

Evaluation of Anti-Depressant Activity of *Garcinia cambogia* Fruit Using Animal Models

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ABSTRACT

Background: *Garcinia cambogia* fruit popularly specified as (Guttiferae) Clusiaceae has been used for variety of diseases. Depression is mental disorder which affects person day to day activities. **Objectives:** The main aim of this study is needed to assess the antidepressant activity of chloroform extract of *Garcinia cambogia* fruit using forced swim test in mice. **Materials and Methods:** Group I received control. Group 2 received standard drug Fluoxetine 20 mg/kg body weight. Group 3 and 4 received in doses 200 mg/kg and 400 mg /kg body weight of *Garcinia cambogia* fruit chloroform extract (P.O.) orally respectively. 60 min after the final dose of standard drug immobility period was recorded. Floating in water without swimming (immobility period) was recorded using a stopwatch. **Results and Discussion:** *Garcinia cambogia* chloroform extract at a concentration of 200 mg/kg and 400 mg/kg showed reduction in immobility period. In concentration of 400 mg/kg was found to exhibit significant antidepressant activity. Immobility period in seconds for 400 mg was found to be 187.8 ± 1.7 when compared with control of 217 ± 0.61 . **Conclusion:** Reduction in immobility period is considered to have antidepressant effect on animal models. Therefore, chloroform extract of *Garcinia cambogia* indicates antidepressant potential. The outcome of the current study specify the *Garcinia cambogia* chloroform fruit extract contains xanthone as one phytochemical constituent which may be responsible to be functioning to show anti-depressant activity.

Keywords: *Garcinia cambogia* fruits, Forced swim test, Immobility period, Fluoxetine.

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INTRODUCTION

Depression is one of the worldwide devastating and most prevalent disease which is very difficult to cure. Depression results in low mood, lack of emotion in daily life and loss of interest in favourite activity. It affects a person's thoughts, behaviour and feelings. The decrease of extracellular concentration of monoamine neurotransmitters (serotonin, nor adrenaline, dopamine) results in depression. Synthetic antidepressant drugs which are available currently has enormous side effects such as insomnia, excessive sleeping, fatigue loss of energy, aches and digestive problems.^[1]

Garcinia (Guttiferae) is a polygamus tree or shrubs commonly found in tropical Asia, Africa^[2] and Polynesia. *Garcinia* contains about 180 species. *Garcinia cambogia* is known as Malabar tamarind is a tropical tree a dicotyledonous tree belonging to the family (Guttiferae) Clusiaceae. The Genus *Garcinia* species has around 200 species^[3] are found throughout the world like

South East Asia, and Africa. The fruits looks like, small yellow, or reddish pumpkin, or purple colour.^[4] Leaves are dark green in colour, shiny in appearance and have elliptic to obovate shape. *Garcinia cambogia* extract uses tumors, ulcers, hemorrhoids, dysentery,^[5] diarrhea, fever, open sores^[6] and parasites.

Malabar tamarind contains a variety of secondary metabolites such as xanthone, flavonoids, and benzophenones,^[7] phenolic, tannins, steroids, carbohydrates. Xanthone derivatives possess various biological properties including anti arrhythmic, hypotensive, anticonvulsant and antidepressant. Xanthones possess antidepressant activity by inhibition of Monoamine oxidases type A and B.^[8] Hydroxy citric acid found in *Garcinia* species is used as weight loss supplement.^[9]

According to report given by world health organization, nearly 450 million people suffer from mental or behavioral disorders.^[10] During the year 2020 depression is one of the leading global burdens of diseases and it is in 4th rank.^[11] Due to undesirable side effects by synthetic drugs medicinal plants serve as an alternative medicine for the management of depression.^[12]

Depression is provoked^[13] by stressful events. Forced swim test is useful for Diagnostic and screening compounds for



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antidepressant activity.^[14] From the literature survey it is found that antidepressant activity has not yet been studied. Hence the present study has been intent to estimate the antidepressant activity of *Garcinia cambogia* fruit extract in forced swim test. Fluoxetine is used as standard drug to compare with other *Garcinia cambogia* fruit extracts in the antidepressant activity.

MATERIALS AND METHODS

Collection of fruits

The *Garcinia cambogia* fruit was plucked in the July month from Thirur Kerala State India. The plant material and fruit were recognized and confirmed by GKVK, Bangalore. The receipt specimen bearing the number UASB-4551 is deposited in the botanical garden specimen file in the department.

