>Feb.</td>
<td>57</td>
<td>38</td>
<td>12 (31.57%)</td>
<td>4 (10.52%)</td>
<td>-</td>
<td>22 (57.89%)</td>
</tr>
<tr>
<td>5</td>
<td>March</td>
<td>61</td>
<td>34</td>
<td>10 (29.41%)</td>
<td>6 (17.64%)</td>
<td>-</td>
<td>18 (52.94%)</td>
</tr>
<tr>
<td>6</td>
<td>April</td>
<td>54</td>
<td>29</td>
<td>8 (27.58%)</td>
<td>6 (20.68%)</td>
<td>-</td>
<td>15 (51.72%)</td>
</tr>
<tr>
<td>7</td>
<td>May</td>
<td>60</td>
<td>25</td>
<td>7 (28.00%)</td>
<td>6 (24.00%)</td>
<td>-</td>
<td>12 (48%)</td>
</tr>
<tr>
<td>8</td>
<td>June</td>
<td>58</td>
<td>29</td>
<td>9 (31.03%)</td>
<td>5 (17.24%)</td>
<td>2 (6.89 %)</td>
<td>13 (44.82%)</td>
</tr>
<tr>
<td>9</td>
<td>July</td>
<td>56</td>
<td>40</td>
<td>16 (40%)</td>
<td>6 (15%)</td>
<td>-</td>
<td>18 (45%)</td>
</tr>
<tr>
<td>10</td>
<td>August</td>
<td>61</td>
<td>43</td>
<td>19 (44.18%)</td>
<td>8 (18.60%)</td>
<td>-</td>
<td>16 (37.20%)</td>
</tr>
<tr>
<td>11</td>
<td>Sept.</td>
<td>48</td>
<td>36</td>
<td>20 (55.55%)</td>
<td>8 (22.22%)</td>
<td>2 (5.55 %)</td>
<td>6 (16.16%)</td>
</tr>
<tr>
<td>12</td>
<td>Oct.</td>
<td>64</td>
<td>53</td>
<td>36 (67.92%)</td>
<td>10 (18.86%)</td>
<td>3 (5.66 %)</td>
<td>4 (7.50%)</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>683</td>
<td>433</td>
<td>181 (41.80%)</td>
<td>72 (16.62%)</td>
<td>7 (1.61%)</td>
<td>173 (39.95%)</td>
</tr>
</tbody>
</table>
Fig. 7

Larva of Trichostrongylus sp.

Egg of Trichostrongylus sp.

Larva of Oesophagostomum sp.

Egg of Oesophagostomum sp.

Fig. 8

Larva of Trichostrongylus sp.

Egg of Trichostrongylus sp.

Larva of Oesophagostomum sp.

Egg of Oesophagostomum sp.
The Haemoglobin, packed cell volume, total leucocyte count, lymphocytes %, monocyte %, neutrophils % values were significantly decreased (Table 11) while eosinophils count was increased in infected animals as compared to clinically non-infected animals.

The results of anthelminthic therapy is depicted in the chart. The results of anthelminthic trial are shown in Table 12.

Ivermectin was given orally at dose rate of 10gm per animal at alternate day of 9 naturally infected dairy animals. The anthelminthic action of ivermectin was observed from 48 hrs after third treatment. The administrations were given on alternate day of treatment. The mean reduction % of mixed infection after treatment was found as 87.22 to 99.90, 47.22 and 50.00 on day 0, 1, 2, and 3 respectively.
1997-98 was in the range of 27.58 to 67.92 with an average of 41.80 per cent. Whereas
trematode occurrence was ranging from 10.52 to 24.00 with an average of 16.62 per cent, while
cestode occurrence was ranging from 5.55 to 6.89 with an average 1.61 per cent. Mixed type
gastrointestinal helminth infection was between 7.50 to 57.89 with an average of 39.95 per cent.

During the study different species of helminths were encountered as shown in
Table 10. Out of 683 faecal samples examined, 314 were found positive (45.97%) for
Haemonchus contortus, 143 (20.93%) for Strongyloides papillosus, 122 (17.86%) for
Oesophagostomum radiatum, 191 (27.96%) for Trichostrongylus axei, 68 (9.95%) for Toxocara
vitulorum, 75 (10.98%) for Trichuris ovis, 259 (37.92%) for Paramphistomum sp., 81 (11.85%)
for Fasciola gigantica, 22 (3.22%) for Schistosoma bovis and 48 (7.02%) for Moniezia sp. of
helminth. The infected dairy animals has shown clinical signs such as poor body condition,
diarrhoea etc. (Photo Fig. 12 & 11).

