Available online on www.ijtpr.com
International Journal of Toxicological and Pharmacological Research 2014; 6(4): 128-135

ISSN: 0975-5160

Research Article

Nootropic Activity of *Tridax procumbens* Linn. in Mice and Rat

*Aute A. A., More R. R., Burande M. D., Shetkar M. A.

Department of Pharmacology, Pad. Dr. D. Y. Patil College of Pharmacy, Pimpari, Pune.

Available Online: 29th November, 2014

ABSTRACT

Aqueous extract of leaf of *Tridax Procumbens* Linn. belongs to the family Asteraceae is most important medicinal plant used for bronchial catarrh, dysentery, and diarrohea and for restoring hair. Also the plant produced reflex tachycardia and showed a transient hypotensive effect on the normal blood pressure of dogs. It has also a marked depressant action on respiration. The Nootropic activity of TP was evaluated by using three methods i.e. Elevated plus maze, cook's pole climbing and 'Y' maze methods in mice and rat. In the Learning and memory study TP at 3 mg/kg (i.p.) significantly $p< 0.01$, $p<0.01$,$p <0.001$, and $p< 0.01$ decreased the time taken to avoid the unconditioned stimulus at day 1, day 2, day 5 and day 9 respectively while 6 and 9 mg/kg (i.p.) showed significant $p <0.001$ avoidance of an shock at day 5. TP 3 mg/kg (i.p.) showed significant $p<0.01$ activities at day 1, while TP at 6 mg/kg (i.p.) showed significant ($p<0.001$) and $p<0.05$ at day 5 and 9, while TP 9 mg/kg showed significant ($p<0.01$, $p<0.05$ and $p<0.001$) activity at day 2, 5 and 9 when administered in combination with Scopolamine. In EPM TP at 4.2 mg/kg (i.p.) showed significant ($p<0.01$) increased in transfer latency at day to day. In 'Y' Maze TP 4.2 mg/kg (i.p.) significantly ($p<0.001$) decreased the percentage of actual arm entries at day 7, while 8.4 mg/kg (i.p.) significantly ($p< 0.01$) decreased the percentage of actual arm entries at day 1, 2 and 5. Thus data of the present experiment suggest that the drug-induced changes could be interpreted as modification in the retrieval or recall phenomenon.

Keywords: *Tridax Procumbens* Linn., Aqueous Extract of Leaf, Nootropic Activity.

INTRODUCTION

In recent times, focus on plant research has increased all over the world and a large body of evidence has been collected to show immense potential of medicinal plants used in various traditional systems of medicine. There has been a phenomenal rise in the interest of scientific community to explore the pharmacological actions of herbs and to confirm the claims made about them in official books of Ayurveda.

Allopathic psychotropic drugs have been the mainstay of treatment for mental illnesses in India. They have number of side effects, especially those belonging to traditional system of like Ayurveda. Pharmaceutical industrial have shown an increased interest in plants as source of new drugs during last few years.

Tridax Procumbens Linn. is a member of Asteraceae family. It is called in English: Coatbuttons – Mexican Daisy, in Hindi: Gavpattha, in Marathi: Dagdipala, in Tamil: Vettu kkaaya – Thalai, in Telugu: Raavanaasuruditalakaai, Kannada: Gabbu Sanna Savanthi, Nettu Gabbu Savanthi and in Dharwar: Tikki kasa, Tikki Toppala. *Tridax Procumbens* Linn. is found in tropical southern part of Nigeria, and throughout India growing primarily during raining season. Annual or perennial weed with long stalked yellow or yellow white flowering heads. Leaves are reported to be employed in bronchial catarrh, dysentery and diarrhoea and for restoring hair. The leaf juice passess antisceptic, insceticidal and parasiticidal properties: it is used to check haemorrage from cuts, bruises and wounds. An aqueous extract of the plant produced reflex tachycardia and showed a transient hypotensive effect on the normal blood pressure of dogs. It had also a marked depressant action on the respiration. Petroleum ether extract of the floral herbs is toxic to webbing cloth- moth and larve of black corpet –betel. The flower contains luteolin, glucoluteolin, quercetin and isoquerecetine. The pollen may causes allergy in some people (Wealth of India 1976).

A hispid, procumbent herb, with woody base, sometimes rooting at the nodes, up to 60cm. High, found as weed up to an altitude of 2,400 m. leaves ovatelanceolate, 2-7 cm X 1- 4 cm., lamina pinnatisect, sometimes 3-lobed; flowers in small, long- peduncle heads; ray florets strap –shaped, white; disc florets yellow; achene's black, narrowly obconical, 2.0 –2.5 mm. long with feathery pappus. Chemical Constituents present in the plant leaves are Crude protein – 26.3%, crude fiber: 17.0%, ether extract 1.8% sol. Carbohydrates -39.0%, ash- 15.9%, K_2O- 8.4%, CAO- 4.6%, P_2O_5- 1% and MgO –1.7%, Fumaric Acid. The presence of β- sitoserol and Tannin has also been reported in the plant. (The Wealth of India, Raw Materials 1976).

