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Anthelmintic Efficacy of *Ocimum sanctum* Against *Syphacia muris* in Mice

[1]S. Verma, [2]S. Gaherwal, [1]M.M. Prakash and [3]R.R. Kanhere

[1]Department of Zoology, Govt. Holkar Science College, Indore (M.P.) India
[2]Department of Biotechnology, Govt. Holkar Science College, Indore (M.P.) India
[3]Departmentof Zoology, Govt. Bheema Nayak P.G. College, Barwani (M.P.) India

Abstract: The objective of this study was to investigate the anthelmintic efficacy of herbal drug (*Ocimum sanctum*) in *Syphacia muris* infected mice. The drugs were administrated to the infected mice on 18th, 19th and 20th post infection days. The % efficacy due to test drug was observed on larva and adult worm recovery response. Larval and Adult worm recovery were found to be directly proportional to the doses of drug. Larval and Adult worm recovery response was maximum (40 and 26) and minimum (16 and 9) in *Ocimum sanctum* treated mice. Significant decrease in worm recovery (larval and adult) due to test drug indicates the anthelmintic efficacy of *Ocimum sanctum*. Obtained results indicate that studied drug can be good anthelmintic/ nematocidal agent.

Key words: *Ocimum sanctum* · *Syphacia muris* · Adult · Larval recovery and Anthelmintic efficacy

INTRODUCTION

Syphacia muris the rat pinworm is an oxyurid nematode which occurs in the cecum and colon of laboratory rodents. Although infection is generally nonpathogenic in immunocompetent animals, pinworm infections may have deleterious effects on behavior, growth, intestinal physiology and immunology [1]. Clinical signs associated with heavy infestations include rectal prolapse,intussusception, faecal impaction and diarrhoea [2]. *Syphacia muris* is considered to be common in the laboratoryrats and the wild rats [3]. Gravid female worms migrate from the cecum or the colon to the perianal region of the host, deposit adhesivecoated embryonated eggs on the skin, then dry up and die. The eggs become infective within 6–24 h and they are very light and will aerosolize, resulting in widespread environmental contamination [1]. Parasitism and gastrointestinal nematode parasitism in particular, is arguably the most serious constraint affecting small ruminant production worldwide. Economic losses are caused by decreased production, cost of prevention, cost of treatment and the death of infected animals [4-9].

Helminthiasis is one of the most important animal diseases worldwide, inflicting heavy production losses in grazing animals. The disease is especially prevalent in developing countries in association with poor management practices and inadequate control measures. An integrated approach is required for the effective control of helminthes which includes strategic and tactical use of anthelmintics and careful management of grazing lands, including control of stocking rates and appropriate rotation strategies [10]. However, problems have emerged with the use of anthelmintics, notably the development of resistance in helminthes [11]. In addition, recognition of the antigenic complexity of parasites has slowed vaccine development. For these various reasons, interest in the screening of medicinal plants for their anthelmintic activity remains of great scientific interest despite extensive use of synthetic chemicals in modern clinical practices all over the world. The plant Kingdome is known to provide a rich source of botanical anthelmintics, antibacterial and insecticides [12-13]. A number of medicinal plants have been used to treat parasitic infections in man and animals [14-16]. In this paper, studies on anthelmintic evaluation of *Ocimum sanctum* plants indigenous to India have been reviewed.

MATERIALS AND METHODS

Experimental Animals: The mice were obtained from the College of Veterinary Science and Animal Husbandry, Mhow (M.P.) and were kept in the animal house under local conditions of light, temperature and ventilation.

Corresponding Anothr: Santosh Gaherwal, Department of Biotechnology, Govt. Holkar Science College, Indore (M.P.) India.

Inbreed Swiss albino mice, *Mus musculus albinus,* 7-9 weeks old and 18-20 gms in weight were selected as the experimental animals. Only those animals which were not having any kind of helminthic infection were selected for the present study. These were kept in sterilized cages with dry husk padding and were fed daily with standard balanced diet.

Maintenance of *S. muris*: *Syphacia muris* was selected as a test parasite. It was obtained from Helminthology laboratory, Department of Zoology, Govt. Model Autonomous Holkar Science College, Indore. *S. muris* is being maintained in the helminthology laboratory by serial passage in healthy mice. Animals from different groups were sacrificed under mild ether anesthesia on 21st day post infection and mature worms from gastrointestinal tract were isolated according to the method of Soh [17]. The adult mature worms were collected from the ceacum and counted.

Experimental Groups: Total 25 mice were used for experiments. Experiments were carried out in the following three groups of mice:

- Control Group I: Non infected and non treated. For this 5 mice were used.
- Control Group II: Infected and non treated. For this 5 mice were used.
- Experimental Groups: Infected and treated with the test drugs. For this 15 mice were used.

Test Drugs: The 100 eggs of *S. muris* were fed to each mouse. After inoculation, mice were kept in cages in groups according to the design of experiments and were fed routinely with the standard diet. *Ocimum sanctum* (Tulsi leaf powder) was selected as the test drug. The different doses 0.005 mg/ml, 0.01 mg/ml and 0.02 mg/ml of proposed drug were administrated in powdered form to the infected mice orally to assess their chemotherapeutic efficacy. The drug treatment was given on 18th, 19th and 20th post infection days.

Evaluation of the Efficacy of Drug: Efficacy of the drug was evaluated on the basis of reduction in the worm burden. The worm burden recovered from experimental and control groups were noted and the percent efficacy of the drug was calculated. The efficacy of the drug was determined according to the method of Steward [18] applying the following formula:

Percent efficacy of the drug / per cent protection = $\frac{N-n}{N} \times 100$

where,

N = Mean worm recovery in control mice.

n = Mean worm recovery in experimental (drug treated) mice.