The fruits are to be washed and cleaned in tap water and distilled water with the help of stainless knife they are cut into slices. The pericarp of the *Garcinia cambogia* species should be removed, and the seeds are to be separated. The pericarp must be in shade dried for a term of 60 days.

Preparation of the crude extract

Pericarp should be in the form of coarse powder. The powder should be kept in an airtight container for further use. Weight 100 g of pericarp powder and extract using 10000 mL of chloroform using soxhlet apparatus for 6 hr. The chloroform crude extract using rotatory vacuum evaporator is evaporated to dryness under reduced pressure and to be stored at 4°C for further use.

Phytochemical test for Xanthone

Take 1 mL alcoholic ferric chloride and add *Garcinia cambogia* fruit extract. The brown colour formed shows the presence of xanthenes.

Animals

Antidepressant activity

Albino wistar mice female weighing between (140-150 g) were procured from animal house. (Gautham College of Pharmacy) for research purposes. The animals were acclimatized to laboratory conditions for seven days. Commercially available standard diet was given to animals. Water and food were always given under hygienic conditions. All animal studies were performed according to guidelines of CPCSEA and IAEC of Gautham College of Pharmacy. (491/PO/Re/S/01/CPCSEA).

Forced swim test

The method was carried out on mice according to the method porsolt (1977, 1978).^[15,16] For the Forced Swim Test (FST), mice of either sex $n=6$ were individually forced to swim in an open cylindrical container (diameter 10 cm, ht 25 cm) containing water 25±1°C. Before Sixty minutes of study, treatment was given as described by study design. All animals were forced to swim

for 6 min and the immobility period in seconds was recorded at 4 min time.^[17,18] The immobility period of mouse was judged when it stopped struggling and remained floating in water. The antidepressant activity was calculated based on the decrease in duration of immobility.

Determination of LD₅₀ of *Garcinia cambogia*

The acute toxicity study was determined by using female albino mice of weight between (140-150 g) maintained under standard conditions. The animals were fasted for 3 hr prior to experiment. Animals were added with single dose of 2000 mg/kg. *Garcinia cambogia* chloroform fruit extract and observed for its mortality up to 48 hr study period (short term toxicity) profile the next dose was decided as per OECD guidelines no.425. Since no mortality was observed up to dose 2000 mg/kg from the LD₅₀ dose. 200 mg/kg and 400 mg/kg were selected and considered as low dose and high dose respectively. Fluoxetine was used as a standard reference drug for evaluating antidepressant activity.

Acute toxicity study

Garcinia cambogia fruit extract didn't produce any sign of toxicity till the oral dose of 2000 mg/kg hence the extracts were used in the range of 200-400 mg/kg orally postulate that LD₅₀ is 2000 mg/kg.

Statistical Analysis

All the results are expressed as Mean value±SEM. All the groups were investigated using Dunetts test. The results were expressed in terms of Mean±Standard Error of the Mean (SEM). Difference between the groups was statistically determined by Analysis of Variance (ANOVA) with Dunnett test using Graph Pad Prism 5. The levels of significance were set at $p<0.001$.

RESULTS

The observation of acute toxicity indicated that there was no death in 2000 mg/kg dose after 72 hr. *Garcinia cambogia* fruit extract at the dose of 200 mg/kg and 400 mg/kg had useful effect on immobility period of mice in forced swim test in the animal study. In this test animals treated with doses 200 mg and 400 mg/kg po the results are tabulated in Table 1. Graphical representation of antidepressant activity is represented in Figure 1.

DISCUSSION

Depression is characterized by bad mood and emotional disturbances which may affect the interest in doing daily life activities and interpersonal relationship. It is a life threatening disease with high rate of mortality.^[19] Forced swim test is a procedure where mice is allowed to swim in restricted space and there is no space to escape and after some time of agitation it will stop attempts to escape and become immobile.^[20] Immobility in rodents results in behavior despair in rodents as seen in human

Table 1: Effect of *Garcinia Cambogia* chloroform extract on immobility period (Secs) of mice using Forced Swim Test.

Sl. No.	Control	Standard Fluoxetine 20 mg/kg	Chloroform 400 mg/kg	Chloroform 200 mg/kg
1.	217.3±0.61	18±2.32***	187.8±1.74***	212.8±2.85

n=6, mean values are expressed±SEM, one way ANOVA followed by Dunett test ****p*<0.001 when matched with the control group.