The leaves are cooked as a vegetable; cattle also eat them. The extract of *Tridax Procumbens* Linn. Has been reported to have various pharmacological effects, anti microbial activity against both gram – positive and gram – negative bacteria, and stimulate wound healing.

Nootropics are a class of psychotropic drugs that enhance

*Author for correspondence




Table 1: For Learning and Memory

Sr. No.	Group	Doses (mg/kg)	No. of Animals	Route of Administration
1	Control (vehicle)	0.5 ml	5	Intraperitoneally
2	Scopolamine	0.3	5	Intraperitoneally
3	Piracetam	100	5	Intraperitoneally
4	Piracetam +Scopolamine	100 + 0.3	5	Intraperitoneally
5	TP	4.2	5	Intraperitoneally
6	TP	8.4	5	Intraperitoneally
7	TP	12.6	5	Intraperitoneally
8	TP+ Scopolamine	4.2 + 0.3	5	Intraperitoneally
9	TP+ Scopolamine	8.4 + 0.3	5	Intraperitoneally
10	TP+ Scopolamine	12.6 + 0.3	5	Intraperitoneally

TP- Aqueous extract of Tridax procumbens Linn

Table 2: For 'Y' Maze

Sr. No.	Group	Doses (mg/kg)	No. of Animals	Route of Administration
1	Control (vehicle)	0.5 ml	5	Intraperitoneally
2	Scopolamine	0.3	5	Intraperitoneally
3	Piracetam	100	5	Intraperitoneally
4	Piracetam +Scopolamine	100 +0.3	5	Intraperitoneally
5	TP	4.2	5	Intraperitoneally
6	TP	8.4	5	Intraperitoneally
7	TP	12.6	5	Intraperitoneally
8	TP+ Scopolamine	4.2 +0.3	5	Intraperitoneally
9	TP+ Scopolamine	8.4 + 0.3	5	Intraperitoneally
10	TP+ Scopolamine	12.6 + 0.3	5	Intraperitoneally

TP- Aqueous extract of Tridax procumbens Linn

learning, acquisition and reverse learning impairments in experimental animals. The term 'nootropic' was introduced to describe a group of drug that has ability to improve brain mechanism postulated to be associated with mental performance. Nootropics exert their action by-facilitating flow of information between the cerebral hemispheres and enhancing resistance of brain to physical and chemical assault. They lack of sedative, analgesic or neuroleptic activity. The chemical structure of prototype 129ootropic, Piracetam is a derivative of GABA (Stahl, 1998). Elucidation of the physiology mechanisms underlying learning and memory remains perhaps one of the greatest challenges facing the neuroscience communication today. One of the significant advances in the past two decades in terms of advanced understanding of learning and memory, is the discovery and elaboration of phenomenon called long term potentiation (LTP) that presumably represent neural correlates of learning in intact animal (Kulkarni S.K., George B.1999).

An analysis of literature revealed some distinguished pharmacological activities of the plant such as Wound healing activity (Udupa A.K. 1995), Depression of wound healing activity of steroid and TP (Diwan PV 1983), Bioactivity studies of extracts from TP (Taddei A 2000), Influence of TP on Lysil oxidase and wound healing activity (Udopa Sl 1991), Immunomodulatory effects of aqueous extract of TP (Tiwari U 2004), Hepatoproctective activity of TP (Saraf S 1991) (Part II Saraf S 1992), Effect of aqueous leaves extract of TP on blood pressure and heart rate in rats (Salahdeen HM 2001), Antiinflammatory profile of TP in animal of fibroblast cell model (Margaret I 1998).

MATERIALS AND METHODS

Plants and Preparation of Extract: *Tridax procumbens* Linn. leaves were collected from the campus of the college in month of June and July and shade dried. Plant was identified Agharkar institute of Pune. The drugs *Tridax Procumbens* Linn. is extracted by Percolation method. Moisten 1000gm powered of *Tridax Procumbens* Linn. Leaves with a sufficient of the prescribed menstruum (solvent) to render it events and distinctly damp and macerate for 6 hr in a tight covered container. This will enable the leaf cells to absorb the menstruum. Then pack it in a cylindrical percolator. The packing of the percolator

Observation Table No. 4

Sr. No	Activity	Model	Group	Drug	Observation
1	Learning and memory	Pole climbing method	10 groups (n=5)	Vehicle, *Tridax Procumbens*, Piracetam, Scopolamine.	Response of animal by jumping on the pole or after 30 sec.
2	Learning and memory	Elevated plus maze method	10 groups (n=5)	Vehicle, *Tridax Procumbens*, Piracetam, Scopolamine.	Time spent by the mouse in 5 min. on the open and closed arms
3	Learning and memory	"Y" maze method	10 groups (n=5)	Vehicle, *Tridax Procumbens*, Piracetam, Scopolamine	Time required to transverse the maze.

