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Research Article

ANXIOLYTIC ACTIVITY OF *GARCINIA MORELLA* DESR. IN MICE AS EXPERIMENTAL MODELS OF ANXIETY

Iyappan R [*1], Senthilkumar SK[2], Neeraj K Sharma[3]

[1] Research scholar, Pacific University,Udaipur, India.
[2] Kamalakshi Pandurangan College of Pharmacy, Tiruvannamalai,Tamilnadu, India.
[3] Pacific University, Udaipur, India.

ABSTRACT

Anxiety is the most common disorders affecting a great number of people. Different neurotransmitter systems, such as GABAergic system, play an important role in emergence of anxiety related behaviors. The purpose of present study is to investigate the anxiolytic effect of methanolic effect of *Garcinia morella* leaves. The anxiolytic activity was evaluated by Elevated plus maze, Rota rod, Open field test, Light/Dark exploration, Anti-Fighting and Hole board models. The comparison has been done between standard anxiolytic drugs diazepam (1.50 mg/kg) and efficacy of extract (200 and 400 mg/kg). The animals used for this investigation showed exploratory behavior for all the tests at both dose levels are similar to the diazepam. In elevated plus maze test, the result proved that the extract remarkably increased the number of entries and time spent in the open arm. In open field test, the extract showed significant increase in number of rearing's, assisted rearing and number of square crossed. As well as in the Hole Board test, the number of head dipping was significantly increased in MEGM of 400 mg/kg dose. Undisputedly, the present study clearly demonstrated that the effect of methanolic extract of *Garcinia morella* leaf deployed an anxiolytic effect on mice, and it could serve as a new approach for the treatment of anxiety.

Key words: Anxiety, Garcinia Morella, Elevated Plus-Maze Test, Light/Dark Explorotion Test, Open-Field Test, Hole-Board Test

Corresponding Author: **Iyappan R** Email: iyps2001@gmail.com

INTRODUCTION

Mental disorders are one of the substantial socioeconomic impacts which occurred with high prevalence and causes severe disability in our society. Among that Anxiety disorders is the most frequently occurring mental disorder. Currently, it is estimated as 30% mental disorders in life time is due to anxiety (Kessler RC*et al.,* 2005). Anxiety disorders are among the most common psychiatric disorders that affect all age groups of the general population (Jung YH*et al.,* 2013). Although the personal distress associated with these illnesses is enormous, there is still an immense lack of awareness for anxiety disorders - not only among medical practitioners, but also among patients. The American Psychiatric Association (APA) provides a classification of anxiety disorders which includes generalized anxiety disorder, panic disorder with and without agoraphobia, specific phobias, social phobia, obsessive compulsive disorder and post-traumatic stress disorder. Among these, generalized anxiety and panic disorder is the most common one (Baldwin DS *et al.,* 2005). In particular, the psychopharmacological treatment of anxiety disorders is still a therapeutic challenge, since the ideal anxiolytic compound has not yet been developed. Today, Benzodiazepines are very potent, fast acting anxiolytic

