ejpmr, 2021,8(4), 552-560

SJIF Impact Factor 6.222

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 2394-3211

EJPMR

PSYCHOPHARMACOLOGICAL STUDIES ON THE DEVELOPMENT OF A NEW EXPERIMENTAL MODEL AKIN TO ANXIETY AND ANTIDEPRSSANT POTENTIAL OF SEROTONIN RICH NUTRIENTS

Sapna Pandey[1], Dr. Shameem Ahmad[1], Dr. Nasiruddin Ahmad Farooqui[1*] and PraveenKumar[1], Jiyaul hak[1]

[1]Translam Institute Pharmaceutical Education and Research Meerut, 250001, U.P.

***Corresponding Author: Dr. Nasiruddin Ahmad Farooqui**

Translam Institute Pharmaceutical Education and Research Meerut, 250001, U.P.

Article Received on 10/02/2021 **Article Revised on 02/03/2021** **Article Accepted on 22/03/2021**

ABSTRACT

Depression and anxiety are the most crippling neuropsychiatric disorders of this modern era. These mostly occur as anxiety followed by depression or in mixed state. Therefore, there is an urgent need of a safe and effective treatment, which proves its worth in this ailment. What else than a conventional food would be a better choice for a convenient therapy. Therefore, *Musa paradisiaca and Lycopersicon esculantum*, fruit rind has been used in the present study to investigate its antidepressant and anti-anxiety potential using forced swim test, tail suspension test, and reserpine-induced hypothermia; and elevated plus maze, hole-board test, and light dark model, respectively. *Musa paradisiaca paste and Lycopersicon esculantum juice* fruit rind given to mice with food for consecutive 14 days at 5, 10, and 20 of *Musa paradisiaca paste and* 5, 10, and 20% *of Lycopersicon esculantum juice* % w/w significantly ($p < 0.01$) reduced despair behavior in forced swim test, immobility duration in tail suspension test, and also switched the hypothermia (reserpine induced) to normal temperature significantly ($p < 0.01$). *Musa paradisiaca paste and Lycopersicon esculantum juice* significantly ($p < 0.01$) raised the time elapsed and count of entries in open arms of elevated plus maze, enhanced incidence of head dipping in holes of hole board along with duration of expending time in lit compartment of light dark model, exhibiting its anti-anxiety effect. *Musa paradisiaca paste and Lycopersicon esculantum juice* significantly reduced monoamine oxidase and malondialdehyde levels providing support to neuroprotective potential of fruit rind.

INTRODUCTION

The word anxiety is derived from the Latin, *angere*, which means to choke or strangle. The anxiety response is often not attributable to a real threat. Nevertheless it can still paralyze the individual into inaction or withdrawal. Anxiety can also be attributed to worries, tensions, fears, concerns and or solicitude. Anxiety is a condition of persistent and uncontrollable nervousness, stress, and worry that is triggered by anticipation of future events, memories of past events, or ruminations over day-to-day events, both trivial and major, with disproportionate fears of catastrophic consequences. Anxiety disorders have been classified according to the severity and duration of their symptoms and specific behavioral characteristics. Categories include (Shekhar and Jacqueline, 2003):

i. Generalized Anxiety Disorder (GAD) - Excessive, unrealistic worry that lasts six months or more,
ii. Obsessive-Compulsive Disorder (OCD) - Persistent, recurring thoughts or obsessions that reflect exaggerated anxiety or fears,
iii. Post-Traumatic Stress Disorder (PTSD) - Exposure to a traumatic event,
iv. Panic Disorders - Severe attacks of panic for no apparent reason
v. Phobias - Extreme anxiety about being judged by others, *or* intense fear reaction to a specific object or situation such as spiders, dogs, or heights.

Anxiety disorders form one of the most common psychiatric disorders affecting both children and adults. Anxiety disorder may develop from a complex set of risk factors including genetics, brain chemistry, personality and life events. Anxiety may be accompanied by a variable constellation of autonomic signs and symptoms such as lightheadedness, perspiration, palpitations, and tightness in the chest, dyspnea, and hypertension, tingling in the extremities, tremor, and restlessness. The principle brain region implicated in the processing of fearful material is the amygdala (fear center), which coordinates the automatic threat response; integrating information from sensory pathways *via* cortical and subcortical inputs (Mathew *et al*., 2008). Different neurotransmitters are involved in fear and anxiety from, which γ-amino butyric acid (GABA) plays a major role in the pathways of anxiety in addition to glutamate, serotonin (5-HT), Corticotrophin releasing hormone (CRH), and norepinephrine (NE) (Shekhar and Jacqueline, 2003).

MATERIAL AND METHODS

Pant martial

The fresh banana (*Musa paradisiaca*) fruit and vegetable tomato (*Lycopersicon esculantum*) were purchased from local market of Hisar and got authenticated from Raw Materials Herbarium and Museum, National Institute of Science Communication and Information Resources, New Delhi (Ref.NISCAIR/RHMD/Consult/2008-09/1157/189). Different concentrations of *Musa paradisiaca* paste (5, 10, 20 %w/w) *was* fed to different groups of mice through a prepared diet fresh once daily. This diet comprised of a mixture of *Musa paradisiaca* paste (MPP), wheat flour kneaded with water, a small amount of refined vegetable oil and a pinch of common salt were added. Each animal consumed approximately 3 gm/day of this specially prepared diet. Control animals received same diet consisting of wheat flour, kneaded with water, small amount of refined vegetable oil and a pinch of salt, but except MPP. *Lycopersicon esculantum* juice (LEJ) was administered to different group of animals in different concentrations (5, 10, 20% v/v) orally once daily at the dose rate of 1 ml/100g body weight for a duration of 15 days.