Table 5: Effect of aqueous extract of TP on learning and memory using Elevated Plus Maze Method

Treatment (mg/kg)	Day I	Day II	Day IX	Inflexion ratio Day II	Inflexion ratio Day IX
Control (i.p.)	8.29±0.69	4.79±0.71***	7.75±0.66	0.59±0.02	0.15±0.03
Scopolamine (0.3) (i.p.)	7.73±1.51	8.83±1.05	8.39±0.29	-0.12±0.10	-0.40±0.63**
Piracetam (100) (i.p.)	9.39±2.40	6.45±1.06***	6.21±0.06***	0.25±0.01	0.26±0.01*
Piracetam (100)+ Scopolamine (0.3) (i.p.)	8.30±1.41	7.33±0.80	5.26±1.41***	0.05±0.08	0.28±0.04**
TP (4.2) (i.p.)	14.51±2.61	7.69±1.34***	6.58±0.07***	0.41±0.01	0.49±0.02*
TP (8.4) (i.p.)	10.66±1.18	8.50±1.68***	7.13±0.05***	0.22±0.02	0.34±0.03**
TP (12.6) (i.p.)	10.54±1.74	5.86±1.04***	5.20±0.07***	0.38±0.01	0.44 ± 0.01
TP (4.2) + Scopolamine (0.3) (i.p.)	15.21±1.97	12.03±2.58***	2.20±0.08***	0.46±0.01	0.19±0.02
TP (8.4) + Scopolamine (0.3) (i.p.)	10.38±2.06	5.99±0.59***	5.46±0.07***	0.35±0.02	0.37±0.03**
TP (12.6) + Scopolamine (0.3) (i.p.)	13.91±2.92	6.81±1.46***	5.04±0.06***	0.47±0.07	0.55±0.96**

n=5, Values are Mean ±SEM; TP- aqueous extract of Tridax Procumbens.

**** p<0.001, **p<0.01 as compared Vs control treated group (ANOVA followed by Tukey Kramer multiple comparison test).*

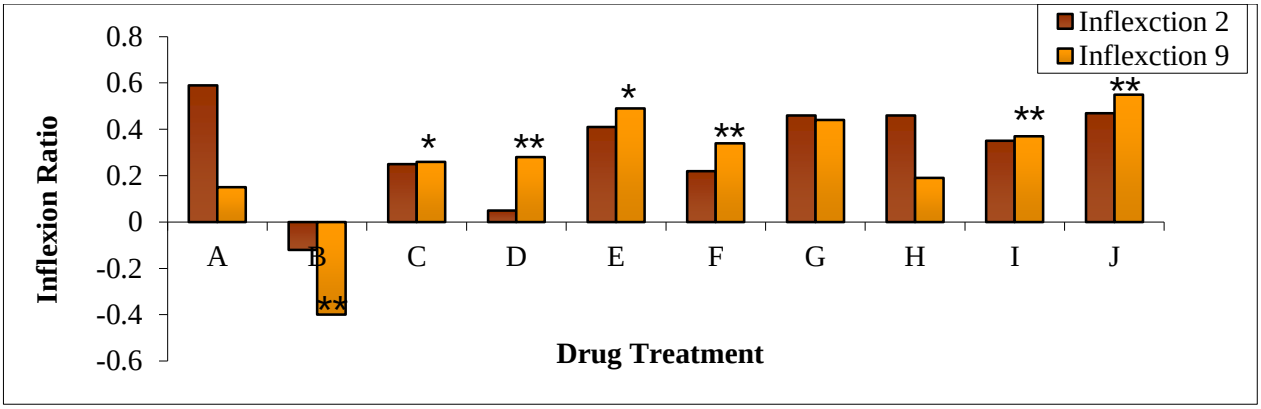
is very important. If packed too tightly, the product will not percolate; or, if packed too loosely, the menstruum will channel, giving a week extract. Add enough of the menstruum to saturate the powder and leave a stratum above it. When the liquid begins to drop from the percolator close the orifice, cover the percolator, and macerate for the prescribed time, usually 48 hr. then open the (Hoffman clamp) valve and all the percolation to proceed slowly. Collect and reserve the first 850 ml percolate. Continue percolation by gradually adding more menstruum over the herb until the botanical is exhausted. The percolation is usually tested for remaining actives. When no more actives remains, the botanical is considered exhausted. Recover the menstruum from the remainder of the percolate and concentrate to a soft extract in a vacuum apparatus at a temperature not exceed 45^0C (Frank S.D' Amelio, Sr. 1999).

