

## PHARMACOLOGICAL AND HAEMOSTATIC INVESTIGATIONS ON *SPHAERANTHUS INDICUS* LINN\*

S. C. SRIVASTWA,† M. S. Y. KHAN AND S. B. VOHORA  
*Departments of Pharmacology and Chemistry,  
Institute of History of Medicine and Medical Reserach,  
Tughlaqabad, New Delhi.*

*Sphaeranthus indicus* Linn. or 'MUNDI' is a branched herb of varied medicinal properties. All parts of the plant are extensively used in Unani and Ayurvedic systems of medicine. The present study deals with preliminary investigations on the flowers of this plant reportedly possessing alterative, depurative, refrigerant, tonic and styptic properties. (2,4,6).

### MATERIALS AND METHODS

Authenticated samples of the flowers of *Sphaeranthus indicus* were exhaustively extracted with 85% ethanol. The semisolid material so obtained was stored in sealed tubes under refrigeration. As this extract was only slightly soluble in water, 5-10% suspensions were prepared with 1% gum acacia and were used for all pharmacological investigations. Gum acacia (1% mucilage) was used as control in studies on cardiovascular system and on the cathartic action of the extract.

**Cardiovascular and respiratory systems :** Carotid blood pressure was recorded with a mercury manometer and respiration was recorded with a tambour in mongrel dogs (7 to 12 Kg) anaesthetised with pentobarbitone sodium (30 mg/kg, iv). All drugs were administered through cannulated femoral vein.

Effects of the extract on Langendorff rabbit heart preparation and on the frog heart *in situ* were studied by the method of Burn (1).

Effects on peripheral circulation were studied on rat leg perfused with normal saline solution at 40°C. The outflow was recorded with Condon's drop recorder.

**Smooth muscles :** Effects of the extract on isolated rabbit and rat ileum, and isolated rat uterus were studied employing 20 ml isolated organ bath. Atropine sulphate and promethazine hydrochloride were used as blockers.

**Cathartic action :** The cathartic action of 'MUNDI' was investigated by administering it orally (200 mg/kg). The increase in faecal weight and change in consistency of faeces after

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† Present Address : Indian Drugs and Pharmaceuticals Ltd., New Delhi.

10 hr of drugging were taken as criteria for the cathartic action (5). Moreau's loop experiment as described by Koppanyi and Karczmar (5) was also carried out to study this action. Hypertonic magnesium sulphate solution and isotonic normal saline solution were used for comparison.

**Haemostatic action :** Blood was collected from the marginal ear vein of rabbit before the drug administration (200 mg/kg, orally) and 2 hr later. Bleeding time, clotting time and one-stage prothrombin time were determined by the methods of Napier and Dasgupta (7). For prothrombin time estimation Russels' viper venom was used as thromboplastin solution.

