SOME BEHAVIOURAL EFFECTS OF AN ACTIVE FRACTION FROM *HERPESTIS MONNIERA*, LINN. (*BRAHMI*)

By

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Herpestis monniera is a small annual creeping plant, N.O. *Schrophularinae*. In India, the plant was known by the vernacular name of 'Brahmi' and was extensively used in folk medicines, particularly in cases of insanity, hysteria and epilepsy. A chemically pure saponin named as 'hersaponin', m.p. 232°C-234°C (decomp.)., in addition to D-mannitol and potassium salts was isolated from *Herpestis monniera* (9). Malhotra *et al* (6 and 7) studied the neuropharmacological effects of hersaponin. Ganguly and Malhotra (4 and 5) studied the behavioural effects of the drug and reported the tranquillizing properties by using a battery of pharmacological tests. We now report some more behavioural properties of *Herpestis monniera* (*HM*) and its neurotoxic manifestations in rats. The extract of HM was prepared and purified in the laboratory.

MATERIALS AND METHODS

(*a*) 'Running time' of rats in the maze

The effect of drugs on learning and motivation were studied by 'Hebb-William's maze' (Techno) by employing the method described by Archer (1). Male albino rats (150-190 *g*.) were used. Approximately 40 rats were divided into different groups, each group having 7 animals was employed to study the effect of a single dose and were maintained *ad lib* 80-85% of their body weight by gradually decreasing the daily diet. They were trained to run the short alley of the maze without error. Each rat was given 10 trials daily and the time interval between each trial was 60 seconds. A '*variable-ratio*' reinforcement schedule was used. The criterion of training was taken as 10 successive running times of less than 7 secs. each without making any wrong choice (blind alley).

HM, chlorpromazine and reserpine were administered intraperitoneally at different doses at intervals of 15, 30 and 120 mins. prior to testing. The 'running time' of each animal was noted for 5 successive responses and the average 'running time' was determined. The errors in the maze were expressed as the percentage of total rat-trials (no. of rats x no. of trials). Different groups received saline injections and served as control. The animals were observed for 5 mins. after placing in the entrance box and the response was taken to be nil if they failed to leave the entrance box within 5 minutes.

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(*b*) On discrimination of rats

Effect of HM, chlorpromazine and reserpine on discriminative capacity of pretrained rats were tested in 'Yerk's brightness discrimination box' (Techno) by the method of Farris and Griffith (2).

The animals (80—85% *ad lib*, body wt.) were trained to select the positive or lighted alley and rewarded with a brief feeding period for 10 secs. as a reinforcement presented at every correct response of the animals and were punished (shock) for incorrect response as soon as it partly or wholly crossed the grill of the negative or dark alley. Each rat was given 15 trials/day. The interval between two successive trials being 60 secs. and the rats learnt to perform the task within approximately a period of 15 days of each-day trial. The criterion of training was 19 to 20 correct responses out of 20 trials. The latency of the response and number of errors were noted.

The trained rats were divided into different groups and each dose was studied on a group of 7 rats. Each animal was given 5 trials before and 5 trials after drug and the average number of failure of discrimination as well as latency-time of response of each group (35- rat-trials) were recorded. HM, chlorpromazine and reserpine were injected intraperitoneally 15, 30 and 120 mins. prior to testing.

(*c*) Neurotoxic effects

Neurotoxic effects of HM at different doses was evaluated by the methods described by Swinyard *et al* (10) and the following tests were employed for the purpose in rats: (*a*) Positional sense test (*b*) Righting test, (*c*) Gait and Stance test, (*d*) Muscular tone test (*e*) Equilibrium test.

A group of 10 rats were taken to study the effect of each dose and HM was injected intraperitoneally 15 to 20 mins. prior to testing.

RESULTS

1. The effects of HM, chlorpromazine and reserpine on running time of rats in the maze are tabulated in Table I.

The running time was increased after different doses of HM, chlorpromazine and reserpine and this increase was found to be dose dependant. The rats did not respond in the maze after a dose level of 8*mg*/100 g., 3 *mg*/*kg*. and 1 *mg*/*kg* (i.p.) for HM, chlorpromazine and reserpine respectively. Increased number of errors were noted after high doses of chlorpromazine (2 *mg*/*kg*) and reserpine (0.75 *mg*./*kg*), the number of errors were least with HM (Table I).

2. The effects of HM, chlorpromazine and reserpine on discriminative capacity of rats and the latency of responses are shown in Table II.

HM 5 *mg*./100 g. and chlorpromazine 2 *mg*/*kg*. (i.p.) did not affect the light-dark dis-cri mination in rats. Reserpine (0.75 *mg*./*kg*., i.p.) exhibited a failure of discrimination of ap-

TABLE I

Table showing the number of errors (with percentage) and average running time per group of rats.