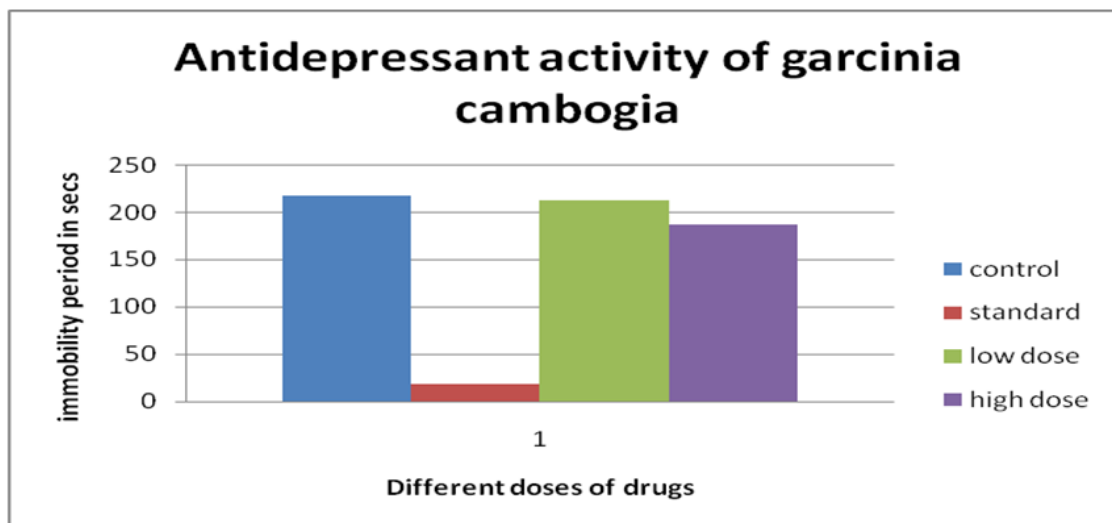


Figure 1: Effects of *Garcinia cambogia* fruit chloroform extracts and Fluoxetine on duration immobility period in seconds forced swim test. *n*=6, values expressed as Mean±SEM, one way ANOVA followed by Dunett test ****p*<0.001 when compared with the control group. Forced swim test table animals treated with 2 doses 200 mg and 400 mg P.O. showed decrease in their mobility time which was more significant in 400 mg. Decrease in mobility time was found to be 212.8±2.85, 187.8±1.7 for 200 mg and 400 mg *p*<0.001 respectively when compared with control 217±0.61. Standard drug fluoxetine .18±2.32 showed decrease in immobility.

depression and that the antidepressant drugs are able to reduce the immobility time in mice.^[21] Forced Swim Test (FST) was designed by Porsolt as a primary screening test for antidepressants.^[22]

In the current scenario the emergence of natural plants and isolation of secondary metabolites has resulted in urgent need for allopathic medicines. In this regard *Garcinia cambogia* fruits have been studied. It was observed at doses of 200 mg/kg and 400 mg/kg exhibited significant reduction in immobility time in a dose dependent manner. Similarly, fluoxetine in dose of 20 mg/kg showed significant reduction in immobility time. *Garcinia cambogia* fruit extract contains xanthone as one of the chemical constituents may activate the serotonergic system and thereby produces CNS^[23] and antidepressant activity. Xanthones flavonoids effectively inhibit monoamine oxidase activity.^[24] Inhibition of monoamine oxidase increases the level monoaminergic system in the brain. Increase in concentration of serotonin and glutamate will increase locomotor activity and leads to treatment of depression.^[25]

CONCLUSION

Thus, the current study results show that chloroform extract of *Garcinia cambogia* fruit showed antidepressant activity by decreasing the immobility period in seconds in case of Forced Swim Test (FST). Reduced transmission monoaminergic in CNS

leads to depression. The chloroform fruit extract of *Garcinia cambogia* was found to be more potent, mostly due to the interactive mediation of adrenaline, dopamine and serotonin neurotransmitter.

Thus, chloroform extract of *Garcinia cambogia* fruit are found to be more potent, high beneficial therapeutic index for the management of depression symptoms. Xanthone present in fruit extract may be active in forced swim test. Antidepressant activity observed in *Garcinia cambogia* fruit extract was due to the presence of xanthones which shows central inhibitory and neuromodulatory effects. Studies are further required for quantification to quantify and isolation the new xanthones for the noted antidepressant activity and further ideas are required to explore this work and to investigate its beneficial activity and to know mechanism of action.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

PO: Per Oral; **IAEC:** Institutional Animal Ethical Committee; **CPCSEA:** Committee for the Purpose of Control and Supervision of Experimentation on Animals; **ANOVA:** Analysis of Variance; **OECD:** Organisation for Economic Co-Operation and Development; **SEM:** Structural Equation Modelling.

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