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Efficacy of anthelmintics against gastrointestinal nematodes of pigs in Tripura, India

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ABSTRACT

Pig husbandry plays a pivotal role in providing subsidiary source of income to the economically weaker section of people in rural areas of Tripura, a north-eastern state of India. However, gastrointestinal (GI) nematode infection is one of the prime constraints in profitable pig husbandry in the state. Though, anthelmintic drugs are commonly used in treatment of such cases, reduced effectiveness has been observed for some of the commonly used drugs. Therefore, the present study was conducted to assess the efficacy of four common anthelmintics *viz.,* albendazole, fenbendazole, ivermectin and piperazine on GI nematodes of pigs in Tripura using faecal egg count reduction test (FECRT). Fecal samples were collected from a total of 50 randomly selected pigs at pre-treatment and 10-days post-treatment. The highest FECR percent was shown by ivermectin (97.32%) and the lowest by albendazole (88.39%). The results indicate the effectiveness of ivermentin and at the same time, development of resistance against albendazole in GI nematodes of pigs in the study area. This is the first ever report on efficacy of the anthelmintic drugs on GI nematodes of pigs in Tripura. The study provides baseline information which can be further confirmed by using molecular techniques.

Keywords: Anthelmintics, Efficacy, Gastrointestinal nematodes, Pigs, Tripura

In Tripura, a north-eastern state of India, pig husbandry plays a crucial role in providing economic support to the weaker section of people. Pigs suffer from various infectious diseases including gastrointestinal (GI) parasitic infection, of which nematodes are very common and one of the major causes of loss in pigs' production worldwide including Tripura (Joachim *et al*. 2001, Nsoso *et al*. 2000, Das *et al*. 2024). In profitable pig husbandry, the GI nematode infections are major constrain mostly due to their effects on average body weight gain, poor performance and development of clinical diseases (Ajayi *et al.* 1988, Roepstorff *et al*. 2011). In Tripura, the GI nematode infections are mostly caused by *Ascaris* spp., *Strongyloides* spp., *Trichuris* spp. (Das *et al*. 2024).

To control the GI nematode infections in pigs, anthelmintic drugs are very frequently used. An anthelmintic drug that eliminates ≥ 95% of GI nematode burden from animals is considered to have good efficacy. Among the anthelmintic drugs, albendazole, fendazole, ivermectin and piperazine are most commonly used against the GI nematode infections in Tripura. Resistance against anthelmintic drugs had been reported in pigs and other domestic species worldwide including India (Kagira *et al*. 2003, Jeyathilakan *et al*. 2013, Chagas *et al*. 2013, Chandra *et al*. 2015, Idika *et al*. 2017, Pettersson *et al*. 2021). Though these drugs are not toxic and are very frequently administered, their efficacy to reduce the load of GI parasites in pigs have been observed to be reduced to varying degree in this region. Frequent and indiscriminate treatment with anthelmintics increases the emergence of anthelmintic resistant nematode species and are often become responsible for such reduced efficacy of anthelmintic drugs (Shalaby 2013).

Since anthelmintic resistance causes huge economic loss to the pig farmers and development of anthelmintic resistance in GI nematodes is inevitable owing to frequent and indiscriminate use of anthelmintics, regular monitoring of the efficacy of the commonly used anthelmintics is of utmost importance. However, systematic studies on the status of anthelmintic resistance in GI nematodes of pigs has not yet been conducted in Tripura. Therefore, we conducted the present study to assess the efficacy of four common anthelmintics against GI nematodes of pigs in Tripura.

MATERIALS AND METHODS

Study area: The present study was conducted in different districts of Tripura which is a state in the north-eastern region of India. The state is situated between 22°7' and

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24°2' North latitudes and 91°0' and 92°0' East longitudes and it is having Tropic of Cancer passing through it. These areas are having large pig population which plays an important role in the rural economy. Pig farming in this state is mostly done by the small and marginal farmers and also by the landless laborers and the demand for pork is also very high.