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compounds which mediate their effects by enhancing γ-amino-butyric-acid (GABA)ergic neurotransmission (Uusi OM *et al.,* 2010). The benzodiazepines are a sedative drug and the regular use may induce tolerance effects and abuse liability. Other groups of anti-depressive compounds with anxiolytic properties like Selective Serotonin Reuptake Inhibitors (SSRI) and Serotonin- Nor-epinephrine Reuptake Inhibitors (SNRI) is used as first-line treatment drug due to their broad anxiolytic efficacy and tolerability (Bandelow B *et al.,* 2008). As alternative treatment strategy, tricyclic antidepressants (TCA) are available; however, they often show lower tolerability. In contrast to benzodiazepines, antidepressants lack tolerance development and abuse liability, which makes these drugs more suitable for long-term treatment. However, initial adverse events of antidepressants such as agitation and insomnia are unfavorable for keeping patients compliant to the treatment. Furthermore, the onset of anxiolytics takes several weeks, which is the major disadvantage compared to benzodiazepines (Sheehan DV, 2000).In clinical practice, benzodiazepines are often temporarily prescribed to bridge the time until the desired effects of SSRI/SNRI emerge. Therefore it becomes obvious that there is a need for the development of novel pharmacological approaches in the treatment of anxiety disorders which combine a broad and potent anxiolytic efficacy with the lack of tolerance induction and abuse liability associated with withdrawal symptoms. One pharmacological target important for the development of novel anxiolytic compounds is the GABAergic system, which plays an important role in the pathogenesis of anxiety disorders (Kalueff AV and NuttDJ, 2007). GABA is the major inhibitory neurotransmitter in the central nervous system (CNS) (Sieghart W *et al.,* 1999). It exerts its action through ionotropic GABAA receptors and metabotropic GABAB receptors. GABAA receptors play an important role as pharmacological targets for anxiolytic compounds (Rudolph U and Mohler H, 2006). These considerations implicate the search for new anxiolytic compounds that have a fast onset of action present with less side effects and a wider safety margin. Medicinal plants are a good source to find new remedies for these disorders. *Garciniamorella Desr* belongs to Guttiferae family and it is a large genus of polygamous trees Or shrubs, distributed in the tropical Asia, Africa and Polynesia. *G. Morella* locally known as *kujithekera* is a medicinal plant used by the locals and tribal people of the north eastern region of India to cure stomach ailments, bowel disorders and inflammatory disease (Gustafson KR *et al.,* 1992). Various extracts of *Garcinia* species has been reported for their antibacterial (Rao PLN and Verma SCL, 1951; Sani BP and Rao PLN, 1969), anti-inflammatory, anti-oxidative (Yamaguchi F*et al.,* 2000), antifungal (Gopalakrishnan G *et al.*,1997) anticancer (Bhaswati C *et al.,* 2017) etc. *Garcinia* species are a rich source of secondary metabolites including Xanthones, flavonoids, benzophenones, lactones, and phenolic acids. Chemical constituents like Morello flavone, guttiferic acid, and Gambogic acid were reported from *G. Morella* plant (Karanjgaokar CG *et al.,* 1967;Rajagopal RD *et al*., 2007; Chantarasriwong O *et al.,* 2010). However, Xanthones, flavonoids and prenylated benzophenones from *Garcinia* have shown to have Neuropharmacological property without scientific validation. So the present study was designed to investigate anxiolytic property of *G. morella*(GM).

MATERIALS AND METHODS

Plant Collection and Identification

Fresh leaves of *Garcinia morella* were procured from Tirunelveli district of Tamilnadu, India in the month of August. Plant materials were authenticated by taxonomist Dr.P.Jayaraman Institute of Herbal Science, Plant Anatomy Research Center, Chennai. Herbarium was prepared and voucher specimen numbers (PARC/2017/3139).

Preparation of Extracts

The leaf of the plant was thoroughly washed, chopped into small pieces and dried under shade. Dried samples were grounded to powder and extracted using Soxhlet continuous extraction process by using methanol as the solvents for 48 hours. The color and percentage yield of extracts were calculated. This extracts were filtered through Whatman filter paper to separate the solvent and marc. Final extracts are concentrated through vacuum evaporation(BuchiR-300,USA)at 45℃ and all dried extracts was stored in a din tightly closed container at −20℃until used for pharmacological testing (Sowemimo A *et al.,* 2015).

LABORATORY ANIMALS

Wistar albino mice (of either sex)weighing 25-50gm was selected and maintained in a controlled room temperature (25±2℃) for 12 hours light/dark cycle (lights on 7.00 am) with free access to sterile food and water *ad libitum*. The experiments were conducted in a sound proof laboratory. This study was conducted in accordance with the ethical committee (KPCP/2017-2018/CPCSEA/0004/1c).

ACUTE TOXICITY AND LETHALITY TEST

OECD guidelines were followed to conduct acute toxicity studies. Wister albino mice of either sex were selected for this study. Animals were kept overnight fasting with free access to water and after 12 h, single oral dose of GL at 2000 mg/kg body weight were administered to three animals. All the animals were observed for 14 days to check for mortality, if mortality was observed in 2 out of 3 animals, then the dose was identified as toxic dose. If mortality was observed in one

animal, experiment was repeated again with same dose to confirm the toxic dose. If mortality observed again, experiment was continued with low doses 300, 50, and 5 mg/kg body weight by following (Ecobichon DJ, 1997).

