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Research Article

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Evaluation of Antidepressant and Antioxidant Activity of Fenugreek (*Trigonella foenum-greacum*) Seed Extract in Wistar Rats

Venkatanarayana Narapogu, Naveen Aalsyam*, Naveen Pokala, T Jayasree, Premendran John

Department of Pharmacology, Vishnu Dental College, Vishnupur, Bhimavaram 534 202, Andhra Pradesh, India

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ABSTRACT

Trigonella foenum-graecum commonly known as fenugreek (leguminoceae), which is an annual, herbaceous and aromatic plant and a seed spice used to enhance flavor, color and texture of food, and for medicinal purposes in many traditional systems. Oxidative stress is caused by disturbances of balance between the production of reactive species (pro-oxidative) and the biological systems ability to readily detoxify them (anti-oxidative). Major depressive disorders is a mental disorder which affect the mood of the person and also known as mood disorder. Depression is one of the major public health care issue all over the world. Medicinal plants are the part and parcel of human society to combat against different diseases from the dawn of human civilization. The antidepressant activity was studied by using tail suspension test (TST), and forced swim test (FST) and antioxidant activity estimated by SOD and MDA levels of serum of wistar rats. The results revealed that oral administration of AETFG at 200 mg/kg and 400 mg/kg respectively, exhibited antidepressant effect comparable to the standard drug imipramine (10 mg/kg), the plant extract showed significant antidepressant and Antioxidant property.

Keywords: Antidepressant; Antioxidant; Trigonella foenum-graecum; Oxidative stress; SOD; MDA

INTRODUCTION

Oxidative stress condition reflects a shift of delicate balance between pro oxidative and anti-oxidative events in the cell which leads to oxidative modification of macromolecular cell components [1].

Oxidative stress may not be the fundamental cause of each diseases but it may render cells more susceptible to oxidative damage depending on the cellular component affects. To prevent the cells and oxygen system of the body against reactive oxygen species (oxidative stress), humans evolved a highly sophisticated and complex antioxidant protection system [2].

Depression is one of psychological disorder, which is characterized by emotional and physical manifestations, feeling of worthlessness, helplessness, hopelessness, guilt or indecision, change in appetite, change in sleep habit, loss of concentration, loss of energy, loss of interest, loss of pleasure, agitation, mental and motor slowing and social withdrawal [3].

Trigonella foenum-graecum (TFG) has been used since ancient times in Indian folklore medicine for its many medicinal properties. [4] It has been used in hypoglycemic [5], hypocholesterolemic [6], antioxidant [7], antirheumatism [8], appetite stimulation [9], gastroprotective [10], burns, aid labour, delivery, gynecological problems [11], increases milk secretion [12], dyspepsia, rickets, haemorrhoids, chronic cough [13], acute and chronic inflammation [14], analgesic [15], fever, abdominal colic, boils, carbuncles [16], antitumor, antiviral, antimicrobial, hypotensive [17,18], laxative [19], anthelmintic, cure leprosy, bronchitis, diuretic, aphrodisiac, useful in dropsy, hair falling off and enlargement of the liver and spleen [20,21]. Bioactive compounds isolated from

fenugreek seeds include saponins (fenugreekine, diosgenin), alkaloids (trigonelline, gentianine, carpaine), amino acids, flavonoids, some of which act as insulin secretogogues (4-hydroxyl isoleucine, arginine), nicotinic acid, coumarins, mucilaginous fibers (galactomannan), and other vitamins and minerals [22,23].
The present study has been undertaken to investigate the anti-depressant and anti-oxidative activity of this fenugreek seed extract.

EXPERIMENTAL SECTION

Experimental Animals

All the animals included in the study were procured from animal house of Mamata Medical College, Khammam. Laboratory breeds of wistar rats of either sex weighing between 150-250 g were used for the present study. The animals were maintained under standard laboratory conditions. Experimental protocol has been approved by Institutional Animal Ethics Committee.

Preparation of Plant Extract

100 gof dry powder of *Trigonella foenum-graecum* was continuously extracted for 48 h with 90% ethanol in Soxhlet apparatus. The collected extract were stored at 0-4°C until it is used.

Toxicity Study of Fenugreek Extract

Wistar rats were used for acute oral toxicity study. The study was carried out as per the guidelines set by OECD 423 and animals were observed for mortality and behavioral changes [24]. So, the dose to be used in this study was fixed as 200 mg/kg and 400 mg/kg.

Study Design

Animals were divided into six groups each group contain six animals.