Animals

All the experiments were carried out using Swiss mice of either sex procured from the Disease-Free Small Animal House of CCS Haryana Agricultural University, Hisar. Young (3-4 months old) mice weighing around 20-25 g were used in the present study. The animals had free access to feed and water except the duration of experiment and they were housed in a natural (12h each) light-dark cycle. The animals were acclimatized for at least 7 days to the laboratory conditions before behavioral experiments. Experiments were carried out between 0900 h and 1800 h. The Institutional Animal Ethics Committee (IAEC) approval was taken for using animals in this study.

DRUG SOLUTIONS AND VEHICLES

Tomato juice was diluted in distilled water. Olanzapine was dissolved in a few drops of diluted HCl and made up to volume with saline; pH was adjusted accordingly. Quetiapine was dissolved in distilled water. Aripiprazole was suspended in 1% Tween-80 solution. Diazepam, Absolute alcohol (99.9%) in concentration of 1%, 2% and 4%, Lorazepam, Venlafaxine, Midazolam, Aripiprazole, Quetapine, Fluoxetine, Imipramine, Prazosin and Baclofen were dissolved separately in normal saline (0.9% sodium chloride. P-chlorophenylalanine (p-CPA) was dissolved in minimum quantity of 0.1 N sodium hydroxide and pH was adjusted to 7 with 0.1 N hydrochloric acid. The volume for oral administration and intraperitoneal injection was 1 ml/100g of mouse.

Experimental design

In the present study, a total of 450 mice divided in 75 different groups were employed. Each group comprised of a minimum of 6 animals.

1. Groups for new model

Group I: Control group of young mice. Animals are put on normal diet for 12 days.

Group II: Standard drug diazepam (2 mg/kg) was given to mice i.p. on 12th day. Animal behavior was observed in response to taped cat voice on 12th day.

Groups III: Mice in this group were exposed to taped cat voice for successive 12 days and behavioral signs were observed.

Groups IV: Mice in this group were exposed to taped cat voice for successive 25 days and behavioral signs were observed.

Group V: MPP (10%, w/w) mixed in diet was fed for 15 successive days to mice. On 15th day mice were exposed to taped cat voice and behavioral signs were observed.

Group VI: LEJ (10%, v/v) was given orally for 15 successive days to mice. On 15th day mice were exposed to taped cat voice and behavioral signs were observed.

STUDIES ON ANTI-ANXIETY DRUGS USING VARIOUS ANIMAL MODELS OF ANXIETY

1. Elevated plus maze

Group I: Control group of mice were treated with vehicle (0.9% sodium chloride), 30 min before observation of total time spent and number of entries in open arm.

Group II, III and IV: Diazepam (0.5, 1 and 2 mg/kg, i.p.), an antianxiety agent was injected to mice, 30 min before observation of total time spent and number of entries in open arm.

Group V and VI: lorazepam (0.25 and 0.5 mg/kg, i.p.), an antianxiety agent was injected to mice, 30 min before observation of total time spent and number of entries in open arm.

Group VII, VIII and IX: Venlafaxine (3, 5 and 10 mg/kg, i.p.), an antianxiety agent was injected to mice, 30 min before observation of total time spent and number of entries in open arm.

Group X, XI and XII: Alcohol (1, 2 and 4%, i.p.), an antianxiety agent at lower doses was injected to mice, 30 min before observation of total time spent and number of entries in open arm.

Group XIII, XIV and XV: Midazolam (0.5, 1 and 2 mg/kg, i.p.), an antianxiety agent was injected to mice, 30 min before observation of total time spent and number of entries in open arm.

2. LIGHT- DARK MODEL

Group XVI: Control group of mice were treated with control vehicle (0.9% sodium chloride), 30 min before observation of total time spent in lit box.

Group XVII, XVIII and XIX: Midazolam (0.5, 1 and 2 mg/kg, i.p.), an antianxiety agent was injected to mice; 30 min before observation of total time spent in lit box.

Group XX, XXI and XXII: Diazepam (0.5, 1 and 2 mg/kg, i.p.), an antianxiety agent was injected to mice; 30 min before observation of total time spent in lit box.

Group XXIII, XXIV and XXV: Venlafaxine (1, 3 and 5 mg/kg, i.p.), an atypical antidepressant agent was

injected to mice; 30 min before observation of total time spent in lit box.

Group XXVI, XXVII and XXVIII: Aripiprazole (0.3, 0.5 and 1 mg/kg, i.p.), an Atypical antipsychotic agent was injected to mice due to involvement of 5-HT_{1A} receptor in anxiety; 30 min before observation of total time spent in lit box.

3. MARBLE BURYING MODEL

Group XXIX: Control group of mice were treated with control vehicle (0.9% sodium chloride), 30 min before observation of total number of marble buried.

Group XXX, XXXI and XXXII: Aripiprazole (0.3, and 1 mg/kg, i.p.), an atypical antipsychotic agent was injected to mice due to involvement of 5-HT_{1A} receptor in anxiety; 30 min before observation of total number of marble buried.

Group XXXIII, XXXIV and XXXV: Quetiapine (10, 30 and 100 mg/kg, p.o.), an atypical antipsychotic agent was injected to mice due to involvement of 5-HT_{1A} and 5-HT_{2A} receptor in anxiety; 30 min before observation of total number of marble buried.

Group XXXVI, XXXVII and XXXVIII: Olanzapine (0.3, 1 and 3 mg/kg, i.p.), an atypical antipsychotic agent was injected to mice due to involvement of 5-HT_{1A} and 5-HT_{2A} receptor in anxiety; 30 min before observation of total number of marble buried.