ELEVATED PLUS-MAZE TEST

The elevated plus maze was carried out as described previously (Ishola IO *et al.,* 2012). It is comprised of two open arms (30 x 5 cm) and two enclosed arms (30 x 5 x 15 cm), which are extended from a common central platform (5 x 5cm). The configuration formed the shape of a plus sign, with like arms arranged opposite to one another, and the apparatus was elevated 60 cm above the ground. For this experiment, albino mice were divided into four groups, each group comprising of six animals. Vehicle (distilled water 10 ml/kg), standard (diazepam 1.50 mg/kg), and extract (200, and 400 mg/kg) were administered *p.o*. Animals were transported from the animal center to the laboratory one hour before the experiment then placed onto the central platform facing an enclosed arm, 5 mins trial was performed and, between trials, the maze was thoroughly cleaned with ethanol (10% v/v) in distilled water to prevent possible cueing effects of odours left by previous animals. During this 5 mins experiment, the behavior of the mice was recorded as:(a)the number of entries into the open arms,(b) average time spent by the mice in the open arms (average time= total time spent in open arms/number of entries in arms)by a trained observer unaware of the treatment groups. An arm entry was recorded when all four paws of the mouse were in the arm. MEGM extracts (200 and 400 mg/ kg, p.o.) and diazepam (1.50 mg/kg, p.o.) were administered 60mins before the test.

OPEN-FIELD TEST

The Open-Field test, which provides simultaneous measures of locomotion, exploration and anxiety, was used for this study. Each animal was placed into an acrylic cage (50 × 50 × 10 cm). The arena of the open field was divided into 25 squares, the 9 inner squares in the center and 16 squares in the periphery along the walls. For this experiment, albino mice were divided into four groups, each group comprising of six animals. Vehicle (distilled water 10 ml/kg), standard (diazepam 1.50 mg/kg), and extract (200 and 400 mg/kg) were administered *p.o*. Experimental room was a sound attenuated, dark room after 1hr of oral administration animals were placed individually in one of the corner squares. During this period, the number of rearing's, assisted rearing's and number of squares crossed was observed for 5 min (Kulkarni SK *et al.,* 2008).

HOLE-BOARD TEST

In the hole-board test, head dipping was generally considered to provide a measure of exploration (curiosity) that was distinct from motor activity. The board is elevated so that the mouse poking its nose into the hole does not see the bottom. The apparatus composed of a wooden arena (42x42x30 cm) with 16 equidistant holes 2.5 cm in diameter. The centre of each hole was 10 cm from the nearest wall of the box and the floor of the box was positioned 15 cm above the ground. For this experiment, albino mice were divided into four groups, each group comprising of six animals. Vehicle (distilled water 10 ml/kg), standard (diazepam 1.50 mg/kg), and extract (200 and 400 mg/kg) were administered *p.o*. An animal was placed in the centre of the hole-board and allowed to freely explore the apparatus for 5 min. During this period of time, the number and duration of head-dips (dipping the head until both eyes disappeared into the hole) were recorded (Pellow S and File SE, 1984).

LIGHT/DARK EXPLOROTION TEST

Natural aversion of rodents from brightly lit places was evaluated in the light/dark transition model. The light/dark box is a rectangular box of 50 × 25 × 25 cm, which is divided into 2 compartments (light and dark). For this experiment, albino mice were divided into four groups, each group comprising of six animals. Vehicle (distilled water 10 ml/kg), standard (diazepam 1.50 mg/kg), and extract (200 and 400 mg/kg) were administered *p.o*. One hour after administration, each mouse was placed individually in the illuminated part of the light/dark box. During the test session of 5 min., latency *(the time it takes for the animal to move into the dark compartment for the first time)*, number of entries into the light and dark compartments, total time spent in the light compartment, and visible number of rearing's and assisted rearing's were recorded (Barua CC *et al.*, 2009; Bourin M, Hascoet M, 2003).

ROTA ROD

The effect on motor coordination was assessed using a rota-rod apparatus. For this experiment, albino mice were divided into four groups, each group comprising of six animals. Vehicle (distilled water 10 ml/kg), standard (diazepam 1.50 mg/kg), and extract (200 and 400 mg/kg) were administered *p.o*. Rota rod apparatus consists of base platform and an iron rod of 3 cm diameter and 30 cm length, with a non-slippery surface. This rod was divided in to four equal sections by three disks, and then enabling four mice to walk on the rod at the same time at the speed of 22rpm observed over a period of 30,60, and 90 min. Intervals between the mounting of the animal on the rod and falling off of it were recorded as the performance time. The effect on motor coordination was assessed using a Rota-rod apparatus. In brief, mice were trained to remain for 5 min on the rod rotating at speed of 22 rpm (Rabbani M*et al.*, 2008).