IIIHaematology :-

The Haemoglobin, packed cell volume, total erythrocytic count, total leucocytic
count, lymphocytes %, monocyte %, neutrophil % values were significantly decreased (Table 11)
while eosinophils count was increased in infected animals as compared to clinically non infected
animals.

IVEvaluation of Anthelmintics :-

The design of anthelmintic therapy is depicted in Annexure II. The results of
anthelmintic trial are shown in Table 12.

Jantana was given orally at dose rate of 10gm per animal on alternate day of 9
naturally infected dairy animals. The anthelmintic action of Jantana was observed from 48 hrs.
after third treatment. Three administrations were given on alternate day of treatment. The mean
reduction epg of mixed infection after treatment was found as 1032.22 to 117.77, 42.22 and nil
with an average of 88.66, 95.93 and 100 per cent on day 3, 4 and 5 post treatment, respectively
<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Species</th>
<th>Total examined</th>
<th>Total positive</th>
<th>percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Haemonchus contortus</td>
<td>683</td>
<td>314</td>
<td>45.97</td>
</tr>
<tr>
<td>2</td>
<td>Strongyloides papillosus</td>
<td>683</td>
<td>143</td>
<td>20.93</td>
</tr>
<tr>
<td>3</td>
<td>Oesophagostomum sp.</td>
<td>683</td>
<td>122</td>
<td>17.86</td>
</tr>
<tr>
<td>4</td>
<td>Trichostrongylus sp.</td>
<td>683</td>
<td>191</td>
<td>27.96</td>
</tr>
<tr>
<td>5</td>
<td>Bunostomum sp.</td>
<td>683</td>
<td>61</td>
<td>8.93</td>
</tr>
<tr>
<td>6</td>
<td>Toxocara vitulorum</td>
<td>683</td>
<td>68</td>
<td>9.95</td>
</tr>
<tr>
<td>7</td>
<td>Trichuris sp.</td>
<td>683</td>
<td>75</td>
<td>10.98</td>
</tr>
<tr>
<td>8</td>
<td>Paramphistomum sp.</td>
<td>683</td>
<td>259</td>
<td>37.92</td>
</tr>
<tr>
<td>9</td>
<td>Fasciola sp.</td>
<td>683</td>
<td>81</td>
<td>11.85</td>
</tr>
<tr>
<td>10</td>
<td>Schistosoma bovis</td>
<td>683</td>
<td>22</td>
<td>3.22</td>
</tr>
<tr>
<td>11</td>
<td>Moniezia sp.</td>
<td>683</td>
<td>48</td>
<td>7.02</td>
</tr>
</tbody>
</table>
Table 11
Statement showing haematological values in naturally infected dairy cattle at Nagpur during the year 1997-98

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Components</th>
<th>Noninfected cattle</th>
<th>Infected cattle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean values</td>
<td>Mean values</td>
</tr>
<tr>
<td>1</td>
<td>Haemoglobin (Hb gm / 100 ml)</td>
<td>11.00</td>
<td>7.47</td>
</tr>
<tr>
<td>2</td>
<td>Packed Cell Volume (PCV %)</td>
<td>30.84</td>
<td>26.49</td>
</tr>
<tr>
<td>3</td>
<td>Total Erythrocyte Count (10^6 / Cu mm)</td>
<td>4.98</td>
<td>3.91</td>
</tr>
<tr>
<td>4</td>
<td>Total Leucocyte Count (10^3 / Cu mm)</td>
<td>7000</td>
<td>5370</td>
</tr>
<tr>
<td>5</td>
<td>Lymphocytes (%)</td>
<td>58.3</td>
<td>50.00</td>
</tr>
<tr>
<td>6</td>
<td>Neutrophils (%)</td>
<td>29.40</td>
<td>32.41</td>
</tr>
<tr>
<td>7</td>
<td>Eosinophils (%)</td>
<td>3.00</td>
<td>8.40</td>
</tr>
<tr>
<td>8</td>
<td>Monocytes (%)</td>
<td>4.00</td>
<td>3.1</td>
</tr>
<tr>
<td>Sr. No.</td>
<td>Drug used</td>
<td>Interval of drug administration</td>
<td>No. of animals used</td>
</tr>
<tr>
<td>--------</td>
<td>-------------------</td>
<td>---------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>1</td>
<td>Jantara (orally)</td>
<td>On alternate day</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>Sonex (orally)</td>
<td>On alternate day</td>
<td>9</td>
</tr>
<tr>
<td>3</td>
<td>Control</td>
<td></td>
<td>9</td>
</tr>
</tbody>
</table>
Table 13