Group XXXIX, XXXX and XXXXI: Venlafaxine (1, 3 and 5 mg/kg, i.p.), an atypical antidepressant agent was injected to mice; 30 min before observation of total number of marble buried.

TO INVESTIGATE ANTIANXIETY ACTIVITY OF SELECTED PLANTS

Group I: MPP (10%, w/w), mixed in diet was fed for 15 successive days to mice. Total time spent and number of entries in open arm was recorded 60 min after feeding last diet 15th day.

Group II: MPP (10%, w/w), mixed in diet was fed for 15 successive days to mice. Total time spent in lit box was recorded 60 min after feeding last diet 15th day.

Group III: MPP (10%, w/w), mixed in diet was fed for 15 successive days to mice. Total number of marble buried was recorded 60 min after feeding last diet 15th day.

Group IV: LEJ (10%, v/v), was administered orally for 15 successive days to mice. Total time spent and number of entries in open arm was recorded 60 min after feeding last dosing on 15th day.

Group V: LEJ (10%, v/v), was administered orally for 15 successive days to mice. Total time spent in lit box was recorded 60 min after last dosing on 15th day.

Group VI: LEJ (10%, v/v), was administered orally for 15 successive days to mice. Total number of marble buried was recorded 60 min after last dosing on 15th day.

RESULTS AND DISCUSSION

EFFECT OF TAPPED CAT VOICE ON TOTAL CHOLESTEROL AND SERUM GLUCOSE LEVELS IN MICE

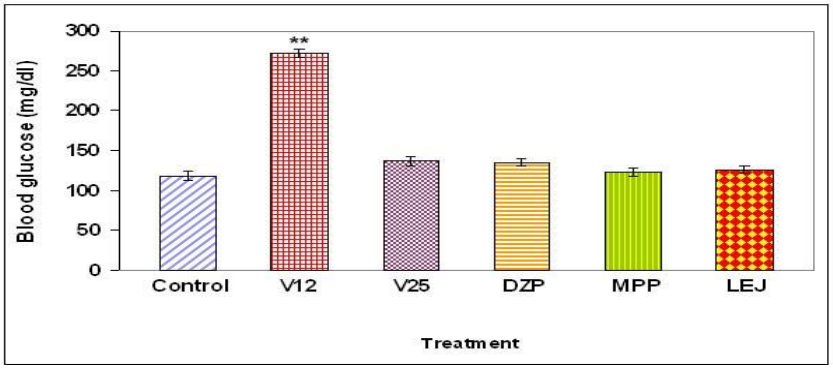

Fig.1. Effects of anxiety on blood glucose levels in mice.

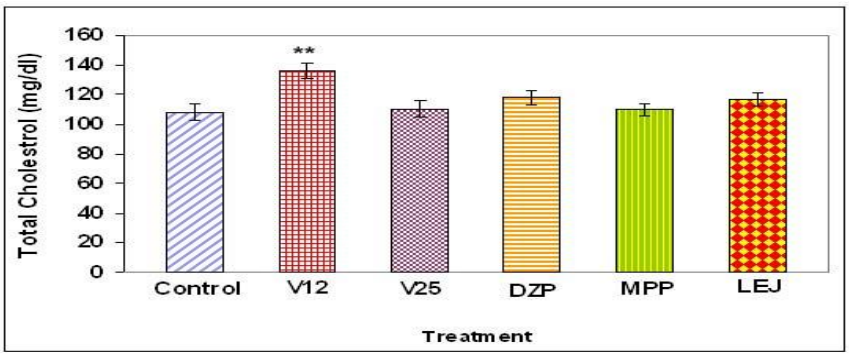

Fig.2. Effects of anxiety on total cholesterol levels in mice.

STUDIES ON ANTIANXIETY DRUGS USING VARIOUS ANIMAL MODELS OF ANXIETY

A) Elevated Plus Maze

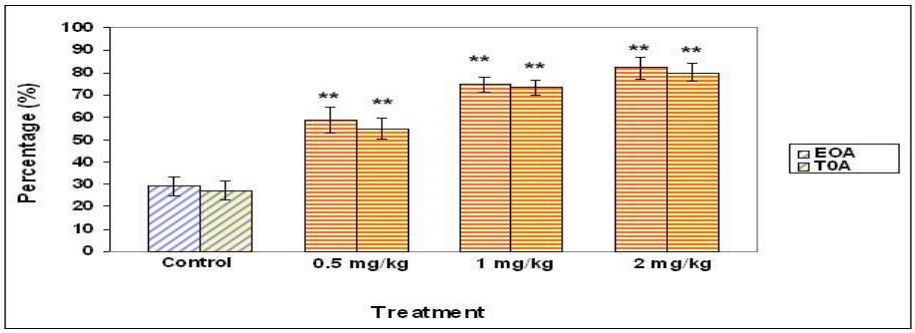

Fig.3. Effects of diazepam on anxiety in mice in EPM.

