INTERNATIONAL JOURNAL OF AGRICULTURE & BIOLOGY
1560-8530/99/01-3-121-124

Evaluation of Anthelmintic Activity of *Chenopodium album* (Bathu) Against Nematodes in Sheep

MUHAMMAD SHOAIB AKHTAR, ZAFAR IQBAL† AND MUHAMMAD NISAR KHAN†
Departments of Physiology and Pharmacology, and †Veterinary Parasitology, University of Agriculture, Faisalabad-38040, Pakistan

ABSTRACT

Chenopodium album in powder or water and methanol extract form @ 2 g/Kg bw reduced significantly ($P<0.05$) the eggs per gram of faeces (EPG) counts on day 10–15 post-treatment. The water extract in amount representing 2 g/Kg of the powder resulted in per cent EPG reduction non-significantly ($P>0.05$) different from that produced by morantel. This indicated that *C. album* as water extract @ representing 2 g/Kg bw powder is as effective as morantel at recommended doses. The glycosides of *C. album* given orally to the sheep suffereing from gastrointestinal nematodes @ 50 mg/Kg bw reduced the EPG count significantly on day 10 and 15 PT; while 100 mg/Kg bw reduced the EPG count significantly ($P<0.05$ or 0.001) on all the days. Statistically 100 mg/Kg dose produced per cent EPG reduction similar to the respective values of Oxfendazole treated group on days 10 and 15, respectively.

Key Words: Anthelmintic activity; *Chenopodium album*; Nematodes; Sheep

INTRODUCTION

Helminthiasis is among the most important animal diseases inflicting heavy production losses. The disease is highly prevalent particularly in third world countries (Dhar *et al.*, 1982) due to poor managemental practices. Therefore, multidimensional approaches are in practice for an effective control of helminths. These include periodical use of anthelmintics and vaccination programs coupled with improved management. However, increasing problems of development of resistance in helminths (Waller & Prichard, 1985) against anthelmintics, chemical residual/toxicity problems (Kaemmerer & Butenkotter, 1973) and antigen complexity of parasites have led to the proposal of screening medicinal plants for their anthelmintic activity. Despite extensive use of synthetic chemicals in modern clinical practices all over the world, interest in exploiting potential of plants as a source of drugs have not waned. The plants are known to provide a rich source of botanical anthelmintics, antibacterials and insecticides (Satyavati *et al.*, 1976; Lewis & Elvin-Lewis, 1977). A number of medicinal plants have been used to treat parasitic infections in man and animals (Nadkarni, 1954; Chopra *et al.*, 1956; Said, 1969). This paper describes the anthelmintic activity of *Chenopodium album* (Bathu) against nematodes of sheep.

MATERIALS AND METHODS

Preparation of plant drugs. The aerial parts of *C. album* were collected, air dried under shade and ground using a household grinder. The powder was used as such or its water and methanol extracts were prepared for anthelmintic activity evaluation. Water extracts of the powdered plants were prepared by soaking a known weight of the powedered plant drug in water overnight in distilled water. Then sieved through musclin cloth to obtain aqueous extract of a known strength. This extract was administered orally to the animals at the dose level {2 g/Kg bw (body weight)} equivalent to the maximum effective dose of the powdered plant drug. Alcoholic extracts of the powdered plant drugs were prepared by using the Soxhlet's apparatus. The methanol extract was obtained by the complete removal of solvent by evaporation. The evaporated residues so obtained were weighed and suspended in 2% gum tragacanth solution and administered at dose equivalent to the highest effective dose (2 g/Kg bw) level of the powdered drug.

Phytochemical analysis

Detection of alkaloids. The presence of alkaloids was checked by the Dragendrorf's reagent (Harborne, 1963), Mayer's reagent (Mayer, 1963) and Wagner's reagent (Jenkins *et al.*, 1967). Then extracts were prepared for the detection and/or quantitative analysis of alkaloids by using Culvenor and Fitzyerald (1963), and Brain and Turner (1975) methods.