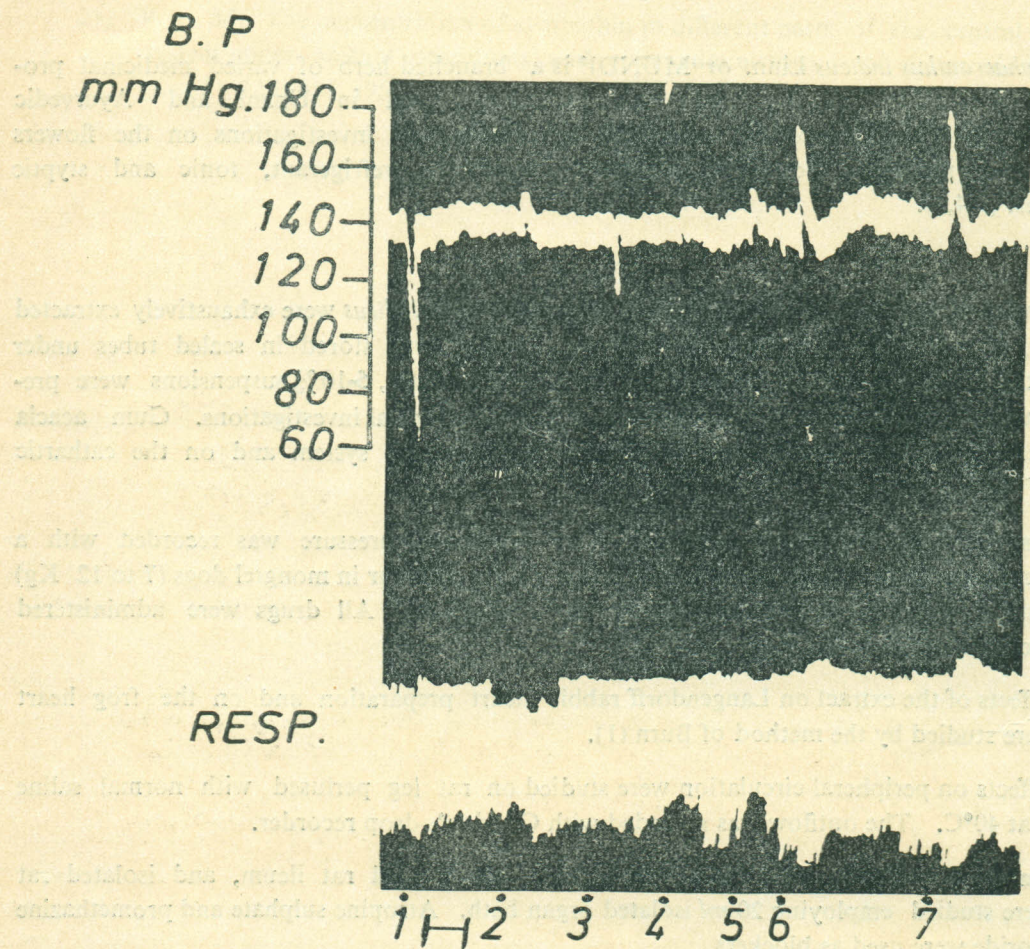


Fig. 1

Effect of 'Mundi' on blood pressure (B.P.) and respiration (RESP) of dog after atropinisation. Reversal of effect on B.P. is observed. Alcoholic extract of 'Mundi' (50 mg/kg) was given at (1), (6), and (7). Atropine (5 mg/kg) was given at (2) and (4), Acetylcholine (1 µg/kg) was given at (3) and (5). Time mark, 1 min.

**Toxicity studies :** The LD<sub>50</sub> was not determined. However, the extract was administered intraperitoneally in doses ranging from 100-500 mg/kg to 5 groups of albino rats, each group containing 5 animals. The animals were observed for seven days for mortality and for behavioural changes.

#### RESULTS AND DISCUSSION

**Cardiovascular and respiratory systems :** The extract when given at a dose level of 50 mg/kg, caused hypotension (40-60 mm Hg) in dogs with slight respiratory stimulation (4 experiments). Both the rate and the depth of respiration were increased. Atropine (5 mg/kg), completely blocked the effect of acetylcholine (4 µg/kg) and caused reversal of the effect of 'MUNDI' on blood pressure (2 experiments, Fig. 1). Promethazine hydrochloride (500 µg/kg) did not alter the response to the extract (2 experiments).

The extract (2 mg) produced marked bradycardia in isolated rabbit heart (3 experiments Fig. 2). The extract (2 mg) elicited negative inotropic and chronotropic actions in frog heart *in situ* (3 experiments). These effects were comparable in magnitude with those produced by 20 µg of acetylcholine and could be reduced by pretreatment with 5 mg of atropine sulphate.