B) Light- Dark Model

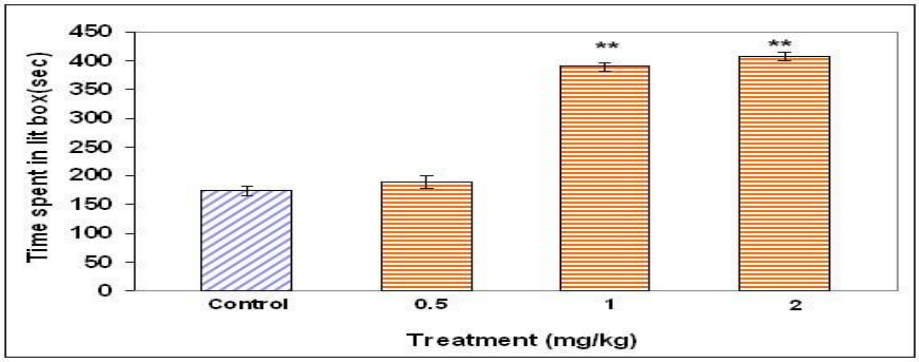

Fig26. Effects of diazepam on anxiety in mice in LDM.

C) Marble Burying Model

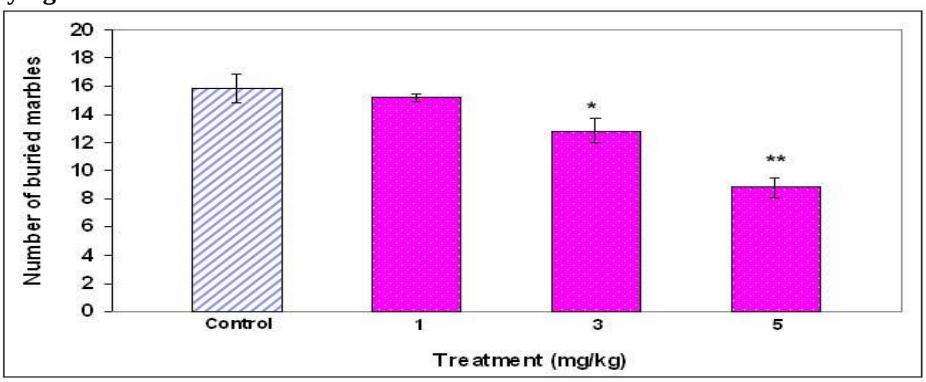

Fig.4. Effects of venlafaxine on anxiety in mice in MBM.

Anti-depressant effects of *Musa paradisiaca* and *Lycopersicon esculantum* in Mice

Table-1: Effects of *Musa paradisiaca* and *Lycopersicon esculantum* on Immobility Period in Tail Suspension Test.

Group No.	Treatment (15 days)	Number of animals	Dose (kg^{-1})	Immobility Time (Sec) (mean ± SEM)
I	Control	6	Normal diet	180.166±6.284
II	Fluoxetine	6	20 mg(p.o.)	97.666±5.6717**
III	Imipramine	6	15 mg(p.o.)	86.333±6.917**
IV	5% MPP	6	150 mg (p.o.)	125.333±9.766**
V	10% MPP	6	300 mg (p.o.)	98.166±4.498**
VI	20% MPP	6	600 mg (p.o.)	92. 166±5.665**
VII	5% LEJ	6	10 ml (p.o.)	122.833±11.934**
VIII	10% LEJ	6	10 ml (p.o.)	103.50±4.78**
IX	20% LEJ	6	10 ml (p.o.)	98.666±5.315**

Table-2 Effects of *Musa paradisiaca* and *Lycopersicon esculantum* on Immobility Period in Forced Swim Test.

Group No.	Treatment (15 days)	Number of Animals	Dose (kg^{-1})	Immobility Time (Sec) (mean ± SEM)
I	Control	6	Normal diet	146.5±8.895
II	Fluoxetine	6	20 mg(p.o.)	51.16667±4.764**
III	Imipramine	6	15 mg(p.o.)	58.5±8.269**
IV	5% MPP	6	150 mg (p.o.)	99.5±8.078**
V	10% MPP	6	300 mg (p.o.)	61.833±3.308**
VI	20% MPP	6	600 mg (p.o.)	58.333±5.308**
VII	5% LEJ	6	10 ml (p.o.)	101.333±9.108**
VIII	10% LEJ	6	10 ml (p.o.)	64.666±3.363**
IX	20% LEJ	6	10 ml (p.o.)	61.5±3.713**

Table-3: Effects of Combination of *Musa paradisiaca* and *Lycopersicon esculantum* with Baclofen/p-CPA/Prazosin.

Group No.	Treatment (15 days)	Number of animals	Dose (kg^{-1})	Immobility Time (Sec) (mean ± SEM)
I	Control	6	Normal diet	180.166±6.284
II	10% MPP	6	300 mg (p.o.)	98.166±4.498**
III	10% LEJ	6	10 ml (p.o.)	103.50±4.78**
IV	Vehicle+Baclofen	6	10 mg (p.o.)	208.166±6.585*
V	10%MPP+Baclofen	6	300 mg +10mg (p.o.)	171.666±6.163$^{\#}$
VI	10%LEJ+Baclofen	6	10 ml +10 mg (p.o.)	158.333±6.323$^{\#}$
VII	Vehicle+p-CPA	6	100 mg (p.o.)	214.833±6.529*
VIII	10%MPP+p-CPA	6	300 mg + 100 mg (p.o.)	176.5±7.61$^{\#}$
IX	10%LEJ+p-CPA	6	10 ml + 100 mg (p.o.)	168.333±6.989$^{\#}$
X	Vehicle+Prazosin	6	62.5 µg	221±9.896**
XI	10%MPP+ Prazosin	6	300 mg + 62.5 µg (p.o.)	186.166±5.618$^{\#}$
XII	10%LEJ+ Prazosin	6	10 ml + 62.5 µg (p.o.)	180.333±5.258$^{\#}$