Selection of animals and collection of samples: A total of 304 pigs, above four months old, were screened for the presence of gastrointestinal nematode eggs by qualitative faecal examination using standard salt floatation technique (Soulsby 1982). All the pigs that were subjected to the study in the selected places were maintained under semi-intensive farming system. The pigs that were found positive for nematode eggs were subjected to quantitative faecal examination and those having faecal egg count i.e. Eggs per gram of faeces (EPG) ≥ 150 were individually identified by neck banding. Fifty (50) such pigs that were not treated with anthelmintics for last 2 months prior to the study were randomly selected for evaluation of anthelmintic resistance in this study. The entire work involved in the study was carried out in laboratory of Department of Veterinary Parasitology of the College of Veterinary Sciences & Animal Husbandry at R. K. Nagar, Tripura.

Selected pigs (N=50) were randomly divided into five equal groups for evaluating four selected commonly used anthelmintics as mentioned in Table 1. The commercially available albendazole, fenbendazole, ivermectin and piperazine were used. in this study. The pigs of all the groups were separately identified by individual neck-tag. The pigs were treated with respective anthelmintics as per the recommended doses of the manufacturer and as per their individual body weight. Per rectal faecal samples were collected twice at 3 days interval for pre-treatment group and after 10 days of anthelmintic treatment for post-treatment group as per the recommendation of Coles *et al*. (2006).

Faecal egg count: All the faecal samples were analyzed quantitatively by Mc. Master technique (Soulsby 1982). Faecal egg count was expressed as eggs per gram (EPG). The total egg count in two chambers of a McMaster slide was multiplied with 50 for getting the EPG of faeces. Susceptibility to the anthelmintics was assessed using the FECRT. The efficiency of the Anthelmintics was calculated based on the FECR (%) following the methods described by Coles *et al*. (1992).

Percent efficacy (%):

$$\frac{\text{Mean EPG in the control group - Mean EPG in the treated group}}{\text{Mean EPG in the control group}} \times 100$$

The FECR percentage less than 95% for an anthelmintic treatment was considered as the presence of resistance.

Statistical analysis: Changes in FECRT results were presented as the percentage. statistically significance was considered for a difference with value $p<0.01$. To determine presence or absence of significant difference in egg count among the different groups, Analysis of variance (ANOVA) was performed. Statistical Package for the Social Sciences (SPSS), Version 25 software (SPSS Inc., Chicago, IL, USA) was used for performing the Duncan's multiple range tests to determine differences between various treatment group means.

RESULTS AND DISCUSSION

The efficacy of four common anthelmintics viz Albendazole, Fenbendazole, Ivermectin and Piperazine was evaluated against naturally occurring GI nematodosis in pigs. The faecal egg count (Mean ± SE) and the efficacy of all four anthelmintics on G.I. parasites in pigs is shown in the Table 1. The efficacy of the anthelmintic was determined on the basis of FECR ability as compared untreated control groups of pigs. It was evident that the pre-treatment EPG for all the groups differed non-significantly ($p>0.05$). However, the post-treatment EPG was significantly different ($p<0.01$) in all the treatment groups except the untreated control. The post treatment EPG were also significantly ($p<0.01$) different between the treatment groups. The post-treatment EPG was significantly ($p<0.01$) higher in untreated control group (560 ± 23.333) as compared to all the treated groups. The lowest post treatment EPG was observed in Ivermectin treatment group (15±7.638) followed by fenbendazole (30 ±11.055), piperazine (35 ± 10.672) and albendazole (65±16.750). The highest efficacy was also observed in the ivermectin treatment group (97.32%) followed by fenbendazole (94.65%), piperazine (93.75%) and albendazole (88.39%). The result in Table 1 showed that treatment with only a single-dose of ivermectin produced

Table.1. Percentage of Faecal egg count reduction in Pigs treated with selected anthelmintics in Tripura, India