### ISOLATED RABBIT HEART

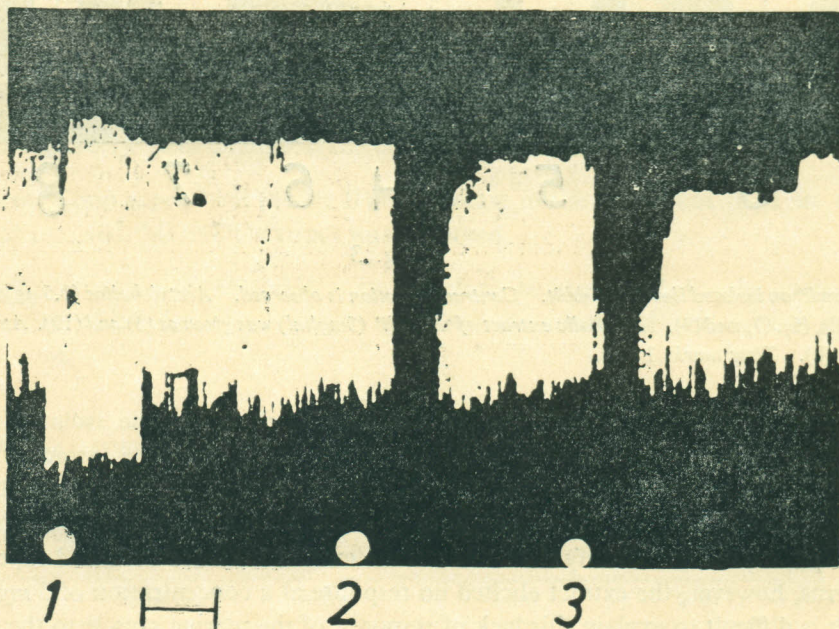


Fig. 2

Effect of 'Mundi' on isolated heart of rabbit. Marked bradycardia is observed. Adrenaline (20 µg was given at (1), acetylcholine (20 µg) was given at (2) and alcoholic extract of 'Mundi' (2 mg) was given at (3). Time mark, 1 min.

In rat leg perfusion experiments, an increase in the rate of perfusion was observed following the administration of the extract (1 mg). The pretreatment and post treatment perfusion rates were  $10.00 \pm 2.00$  and  $18.66 \pm 1.15$  drops per min respectively (3 experiments).

These observations suggest the presence of a cholinergic principle in the alcoholic extract of the flowers of 'MUNDI'. Slight respiratory stimulation may be attributed to the compensatory mechanism following hypotension caused by the extract.

## ISOLATED RABBIT ILEUM

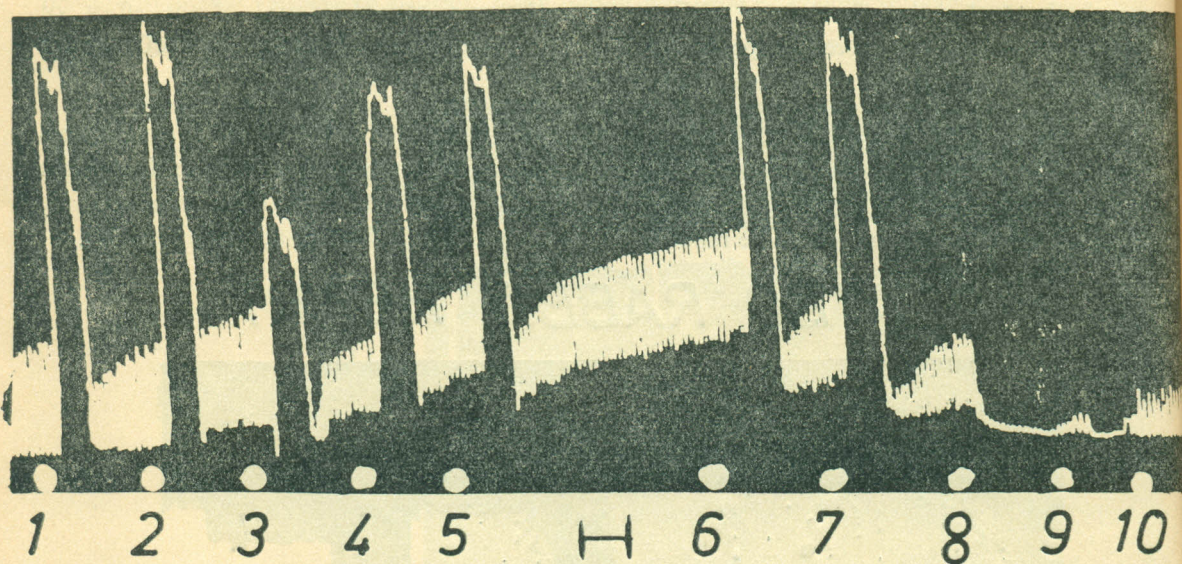


Fig. 3

*Effect of 'Mundi' on isolated ileum of rabbit. Contractile action is observed. Acetylcholine (0.5  $\mu\text{g/ml}$ ) was given at (1), (2), (4), (5), (6), (7) and (9). Alcoholic extract of 'Mundi' (5mg/ml) was given at (3) and (10). Atropine (1  $\mu\text{g/ml}$ ) was given at (8). Time mark, 1 min.*