RESULTS

Larval and Adult Worm Recovery: The level of therapeutic efficacy was assessed on the basis of reduction in worm-burden in various experimental groups treated with *Ocimum sanctum* (Tulsi). Results of larval and adult worm recovery in various experimental groups are summarized in Table (1) and presented by Figure (1).

The mean recovery and per cent efficacy deferred significantly when treated with various doses of drug. In control i.e., infected and non treated mice worm burden (Larva and Adult worm) was found to be (68 and 54) on 10th and 21st day post infection.

Mice were treated with *Ocimum sanctum* (Tulsi), maximum larval and adult worm burden (40 and 26) and minimum (16 and 9) were found at the doses of 0.005 mg/ml and 0.02 mg/ml on 10th and 21st day post infection. Per cent efficacy were found to be (41, 67 and 76%) on the 10th days post infection and (51, 70 and 83%) on 21st days post infection at the doses of 0.005 mg/ml, 0.01 mg/ml and 0.02 mg/ml respectively. This states that the level of per cent efficacy was directly proportional to the dose of drug. All the results obtained were statistically significant.

Thus a remarkable decrease in larval and adult worm burden was observed in all the experimental mice treated with herbal drug (*Ocimum sanctum*). Obtained results indicate that studied drug can be good anthelmintic/ nematocidal agent.

DISCUSSION

The pinworm, *Syphacia muris, Syphacia obvelata* and *Aspicularis tetraptera,* are common parasites of laboratory rodents. The innocuous reputation of pinworms in rodents is at least questionable as they have been thought to affect weight gain and growth rate, in addition various disorders of the intestine have been attributed to pinworm [19-23]. Despite the wide prevalence of pinworm infection, its chemotherapy has remained surprisingly backward during the past decade.

Table 1: Worm recovery from *S. muris* infeted mice, treated with different doses of *Ocimum sanctum* (Tulsi)

			Average no. of larva recovered on 10th p.i. days ± S.D.			Average no. of adult recovered on 21st p.i. days		
Group No.	Groups	Doses in mg/ml	Mean recovery ± S.D.	% Infection	% Efficacy	Mean recovery ± S.D.	% Infection	% Efficacy
1	$NINTC_1$	-	-	-	-	-	-	-
2	INTC2	-	68 ± 3.61	68	-	54 ± 2.65	54	-
3	$ITTU_1$	0.005	40 ± 2.65	40	41	26 ± 3.61	26	51
4	$ITTU_2$	0.01	22 ± 1.73	22	67	16 ± 3.61	16	70
5	$ITTU_3$	0.02	16 ± 3.00	16	76	9 ± 3.00	9	83

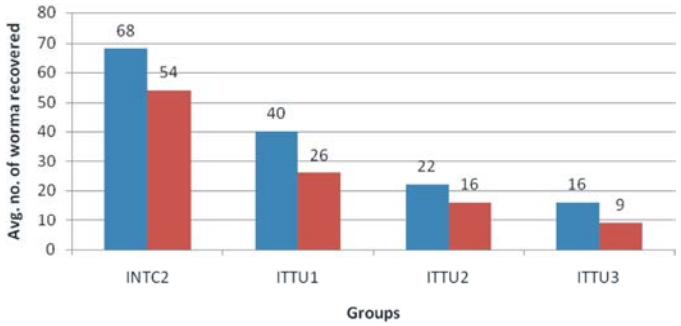

Fig. 1: Showing worm recovery from *S.muris* infected mice, treated with different doses of *Ocimum sanctum*

$NINTC_1$ -- Non infected non treated control-1.
INTC2 - Infected non treated control-2.
$ITTU_1$ - Infected and treated with 0.005 mg/ml. *Ocimum sanctum* (Tulsi) on 18th 19th and 20th p.i. days.
$ITTU_2$ - Infected and treated with 0.01 mg/ml. *Ocimum sanctum* (Tulsi) on 18th 19th and 20th p.i. days.
$ITTU_3$ - Infected and treated with 0.02 mg/ml. *Ocimum sanctum* (Tulsi) on 18th 19th and 20th p.i. days.
P. I. - Post infection days.
± S.D. - Standard Deviation

No dependable and effective drug has yet been discovered against the pinworm. Majority of the available anticestode agents do not fulfill the requirement of an ideal drug.

Ocimum sanctum has been used for thousands of year in Ayurveda for its medicinal properties. Anthelmintic activity of *Ocimum sanctum* against gastrointestinal nematodes has been evaluated by many authors [24-29]. *O. sanctum* showed increasing antibody production. It may be due to the release of mediators of hypersensitivity reactions and tissue responses to these mediators in the target organs as described by Godhwani [30] The same results were obtained in the methanol extract and aqueous suspension of *Ocimum sanctum* leaves by Mediratta [31, 32]. Both humoral and cell mediated immune response of *Ocimum sanctum* seed oil was proved by Mitra [33]. In the present investigation *ocimum sanctum* leaf powder was found to be effective in the eradication of larva (10th days) and adult worm (21st days) at the dose of 0.02 mg/ml body weight in three days consecutive treatment.

Thus, in the light of available literature and result of present investigation it can be derived that *Ocimum sanctum* is an ideal drug for the treatment of wide variety of nematode infections. Thus it can be used as broad-spectrum anthelmintic. It can also be used in controlling the spread of mixed helminthic infections as it exhibited excellent prophylactic potential too.

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