Group	Anthelmintic drug	Dose and route	Mean (± SE) EPG of different groups			*p* value
			Pre-treatment	10th day post- treatment	Efficacy (%)	
Gr – 1	Albendazole	10 mg/kg bwt, orally	520 ± 28.087^{xa}	65 ± 16.750^{yb}	88.39	$p<0.01^{*}$
Gr – 2	Fenbendazole	10 mg/kg bwt, orally	510 ± 16.330^{xa}	30 ± 11.055^{yzb}	94.65	$p<0.01^{*}$
Gr – 3	Ivermectin	0.3 mg/kg bwt, orally	515 ± 23.629^{xa}	15 ± 7.638^{zb}	97.32	$p<0.01^{*}$
Gr – 4	Piperazine	110 mg/kg bwt, orally	535 ± 15.000^{xa}	35 ± 10.672^{yzb}	93.75	$p<0.01^{*}$
Gr- 5	Untreated control	No treatment	535 ± 23.629^{xb}	560 ± 23.333^{xa}	-	$p>0.05$
p value			$p> 0.05$	$p< 0.01^{*}$		

N.B. Values bearing different superscripts x, y and z in a column and a and b in a row differ significantly, *Denotes statistically significant *p* value ($p< 0.01$)

reduction of the eggs over 95% while fenbendazole and piperazine also gave satisfactory result except albendazole. Therefore, the GI nematode population in pigs in the study area was considered susceptible to ivermectin but resistant to albendazole. Developing trend of resistance was also indicated against fenbendazole and piperazine.

Parasitic infection caused by GI nematodes is one of the most common occuring infections and is a prime cause of loss in domestic pig production. Till date, the Control strategies against these parasites rely mostly on routine use of different anthelmintic products. The present findings on the efficacy of the commonly used anthelmintics are in accordance with the reports of Ayoade *et al*. (2003), RUMA (2010) and Idika *et al*. (2017). They reported rare resistance to avermectin or benzimidazole in pig GI nematodes possibly due to the lesser parasite burdens and limited use of anthelmintic drugs in pigs, compared to ruminants. The pigs used in the present study for evaluating anthelmintics did not received regular anthelmintic treatments. However, fenbendazole and ivermectin drugs are sometime used by the farmers to manage both ecto and endo parasites, due to their high efficacy and wide range of effectiveness against parasites (Holden-Dye and Walker 2006). Further, they are also comparatively non-toxic, and have sustained effects in animals (Lankas and Gordan 1989, Omura and Crump 2014).

Albendazole, in present study, was found to be less effective against GI nematodosis in pigs. The development of resistance is an predictable outcome of use of anthelmintics (Jackson 1993). The availability of the anthelmintics in market without the prescription of registered veteriarian in the present study area also leads to indiscriminate use of these common anthelmintics in all the livestock species including pigs. This is one of the major factors which in long run contributes to the development of resistant parasitic populations. Hence, adequate measures need to be taken in the use of the anthelmintic drugs that are still effective against GI nematodes in pigs in the study area to check the selection pressure being imposed on the resistant genes.

The study provides baseline data on the efficacy of common anthelmintics on GI nematodes of pigs. However, molecular detection techniques can be employed for further confirmation for the presence of resistant genes in the GI nematode population in pigs in the study area.

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REFERENCES

Ajayi J A, Arabs W L and Adeleye G. 1988. Helminths and protozoa of pigs on the Jos Plateau, Nigeria: occurrence, age incidence and seasonal distribution. *Bulletin of animal health and production in Africa* **36**: 47-54.

Ayoade G O, Adejinmi J O, Abiola J O and Lucas F. 2003. Efficacy of some anthelmintics used in Porcine practice in Ibadan, Nigeria. *African Journal of Biomedical Research* **6**(2): DOI: 10.4314/ajbr.v6i2.54035.

Chagas A C S, Katiki L M, Silva I C, Gigliotti R, Esteves S N, Oliveira M C S and Júnior W B. 2013. *Haemonchus contortus*: A multiple-resistant Brazilian isolate and the costs for its characterization and maintenance for research use. *Parasitology International* **62**(1):1-6.

Chandra S, Prasad A, Yadav N, Latchumikanthan A, Rakesh R L, Praveen K, Khobra V, Subramani K V, Misri J and Sankar M. 2015. Status of benzimidazole resistance in *Haemonchus contortus* of goats from different geographic regions of Uttar Pradesh. India. *Veterinary Parasitology* **208**: 263-267.