Detection of glycosides, anthraquinones and saponins. These chemical entities were extracted by methods used by Brain and Turner (1975), and Akhtar (1988).

Trial # 1. Forty two sheep naturally parasitised with different species of nematodes (*Haemonchus contortus, Ostertagia circumcincta, Bunostomum trigonocephalum, Trichuris ovis, Oesophagostomum venulosum)* were procured from field. The animals were divided into seven equal groups as follows:

I. Untreated control group
II. Treated with Morantel tartrate[1] @ 10 mg/Kg bw
III. Treated with *C. album* powder @ 1 g/Kg bw
IV. Treated with *C. album* powder @ 1.5 g/Kg bw
V. Treated with *C. album* powder @ 2.0 g/Kg bw
VI. Treated with *C. album* water extract equivalent to 2.0 g/Kg bw
VII. Treated with *C. album* methanol extract equivalent to 2.0 g/Kg bw

Trial # 2. Thirty sheep naturally parasitised with different species of nematodes (*Haemonchus contortus, Ostertagia circumcincta, Bunostomum trigonocephalum, Trichuris ovis, Oesophagostomum venulosum)* were procured from field. The animals were divided into five equal groups as follows:

I. Untreated control group
II. Treated with Oxfendazole[2] @ 4.5 mg/Kg bw
III. Treated with *C. album* glycoside content @ 25 mg/Kg bw
IV. Treated with *C. album* glycoside content @ 50 mg/Kg bw
V. Treated with *C. album* glycoside content @ 100 mg/Kg bw

Observations

Eggs per gram of faeces (EPG). EPG were counted in all the animals at day 0, 3, 10 and 15 post–treatment (PT) according to the procedure described by Soulsby (1982). The per cent reduction in the EPG was calculated as follows:

$$\% \text{ EPG reduction} = \frac{EPG(PreT) - EPG(PT) \times 100}{EPG(PreT)}$$

Where

EPG (PreT)= EPG before treatment

EPG(PT)=EPG post–treatment

Side effects. All the treated animals were kept closely observed initially for 24 hours and then on post-treatment days 3, 10 and 15. The symptoms including dullness, restlessness, diarrohoea, contipation, convulsions, abdominal pain etc. were recorded for 15 days as described by Laurence and Bacharch (1964). Any mortality occuring during this period was also registered.

Mechanism of action. Isolated rabbit duodenum (Barlow & Khan, 1959) and Frog's Gastro-cnemious Muscle–Sciatic nerve (Ahmad, 1967) preparations were used to study the possible mode of action of the isolated chemicals of plants.

Statistical analysis

The data on reduction in EPG were subjected to statistical analysis using Student "t" test to compare the effect of various treatments (Steel & Torrie, 1980).

RESULTS AND DISCUSSION

It is evident from the results (Table I) that *C. album* in powder form @ 2 g/Kg bw reduced significantly ($P<0.05$) the EPG counts on day 10 PT. However, this value of % EPG reduction was significantly ($P<0.05$) lower than the respective values of the morantel treated group. Water and methanol extracts produced significant ($P<0.05$) reduction in EPG count on day 15 PT. The %EPG reductions of the methanol extract tratment were significantly ($P<0.05$) lower than the morantel treated group. However, the water extract in amount representing 2 g/Kg of the powder resulted in %EPG reductions non-significantly ($P>0.05$) different from that produced by morantel. This indicated that *C. album* as water extract @ representing 2 g/Kg bw powder was as effective as mornatel at recommended doses. The glycosides of *C. album* were given orally to the sheep suffereing from gastrointestinal nematodes @ 50 mg/Kg bw reduced the EPG count significantly on day 10 and 15 PT; while 100 mg/Kg bw reduced the EPG count significantly ($P<0.05$ or 0.001) on all the days (Table II). Statistically 100 mg/Kg dose produced %EPG reduction similar to the respective values of Oxfendazole treated group on days 10 and 15, respectively.

