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Evaluation of anti-anxiety activity of *Mucuna pruriens*

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ABSTRACT

Mucuna pruriens, also known as Velvet Bean, *Mucuna pruriens* has been used for centuries by Ayurvedic herbalists for overall wellness. *Mucuna pruriens* provides support for brain function, muscle health and libido. *Mucuna pruriens* has also been shown to have diuretic effects. It increases tissue resiliency and improves coordination. Mucuna can also increase testosterone levels, which in turn can lead to increased muscle mass and strength. It also supports the nervous and reproductive systems in the body. anti-oxidant activity of *M. pruriens* has been also demonstrated *in vitro* by its ability to scavenge DPPH radicals and reactive oxygen species. This is an excellent natural source of L-dopa and 5-hydroxy tryptophan (5-HT) Present study was designed to evaluate the anti-anxiety activity of *Mucuna pruriens* extract in Swiss albino mice. Three doses of *Mucuna pruriens* (100, 200,400 mg/kg, p.o.) and standard dose of Buspirone (5 mg/kg, i.p.) were used for evaluation of the anti-anxiety activity. The elevated plus maze (EPM) was used to take as a measure of antianxiety effect. *Mucuna pruriens* at the doses of 200 mg/kg and 400 mg/kg significantly reduced the time spent and no. of entries in closed arm, increased the time spent and entries into open arm in elevated plus maze ($p<0.05$) as compared to control group. These results indicate that MP may be possesses antianxiety property.

Keywords: Anxiety, Elevated plus maze, *Mucuna pruriens*, Buspirone, Swiss Albino Mice.

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INTRODUCTION

Anxiety is fretted about upcoming events and fear is a reaction to ongoing circumstances. These feelings may cause physical symptoms such as a racing heart and shakiness nervousness, panic, restlessness, tension, and agitation [1]. Anxiety disorders are partly hereditary but it may also be due to some drug use including caffeine and alcohol. They often occur with other mental disorders. It may be treated with lifestyle changes, therapy, and medications. Medications should be recommended only if other measures are not effective [2]. The Neurotransmitters which involved in anxiety generation include noradrenaline, dopamine, GABA, serotonin, Corticotropin releasing factor (CRF), neurosteroids neuropeptides and Melanocyte stimulating hormone (MSH) [3].

Buspirone is an anxiolytic psychoactive drug of the azapirone chemical class. It is primarily used to treat generalized anxiety disorder (GAD). Unlike most drugs typically used to treat anxiety, but the pharmacology of buspirone is not associated to benzodiazepines or barbiturates, therefore the risk of withdrawal symptoms abolished after discontinued [4]. Buspirone works as a serotonin 5-HT1A receptor partial agonist. This action is belief to arbitrate its anx-iolytic and antidepressant effects. Besides, it works as a presynaptic dopamine antagonist at the D2, D3 and D4 [5] receptors. Buspirone is also a partial α1 receptor agonist. The ability of buspirone to selectively block presynaptic mesolimbic D2 autoreceptors in lower doses appears to result in increased dopamine synthesis and release [6]. The anxiolytic effects of non-benzo- diazepine azapirones agents i.e. buspirone, act as 5HT1A partial agonists and their therapeutic role in clinical anxiety and mood disorders has further focused attention on the 5-HT1A receptor.

Although the azapirones interact with dopaminergic and noradrenergic neurotransmitter systems, they show nanomolar empathy for 5HT1A receptor sites.[7] *Mucuna pruriens* (L.) DC. Belongs to family Fabaceae. Popularly known as "Konch" in Hindi, "Velvet bean" in English *Mucuna pruriens* (L.) has been used for centuries in the Indian traditional medicine [8]. The main constituents found in *Mucuna pruriens* include, dopamine, fatty acids, flavones,

glutamic acid, alkaloids, glutathione, histidine, gallic acid, hydroxygenistein, mucunadine, glycine, mucunain, mucunine, trypsin, tryptamine, histamine, 5-hydroxytryptamine and it possesses various other pharmacological activities [9], Mucunapruriensalso showed significant antidepressant activity in rodent models [10]. Previous studies have reported that *Mucuna pruriens* contains L-DOPA and 5-hydroxy tryptophan (5-HTP) as a major constituent with higher concentration in seeds [11].