Animals: Male/ Female albino mice weighing 20-25 gm and male/ female albino rats weighing 180- 250 gm were obtained from National Institute of Toxicology, Pune. Animals were housed in groups of five per cage under standard laboratory conditions with food and water continuously available. A 12 h: 12 h (light: dark) cycle was used with the light on from 7:00 to 19:00 h. All behavioral testing was done during the day light period between 10:00 and 17:00 h. Animals were tail marked and handled daily for 5 min during the last 3 days before the experiment.

Drugs and Chemicals: The following drugs was used for study and procured as gift sample; Piracetam (Standard nootropic drug) from UCB India Ltd, India, Scopolamine (Muscarinic antagonist) from Buscopan, German Remedies, India, Diazepam (CNS Depressant) from Ranbaxy, India, and Phenytoin (Antiepileptic) from Zydus Pharmaceuticals, and these all drugs were dissolved and /or diluted with distilled water (vehicle). *Tridax Procumbens* Linn. was dissolved in distilled water and administered intraperitonially.

Phytochemical Screening of Crude Drug: Various chemical tests were carried out to identify the phytoconstituents as described by Khandelwal (2003).

METHODS



Graph No. 1: Screening of Nootropic activity of aqueous extract of Tridax procumbens using Elevated Plus Maze
TP- Aqueous extract of Tridax procumbens.
A-Control, B- Scopolamine, C- Piracetam, D- Piracetam + Scopolamine, E- 4.2 mg/kg TP, F- 8.4 mg/kg TP, G- 12.6 mg /kg TP H- 4.2 mg /kg TP, I- 8.4mg /kg 0TP, J-12.6 mg /kg TP
***p<0.01, as compared with Scopolamine treated group (ANOVA followed by Tukey Kramer multiple comparison test).*

Table 6: Effect of aqueous extract of TP on learning and memory using Pole climbing

Treatment (mg/kg)	Time Takes to Reach The Safe Place (Seconds)			
	Day I	Day II	Day V	DAY IX
Control (i.p.)	0.8 ±0.05	0.76 ± 0.04	0.84 ± 0.04	0.78 ± 0.03
Scopolamine (0.3) (i.p.)	1 ± 0.03*	1.16 ± 0.05***	1.06 ± 0.02	0.96 ± 0.06***
Piracetam (100) (i.p.)	0.24 ± 0.02***	0.44 ± 0.02***	0.34 ± 0.04***	0.58 ± 0.08***
Piracetam (100) + Scopolamine (0.3) (i.p.)	0.76 ± 0.02	0.84 ±0.02	0.68 ± 0.05	0.48 ± 0.03
TP (3)(i.p.)	0.54 ± 0.05**	0.54 ± 0.05**	0.46 ± 0.05***	0.46 ± 0.05**
TP (6) (i.p.)	0.84 ± 0.02	0.84 ± 0.02	0.46 ± 0.05***	0.40± 0.1
TP (9) (i.p.)	0.84 ± 0.05	0.84 ± 0.02	0.40 ± 0.04***	0.58 ± 0.08
TP (3) + Scopolamine (0.3) (i.p.)	1.04 ± 0.05**	0.78 ± 0.03	0.78 ± 0.03	0.48 ± 0.08
TP (6) + Scopolamine (0.3) (i.p.)	0.62± 0.03	0.56 ± 0.02	0.32 ± 0.06***	0.52 ± 0.05*
TP (9) + Scopolamine (0.3) (i.p.)	0.76± 0.05	0.50 ± 0.04 **	0.60± 0.05*	0.52 ± 0.05***

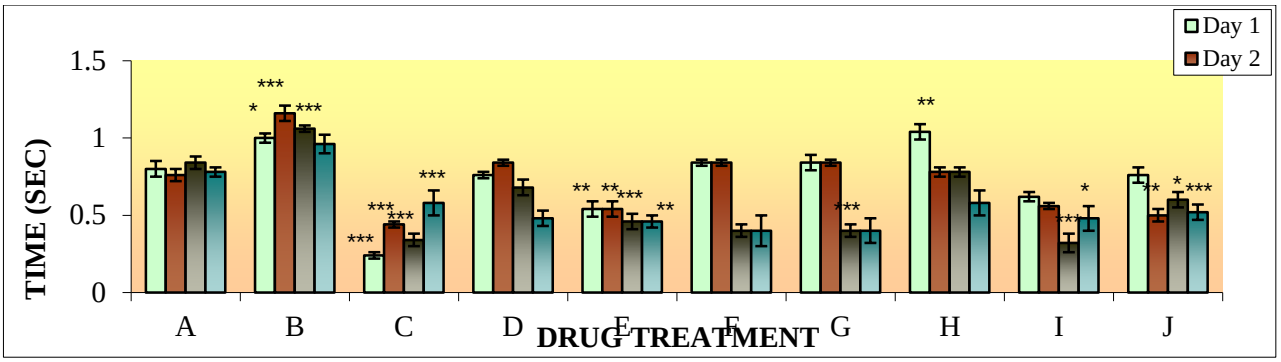
n=5, Values are Mean ±SEM; TP- aqueous extract of Tridax procumbens.
**** p<0.001,**p<0.01 as compared Vs control treated group (ANOVA followed by Tukey Kramer multiple comparison test).*