Mean epg in antihelmintic therapy against gastrointestinal helminths in dairy animals at Nagpur during the year 1997-98

<table>
<thead>
<tr>
<th>Group</th>
<th>Eggs per gram of faeces (mean) on days</th>
<th>Percent reduction of eggs on days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Jantana</td>
<td>1032.22</td>
<td>1033.33</td>
</tr>
<tr>
<td>Sonex</td>
<td>1024.44</td>
<td>1013.33</td>
</tr>
<tr>
<td>Unmedicated</td>
<td>1004.00</td>
<td>1002.22</td>
</tr>
</tbody>
</table>
(Table 13). All 9 animals were cured effectively on fifth day of treatment.

Sonex was given orally at recommended dose rate 20gm per animal on alternate day. The anthelmintic activity observed from after third treatment. All 9 animals were cured on sixth day of treatment. The average epg was reduced from 1024.44 to 178.88, 111.77, 28.88 and nil with an average reduction of 82.61, 89.16, 97.26 and 100 per cent on day 3, 4, 5 and 6 post treatment respectively (Table 13).

Dairy animals of unmedicated control group had mixed infections of gastrointestinal helminths and the mean epg was 1004.00, 1002.22, 1000.00, 1105.00, 1011.00, 1030.22 and 1014.40 for day 0, 1, 2, 3, 4, 5 and 6, respectively. Animals of this group showed clinical symptoms such as poor body condition, diarrhoea etc.
DISCUSSION

Since times immemorial man and animals have been companions. The human instinct of love for the animals, use of the various animals has grown naturally as a part of the biological, environmental and ecological history of man’s evolution. Dairy animals are rendering indispensable services mainly of nourishment to man from birth to his last moment of life. With the animals evolution, the nature has also been created some health problems. Animals are prone to various diseases. The edgeovering of diseases especially of parasites origin is governed by climatic factors. The occurrence of such diseases is also varied according to geographical areas, hosts, localities etc. In order to form strategy for effective control of parasitic diseases, the epidemiology forms the foundation. Keeping these points in view the present studies were formulated systematically on same epidemiological aspects of gastrointestinal helminth parasites in dairy animals at Nagpur. The reason and relationship for prevalence of helminths amongst animals was studied with reference to temperature, humidity, seasons, localities, breed, sex and age to know the forces concerning infection.

The percentage of infection existed month to month variation (Table 1), but the overall picture exhibited 63.39 per cent dairy animals were prone for helminthic infection. These findings partially correlate to Maske et al. (1990), who recorded overall 72.99 per cent of helminth infection of domesticated animals in Nagpur, Maharastra. More than fifty per cent of the population was acting as harbourer. July, August, September, November and February of the year showed more than 60 per cent infection, while December, January, March, April and June had less than 60 per cent. October recorded the highest (82.81%) where as May the least (41.66%) Campos et al. (1990) and Krishna et al. (1989) have also recorded observations. According to Barughet et al. (1979), helminth infection was major problem of cattle. The present studies revealed that the percentage of infection and the temperature, relative humidity maximum was correlated (P<0.05), where r1, r2 and r4 was 0.927, 0.769 and 0.638, respectively. This showed that the temperature and relative humidity maximum was significant factor favouring the dairy animals to be remained sensitive to the infection all the year round. The analysis on percentage of infection and humidity minimum was not correlated (P>0.05) indicating that minimum humidity was not important factor favouring the prevalence of helminths.
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The remarkable variability in intensity of infection at private Dairy Farms was observed as compared to the Organised Farms. The prevalence of infection recorded at Private Dairy Farm, Nagpur Vety. College, Cattle Breeding Farm and Agriculture College, Nagpur Dairy Farm was 64.86, 57.74 and 56.14 per cent, respectively (Table 3). The climate factors being identical the probable resason of variation could be different methods of managemental practices. In a Farm, where animals are kept in one group and no proper care of feeding and watering is taken besides allowing the animals to graze on pasture surrounding the tank, there the chances of picking up of infection are more, while at Organised Farms where dairy animals are kept in different pens with appropriate care especially the regular deworming programme besides watering the animals with well-water, the chances of harbouring the infection are comparatively minimized. None of the selected dairy farms were totally free from helminths infection indicating thereby that the gastrointestinal infection was wide-spread. It warrants the situation to take appropriate steps in controlling the infection.