The water extract of *C. album* was observed to be more effective than the powdered plant itself showing that there are perhaps more than one types of active principles in the plant which appear to be more extractable in water than methanol. The total glycosides isolated from *C. album* in 100 mg/Kg dose and the 4.5 mg/Kg dose of Oxfendazole were found to be equi-effective against gastrointestinal nematodes of sheep. Since glycosides were the only chemical entity that could be detected and isolated from the plant drug, it is possible that their active principles would be their

[1] Banminth-II, Pfizer Laboratories (Pakistan) Ltd.
[2] Oxafax, Glaxo–Wellcome (Pakistan) Ltd.

glycosides. These data have also suggested that since the water extract is more potent than the glycosides on weight per kg body weight basis, some chemical substances other than the glycosides might also be contained in the extract that which enhanced its antinematodal effect. The results do support the use of *C. album* plant in the traditional medicine as reported by Ikram and Hussain (1978) and Said (1969).

The phytochemical analysis revealed presence of 0.02% glycosides in aerial parts of *C. album* plant. However, alkaloids, cardiac glycosides, anthraquinones, flavonoids and saponins were not detected in *C. album*.

Table I. Mean±SE (n=6) eggs per gram counts and per cent EPG reduction in *Chenopodium album* treated, Morantel treated and untreated sheep parasitised with nematodes.

Treatment	EPG PreT	Post-treatment EPG			% EPG reduction		
↓		3rd	10th	15th	3rd	10th	15th
Untreated control	1876±84	1948±90	1956±190	1980±196	-	-	-
Morantel treated @ 10 mg/Kg	2160±292	1212±112*	432±66**	84±24**	43±3	80±7	96±4
C. album powder treated							
@ 1 g/Kg	504±120	456±180	408±96	348±144	10±3	19±5	31±4
@ 1.5 g/Kg	814±144	708±176	516±120	360±96	14±5	37±4	57±7
@ 2.0 g/Kg	888 ±108	696±117	492±94*	357±74*	21±4	45±8	60±9
C. album water extract treated							
@ Eq. 2 g/Kg b.wt.	756±202	540±116	424±60	98±48*	29±6	43±7	87±6@
C. album methanol extract treated							
@ Eq. 2 g/Kg b.wt.	2232±244	2014±232	1732±186	968±201*	10±2	23±1	56±3

*Significantly (P<0.05) less than the pre-treatment values; **Highly significantly (P<0.001) less than the pre-treatment value; @Non-significantly (P>0.05) different from respective values of Morantel group; EPG PreT= Pre-treatment eggs per gram of faeces.

Table II. Mean±SE (n=6) eggs per gram counts (EPG) and %EPG reduction in *Chenopodium album* glycoside treated, Oxfendazole treated and untreated sheep parasitised with nematodes.

Treatment	PT-EPG	Post-treatment EPG			Per cent EPG reduction		
↓		3rd	10th	15th	3rd	10th	15th
Untreated control	1836±241	1866±211	1888±307	1842±273	-	-	-
Oxfendazole treated 4.5 mg/Kg	2017±314	800±94*	283±66**	100±57**	58.2±5.0	83.8±4.5	94.0±3.1
C. album glycoside treated							
@ 25 mg/Kg	2567±337	1933±308	1617±261	1833±302	25.1±3.8	37.3±3.8	30.0±4.4
@ 50 mg/Kg	2617±429	1857±369	1317±282*	1067±249*	29.7±5.0	50.0±5.0	59.8±4.9
@ 100 mg/Kg	2150±152	1300±163*	600±123**	317±123**	40.0±4.9	72.5±4.9@	85.8±4.3@

*Significantly less than the pre-treatment values; **Highly significantly less than the pre-treatment value; @Non-significantly different than that of respective values of Oxfendazole group; PT-EPG= Pre-treatment eggs per gram of faeces

As far as side effects of the plant drug are concerned, only 17% of the treated animals were observed to manifest transient diarrohoea, dullnes and/or restlessnes during 15 days of the treatment. Similar side effects were also observed in animals treated with positive control drugs. Addition of 2 mg/ml solution of the methanol extract of *C. album* to the isolated bath did not cause contractions of isolated rabbit duodenum. However, 4 mg/ml solution could cause only slight duodenum contractions. But these concentrations of the extract when added to the tissue bath containing gastro-cnemious Muscle-sciatic nerve preparation did not inhibit the muscle contraction. Therefore, these findings have suggested that this plant drug might have irritated the parasites and also increased the peristaltic movements of the host intestines. Thus removing the helminths from the animal body.