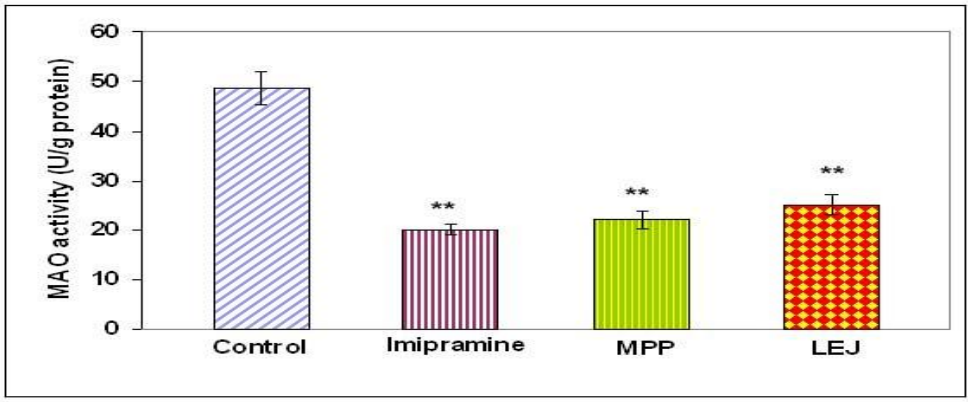

Fig.5. Effects of MPP and LEJ on brain Monoamine oxidase-A (MAO-A) activity in mice.

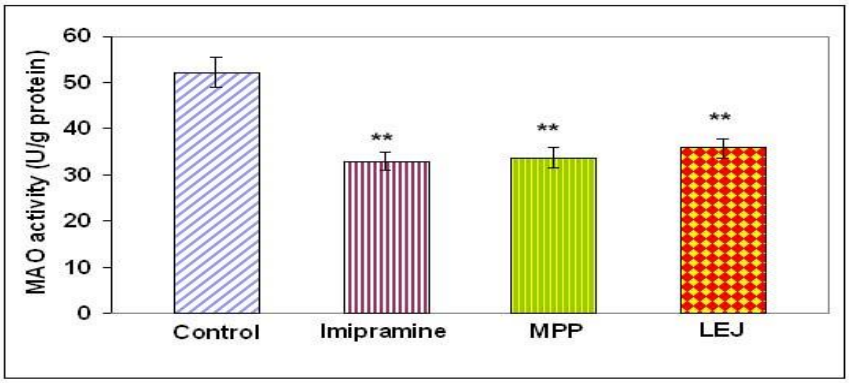

Fig.6. Effects of MPP and LEJ on brain Monoamine oxidase-B (MAO-B) activity in mice.

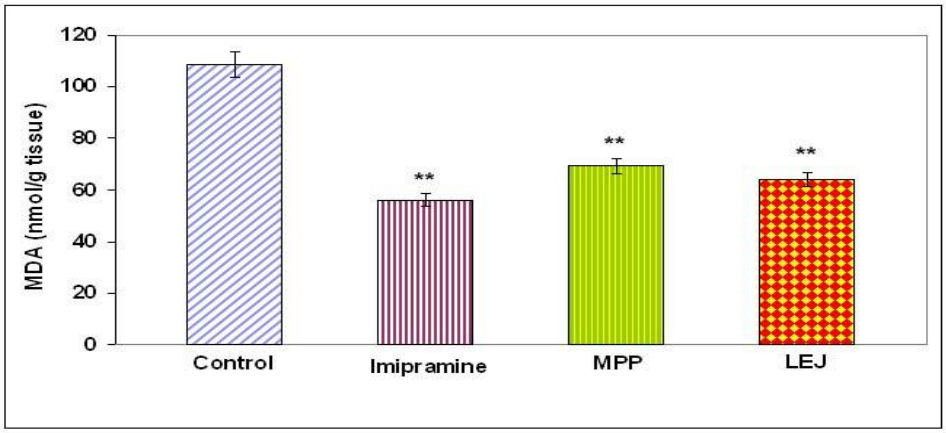

Fig.7. Effects of MPP and LEJ on brain Malondialdehyde (MDA) levels in mice.

Anti-anxiety effects of *Musa paradisiaca* and *Lycopersicon esculantum* in Mice

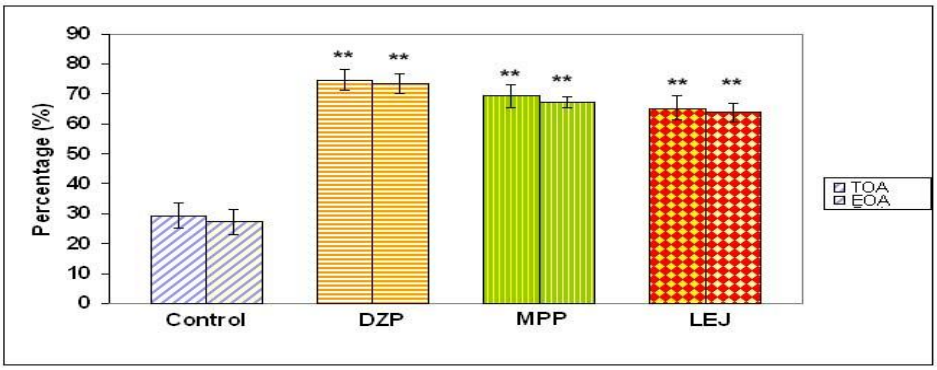

Fig.8. Effects of MPP and LEJ on percent entries and time spent open arms of EPM in mice.