Drug	*Dose i.p.*	*Total no. of errors with percentage per group (35 rats-trial)*		*Average running time in secs./group (35 rat-trials) +S.E.*	
		Control	*Treated*	*Control*	*Treated*
Saline	1 ml	1(2.8%)	Nil	6.4±0.8	7.3±1.1
HM	1.25 *mg./100g*	Nil	1	7.2±0.9	12.2±1.8
	2.5 *mg./100g.*	1	1	9.3±0.9	48.0±3.2
	5 *mg./100g.*	Nil	4.(11.5%)	7.4±0.7	96.7±4.5
Chlorpromazine	0.5 *mg./kg.*	Nil	Nil	8.9±0.6	16.3±1.6
	1 *mg./kg.*	1	2.(5.7%)	7.6±1.1	39.9±2.9
	2 *mg./kg.*	Nil	9.(25.7%)	8.5±0.8	105±5.2
Reserpine	0.25 *mg./kg.*	Nil	1	5.3±0.5	11.1±0.7
	0.5 *mg./kg.*	Nil	6 (17.1%)	9.4±1.2	61.3±4.9
	0.75 *mg./kg.*	1	12 (35.7%)	6.5±0.6	114.4±6.3

TABLE II

Table showing the effect of HM, Chlorpromazine and reserpine on latency of response and discrimination before and after drug.

Drug	*Dose,i.p. (N=7/gp.)*	*Average latency (in secs.) per group±S.E.*		*Total No. of failure of discrimination/group (35 rat trial)*	
		Control	*Treated*	*Control*	*Treated*
Saline	1 *ml.*	3.8±0.9	4.7±1.03	Nil	1
HM	5 *mg./100g*	2.9±0.8	43.5±3.1	1	2
Chlorpromazine	2 *mg./kg.*	4.3±1.1	53.6±4.3	2	3
Reserpine	0.75 *mg./kg.*	3.6±1.3	48.04±.1	Nil	10

proximately 30%. The latency of responses i.e., the time before starting for the food box after placement of each animal in the entrance box, was grossly increased after administration of HM, chlorpromazine and reserpine (Table II).

3. Neurological deficits manifested by administration of different doses of HM is represented io Table III.

TABLE III

Table showing percentage of rats affected by different neurotoxicity tests. HM, i.p. N=10/group.

Dose mg/100 g.	*Positional sense test*	*Righting test*	*Muscular tone test*	*Gait and stance test*
10	0	0	0	0
15	0	0	0	10%
20	10%	0	0	30%
25	30%	0	20%	50%
30	60%	10%	60%	80%

The animals exhibited some neurological deficit at 20 mg./kg.,i.p., as had been found at this dose level, the 'positional sense' was affected only in 10% of animals and abnormal gait and sitting posture (Gait and Stance test) in 30% of the animals.

DISCUSSION

Ganguly and Malhotra (4 and 5) earlier reported the neuropharmacological and behavioural effects of HM using a battery of pharmacological tests. An investigation of motivational effect of HM was carried out by measuring the speed of running to goal in rats pretrained to predictable running time. HM, reserpine and chlorpromazine produced a dose dependant increase in the running time of rats. Increased number of errors were noted after higher doses of chlorpromazine (2 *mg./kg.*) and reserpine (0.75 *mg./kg*), least number of errors were observed after HM, indicating that the drug had a very little deleterious effect upon learning but reduced the motivation like chlorpromazine and reserpine. The effect of HM on this behavioural aspect simulated known tranquillizers.

In the study of the effects of these drugs (HM chlorpromazine and reserpine) on visual discrimination only reserpine (0.75 *mg./kg*). exhibited a failure of discrimination of approximately 30%. HM (5 *mg*/100*g*.) and chorpromazine (2 *mg/kg*.) did not affect light dark discrimination. The latency of responses i.e., the time before starting for the food box after placement of each animal in the entrance box, was increased (dose-dependant) after all the drugs which can be attributed as the motivational effect of the drugs. Many workers have demonstrated that the discriminative behavour remains unaffected after chlorpromazine (8). HM resembled chlorpromazine on this aspect. The higher doses of these three drugs could not be studied as the animals showed non-reactivity.

The different neurotoxicity tests which were carried out with HM showed that pharmacologically effective doses did not produce any neurological deficit. A low degree of neurological deficit was exhibited at 20 *mg.*/100g., i.p., as had been found at this dose level, the positional sense was affected only in 10% of the animals. It may be noted that the dose after which

a minimum neurological deficit, was observed is near to LD_{50} dose (25.61 *mg.*/100 g., i.p.) as observed for this compound (3).

Summary

1. HM decreased motivation for food in hungry rats and in this respect simulated known tranquillizers like chlorpromazine and reserpine.

2. HM and chlorpromazine did not affect the visual discriminative capacity in rats. Reserpine exhibited a low degree of blockade of the discriminatory capacity in rats.

3. HM exhibited signs of neurological deficit at 20 *mg/kg.*, i.p. which is near to the LD_{50} dose of the drug.

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