ANTI FIGHTING EFFECT

Pairs of male mice were placed under a glass beaker on a grid constructed of stainless steel rods. Foot shocks of 2-mA intensity were delivered for 3 min and the frequency of fighting episodes was noted. For this experiment, albino mice were divided into four groups, each group comprising of six animals. Vehicle (distilled water 10 ml/kg), standard (diazepam 1.50 mg/kg), and extract (200, and 400 mg/kg) were administered *p.o*. If mice show 5 or more fighting episodes then that showed 5 or more fighting episodes were selected for this study. During the observation period of 3 mins, the mice pairs were re-tested after drug treatments and fighting episodes were recorded (Ambavade SD *et al.,* 2006).

STATISTICAL ANALYSIS

Values were expressed as mean ± SEM. The mean parameters were analyzed using One way ANOVA followed by Dunnett's test. The values were considered significant at P<0.01 and P<0.05. Analysis was performed using Graph Pad prism statistical software (Version 5.03).

Results

Acute toxicity study

Following oral administration of Methanolic extract of *Garcinia Morella*(MEGM) at a dose of 2000 mg/kg, P.O., animals were observed for signs of toxicity such as convulsions, hypothermia, hyperactivity, and grooming continuously for 2 h and for mortality up to 24 h after administration of the doses. As a result of the acute toxicity study, there is no toxicity and significant changes in the body weight of the animal were observed between the treated and control group.

Elevated Plus Maze

In table 1, Diazepam treated group showed remarkable increase ($P < 0.05$) in the number of open arm entries, time spent in open arms as well as showed depletion in the time spent and number of entries in closed arm. MEGM extract treated mice(200 and 400 mg/kg) exhibited significant increase ($P < 0.05$) in the number of open arm entries, time spent in open arm, and decrease in time spent and number of entries in closed arm as compared to control group. But in the MEGM extract treated group, MEGM (400 mg/kg) treated group has the greater activity when compared to MEGM (200 mg/kg).

Open Field Test

In table 2, the diazepam treated mice showed significant increase ($P < 0.05$) in the number of rearing's, number of squares crossed and number of assisted rearing's as compared to control groups. The MEGM extract treated group (400 mg/kg) also showed a significant increase in the number of rearing's ($P < 0.05$), number of assisted rearing's and number of squares crossed ($P < 0.01$) where as MEGM (200 mg/kg) treated group shows lesser activity as compared to MEGM (400 mg/kg) and diazepam treated group.

Hole-board test

In table 3, the number of line crossings, head dipping and duration of head dipping was increased significantly in diazepam treated group as compared to control group. The MEGM (400 mg/kg) treated group showed significant increase($P < 0.05$) in the number of line crossing, head dipping($P < 0.01$) and duration of head dipping like that of standard drug. But MEGM 200 mg/kg showed lesser activity as compared to MEGM 400 mg/kg.

Light/dark test

In table 4,Treatment with diazepam significantly increased the time spent ($P < 0.001$) in light box as well as the number of crossings ($P < 0.05$) between the light and dark boxes, whereas the time spent in dark box ($P < 0.001$) and duration of immobility ($P < 0.01$) were significantly reduced. The MEGM extract (400 mg/kg) treated mice also showed significant increase ($P < 0.001$) in the time spent in light box and the number of crossings between light and dark boxes. However, the time spent in dark box ($P < 0.01$) and duration of immobility were significantly reduced ($P < 0.05$) as compared to the control group, whereas MEGM (200 mg/kg) treated group shows lesser activity as compared to MEGM (400 mg/kg) and diazepam treated groups.

Rota rod test

In table 5, *MEGM* (200 and 400 mg/kg) significantly reduced the time spent by the animals on revolving rod when compared to control ($P < 0.05$). The standard drug diazepam showed significant effect when compared to control ($P < 0.01$) where as MEGM (200 mg/kg) showed lesser activity as compared to MEGM (400 mg/kg) and diazepam treated group.

Anti-fighting activity

In table 6, The diazepam treated group showed significant decrease in the Fighting Episodes as compared to control group, likewise MEGM treated group showed significant effect ($P < 0.05$) as like that of diazepam but MEGM 400 mg/kg treated group showed superior activity as compared to the MEGM 200mg/kg treated group.