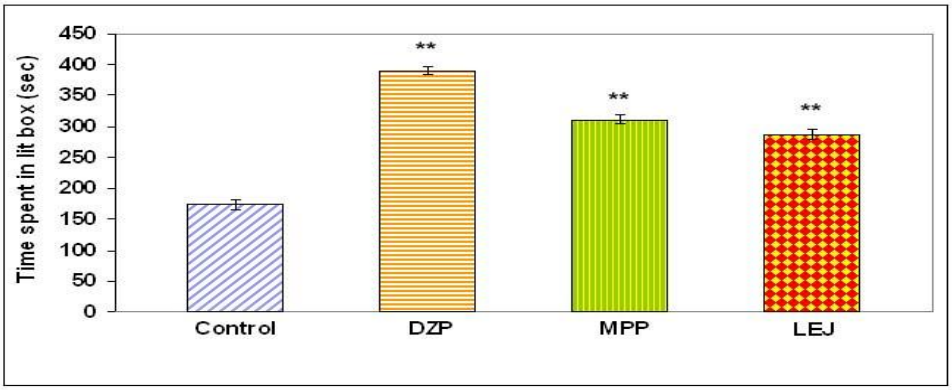

Fig.9. Effects of MPP and LEJ on time in lit box of LDM in mice.

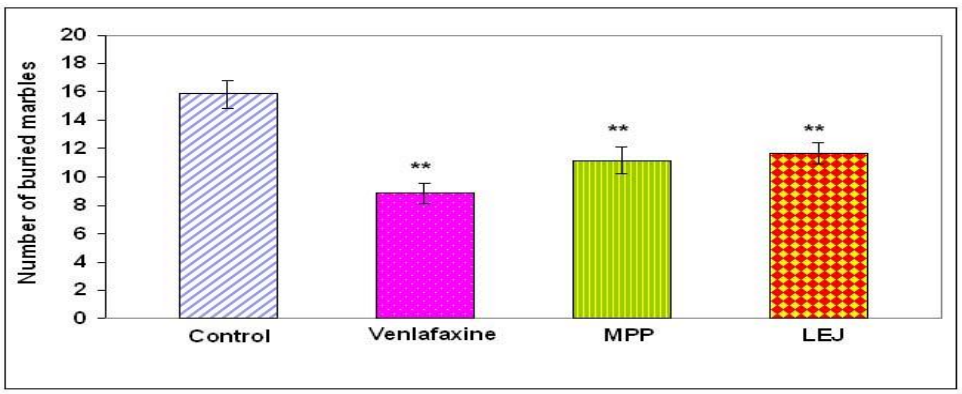

Fig.10: Effect of MPP and LEJ on Number of buried marbles in MBM in mice.

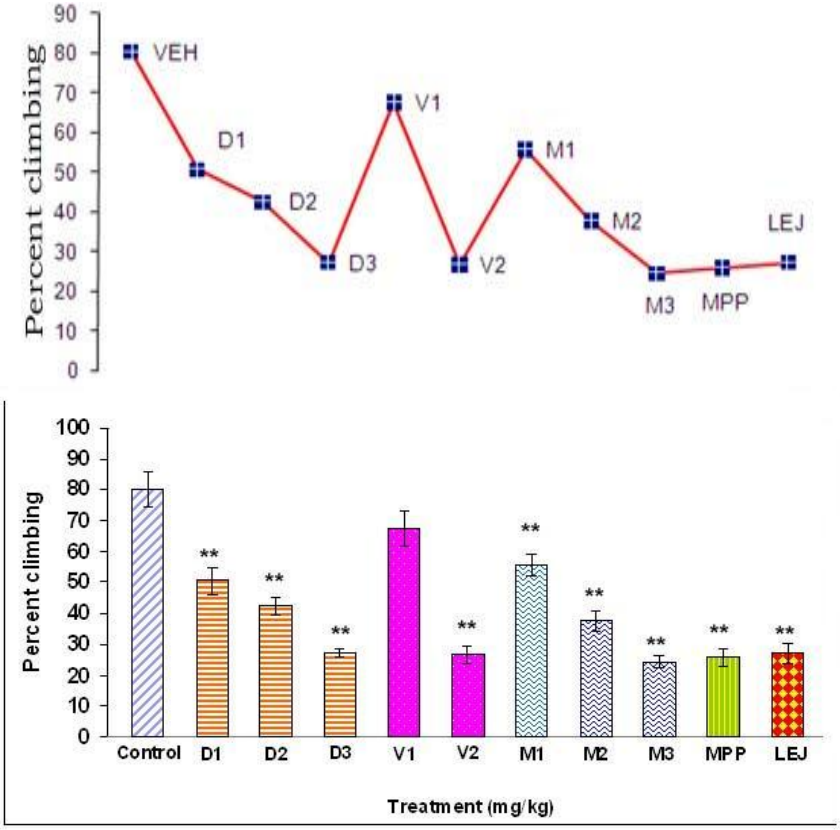

Fig.11. Effect of Different Anxiolytic agents on duration of climbing of mice in new model.

Effects of taped cat voice on various parameters of anxiety in mice

A. Effects of cat voice on behavioural parameters

Animals exhibited normal behaviour in the cage, which changed when animals were exposed to taped cat voice. After, exposure increased movements in animals were observed and later there was increase in cage climbing behaviour. In this experiment animals showed anxiety up to 12 days which started decreasing thereafter. Total time of climbing of mice on cage ceiling and walls was observed, which was found to decrease with standard anxiolytic agents (Fig.11).

B. Effects of cat voice on Total cholesterol and Serum glucose levels

As in case of anxiety, total cholesterol levels and serum glucose levels were found to be increased. After, exposure of animals to taped cat voice up to 12 and 25 days, cholesterol and glucose levels were compared to control animals. These levels of animals were also measured after exposing to cat voice on 12^{th} day of treatment with standard anti-anxiety drug (Diazepam 2mg/kg). Increased in total cholesterol and glucose levels of mice were found to be significant ($p<0.01$) on 12 days of exposure. Total cholesterol and serum glucose concentrations were not significantly different on further exposure of animal to taped voice up to 25 days and also after treatment with anxiolytic drugs (Fig. 1 and 2).