**Smooth muscles :** Marked contractile action was elicited on the isolated ileum of the rabbit (3 experiments, Fig 3) and rat (2 experiments) by 5 mg/ml of the extract. These effects could be abolished by atropine (1  $\mu\text{g/ml}$ ) in all the experiments. This further substantiates the suggestion that a cholinergic principle may be present in the extract. Promethazine hydrochloride (1  $\mu\text{g/ml}$ ) did not modify the action of the extract on these tissues (2 experiments). On the rat uterus, however, the extract elicited no response at a concentration of 5 mg/ml (2 experiments). It is difficult to explain this lack of response of the uterine muscle to the extracts.

**Cathartic action :** The results are presented in Tables I and II.

TABLE I  
*Effect of 'MUNDI' on the weight of faeces in mice.*

<i>Mean weight of faeces (mg ± S.E.)</i>	
<i>Control Group (10)*</i>	<i>Drugged Group (10)*</i>
57.00 ± 8.31	75.50 ± 17.52
p > 0.1	

Figures in parentheses denote the number of mice.

TABLE II  
*Moreu's loop experiment showing volume of recovered fluid after injecting 5 ml of different solutions.*

<i>*Mean volume (ml) of recovered fluid ± S.E.</i>			
<i>Norma, saline</i>	<i>Hypertonic magnesium sulphate</i>	<i>'MUNDI' Extract</i>	
		<i>25 mg/ml</i>	<i>50 mg/ml</i>
4.60 ± 0.28	7.00 ± 0.63	1.80 ± 0.96	1.82 ± 0.79
	p < 0.01	p < 0.01	p < 0.01

\*Mean of 4 observations.

The weight of faeces was found to be higher in the drugged group of mice (75.50 ± 8.31 mg) suggesting some cathartic action of the extract. The difference was, however, not statistically significant (p > 0.1). No change in the consistency of faeces was observed.

In Moreu's loop experiment (Table II) no increase in the amount of fluid in the gut in the groups that received 'MUNDI' extract was observed.

The cathartic action of 'MUNDI' may, therefore, be attributed to the increase in the contractile activity of the intestines which has been demonstrated with the isolated tissue experiments.

TABLE III  
*Effect of 'MUNDI' on bleeding time, clotting time and prothrombin time in rabbits.*

<i>*Mean bleeding time Sec. ± S.E.</i>		<i>*Mean clotting time Sec. ± S.E.</i>		<i>*Mean prothrombin time Sec. ± S.E.</i>	
0 hr	2 hr	0 hr	2 hr	0 hr	2 hr
100.83 ± 16.93	92.50 ± 12.82	135.00 ± 12.24	122.50 ± 18.20	11.66 ± 0.78	11.00 ± 0.00
p > 0.4		p > 0.2		p > 0.05	

\*Mean of 4 observations each.

**Haemostatic action:** The extract did not change the bleeding, clotting or prothrombin time in rabbits (Table III). The alcoholic extract of 'MUNDI' flowers, therefore, does not have any haemostatic property and its use as a styptic agent among the Mundas of Chotta Nagpur (4) is without any pharmacological basis.

**Toxicity studies :** No mortality or behavioural changes were observed in any of the animals.

Thus the preliminary observations with the crude alcoholic extract of 'MUNDI' flowers suggest that it is a fairly safe and potentially useful plant. It may be worthwhile to isolate and test the different chemical principles in flowers *e.g.* alkaloids, essential oils (2,6) sterols, glucosides (3) etc. for their pharmacological properties and medicinal uses.

#### SUMMARY

1. Pharmacological studies were conducted on the flowers of *Sphaeranthus indicus*. Linn (MUNDI), with special reference to its haemostatic and cathartic actions.

2. The alcoholic extract of flowers was found to exert hypotensive and peripheral vasodilator actions. The isolated rabbit ileum and rat ileum were contracted. Many of these effects could be reversed or antagonised by prior atropinisation. The possibility of the presence of a cholinergic principle has been discussed.

3. The extract caused increase in the weight of faeces of drugged mice without affecting the consistency of faeces indicating some cathartic action. This was, however, not substantiated by the Moreau's loop experiment.

4. The extract did not affect the bleeding time, clotting time and prothrombin time in rabbits.

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