PHARMACOLOGICAL STUDY OF ACHYRANTHES ASPERA LINN.— *A PRELIMINARY REPORT*

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The plant *Achyranthes aspera*, Linn. (N. O. Amaranthaceae) (Hindi : Chirchira) has enjoyed wide reputation in Ayurvedic medicine and many useful medicinal properties have been claimed. It has been used in general anasarca (2); as an abortifacient and antitussive (8), and as an emetic and expectorant (7). The plant has been reported to contain a sapogenin and hydrocarbon (3); an alkaloid-Achyranthine (1); an aglycone; oleanolic acid (6) and fatty acids (4). Systematic study on this plant was undertaken to find pharmacological basis of the reported uses.

I. *Chemical Studies*

Water and alcoholic extracts of pulverised roots of the plant *Achyranthes aspera* were prepared. The aqueous extract was concentrated to contain 2.0 gm. of the crude drug in 1.0 ml of the final extract. This extract showed the presence of alkaloids and reducing sugars. It was labelled as solution 'A' and used for pharmacological studies.

The alcoholic extract was defatted by shaking with petroleum ether and water soluble fraction of the alcoholic extract was prepared. This also showed the presence of alkaloids and reducing sugars. Each ml. of the water soluble fraction of the alcoholic extract contained the active principle present in 1.0 gm. of crude drug. This solution was labelled as solution 'B' and used for pharmacological studies.

II. *Pharmacological studies*

MATERIALS AND METHODS

Studies on acute toxicity were carried out on albino rats by intravenous administration of the drug. L. D. 50 was determined by Karber's (5) method.

Effect of the drug on carotid blood pressure, respiration, myocardium, carotid occlusion response and intestine *in situ* was studied on anaesthetised dogs by the usual methods. Pentobarbitone (35 mg./kg. I. P.) was used as the anaesthetic agent except for experiments on intestine *in situ* where intravenous chloralose (70 mg./kg.) was used.

Effect of the drug was observed in isolated preparations of rabbit's intestine and gravid and nongravid uteri of albino rats, guinea-pigs and rabbits by usual methods.

The effect of the drug on urinary output was studied by recording the same in a group of 4 catheterised male rabbits by 'Cross over' method. Easy access to water and

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food was allowed till the night before the experiment. Animals were hydrated with 40 ml./kg. of water orally. Hourly urinary output was measured upto 4 hours. After a gap of 48 hours, the dose of the drug was dissolved in water to make the total volume the same *i.e.* 40 ml./kg. Urinary output was similarly measured upto the end of the 4th the hour. All urinary samples were examined for any evidence of renal damage.

RESULTS

1. Effect on cardio-vascular system and ileum in situ of Dog : Solutions A and B in graded doses caused a sharp and transient fall in blood pressure without having any significant action on the respiration of anaesthetised dogs. In higher doses, however, there was slight respiratory depression. Atropine sulphate (1 mg./kg.) blocked the hypotensive effect of the extracts. But unlike acetylcholine, the extracts did not give any pressor response when given after administration of atropine and eserine sulphate (1 mg./kg.). Both the solutions had no significant effect on dog's myocardium, carotid occlusion reflex and ileum *in situ*.

2. Frog heart : Solutions A and B both had temporary negative inotropic and negative chronotropic effects on perfused frog's heart. The cardiodepressant effect of these solutions could not be blocked by pretreatment with atropine, which, however, blocked the activity of equidepressant doses of acetylcholine.

3. Isolated rabbit's ileum : Solutions A and B produced spasm of isolated rabbit's ileum. Pretreatment of the ileum with atropine (1×10^{-6}) blocked the spasmogenic action of both the solutions and acetylcholine without affecting that of histamine.

4. Isolated Uterus : Solutions A and B increased the tone and amplitude of contractions in gravid and non-gravid uteri of albino rats, guinea-pigs and rabbits.

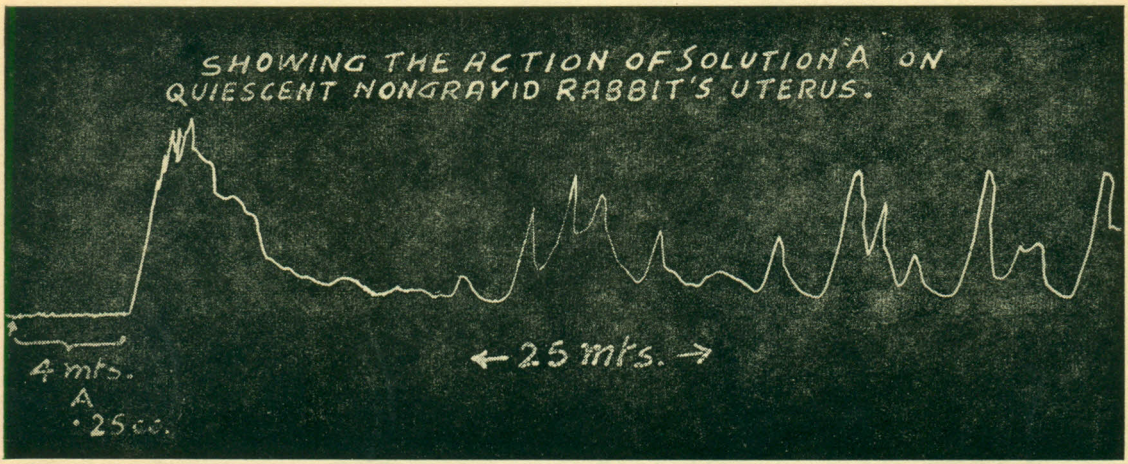

Fig. 1. Showing the action of solution 'A' on quiescent nongravid rabbit's uterus. Note the marked uterine stimulant action after an initial latent period.