Evaluation of Nootropic Activity Using Isolated Mice and Rat:

Elevated Plus –Maze: Mazes are traditionally tools for assessing learning and memory performance in laboratory animals. Originally designed to evaluate the antianxiety agents, elevated plus-maze has also been recently extended to measure the spatial long- term memory in animals. The elevated plus-maze (EPM) was introduced by Pellow *et al* (1985) for rats and by Lister (1987) for mice. Many researchers have preferred mice because of their high exploratory activity compared to that of rats. It consists of two open and two closed arms and is based on the apparent natural aversion of rodents to open and high spaces in the measurement of anxiety state in animals. Animals spend more time in enclosed arms because they feel unsafe in open arms. The aversive quality of the open arm is not apparent until the animals enter it. Based on this parameter, Itoh *et al.* (1990; 1991) have demonstrated that transfer latency (the time in which the animal moves from the open arm to the enclosed arm) was markedly shortened if the animal has previously experienced entering the enclosed arms. This shortened transfer latency has been shown to be related to memory processes. Accordingly, the transfer latencies from second day onwards become shorter than on first day of exposure of animals to the EPM.

Recent revelations of several nootropics and amnestic agents on elevated plus- maze made this model a widely acceptable paradigm to study learning and memory processes in rodents (Sharma and Kulkarni, 1992). It is simple and less time consuming procedure, does not involve any sophisticated equipment not prior training nor noxious stimuli. Further, there is no need to manipulate appetitive behaviors. The impairment of learning and memory induced by scopolamine, an anticholinergic agent or electro convulsive shock was reflected by prolonged transfer latency. Piracetam, a nootropics agent, showed memory-enhancing effect as it significantly shortened the transfer latency on the EPM (Itoh *et al*., 1990). The TL was expressed as inflexion ratio (IR) using the formula earlier by Jaiswal and Bhattacharya (1992).

$IR = (L_1 - L_0)/L_0$



Graph No. 2: Screening of Nootropic Activity of Aqueous Extract of Tridax Procumbens using Cook's Pole Climbing
TP- Aqueous extract of Tridax procumbens.
A-Control, B- Scopolamine, C- Piracetam, D- Piracetam + Scopolamine, E- 3 mg/kg TP, F- 6 mg/kg TP, G- 9 mg /kg TP H- 3 mg /kg + Scopolamine TP, I- 6 mg /kg +Scopolamine TP, J-9 mg /kg T.P + Scopolamine.
** p < 0.05,** p< 0.01,*** P<0.001, as compared with control treated group (ANOVA followed by Tukey Kramer multiple comparison test).*

Where L_0 =TL after 24h or on the ninth day and L_1 = initial TL(s).

Cook's Pole Climbing: The basic operational mode of this method is that following an auditory warning stimulus, the animal learns to avoid the foot – shock delivered through the cage floor by jumping to pole. This method has long being accepted as a reliable technique to evaluate learning and memory in experimental animals.

In this method, Cook's pole climbing apparatus was used for inducing stable base line behaviour. The rats had to learn to jump on a pole to avoid foot shock. A tone 50 Hz. Was used as a conditioned stimulus and foot shock of 1 mA was the unconditioned stimuli. In the training procedure, the animal was initially allowed to adopt in the chamber for 1 min. this was followed, in succession, by conditioned and unconditioned stimuli, for a period of 15 sec each. The trial ended either after the animal responded by jumping on the pole or after 30 sec, whichever was earlier the animal was given such trial every day for 10 days. A trained animal either responded spontaneously or to buzzer without waiting for the shock. Retention of the memory of the painful stimuli established in learning procedure was tested before and after drug treatment. It was quantified as the percentage of animals avoiding shock by jumping on the pole. The data of different groups were tested for statically significance. (Goswami M. *et al.* 1996).

'Y'-Maze: Other maze used to study learning and memory in experimental animals includes Y-maze. A variety of Y-maze task paradigms are available for the evaluation of spatial working and long- term memory in rodents. The spontaneous alteration task paradigm is the simplest version of Y-maze task used to measure the spatial working memory in rats and mice. Each mouse was placed at the end of one arm and allowed to move freely through the maze for 8 -min. Mice tend to explore the maze systematically, entering each arm in turn. The ability to alternate requires that the mice know which arm they have already visited. The series of arm entries, including possible returns into the same arm, are recorded visually. Alteration is defined as the number of successive entries into the three arms, on overlapping triplet sets. The percentage of alteration is calculated as the ratio of actual alterations to possible alterations, defined as the total number of arm entries minus two, and multiplied by 100. Typically, mice exhibit an alteration percentage of 60-70% and perform 25-35 arm entries within 8-min session. Pretreatment with amnestic agents such as scopolamine (0.3 mg/kg) 30 min prior to trails induces a marked decrease in spontaneous alteration performance with a concomitant increase in the total number of arm entries. Administrations of agents that possess memory-enhancing effects are expected to reverse the changes. Memory loss and cognitive disturbances are caused by dysfunction of the neurotransmitter system and decrease in cerebral metabolism and blood flow.