MATERIAL AND METHOD

Animals The study was conducted in the Pharmacology LAB Institute of Pharmacy Bundelkhand University, Jhansi. permission was sought from the Institutional Animal Ethics Committee (IAEC) for conducting the study [Project no. BU/Pharm/IAEC/13/24]. Adult healthy male Swiss Albino mice, of similar physical constitution (in terms of age, body weight), weighing 20-30 g had been used in study. Animals had been obtained from animal house of DRDE, Gwalior, which is certified by Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA) for breeding and housing of animals. The animals were housed in our Institutional Animal facility under temperature, humidity and light and dark cycle-controlled environment [25 ± 2°C, 70%, 12 hrs. cycle) and were given standard pellet diet and water ad libitum. All the animals were treated and housed as per the norms of CPCSEA and IAEC.

Drugs

Mucuna pruriens (MP) seed extract was procured from Baidyanath Ayurveda Bhawan, Jhansi, India, Buspirone as tablets, with each tablet containing 15 mg of Buspirone hydrochloride were manufactured by Zydus Cadila Healthcare Ltd. (Alidac) Tablets were crushed and then dissolved in distilled water.

Dosage and Treatment

Buspirone was administered in a dose of 5 mg/kg, i.p. [12]. MP dissolved in distilled water and administered per-orally (p.o.). 30 mice were divided into control and experimental groups (n=6). Group First received the Distilled water and functioned as the control group, group second received the standard drug Buspirone (5 mg/kg) i.p, groups third, fourth and fifth received the test drug (MP) in doses of 100, 200 and 400 mg/kg, per-orally.

Elevated Plus Maze

The plus maze apparatus was designed as describe in hand book of experimental pharmacology by S.K. Kulkarni. The plus maze apparatus consists of two open (16 × 5 cm) and two closed arms (16 × 5 × 12 cm) for mice and an open roof with the entire maze elevated (25 cm) from the floor the animals are placed individually at the end of one arm facing away from the central platform.

The time taken by the animals to move from the open arm to either of two sides of enclosed arms was recorded. The mouse was taken away from the apparatus when it came out of the enclosed arm [13].

Statistical Analysis

The data were expressed as mean ± standard error mean (SEM). The significance of differences among the groups was assessed using one-way analysis of variance (ANOVA). The test was followed by Dunnett's test, $p< 0.05$ were considered as significance.

RESULT

Observed the distilled water treated group animals in EPM, the time spent in the open arms and closed arms, and entries in the open arms and closed arms were compared with *Mucuna pruriens* extract at the dose of 100 mg/kg, 200 mg/kg and 400 mg/kg & standard drug Buspirone (5 mg/kg). MPE at the dose of 200 mg/kg and 400 mg/kg showed significant ($p<0.05$) increase in the time spent in the open arms and at the dose of 400 mg/kg it showed significant ($p<0.05$) increase in number of entries in open arm (Graph 2).

Furthermore, MPE 200 and 400 mg/kg had decrease in time spent and number of entries in closed arm (Table 1) as compared to control group showed a significant ($p<0.05$) in elevated plus-maze. In this experimental model MP extract showed significant results in dose dependent increase in time spent in open arm as well as number of entries in open arm, also the maximum time spent in open arm is with maximum dose i.e.400 mg/kg. (table 2) come next the dose 0f 200 mg/kg and least time spent with dose 100 mg/kg.as compared to control group, so, it is significant at the dose of 200 mg/kg and 400 mg/kg of *Mucuna pruriens* extract and Buspirone.