Studies on anti-anxiety drugs using various animal models of anxiety

A. Elevated Plus Maze

Animal model was validated using different standard anti-anxiety drugs and the significantly effective doses were calculated.

Diazepam (0.5, 1 and 2 mg/kg, i.p.), Midazolam (0.5, 1 and 2 mg/kg, i.p.), Venlafaxine (3, 5 and 10 mg/kg, i.p.), Lorazepam (0.25 and 0.5 mg/kg, i.p.) and Alcohol (1, 2 and 4 %) were administered 30 min before recording the total time spent and number of entries of mice in open arm. Diazepam (0.5, 1 and 2 mg/kg), Midazolam (0.5, 1 and 2 mg/kg), Venlafaxine (3, 5 and 10 mg/kg) and Lorazepam (0.25 and 0.5 mg/kg i.p.) and Alcohol (4 %) were found to significantly ($p<0.01$) increase total time spent as well as number of entries in open arm as compared to the control animals.

B. Light-Dark Model

Animal model was validated using different standard anti-anxiety drugs and the significantly effective doses were calculated. Diazepam (0.5, 1 and 2 mg/kg, i.p.), Midazolam (0.5, 1 and 2 mg/kg, i.p.), Venlafaxine (1, 3 and 5 mg/kg, i.p.) and Aripiprazole (0.3, 0.5 and 1 mg/kg, i.p.) were administered 30 min before recording the total time spent in lit box in light-dark box. Diazepam (1 and 2 mg/kg), Midazolam (0.5, 1 and 2 mg/kg), Venlafaxine (3 and 5 mg/kg) and Aripiprazole (0.5 and 1 mg/kg) were found to significantly ($p<0.01$) increase

total time spent in lit box as compared to the control animals.

C. Marble Burying Model

Animal model was validated using deferent standard anti-anxiety drugs and the significantly effective doses were calculated. Venlafaxine (1, 3 and 5 mg/kg, i.p.), Olanzapine (0.3, 1 and 3 mg/kg, i.p.), Quetapine (10, 30 and 100 mg/kg, p.o.) and Aripiprazole (0.3 and 1 mg/kg, i.p.) were administered 30 min before recording the total number of buried marbles in marbel burying model. Venlafaxine (3 and 5 mg/kg), Olanzapine (3 mg/kg), Quetapine (100 mg/kg, p.o.) and Aripiprazole (1 mg/kg) were found to significantly ($p<0.01$) decrease in total number of buried marbles as compared to the control animals in marble burying model.

Anti-depressant effects of *Musa paradisiaca* and *Lycopersicon esculantum* in Mice

A. Effects of *Musa paradisiaca* paste (MPP) and *Lycopersicon esculantum* juice (LEJ) on immobility periods in TST and FST

MPP (5, 10 and 20% w/w, p.o.) and LEJ (5, 10 and 20% v/v, p.o,) *per se* administered for 15 successive days to mice decreased the duration of immobility significantly ($p<0.01$) in a dose-dependent manner in both the experimental models (TST & FST), indicating significant anti-depressant activity. The anti-depressant efficacy of MPP and LEJ was found to be comparable to that of fluoxetine (5-HT reuptake inhibitor) and imipramine (Tricyclic anti-depressant) administered for 15 successive days in both TST and FST (Table 1 and 2).

B. Effects of combination of *Musa paradisiaca* paste (MPP) and *Lycopersicon esculantum* juice (LEJ) with Prazosine/p-CPA/Baclofen on immobility periods in TST

Prazosin (62.5 mg/kg i.p.)/Baclofen (10 mg/kg, i.p.)/p-CPA (100 mg/kg, i.p.) *per se* increased significantly the immobility period of mice as compared to the control group. Pretreatment of animals with pCPA or prazosin or baclofen significantly ($p<0.05$) and $p<0.01$) reversed the diminished immobility time observed with MPP (10%, w/w) and LEJ (10%, v/v) in TST (Table-3).

C. Effects of MPP and LEJ on brain Monoamine oxidase (MAO) activity

MPP (10%, w/w) and LEJ (10%, v/v) administered for 15 successive days to mice significantly ($p<0.01$) decreased brain MAO-A and MAO-B levels as compared to the control. MAO inhibition was comparable to imipramine (Tricyclic anti-depressant) administered for 15 successive days (Fig 5 and 6).

D. Effects of MPP and LEJ on brain Malondialdehyde levels

MPP (10%, w/w) and LEJ (10%, v/v) were administered for 15 successive days to mice significantly ($p<0.01$) decreased brain malondiadehyde levels as compared to the control. MDA decrease was comparable to imipramine (Tricyclic anti-depressant) administered for 15 successive days (Fig 7).

Anti-anxiety effects of *Musa paradisiaca* and *Lycopersicon esculantum* in Mice

A. Effects of *Musa paradisiaca* paste (MPP) and *Lycopersicon esculantum* juice (LEJ) on anxiety in EPM

MPP (10%, w/w) and LEJ (10%, v/v) were administered for 15 successive days to mice increased significantly ($p<0.01$) total number of entries and total time spent in open arms as compared to the control group, indicating significant anti-anxiety activity. The efficacy of MPP and LEJ was found to be comparable to diazepam (1 mg/kg, i.p.) administered 30 min before testing (Fig 8) as positive control.