The percentage of positive cases to that of total examined for monsoon, postmonsoon, winter and summer was revealed 72.12, 82.30, 60.46 and 50.21, respectively (Table 4). Many authors (Bouvry and Rau, 1986., Harding and Threfall, 1989., Nowasad et al., 1989., Campos et al., 1990., Ndao et al., 1995., Dutt, 1978., Ray and Tandon, 1991., Tohal and Kaur, 1995) reported occurrence of helminths in season to season variation in India and abroad. In present study postmonsoon appeared to be more conducive in prevalence of gastrointestinal helminths as compared to rest of season of the year, but in all seasons the infection rate was above 50.00 per cent. These observations are in contrast with those describrd by Mathur et al., (1996) and Ray and Tandon (1997), they reported that the infection of cattle helminths occurs more during monsoon than rest of season in Wast Bengal and Meghalaya, respectively. The dairy animals being identical, the probable cause of variation in prevalence of infection could be geographical and environmental features in eastern areas are prevalent. The statistical difference observed in respect of seasons was found to be significant (P<0.05), indicating that the prevalence starts increasing from monsoon, reaches its peak in postmonsoon particularly in month of October and then declines with minimum percentage in summer. Probably, the temperature in the range of 15.82 Oc to 27.12 Oc and exists during postmonsoon might be cause for considerably high infection and warm of temperature and 37.5 to 70.2 per cent humidity during summer season at Nagpur might
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be reason of low gastrointestinal infection. The percentage of seasonal prevalence of infection is in ascending manner from monsoon to maximum in postmonsoon and then descending in summer. This given clue for strategic attack on gastrointestinal infection. Since during the months of postmonsoon there is maximum prevalence of infection followed by monsoon, additionally the winter and summer is also virtually over, the treatment can be recommended.

The data presented (Table5) on the record of prevalence of helminthic infection in crossbred, local cattle and Murrha, Nagpuri buffaloes showed that parasites are deployed in all breeds of dairy animals in remarkable varied frequency. The study encountered the infection of 71.42 and 68.29% in Murrha and Nagpuri buffalo, respectively, while in crossbred and local cattle 61.34 and 58.57 per cent. Dutt (1978) reported occurrence of trematode helminths in cattle and buffaloes in Jabalpur. Krishna et al (1989) reported 50 and 64% per cent prevalence of trematodes in cattle and buffaloes, respectively from Himachal Pradesh, without considering the occurrence of other helminths. Jagannath et al. (1988) reported prevalence of gastrointestinal in dairy cattle and buffaloes from Karnataka, However they not mentioned species intensity. Banerjee et al. (1989) mentioned 20-54% and 13.3-60.00% Schistosome in cattle and buffaloes, respectively. It was observed that the dairy cattle were detected for prevalence of nematodes as well as cestode parasites, while buffaloes were found affected with trematode species only. The higher occurrence of infection in crossbred cattle is in agreement to Sanyal et al. (1992).

Sex, another parameter studied during the period under observation. The prevalence of gastrointestinal helminth infection female, male cattle and female, male buffaloes was 61.68, 55.90 and 70.65, 67.64 per cent, respectively (Table6). No significant variation was observed in sexwise prevalence of gastrointestinal infection in dairy animals at Nagpur.

Regarding age, the infection in below two years, between two to four years, between four to eight years and above eight years in both the dairy animals significantly in variable manner (Table 7and 8). These observations are in close proximity with Jagannath et al. (1988), who reported more occurrence of gastrointestinal parasites in 4 to 8 years age group and least in animals below one year of age in Karnataka.