Table 1: Effect of *Mucuna pruriens* in Mice using EPM on EPM in mice

GROUP	Time spent in seconds (Mean±SD)		No. of entries (Mean±SD)	
	Open arm	Close arm	Open arm	Close arm
Distilled water	12.25±1.14	192.24±11.25	2.30±1.25	10.45±2.45
Buspirone (5 mg/kg)	98.22±2.06**	128.35±5.20**	12.03±1.48**	09.47±1.28**
Mucuna pruriens (100 mg/kg)	32.200±2.38	154.20±7.34	3.40±.84	09.40±1.35
Mucuna pruriens (200 mg/kg)	42.11±2.39**	175.13±6.78*	4.11±2.11	12.27±2.10*
Mucuna pruriens (400 mg/kg)	82.28±6.28**	125.39±3.96**	11.40±1.45**	7.23±1.22**
p-value	< .01##	< .01##	< .01##	< .01##

Values expressed as mean ± SEM., n=6, One-way ANOVA followed by Dunnett's test. * $p< 0.05$, ** $p< 0.01$ considered significant when Compared to control.

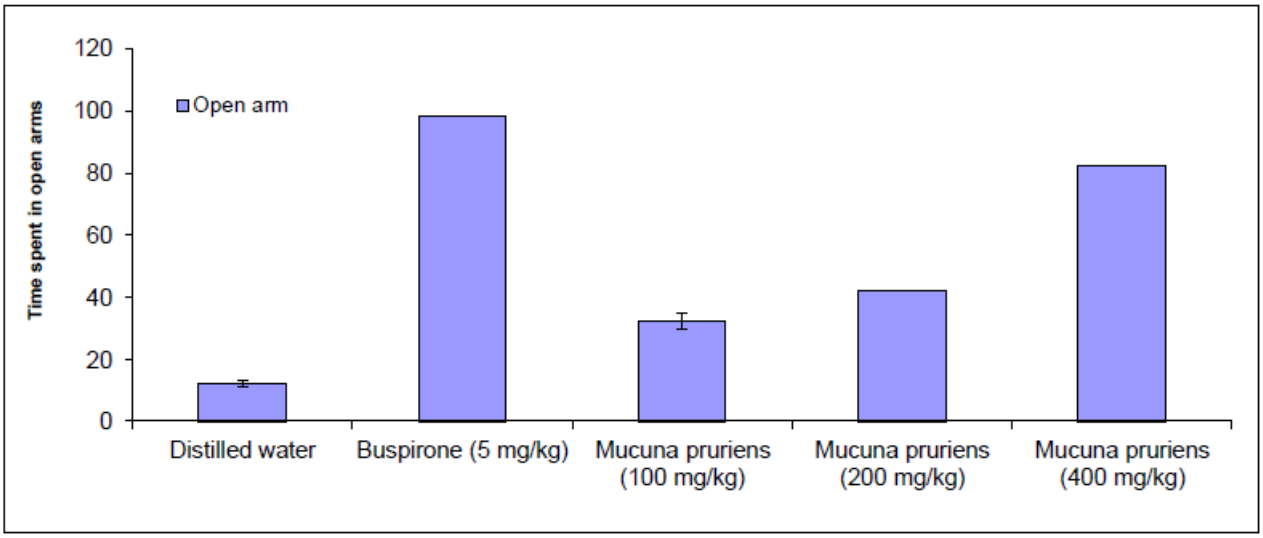

Figure 1A: Effect of *Mucuna pruriens* (MP) and Buspirone (5 mg/kg) in open arm in Elevated Plus Maze Apparatus