B. Effects of Musa paradisiaca paste (MPP) and Lycopersicon esculantum juice (LEJ) on anxiety in Light-Dark Model

MPP (10%, w/w) and LEJ (10%, w/w) were administered for 15 successive days to mice increased significantly ($p<0.01$) total time spent in lit box as compared to the control, indicating significant anti-anxiety activity. The efficacy of MPP and LEJ was found to be comparable to diazepam (1 mg/kg i.p.) administered 30 min before testing (Fig 9) as positive control.

C. Effects of *Musa paradisiaca* paste (MPP) and *Lycopersicon esculantum* juice (LEJ) on anxiety in Marble Burying Model

MPP (10%, w/w) and LEJ (10%, v/v) were administered for 15 successive days to mice decreased significantly total number of buried marbles as compared to the control, indicating significant ($p<0.01$) anti-anxiety activity. The efficacy of MPP and LEJ was found to be comparable to venlafaxine (5 mg/kg, i.p.) administered 30 min before testing (Fig 10) as positive control.

Effects of *Musa paradisiaca* paste and *Lycopersicon esculantum* juice on anxiety in New Model

i. Effects of cat voice on behavioural parameters

Animals treated with MPP (10%, w/w) and LEJ (10%, v/v) for 15 successive days when exposed to taped cat voice showed no significant increase in climbing behavior (Fig.11 .) and urination and feces frequency .

ii. Effects of cat voice on Total cholesterol and Serum glucose levels

Animals treated with MPP (10%, w/w) and LEJ (10%, v/v) for 15 successive days when exposed to tape cat voice showed no significant increase in total cholesterol and glucose concentrations (Fig. 1-2).

Effects of MPP and LEJ on locomotors activity

MPP (10%, w/w) and LEJ (10%, v/v) were administered for 15 successive days did not show any significant change in the locomotors function of mice

(713.667+27.782, 706.33 +21.093) as compared to the control (733.33 +29.095).

Effects of MPP and LEJ on neuromuscular coordination

MPP (10%, w/w) and LEJ (10%, v/v) were administered for 15 successive days did not show any significant change in the neuromuscular coordination of mice on Rota rod apparatus (229.833 +11.64, 226.166+11.923) as compared to the control (259.166 +11.998).

CONCLUSION

Anti-anxiety effects of *Musa paradisiaca* and *Lycopersicon esculantum* in Mice

The present study was undertaken to investigate the effect of *Musa paradisiaca* paste (MPP) and *Lycopersicon esculantum* juice (LEJ), on anti-anxiety activity in several behavioural animal models viz. Elevated Plus-Maze, Light-Dark Model, Marble Burying Model and in New Model. MPP and LEJ administered for 15 successive days to mice produced (i) increase in percentage of open arms entries and the time spent in open arms of elevated plus maze (ii) increase in time spent in the lighted box (iii) decrease in number of buried marbles (iv) decrease in total climbing of mice on ceiling and walls of cage and therefore, ultimately showed anxiolytic activity. Hence, MPP and LEJ may have potential therapeutic value for the management of anxiety disorders.

The banana and tomato being commonly available to Indian population can serve as a useful nutrient-cum-medicine to counteract stressful lifestyle, anxiogenic and depressive episodes occurring at different phases of our life by virtue of its anti-oxidant, MAO inhibitory, pro-adrenergic and pro-serotonergic activities. Thus, *Musa paradisiaca* and *Lycopersicon esculantum* have enormous potential of use in the management of mental disorders like depression and anxiety.

REFRANCES

1. Acosta GB A possible interaction between CCKergic and GABAergic systems in the rat brain. Comp Biochem Physiol C Toxicol Pharmacol, 2001; 128: 11-17.
2. Ali MM, Agha FG Amelioration of streptozotocin-induced diabetes mellitus, oxidative stress and dyslipidemia in rats by tomato extract lycopene. , 2009; 69(3): 371-9.
3. Allain, C. C., Poon, L. S., Chan, C. S. G., Richmond, W. and Paul, C. F. Enzymatic determination of total serum cholesterol. Clinical Chemistry, 1974; 20: 470-475.
4. Anjaneyalu YV, Jagadish RL and Raju TS Polysaccharide components from the scape of Musa paradisiaca: main structural features of water-soluble polysaccharide component. Glycoconj, 1997; 14: 507-512.
5. Arulmozhi S., P. M. Mazumder, V.A. Kangralkar and L. S. Narayanan Anti-anxiety activity of Alstonia scholaris Linn. R.Br. Pharmacologyonline, 2008; 3: 761-775.
6. Asmundson GJ, Taylor S, Bovell CV, Collimore K Strategies for managing symptoms of anxiety. Expert Rev Neurother, 2006; 6: 213-222.
7. Baissac Y., F. Benoit-Vical, C. Lavaud, C. Antifungal activity of a spirostanol tomatoside obtained from Lycopersicon esculentum Mill against various yeast species. Journal de Mycologie Médicale, 2006; 70(2): 181-183.
8. Behnke K, Jensen GS, Graubaum HJ and Gruenwald J. Hypericum perforatum versus fluoxetine in the treatment of mild to moderate depression. Adv Ther, 2002; 19: 43-53.
9. Beinfeild MC, Meyer DK, Eskay RL, Jensen RT, Brownstein MJ The distribution of cholecystokinin immunoreactivity in the central nervous system of the rat as determined by radioimmunoassay. Brain Res, 1981; 212: 51-57.
10. Beinfeld MC Cholecystokinin in the central nervous system: A minireview. Neuropeptides, 1983; 3: 411-427.