Coles G C, Bauer C, Borgsteede F H, Geerts S, Klei T R, Taylor M A and Waller P J. 1992. Methods for the detection of anthelmintic resistance in nematodes of veterinary importance. *Veterinary Parasitology* **44**: 35-44.

Coles G C, Jackson F, Pomroy W E, Prichard R K, von Samson-Himmelstjerna G, Silvestre A, Taylor M A and Vercruysse J. 2006. The detection of anthelmintic resistance in nematodes of veterinary importance. *Veterinary Parasitology* **136**: 167-85.

Das S, Pandit S, Jas R, Baidya S, Mandal SC, Debbarma A, Batabyal S and De A. 2024. Prevalence of gastrointestinal parasitism in pigs of Tripura, India. *Journal of Parasitic Diseases* **48**: 108-16.

Holden-Dye L and Walker R J. 2006. Actions of glutamate and ivermectin on the pharyngeal muscle of Ascaridia galli: a comparative study with *Caenorhabditis elegans*. *International Journal of Parasitology* **36**: 395-402.

Idika I K, Nwauzoije H C, Uju CN, Ugwuoke C and Ezeokonkwo R C. 2017. Efficacy of ivermectin against gastrointestinal nematodes of pig in Nsukka area of Enugu State, Nigeria. *Veterinary Parasitology: Regional Studies and Reports* **10**: 39-42.

Jackson F. 1993. Anthelmintic resistance - the state of play. *British Veterinary Journal* **149:** 123-38.

Jeyathilakan N, Radha G, Gomathinavagam S and John L. 2013. Emergence of anthelmintic resistance in G.I nematodes of sheep in Tamil Nadu. *Journal of Veterinary Parasitology* **17**: 159-60.

Joachim A, Dülmer N, Daugschies A and Roepstorff A. 2001. Occurrence of helminths in pig fattening units with different management systems in Northern Germany. *Veterinary Parasitology* **96**(2): 135-46.

Kagira J, Kanyari P, Munyua W and Waruiru R M. 2003. The Control of Parasitic Nematodes in Commercial Piggeries in Kenya as Reflected by a Questionnaire Survey on Management Practices. *Tropical Animal Health and Production* **35**: 79-84.

Lankas C R and Gordan L R. 1989. *Toxicology in Ivermectin and Abamectin*. Pages 89-112. Campbell, W.C. (Ed.), Springer-Verlag, New York.

Nsoso S J, Mosala K P, Ndebele R T and Ramabu S S. 2000. The prevalence of internal and external parasites in pigs of different ages and sexes in Southeast District, Botswana. *Onderstepoort Journal of Veterinary Research* **67**: 217-20.

Omura S and Crump A. 2014. *Ivermectin: Panacea for resource-*

poor communities? *Trends in Parasitolgy* **30** (9): 445-55.

Pettersson E, Halvarsson P, Sjölund M, Grandi G, Wallgren P and Höglund J. 2021. First report on reduced efficacy of ivermectin on *Oesophagostomum* spp. on Swedish pig farms. *Veterinary Parasitology: Regional Studies and Reports* **25**: 100598.

Roepstorff A, Mejer H, Nejsum P and Thamsborg S M. 2011. Helminth parasites in pigs: New challenges in pig production and current research highlights. *Veterinary Parasitology* **180**(1–2): 72-81.

RUMA. 2010. Anthelmintics in pigs. A guideline of the Responsible use of medicines in agricultural alliance (RUMA). Retrieved from. http://www.ruma.org.uk/wpcontent/uploads/2014/09/RUMA-Pig-Anthelmintics_pigs_Long_2010.pdf

Shalaby H A. 2013. Anthelmintics Resistance; How to Overcome it? *Iranian Journal of Parasitology* **8**(1): 18-32.

Soulsby E J L. 1982. Helminths, Arthropods and Protozoa of domesticated animals (7th Edn.). Elsevier, New Delhi.