The variability of infection in types of gastrointestinal helminths from Nagpur recorded,
revealed that the intensity of nematode infection was more followed by trematodes and cestodes (Table 9). The authors (Pal and Balkrishnan, 1987; Jagannath et al. 1989; Krishna et al., 1989; Maske et al. 1990; Islam et al. 1991; Pradhan et al. 1991; Johal and Kaurnapesar, 1995) recorded variable intensity of helminths infection. Average 0.4 to 84 per cent for nematodes, 3.24 to 64.0 per cent trematodes, 0 to 1.0 per cent for cestodes and 36 to 72 per cent for mixed type of gastrointestinal helminth parasites in various parts of India. The present study encountered average 41.80 per cent nematodes, 16.62 per cent trematodes, 1.61 per cent cestodes and 39.95 per cent mixed type helminth parasites (Table 9). The intensity of infection was observed in variable form. The climatic factors at different geographical locations can be the cause for the variable distribution of types of helminth infection.

The study recorded different species viz., Haemonchus contortus (45.97%), Strongyloides papillosus (20.93%), Oesophagostomum radiatum (17.86%), Trichostrongylus axei (27.96%), Bunotomum phlebotomum (8.93%), Toxocara vitulorum (9.95%), Trichuris ovis (10.98%), Paramphistomum sp. (37.92%), Fasciola gigantica (11.85%), Schistosoma bovis (3.22%) and Moniezia sp. (7.02%). The authors (Bremner, 1970; Saad et al., 1980; Campos et al., 1990, Maingi and Gichigi, 1992; Javed et al., 1993; Pal and Balkrishnan, 1987, D’ souza et al., 1988; Krishna et al., 1989 and Pradhan et al., 1991) recorded either single species one type of helminth or more than one to seven species of one type of gastrointestinal helminths infection dairy animals. The present study encountered seven genera with seven species of nematode, three genera each with one cestode. The occurrence of nematode species closely proximated to that of Raman et al. (1996) in Tamilnadu. The study revealed highest prevalence of nematodes (41.62%) followed by trematodes (16.62%) and cestodes (1.61%). It was also noticed that the animals belonging to Private Dairy Farms were more prone to nematode and trematodes infection as compared to dairy animals of Organised farms.

As regards haematological findings, there was significant reduction in haemoglobin, packed cell volume, total erythrocytic count. Differential leucocytic count revealed decrease in lymphocytes, monocytes and neutrophils with significant increase in eosinophils (Table 11). These observations concur with those of Ogurinade and Bamgboye (1980), they mentioned significant decrease in Hb, PCV, TEC and increase in eosinophils in cattle infected with helminths.
Efficacy trials indicated that three applications of Jantana at dose of 10 gm. per animals reduces cent percent epg of helminths in 5 days of treatment of all animals (Table 13). The onset of action of drug was 24 hours after third application. These findings correlate cent percent efficacy of course he was not mentioned the intervals of efficacy. Janatana is known to contain herbal constituents which are antiparasitic in their action and that help in complete cure of gastrointestinal helminths infection of dairy animals.

Sonex, a another herbal preparation given at dose rate of 20 gm. per animals reduced 100 per cent epg of helminths on 6th day of treatment. The onset of anthelmintic action was 24 hours after third application as compared to animals of unmedicated control group continued to show epg.

Current anthelmintic trials of Jantana and Sonex herbal preparation showed no side effects.

In efficacy trials, the Jantana was found to have edge over Sonex anthelmintic.

* to Sharma (1983), who reported
Summary

The studies conducted on prevalence of gastrointestinal helminth parasites in dairy animals during the period from November, 1977 to October 1998 in the University Department of Parasitology, Nagpur Veterinary Collage, Nagpur, revealed that:

1) Of the 683 animals examined, 433(63.39%) harboured gastrointestinal helminth parasites.

2) The infection at Private Dairy Farms, Nagpur Veterinary Collage, Cattle Breeding Farm and Agriculture College Dairy Farm was 64.86, 57.74 and 56.14 per cent, respectively.

3) The seasonal studies showed that the infection was 72.12, 82.30, 60.46 and 50.21 per cent in monsoon, postmonsoon, winter and summer, respectively.

4) The infection in cross-bred and native cattle was 61.34 and 58.57 per cent, respectively, while the percentage of infection in Murrha and Nagpuri buffalo was 71.42 and 68.29 per cent, respectively.

5) The percentage of infection in female and male cattle was 61.68 and 55.90 per cent, respectively, while in female and male buffalo, the infection was 70.65 and 67.64 per cent, respectively.

6) The severity of infection in below two years, between two to four years, between four to eight years and above eight years cattle was 47.22, 57.28, 63.01 and 66.14 per cent, respectively, while the percentage of infection in below two years, between two to four, four to eight and above eight years buffalo was 59.52, 65.51, 71.42 and 80.39 per cent, respectively.