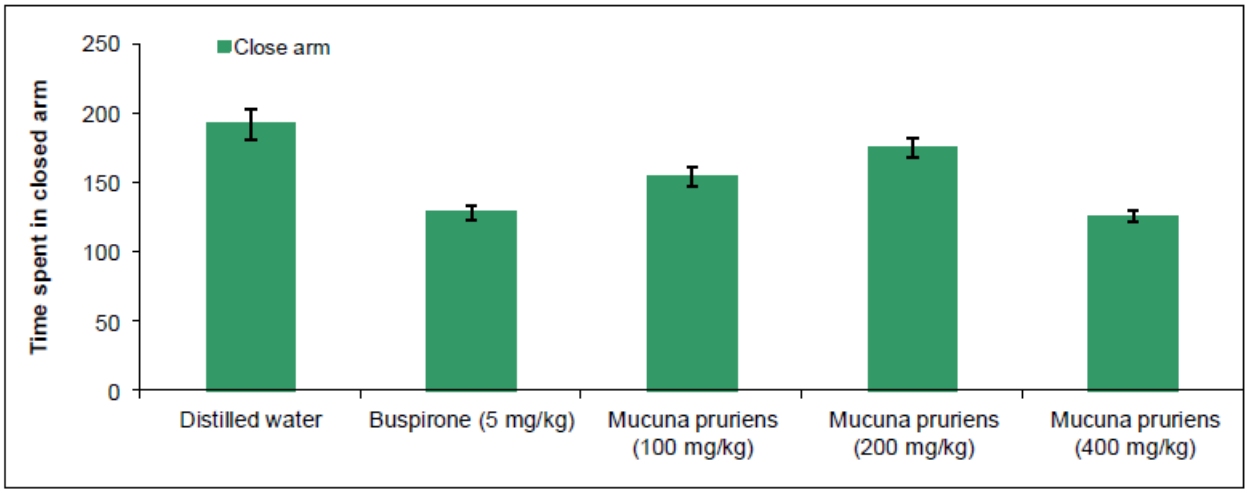

Figure 1B: Effect of *Mucuna pruriens* (MP) and Buspirone (5 mg/kg) in closed arm in Elevated Plus Maze Apparatus

The column represents the mean of the time spent in open arm recorded in a 5 min observation period. *(p< .05), **(p< .01), (Dunnett's test.), compared with control group

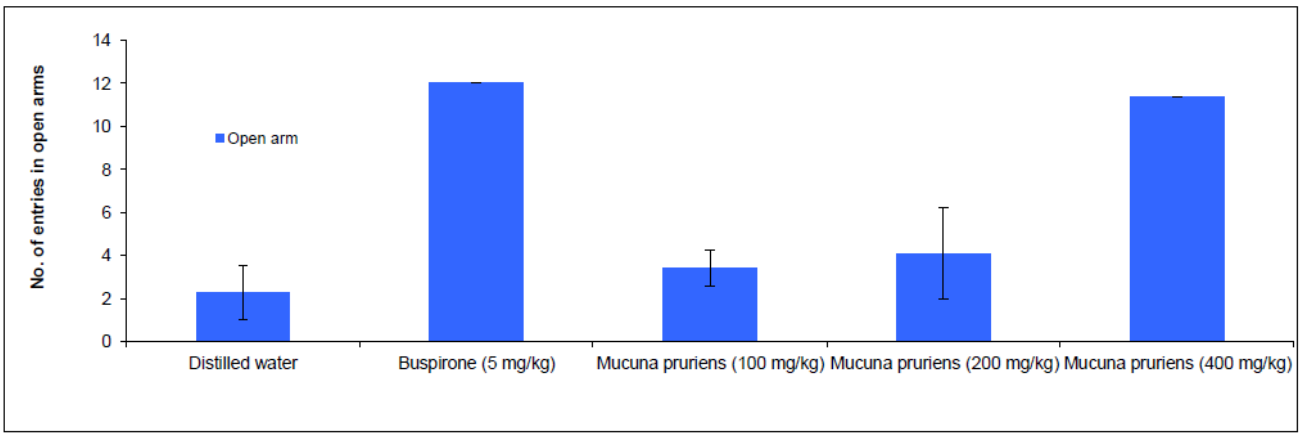

Figure 2A: Effect of *Mucuna pruriens* (MP) and Buspirone (5 mg/kg) in open arm in Elevated Plus Maze Apparatus

