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Research Article

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CNS activities of *Bassia latifolia* in mice

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ABSTRACT

Methanol extract of Bassia latifolia (MEBL) bud potentiated significantly the sleeping time induced by pentobarbitone sodium, meprobamate and diazepam in mice. MEBL was found to cause significant depression in general as well as exploratory behavioral profiles in mice. Pretreatment with MEBL caused significant protection against strychnine and leptazole-induced convulsions. The results suggest that MEBL exhibits CNS depressant activity in a dose dependent manner.

Keywords: *Bassia latifolia*, sleeping time, general behavior, anticonvulsant activity.

INTRODUCTION

Since time immemorial man has been using herbs or plant products as medicine for developing immunity or resistance against various diseases.[1] The traditional systems of medicine are based on the experience in the use of plant products in amelioration of common diseases and a number of herbal remedies have stood the test of time. *Bassia latifolia* (Family: Sapotaceae) [2] commonly known as Madhuka, Indian Butter Tree, Mahua etc. It grows well in hot and dry, moist climate of central, western and eastern India. Fresh corollas of *Bassia latifolia* are used as contraceptive.[3] Its fresh root is used as an abortifacient agent.[4] The methanol extract of *Bassia latifolia* (MEBL) showed marked CNS depressant action compared to other extracts of it in preliminary pharmacological screening. However, no work has been reported on the CNS activities of this plant. Keeping this in view, the present study has been undertaken to investigate various CNS activities such as behavioral, sedative-hypnotic, and anticonvulsant effects of MEBL in mice to substantiate the folklore claim.

EXPERIMENTAL SECTION

Preparation of extract

The bud of *Bassia latifolia* was collected from West Bengal and were authenticated by the division of Pharmacognosy, Department of Pharmaceutical Technology, Jadavpur University, Kolkata. Shade-dried, powdered, and sieved in 40 × mesh. The plant material was soxhelet extracted first with petroleum ether and then with methanol. The methanol extract was evaporated to dryness. The trace amount of methanol which might be present within the solid mass of methanol extract was removed by vacuum pressure. For pharmacological testing, methanol extract (ME) of *Bassia latifolia* bud were dissolved in propylene glycol (PG). The yield of methanol extracts were 7.1% for *Bassia latifolia* on dry weight basis.

Animals and treatment
Albino (Swiss) mice of either sex weighing between 20-25 g were used. The animals were fed standard pellet (Hindustan Lever Ltd., India) and given tap water *ad libitum.* The experiments were performed in a quiet room with an ambient temperature of $22^0 \pm 2^0$C.

Acute toxicity study
An acute toxicity study related to the determination of LD_{50} value was performed with different doses of MEBL into different group of mice, each containing 10 animals, according to the method described by Litchfield and Wilcoxon [5,6].The LD_{50} value for *Bassia latifolia* was 451.88 mg/Kg. body weight. Low, medium and high dose of the extracts were approximately 1/8th, 1/6th and 1/4th of the LD_{50} value. Normal saline (0.9 % w/v), propylene glycol (5 ml/kg, b.w.) and Methanol extract (low, medium and high dose) were given intraperitoneally in alternate days for 14 days for all the groups.

Effect on sleeping time
Mice were divided into 4 groups, each group containing 6 mice. The animals of group I served as the control (normal saline, 0.9 % w/v NaCl, 5 mL/kg); groups II, III, and IV received MEBLat a low, medium and high dose (55 mg/kg, 75 mg/kg and 110 mg/kg, respectively). Normal saline and the extracts were injected intraperitoneally 30 min prior to the administration of pentobarbital sodium (40 mg/kg, *i.p.*), diazepam (3 mg/kg, *i.p.*) and meprobamate (100 mg/kg, *i.p.*). The sleeping time was noted by recording the interval between the losses and regaining of righting reflex [7].

Effect on anticonvulsive property
The anticonvulsive property of MEBL at 55, 75 and 110 mg/kg body wt was obtained against two standard drugs, strychnine hydrochloride (2 mg/kg; Sigma) and leptazole (80 mg/kg; Sigma). The average survival time (min) and the percentage mortality of the albino Swiss mice were observed after 24hr. [8,9]

Behavioral effects
CNS depressant action of MEBL (55, 75, 110mg/kg , *i.p.*) on righting reflex, pinna reflex, awareness, grip strength, touch and pain responses on mice were observed by conventional methods. Diazepam (3mg/kg, *i.p.*) was used as a reference drug.[10-15]

Statistical analysis-The unpaired Student's t test was applied to evaluate the statistical significance of the data. [16]