CONCLUSION

It may be concluded from the current studies that *C. album* can be used as an anthelmintic in animals.

REFERENCES

Ahmad, K., 1967. *Practical Pharmacology*. Kohinoor Electric Press. Chittagong, Bengladesh.

Akhtar, M.S., 1988. Anthelmintic evaluation of indigenous medicinal plants for veterinary usage-*Final research report (1983 88)*. Department of Physiology and Pharmacology, University of Agriculture, Faisalabad, Pakistan.

Barlow, R.B. and I. Khan, 1959. Action of some analogues of 5–hydroxytryptamine on isolated rat uterus and rat fundus strip preparation. *British J. Pharmacol.*, 14: 265.

Brain,. K.R. and T.D. Turner, 1975. *The Practical Evaluation of Phytophamaceuticals*. Wright Scientechnica Bristol.

Chopra, R.N., Nayyar, S.L. and Chopra, I.C., 1956. *Glossary of Indian Medicinal Plants*. pp: 160. Council of Scientific and Industrial Research, New Delhi..

Culvenor, C.C.J. and J.B. Fitzyerald, 1963. Test tube spots for alkaloids. *Pharm. Sci.*, 52: 303.

Dhar, D.N., Sharma, R.L. and Bansal, G.C., 1982. Gastrointestinal nematodes in sheep in Kashmir. *Vet. Parasitol.*, 11: 271–7.

Harborne, J.B., 1963. *Phytochemical Methods*. Chapman and Hall, London.

Ikram, M. and S.F. Hussain, 1978. *Compendium of Medicinal Plants*. Pakistan Council Of Scientific and Industrial Research, Peshawar, Pakistan.

Jenkins, G.L. and A.M. Knevel and F.E. Digangi, 1967. *Quantitative Pharmaceutical Chemistry*. 6th ed., pp: 286–7. McGraw Hill Book Company, London.

Kaemmerer, K. and S. Butenkotter, 1973. The problem of residues in meat of edible domestic animals after application or intake of organophosphate esters. *Residue Rev.*, 46: 1.

Laurence, D.R. and A.L. Banarach, 1964. *Evaluation of drug activities Pharmacometrics*. Academic Press, London.

Lewis, W.H. and M.P.H. Elvin- Lewis, 1977. *Medicinal Botany Plants Affecting Man:s Health*. John Wiley and Sons, New York.

Mayer, F.P., 1963. Preparation of Mayer's Reagent. *Chem. News*, 7: 159.

Nadkarni, A.K, 1954. *Indian Materia Medica*. 3rd ed. Popular Prakashan, Bombay, India.

Said, M., 1969. *Hamdard Pharmacopea of Eastern Medicine*. Hamdard National Foundation, Karachi, Pakistan.

Satyavati, G.V., M.K. Raina, and M. Sharma, 1976. *Medicinal Plants of India*. Volume I. Indian Council of Medical Research, New Delhi, 201-206 pp.

Soulsby, E.J.L., 1982. *Helminths, Arthropods and Protozoa of Domesticated Animals*. 7th ed. The English language Book Society, Baillere Tindall, London.

Steel, R.C.D. and J.H. Torrie, 1980. *Principles and Procedures of Statistics*. McGraw Hill Book Company Inc., New York.

Waller, P.J. and R.K. Prichard, 1985. Drug resistance in nematodes. *In: W.C. Campbell and Rew, R.S. (Editors), Chemotherapy of Parasitic Infections*. Phenum, New York, USA. pp. 339-362.

(Received 04 April 1999; Accepted 20 May 1999)