Table 1. Effect of diazepam and methanolic extract of *Garcinia morella on* Elevated plus maze in mice

S.No	Treatment	Time spent in		No of entries in	
		Open arm	Closed arm	Open arm	Closed arm
1	Control	37.33± 2.96	195±2.85	15±1.30	34±1.36
2	Standard Diazepam 1mg/kg	195.66±6.47	23.16±3.60	37.33±0.71	16.16±1.49
3	MEGM 200mg	89±3.44	48.16±7.52	24.83±1.04	13.66±8.02
4	MEGM 400mg	182.66±10.36	19.66±3.41	30.83±2.41	10±0.96

n=6, Data were expressed as Mean± SEM, One way ANOVA followed by Dunnett's test, All groups were compared with control,*p<0.05, **p<0.01,***p< 0.001

Table 2. Effect of diazepam and methanolic extract of *Garcinia morella on* Open field test in mice

S.No	Treatment	No of Rearings	No of assisted Rearings	No of squares crossed
1	Control	10.16±0.68	23.33±0.64	103.50±2.24
2	Standard Diazepam 1mg/kg	22.83±0.76	32±0.94	194.16±3.94
3	MEGM 200mg	17±0.50	28.16±0.68	162.50±2.35
4	MEGM 400mg	24.66±0.96	37±1.15	220.66±3.62

n=6, Data were expressed as Mean± SEM, One way ANOVA followed by Dunnett's test, All groups were compared with control,*p<0.05, **p<0.01,***p< 0.001

Table 3. Effect of diazepam and methanolic extract of *Garcinia morella on* Hole board test in mice

S.No	Treatment	No of Head dip	Duration of head dip (sec)	No of crosses
1	Control	9.33±0.49	18.50±0.76	6.33±0.41
2	StandardDiazepam 1mg/kg	18.13±0.58	49±1.78	4.16±0.39
3	MEGM 200mg	12.16±0.46	39±1.13	4.60±0.48
4	MEGM 400mg	17.50±0.74	51.33±2.47	3.16±0.46

n=6, Data were expressed as Mean± SEM, One way ANOVA followed by Dunnett's test, All groups were compared with control,*p<0.05, **p<0.01,***p< 0.001

Table 4. Effect of diazepam and methanolic extract of *Garcinia morella on* light/ Dark test in mice

S.No	Treatment	Time spent in lighted box (sec)	Time spent in dark box (sec)	No of crossings	Duration of Immobility (sec)
1	Control	99.83±1.77	200±5.96	13.50±0.65	37.66±0.86
2	StandardDiazepam 1mg/kg	204±6.58	82.66±5.46	25.33±1.06	19.33±1.6
3	MEGM 200mg	140.66±2.81	93.16±2.93	20.16±0.68	28±1.60
4	MEGM 400mg	216.33±2.56	80±1.87	27±0.66	23.83±1.50

n=6, Data were expressed as Mean± SEM, One way ANOVA followed by Dunnett's test, All groups were compared with control,*p<0.05, **p<0.01,***p< 0.001

Table 5. Effect of diazepam and methanolic extract of *Garcinia morella on* Rota rod test in mice

S.No	Treatment	Time (sec) of animals remained without falling from revolving rod		
		30	60	90
1	Control	247.16±2.76	232.83±5.55	204.33±4.33
2	Standard Diazepam 1mg/kg	203.16±4.16	110.83±0.99	85.33±1.88
3	MEGM 200mg	226±2.86	186.50±2.30	143±6.01
4	MEGM 400mg	211±4.01	95.83±3.40	84.83±3.13

n=6, Data were expressed as Mean± SEM, One way ANOVA followed by Dunnett's test, All groups were compared with control,*p<0.05, **p<0.01,***p< 0.001

Table 6. Effect of diazepam and methanolic extract of *Garcinia morella on* Anti fighting effect in mice

S.No	Treatment	Fighting Episodes
1	Control	6.83±0.46
2	StandardDiazepam 1mg/kg	2.5±0.42
3	MEGM 200mg	5.16±0.58
4	MEGM 400mg	3.50±0.41

n=6, Data were expressed as Mean± SEM, One way ANOVA followed by Dunnett's test, All groups were compared with control,*p<0.05, **p<0.01,***p< 0.00

DISCUSSION

Anxiety is a negative emotion that occurs in response to perceived threats that can come from internal or external sources and can be real or imagined (Moser DK, 2007).The manifestation of anxiety and fear in animals is mainly due to the decreases in the motor activity exhibited by the animal and preference to remain at the safer place. We have already known that low level of GABAergic in CNS plays vital role in the anxiety disorder. These considerations make the search for new anxiolytic compounds with less side-effect. Medicinal plants are the good remedies to overcome this kind of disorders. So in this study we design to investigate *Garcinia morella* plant, to prove the anxiolytic activity. This study revealed that acute oral administration of MEGM has prospective of producing anxiolytic effect in mice comparable to that of standard drug diazepam (conventional anxiolytic drug).The MEGM extract was screened in various test models like Elevated plus maze, Light/Dark test, Open field test, Hole-board test, Rota rod test and Anti fighting test in mice for the anxiolytic effect.