7) In species wise prevalence of helminths, Haemonchus sp. were highest (45.97%) followed by Paramphistomum sp. (37.92%), Trichostrongylus sp. (27.96%), Strongyloides papillosus (20.93%), Oesophagostomum sp (17.86%), Fasciola sp. (11.85%) Trichuris sp. (8.93%), Toxocara sp. (9.95%), Bunostomum sp. (8.93%), Moniezia sp. (7.02%) and Schistosoma sp. (3.22%).

8) Infected animals showed significant reduction in Hb, PCV, TEC, TLC, lymphocytes, monocytes, neutrophils with significant increase in eosinophils.

9) In herbal anthelmintic trials, three applications of Jantana at dose 10 gm. per animal reduced cent percent epg on 5th day at treatment. The efficacy of ‘Sonex’ at dose 20 gm. Per animal was 100 per cent on 6th day at treatment, the onset of anthelmintic action in both the drugs was 24 hours after 3rd treatment.

10) In efficacy trials, ‘Jantana’ was found superior to ‘Sonex’ herbal anthelmintic.
Conclusions

1) Overall prevalence of gastrointestinal helminths in dairy cattle at Nagpur was 63.39%.
2) Infection was more in Private Dairy Farms than in Organised farms.
3) Infection was more in post monsoon followed by monsoon, winter and summer season.
4) Infection was more in crossbred than in native cattle.
5) Infection in Murra buffaloes was more than in Nagpuri.
6) Infection was more in female cattle and female buffaloes than in male cattle and male buffaloes.
7) Adult cattle and buffaloes harboured more infection than young ones.
8) Prevalence of nematode was more than trematode and cestode helminths.
9) Infected animals showed reduction in Hb, PCV, TEC, TLC, Lymphocytes, Monocytes, Neutrophils and increase in Eosinophils.
10) ‘Jantana’ found superior to ‘Sonex’ herbal anthelmintic.
ABSTRACT

Prevalence and drug therapy of gastrointestinal helminths infection in dairy animals studied during November, 1997 to October, 1998 at Nagpur indicated that:

1. Of the 683 animals examined, 433 (63.39%) harboured gastrointestinal helminth parasites. (2) The infection at Private Dairy Farms, Nagpur Veterinary Collage, Cattle Breeding Farm and Agriculture College Dairy Farm was 64.86, 57.74 and 56.14 per cent, respectively. (3) The seasonal studies showed that the infection was 72.12, 82.30, 60.46 and 50.21 per cent in monsoon, postmonsoon, winter and summer, respectively. (4) The infection in crossbred and native cattle was 61.34 and 58.57 per cent, respectively, while the percentage of infection in
Murrha and Nagpuri buffalo was 71.42 and 68.29 per cent, respectively. (5) The percentage of infection in female and male cattle was 61.68 and 55.90 percent, respectively, while in female and male buffalo, the infection was 70.65 and 67.64 per cent, respectively. (6) The severity of infection in below two years, between two to four years, between four to eight years and above eight years cattle was 47.22, 57.28, 63.01 and 66.14 per cent, respectively, while the percentage of infection in below two years, between two to four, four to eight and above eight years buffalo was 59.52, 65.51, 71.42 and 80.39 per cent, respectively. (7) In specieswise prevalence of helminths, Haemonchus contortus were highest (45.97%) followed by Paramphistomum sp. (37.92%), Trichostrongylus sp. (27.96%), Strongyloides papillosus (20.93%), Oesophagostomum sp. (17.86%), Fasciola sp. (11.85%) Trichuris sp. (8.93%), Toxocara sp. (9.95%), Bunostomum sp. (8.93%), Moniezia sp. (7.02%) and Schistosoma sp. (3.22%) (8) Infected animals showed significant reduction in Hb, PCV, TEC, TLC, lymphocytes, monocytes, neutrophils. (9) In herbal anthelmintic trials, three applications of Jantana at dose 10 gm. per animal reduced cent percent epg on 5th day at treatment. The efficacy of ‘Sonex’ at dose 20 gm. per animal was 100 per cent on 6th day at tratament, the onset of anthelmintic action in both the drugs was 24 hours after 3rd treatment. (10) In efficacy trials, ‘Jantana’ was found superior to ‘Sonex’ herbal anthelmintic.
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