RESULTS AND DISCUSSION

MEBL at 55, 75 and 110 mg/kg body wt showed significant CNS depressant action in a dose dependent, manner (Table 1). ME decreases touch response, pain response, righting reflex and grip strength of mice in comparison with respective control groups (vehicle PG) probably due to a pronounced depressant action [17]. Reduction of awareness and depressant action may be due to the action of MEBL on CNS [18] . The reduction of pinna reflex may be due to blocking synapses of the afferent pathway[19]. Benzodiazepins are believed to act at specific binding sites which are closely linked to gamma aminobutyric acid (GABA) receptors, the binding of benzodiazepines enhances GABAergic transmission [20]. Although the cause of prolongation of diazepam induced sleeping time is not known, the enhancement of GABAergic transmission might be related to its sedative activity. Prolongation of pentobarbitone induced sleeping time might be due to tranquilizing action as well as CNS depressant action. Although the exact mechanism responsible for the sedative action of meprobamate is not clear, it may be due to CNS depressant action or due to enhancement of GABAergic transmission [20-23]. MEBL does not have any hypnotic action but potentiates the sedative hypnotic action of other reference standard drugs, such as pentobarbitone, Meprobamate and diazepam. MEBL at a dose level of 55, 75 and 110 mg/kg body wt prolonged sleeping time induced by pentobarbitone, Meprobamate and diazepam respectively as compared with saline and vehicle control animals (Table 2). MEBL not only increased the average survival time but also decreased the percentage mortality in a dose dependent manner in strychnine / leptazole treated mice (Tables 3 and 4). GABA is known to protect the mice against strychnine and leptazole induced convulsions [24]. MEBL increases the brain GABA level (unpublished data) and thereby it acts as an anticonvulsive agent.

Table-1 Effects of methanol extract of Bassia *latifolia* BUD (MEBL) on behavioural profiles in mice

Key for scoring: 0 = No Effect (Normal), + = Slight Depression, ++ = Moderate Depression, +++ = Strong Depression, ++++ = Very strong Depression

Treatment	Dose (i.p.)	Behaviors						
		Loss of Awareness Response	Loss of Touch Response	Loss of Pain Reflex	Loss of Righting Reflex	Pinna Reflex	Grip Strength	Mortality in 24 hr
Saline (0.9% NaCl, w/v)	5 ml/kg body weight	0	0	0	0	0	0	Nil
Vehicle (PG)	5 ml/kg body weight	0	0	0	0	+	+	Nil
Diazepam	3.0 mg/kg body weight	++++	++++	++++	++++	++++	++++	Nil
MEBL	55 mg/kg body weight	+	++	++	+	++	+	Nil
MEBL	75 mg/kg body weight	++	+++	++	++	+++	+	Nil
MEBL	110 mg/kg body weight	+++	++++	+++	++++	+++	+++	Nil

i.p. – intraperitoneal, PG- Propylene Glycol

Table-2 Effect of methanol extract of *Bassia latifolia* (MEBL) on pentobarbitone/ meprobamate/ diazepam induced sleeping time
[Values are mean ± SEM]

Treatment	Dose (mg/kg, i.p.)	Sleeping time (min) induced by		
		Pentobarbitone (40mg/kg, i.p.)	Meprobamate (100 mg/kg, i.p.)	Diazepam (3 mg/kg, i.p.)
Saline	5 ml/kg	42.0±0.98	48.0±1.77	59.5±0.73
Vehicle (PG)	5 ml/kg	55.0±1.12	56.0±0.85	67.0±0.84
MEBL	55	70.5±1.12*	85.5±1.88*	111.0±2.21*
MEBL	75	82.0±1.97*	95.0±1.71*	154.0±1.68*
MEBL	110	90.0±0.91*	121.0±2.05*	189.5±1.97*

*n= 6, *P < 0.05 as compared with vehicle control (student's 't' test),*
i.p. – intraperitoneal, PG- Propylene Glycol.

Table 3 Effect of methanol extract of Bassia *latifolia* BUD (MEBL) on average survival time on strychnine and leptazole induced convulsion in mice
[Values are mean±SEM, 6 mice in each group]

Treatment	Dose (i.p.)	Survival time (min) after treatment of	
		Strychnine (2mg/kg,b.w., i.p.)	Leptazol (80 mg/kg,b.w., i.p.)
Saline (0.9% NaCl,w/v)	5ml/kg. b.w.	4.50±0.16	7.30±0.11
Vehicle(PG)	5ml/kg b.w.	5.00±0.58	9.20±0.58
MEBL	44mg/kg. b.w.	138±0.73*	151±0.59*
MEBL	55mg/kg. b.w.	214±1.15*	245±0.86*

*n= 6, *P < 0.01 as compared with vehicle control (student's't' test),*
i.p. – intraperitoneal, PG- Propylene Glycol, b.w. – Body Weight.

Table 4 Effect of methanol extract of Bassia *latifolia* BUD (MEBL) on percentage of mortality induced by convulsive drugs in mice

Treatment	Dose (i.p.)	Percentage mortality after 24 hr of the treatment with	
		Strychnine (2mg/kg,b.w., i.p.)	Leptazol (80 mg/kg,b.w., i.p.)
Saline (0.9% NaCl,w/v)	5ml/kg. b.w.	100	100
Vehicle(PG)	5ml/kg b.w.	100	100
MEBL	44mg/kg. b.w.	100	100
MEBL	55mg/kg. b.w.	53	48
MEBL	75mg/kg. b.w.	20	18
MEBL	110mg/kg. b.w.	0	0

n= 6, i.p. – intraperitoneal, PG- Propylene Glycol, b.w. – Body Weight.

CONCLUSION

From these results it can be suggested that methanol extract of the leaf of *Bassia latifolia* exhibits CNS depressant action in a dose dependent manner.

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