Various neurotransmitters have been indicated in the physiology of memory e.g. acetylcholine, β-endorphine, catecholamines such as noradrenaline (NA) and dopamine (DA), gamma-aminobutyric acid (GABA) and other substances like peptides, adrenocorticotrophic hormones, vasopressin, opioid and inducers of protein synthesis. It has been reported that pre and post- natal undernourishment causes poorer learning and memory (Jaiswal *et al.*1992). Prenatal insults, in the form of undernourishment, stress and anxiolytic drugs, leave a lasting imprint on cognitive behavior of the offspring (Jaiswal and Bhattacharya, 1993). Chronic restraint stress found to impair spatial learning and memory in rats (Sunanda *et al.*, 2000). Petitto et al. reported that interleukin-II play a role in development and regulation of brain neurons involved in spatial learning and memory

RESULTS AND DISCUSSION

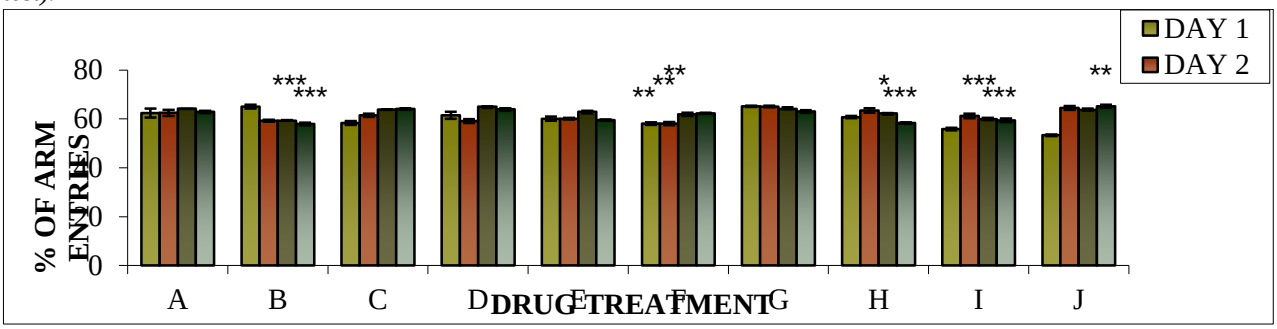
Central nervous system is complex, regulating/controlling various body functions through the balance of variety of stimulating and inhibitory neurotransmitters. Any drug that alters the action of any of the neurotransmitters may affect various neurobehavioral and neuroendocrinal functions.

In the present study leaf extract of '*Tridax Procumbens*' (TP) Linn. Family Asteraceae was extracted by Percolation method for its pharmacological action on Central Nervous

Table 7: Effect of aqueous extract of TP on learning and memory using Y' Maze Method

Treatment (mg/kg)	Actual Arm Entries in Percentage			
	Day I	Day II	Day V	DAY VII
Control	62.4±1.87	62.51±1.25	64.31±0.23	62.91 ± 0.45
Scopolamine (0.3) (i.p.)	65.00±0.80	60.60±0.44	60.10±0.01***	57.94 ± 0.50***
Piracetam (100) (i.p.)	60.00±0.78	61.50±0.68	63.89±0.18	64.12 ± 0.23
Piracetam (100) + Scopolamine (0.3) (i.p.)	62.33±1.40	59.55±0.80	65.00±0.43	63.96 ± 0.43
TP (4.2) (i.p.)	56.77± 0.82	60.10±0.30	62.54±0.61	59.58 ± 0.25***
TP (8.4) (i.p.)	60.00±0.58**	58.10±0.77**	61.89±0.67**	62.33 ± 0.25
TP (12.6) (i.p.)	60.06±0.30	65.1±0.29	64.15±0.20	63.07 ± 0.57
TP (4.2) + Scopolamine (0.3) (i.p.)	60.77±0.43	63.46±0.91	62.26±0.43	58.37 ± 0.26***
TP (8.4) + Scopolamine (0.3) (i.p.)	55.83±0.32	61.28±0.94	59.96±0.46	59.44 ± 0.73***
TP (12.6) + Scopolamine (0.3) (i.p.)	53.33±0.78	64.50±0.78	63.75±0.31	65.22 ± 0.61**

n=5, Values are Mean ±SEM; TP- aqueous extract of Tridax procumbens.
**** p<0.001,**p<0.01 as compared Vs control treated group (ANOVA followed by Tukey Kramer multiple comparison test).*