Gravid uterus was, however, found to be more sensitive to these drugs than the non-gravid uterus. The onset of action was usually after a latent period of few minutes, but the action was prolonged lasting for 10 to 55 minutes (Fig 1). The ecbolic action of these drugs could not be blocked by atropine.

5. Urinary output : Oral administration of the solutions A and B in doses of 0.5 ml. significantly increased the urinary output in rabbits (Fig. 2). Urine samples of drug treated rabbits showed the presence of only few epithelial cells but no albumin, casts or red cells.

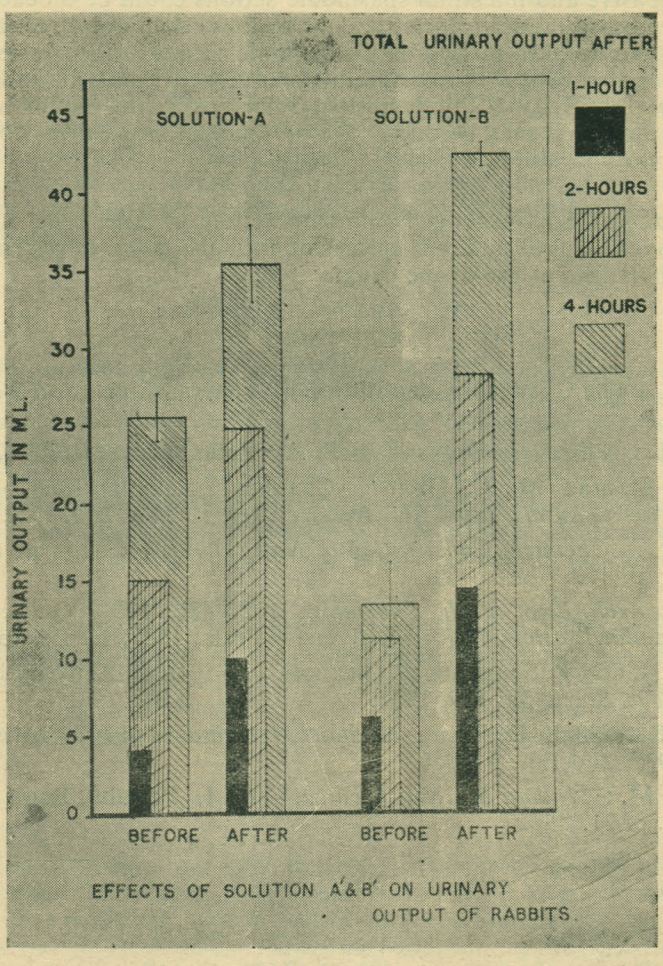

Fig. 2. Showing the effects of solutions 'A' and 'B' on urinary output of rabbits.

Note the marked diuretic activity of both the solutions. The diuretic activity starts within one hour.

6. *Acute Toxicity* : L. D. 50 of solution A as calculated by Karber's (5) method was found to be 7.16 ml./kg. The deaths appeared to be due to respiratory failure.

DISCUSSION

The phytochemical studies of the roots of the plant *Achyranthes aspera* showed the presence of alkaloids, confirming the earlier report of Basu (1). In addition, the presence of reducing sugars has also been found. The aqueous extract solution 'A' and the aqueous fraction of the defatted alcoholic extract solustion 'B' gave similar pharmacological actions. The action in general appeared to be partially resembling that of acetylcholine. Though the hypotensive and intestinal spasmodic actions could be blocked by atropinisation, the cardiodepressant and uterine stimulant actions could not be antagonised. However, the drug did not seem to possess any ganglionic action in the doses used, as there was no rise in blood pressure when administered in atropinised and eserinised dogs. The marked diuretic activity of the drug also differs from the action of acetylcholine. These differences, however, may be due to the presence of more than one water soluble principles in the extracts studied.

The pronounced and prolonged stimulant action of the drug in nongravid and more so in the gravid uteri of different species of animals gives a pharmacological basis for the existing abortifacient use of the drug.

REFERENCES

1. Basu, N. K. : 'The Chemical Constitution of Achyranthine', *J. & Proc. Inst. Chem.*' 29: 73, 1957.
2. Chopra, R. N. : *Indigenous Drugs of India*. Art Press, Calcutta, 1958, 2nd Ed., p. 662.
3. Gopalachari, R. and M. L. Dhar : Chemical Examination of the Seeds of Achyranthes aspera Linn., *Jour. Sci. Industr. Res.* : 11B: 209, 1952.
4. Hilditch, T. P. : *Chemical Constitution of Natural Fats*, Chapman & Hall, London, 1956, 3rd Ed., p. 169.
5. Karber, G. : *Arch. Exp. Path. Pharmak.*, 162, 480, 1931, Quoted by Burn, J. H. *Biological Standardisation*, Oxford University Press, 1937, 1st Ed., p. 37.
6. Khastgir, H. N. and P. Sengupta : Oleanolic acid from Achyranthes aspera Linn., *Jour. Ind. Chem. Soc.* : 35: 529, 1958.
7. Kirtikar, K. R. and B. D. Basu : *Indian Medicinal Plants*, Vol. III, L. M. Basu, Allahabad, 1935, 2nd Ed., p. 2066.
2. Nadkarni, K. M. : *Indian Meteria Medica*, Vol. I, Popular Book Depot, Bombay, 1954, 3rd Ed., p. 21.