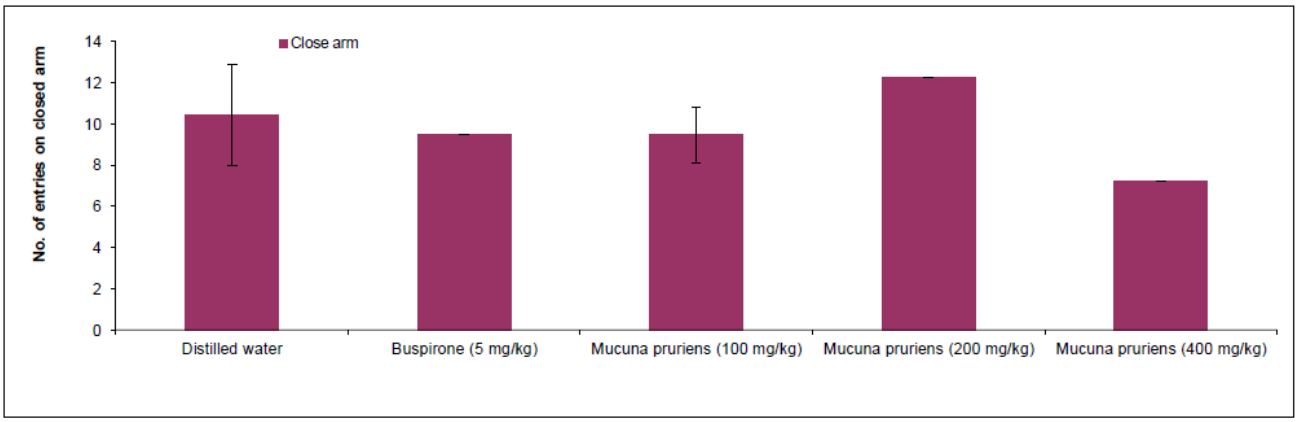

Figure 2B: Effect of *Mucuna pruriens* (MP) and Buspirone (5 mg/kg) in closed arm in Elevated Plus Maze Apparatus

The column represents the mean of no. of entries in open arm recorded in a 5 min observation period. *(p< .05), **(p< .01), (Dunnett's test), compared with control group

RESULT AND DISCUSSION

In many previous studies, reported that extract of *Mucuna pruriens* did not produce any toxicity, or significant behavioral change, or mortality upto an oral dose of 2000 mg/kg in albino mice [14]. In the elevated plus maze, the open arms are more distress provoking, vulnerable and Anxiogenic than the closed arms. So, the animal likes to spend more time and shows normal rearing behavior in the closed arm. The ratio of entries, time spent and rearing behavior in open arms to closed arms reflects the safety of closed arms with relative fearfulness of open arms [15]. The reduction in entry, time spent, rearing in open arms, ratio of open arm to total arm entries and increased defecation are the indications of high level of fear or anxiety. Anxiolytic drugs increase the proportion of entries, time spent and rearing in open arms. They also increase the ratio of open arm to total arm entries [16]. *Mucuna pruriens* extract at the dose of 200 mg/kg and 400 mg/kg exhibit significant ($p<0.05$) increase in the time spent in the open arms and at the dose of 400 mg/kg it showed significant ($p<0.05$) increase in number of entries in open arm (Figure 2).

Additionally, MPE 200 and 400 mg/kg had decrease in time spent and number of entries in closed arm (Table 1) as compared to control group showed a significant ($p<0.05$) in elevated plus-maze. Antianxiety effect of MPE at the dose of 400 mg/kg is comparable to the antianxiety effect of diazepam [17].

CONCLUSION

The results of the present study indicate that *Mucuna pruriens* on administration, showed significant anxiolytic activity in the animal models studied. The presence of L-DOPA and 5-hydroxy tryptophan (5-HTP) as a major constituent in *Mucuna pruriens* may suggest the role of dopaminergic and/or serotonergic pathways in its anxiolytic activities. However, advance studies are required to clarify the targets of action and the exact mechanism of action of *Mucuna pruriens* as an antianxiety drug.

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