The Elevated plus Maze Test is used to evaluate psychomotor performance and emotional aspects of mice. In this model, the mice spend most of their time in closed arms and avoided the open arms in control group due to the anxiety. Whereas in the standard drug (diazepam) treated group, the mice spend most of their time in the open arm and also number of entries in the open arms increased when compared to that of control group. Animals treated with MEGM extract (400 mg/kg) exhibited same activity as compared to that of control. But MEGM extract (200 mg/kg) shows the lesser activity compared to Diazepam and MEGM extract (400 mg/kg).

In the case of open field test where animals are taken from their home cage and placed in an unfamiliar environment normally they showed anxiety and fear by remaining immobile, decreasing ambulation, exploration and freezing due to heightened autonomic anxiety. These phenomena will be attenuated by diazepam and MEGM extract. Here the MEGM extract (400 g/kg) shows the rapid increase in the number of rearing's, assisted rearing's and square crossed when compared to the standard drug, control group and MEGM extract (200 mg/kg), which indicates the anxiolytic effect.

The hole-board model indicates that head-dipping behavior is sensitive to changes in the emotional state of the animal and suggests that the expression of an anxiolytic state in animals may be reflected by an increase in head-dipping behavior (Barua CC*et al.,* 2009; Takeda H*et al.,* 1998). In this study, MEGM significantly increased the number and duration of head dips with peak effects produced at doses of 400 and 200 mg/kg respectively, suggesting anxiolytic effect. At these doses, the extract also significantly increased the number of sectional crossings indicating that the anxiolytic effect of MEGM is associated with increase in locomotion.

The light/dark test is based on the innate aversion of mice to brightly illuminated areas and on the spontaneous exploratory behavior of mice in response to mild stressors including new environment and light. Accordingly, this test may be useful to predict anxiolytic-like or anxiogenic-like activity in mice. Transitions have been reported to be an index of activity-exploration because of habituation over time, and the time spent in each compartment to be a reflection of aversion (Bourin M and Hascoet M, 2003; Belzung C*et al.,* 1987). In this study, MEGM (200- 400 mg/kg) significantly increased the latency of entry into the dark compartment and time spent in the light box. Diazepam also significantly increased the time spent in the light box and reduced the duration of stay in the dark section. The extract (200-400 mg/kg) also significantly increased the number of rearing and assisted rearing. Diazepam also increased the number of rearing and assisted rearing. The light/dark exploration test suggests that anxiolytic activity is greater in the dose of 400mg/kg.

In Rota Rod test, the difference in the fall of time from the rotating rod between the controls and extract treated groups were taken as an index of muscle relaxation. Diazepam and MEGM extract showed significant decrease in the locomotors score and fall of time of the mice from the rotating rod. Unlike both the above experimental test models that are dependent upon fear and anxiety.

Anti-Fighting model as the fighting behavior in paired rodents represents hyper emotionality and inherent aggressive behavior, the diazepam and MEGM extract devoid such behavior.

As we discussed above, the pharmacological actions of medicinal plants are due to the presence and manifestations of bioactive compound(s). In traditional medicine practice the use of plant secondary metabolites for neuropharmacology related diseases is abundant, especially in the case of anxiety; mostly they act on CNS

neurotransmitters like nor-adrenaline, serotonin, GABA and benzodiazepine. Phytochemical screening of the aerial part methanolic extract of *Garcinia morella* revealed the presence of alkaloids, tannins, glycosides, xanthomes polyphenol and flavonoids. The anxiolytic activity of *Garcinia morella* identified in this study may be due to the presence of one or a combination of phyto constituents present in the MEGM extract such as Flavonoids, Alkaloids, Xanthomes and Polyphenol have been reported to be responsible for anxiolytic and sedative effects.

CONCLUSION

Hereby we conclude that the results obtained in this study clearly demonstrate that the methanolic extract of *Garcinia morella* possesses anxiolytic activity at both dose levels comparable to the standard treated group. This effect is due to one or a combination of phyto constituents identified in the extract. Further investigations are ongoing in our laboratory to isolate, identify and characterize the chemical principle(s) responsible for the observed biological property of the extract and the precise mechanism(s) of action of the compound.

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Nil

CONFLICT OF INTEREST

No interest

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