Graph No. 3: Screening of Nootropic activity of aqueous extract of Tridax procumbens using 'Y' Maze
TP- Aqueous Extract of Tridax procumbens
A-Control, B- Scopolamine, C- Piracetam, D- Piracetam + Scopolamine, E- 4.2 mg/kg TP, F- 8.4 mg/kg TP, G- 12.6 mg /kg TP, H- 4.2 mg /kg TP, I- 8.4mg /kg TP, J-12.6 mg /kg TP
**** p<0.001, as compared with control group (ANOVA followed by Tukey Kramer multiple comparison test)*

System. To access the preliminary activity of TP leaf on CNS, Nootropic activity (learning and memory) was performed.

Learning and Memory: Number of experimenter has presented evidence suggesting that learning and memory can be modified by stimulation of central dopaminergic system. Many other studies also suggest the involvement of mesolimbic cortical dopaminergic system in cognitive effects. Increased noradrenergic activity has been shown to improve memory.

Nootropics represents a new class of psychotropic agents with selective facilitatory effect on integrative functions of the central nervous system, particularly on intellectual performance, learning capacity and memory. A number of drugs, including Piracetam, Aniracetam have now been introduced in therapy to ameliorate cognitive deficits. Several studies conducted in laboratory have indicated that the proposed nootropic agents have more significant effects on learning and memory (Jaiswal A.K.1992).

The neurochemical basis of learning and memory remains controversial, despite extensive experimental and clinical studies. Although the role of the central cholinergic system is fairly well established, its deficiency being implicated in memory deficits, the role of the other neurotransmitter systems cannot be ignored. Several studies have indicated that increase in serotonergic neurotransmission can interfere with learning acquisition and memory consolidation.

Learning and memory involve mechanisms like acquisition, storage, consolidation and recall. Active avoidance learning is reasonably good tests for cognitive function (Goswami, Mund, Ray, 1996). The ability of the animal to identify the conditioning stimuli (buzzer) as precursor of the unconditioned stimulus (shock) involves recall of task and may implicate long term memory. In the present study Scopolamine significantly $p< 0.05$, $p< 0.001$ and $p< 0.001$ increased the time taken to avoid the shock when compared to control, while Piracetam significantly $p< 0.001$ decreased the time taken to avoid the unconditioned stimulus at day 1, day 2, day 5 and day 9. Tridax *procumbens* at 3 mg/kg (i.p.) significantly $p< 0.01$, $p<0.01$,$p <0.001$, and $p< 0.01$ decreased the time taken to avoid the unconditioned stimulus at day 1, day 2, day 5 and day 9 respectively while 6 and 9 mg/kg (i.p.) showed

significant p <0.001 avoidance of an shock at day 5. *Tridax procumbens* 3 mg/kg (i.p.) showed significant p<0.01 activities at day 1, while *Tridax procumbens* at 6 mg/kg (i.p.) showed significant (p<0.001) and p<0.05 at day 5 and 9, while *Tridax procumbens* 9 mg/kg showed significant (p<0.01, p<0.05 and p<0.001) activity at day 2, 5 and 9 when administered in combination with Scopolamine. Thus data of the present experiment suggest that the drug-induced changes could be interpreted as modification in the retrieval or recall phenomenon.

Memory forms one of the most complex functions of the brain. Time taken by the rat to reach reward chamber (TRC) from the start box on 1st day reflected the learning index, whereas, TRC of the next day (second day) indicated retention capacity (memory score) of animals. Transfer Latency (TL) was defined as the time taken by the animal (rat/mouse) to enter into one of the enclosed arms with all its four legs. TL of the first day reflected learning ability of animals whereas, TL of the next day indicated retention capacity (memory) of animals (Milind Parle *et al* 2005).

The elevated plus maze is used to measure transfer latency *i.e.* the time elapsed between the movement of the animal from an open to an enclosed arm was markedly shortened if the animal had previously experienced entering open and closed arms, and this shortened transfer latency has been shown to be related with memory processes. Studies of several nootropics and amenestic agents on EPM made this model a widely accepted paradigm to study learning and memory processes in rodents (Achliya *et al* 2004). In EPM, acquisition (learning) can be considered as transfer latency on first day trials and the retention / consolidation (memory) is examined 24 hr later.

In the presence study *Tridax procumbens* at 4.2 mg/kg (i.p.) showed significant (p<0.01) increased in transfer latency at day to day.

In 'Y' maze- Other maze used to study learning and memory in experimental animals includes Y-maze (Kulkarni SK 1999). The spontaneous alteration task paradigm is the simplest version of Y-maze task used to measure the spatial working memory in rats and mice. Spontaneous alternation behavior in 'Y' maze is considered to reflect a primitive form of spatial working memory. (Jing Yan *et al* 2001). In the presence study Scopolamine significantly (p<0.001) showed decrease in percentage of actual arm entries at day 5 and 7 as compared to control. *Tridax procumbens* 4.2 mg/kg (i.p.) significantly (p<0.001) decreased the percentage of actual arm entries at day 7, while *Tridax procumbens* 8.4 mg/kg (i.p.) significantly (p< 0.01) decreased the percentage of actual arm entries at day 1, 2 and 5. *Tridax procumbens* 4.2 and 8.4 mg/kg (i.p.) when given along with Scopolamine significantly p<0.001 decreased the percentage of actual arm entries at day 7, while *Tridax procumbens* 12.6 mg/kg (i.p.) showed significant (p<0.01) increase in the percentage of actual arm entries at day 7.

CONCLUSION

The aqueous extract of leaf '*Tridax Procumbens*' (TP) Linn. Family Asteraceae was extracted by Percolation method, for the study of Nootropic activity in mice and rat by using three methods are i.e. Elevated Plus Maze method, Cook's Pole Climbing method and 'Y' Maze method. These three methods are successfully performed and it shows significant activity with various doses. Therefore it can be concluded that the plant *Tridax Procumbens* Linn. is said to possess the Nootropic activity.

ACKNOLEDGEMENT

Authors are thankful Prof. T. J. Sawant Founder Secretary, Jayant Sikshan Prasarak Mandal, Pune for providing necessary facilities.

REFERENCES

1. The wealth of India. Raw materials Vol. X: SP-W 1976
2. The Ayurveda Encyclopedia. Ist Sri. Satguru Publications Delhi, 1998.
3. Stahl SM. Essential psychopharmacology: Neuroscientific basis and practical application. UK: Cambridge University Press, 1998; 167-248.
4. Kulkarni SK, George B. Significance of long- term potentiation (LTP) in cognitive functions and epilepsy. Indian J. of Pharmacology. 1999; 31: 14-22.
5. Diwan PV, Tilloo, LD, Kulkarni D. Influence of *Tridax Procumbens* on wound healing. Indian J. Med. Res. 1983; 75: 450-4.
6. Taddei A, Rosas Romero AJ. Bioactivity studies of extracts from *Tridax Procumbens*. Phytomedicine, 2000; 7(3): 235-8.
7. Udopa Sl, Udopa Al, Lalkarni DR. Influence of *Tridax Procumbens* on lysl oxidase activity and wound healing. Planta Med. 1991; 57(4): 325-7.
8. Tiwari U, Rastogi B, Singh P, Saraf DK, Vyas SP. Immunomodulatory effects of aqueous extract of *Tridax Procumbens*. J. Ethanopharmacol. 2004; 92(1): 113-9.
9. Salahdeen HM, Yemitan OK, Alada ARA, 2001. Effect of aqueous leaf extract of *Tridax Procumbens* on blood pressure and heart rate in rats. African Journal of Biomedical research, 17: 27-29.
10. Margaret I, Reddy PS, Kaisar J. Antiinflammatory profile of *Tridax Procumbens* in animal of fibroblast cell model. Phytotherapy Research. 1998; 21: 285-287.
11. Khandelwal KR. Practical Pharmacognosy Techniques and Experiments. 9th Edn. Nirali Prakashan, India, 2003.
12. Itoh J, Nabeshima T, Kameyama T. Utility of an elevated plus- maze for the evaluation of memory in mice: effect of nootropics, scopolamine and electroconvulsive shock. Psychopharmacology (Berl), 1990; 101(1): 27-33.
13. Itoh J, Nabeshima T, Kameyama T. Utility of an elevated plus-maze for dissociation of amnesic and behavioral effects of drugs in mice. Eur. J. of Pharmacology. 1991; 194 (1): 71-76.
14. Jaiswal AK, Bhattacharya SK. Effect of Shilajit on memory, anxiety and brain monoamines in rats. Indian J. of Pharmacology. 1992; 24: 12-17.

15. Goswami M, Mund S, Ray A. Effectrs of some psychotropic agents on cognitive functions in rats. 1996; 40 (1): 75-78.
16. Parle M, Mani V, Sing N. Swim every day to keep dementia away. J. of sports science and medicine. 2005; 37-46.
17. Achliya G, Barabde U, Wadodkar S, Dorle A. Effect of Bramhi Ghrita, an Polyherbal Formulation on Learning and Memory in experimental animals. Indian J. of Pharmacology. 2004; 36(3): 159-162.
18. Jing -Ji. Jae- Young Cho, Hee-sung Kim., Protection against β-amyloid peptide toxicity in vivo with long-term administration of ferulic acid. British J. of Pharmacology. 2001; 133: 89-96