Group I – Control
Group II – Imipramine
Group III – Test 1 (200 mg/kg)
Group IV – Test 2 (400 mg/kg)
Group V – Imipramine+Test 2
Group VI – Imipramine+Test 2+Vit C

The animals of all groups were treated for 7 days.
Antidepressant activity was evaluated by Tail suspension test (TST) [25] and Forced swim test (FST) [26].
Antioxidant activity of extract was compared with control group by using SOD [27] and MDA [28] levels in blood serum and sample collected by retro orbital plexus method.

Statistical Analysis

Analysis of the data was done using one way ANOVA and Dunnets test. P values of less than 0.05 were considered significant.

RESULTS AND DISCUSSION

The total duration of immobility time was taken as parameter for tail suspension and Forced swim test.

Evaluation of Antidepressant Activity

Tail suspension test

In standard group (Imipramine – 10 mg/kg) immobility time (79.1 ± 3.7) was reduced when compared to control group. In treatment with plant extracts (fenugreek-200 mg/kg and fenugreek-400 mg/kg) immobility time (156.7 ± 8.7 and 140 ± 8.9) was significantly reduced when compared to control group, and immobility time was slightly increased when compared to standard group.

In group – V administered with standard and test 2 produced a significant reduction in immobility time (101.7 ± 5.1), when compared to control group. Group – VI treated with test 2, standard and vitamin C showed a significant reduction in immobility time (92.5 ± 2.7), when compared to control group, and immobility time is almost similar to standard group.

Table 1: Tail suspension test: Immobility time (secs), mean and standard deviation

		Mean ± SD
Group – I	Control	212.5 ± 7.5
Group – II	Imipramine	79.1 ± 3.7
Group – III	Test 1 (Fenugreek – 200 mg/kg)	156.7 ± 8.7
Group – IV	Test 2 (Fenugreek – 400 mg/kg)	140 ± 8.9
Group – V	Test 2+Imipramine	101.7 ± 5.1
Group – VI	Test 2+Imipramine+Vit C	92.5 ± 2.7

Forced swim test

Control group did not show any significant reduction in immobility time (206.7 ± 6.05). when compared to control group, standard (Imipramine – 10 mg/kg) and test groups (fenugreek-200 mg/kg and fenugreek-400 mg/kg) significantly reduce the immobility time (85 ± 3.16, 151.7 ± 9.8, 138.3 ± 11.25).

Group – V and Group – VI showed significant reduction in immobility time (95 ± 4.4, 90.8 ± 3.7), these group result almost similar to standard group.

Table 2: Forced swim test: Immobility time (secs), mean and standard deviation

		Mean ± SD
Group – I	Control	206.7 ± 6.05
Group – II	Imipramine	85 ± 3.16
Group – III	Test 1 (Fenugreek – 200 mg/kg)	151.7 ± 9.8
Group – IV	Test 2 (Fenugreek – 400 mg/kg)	138.3 ± 11.25
Group – V	Test 2+Imipramine	95 ± 4.4
Group – VI	Test 2+Imipramine+Vit C	90.8 ± 3.7

Antioxidant Activity

SOD levels were decreased in control group. In standard, test groups SOD levels are increased. In group – III, IV, V and VI dose dependant increased in SOD levels, when compared to control group. So, it indicates plant extract having antioxidant activity. MDA levels are increased in control group it indicates stress levels are increased in control group. In standard group MDA levels are significantly reduced. In group III, IV, V and VI dose dependant reduction in MDA levels ($P<0.05$), it indicates plant extract having antioxidant activity.

Table 3: Forced swim test: Superoxide dismutase and malondealdehyde, mean and standard deviation

		Mean ± SD	
		SOD	**MDA**
Group – I	Control	1.19 ± 0.17	10.68 ± 0.29
Group – II	Imipramine	9.5 ± 0.26	4.71 ± 0.21
Group – III	Test 1 (Fenugreek – 200 mg/kg)	4.3 ± 0.31	8.55 ± 0.26
Group – IV	Test 2 (Fenugreek – 400 mg/kg)	4.5 ± 0.60	7.55 ± 0.38
Group – V	Test 2+Imipramine	6.7 ± 0.24	6.71 ± 0.26
Group – VI	Test 2+Imipramine+Vit C	8.7 ± 0.14	5.61 ± 0.24

Table 4: Tail suspension test: Superoxide dismutase and malondealdehyde, mean and standard deviation

		Mean ± SD	
		SOD	**MDA**
Group – I	Control	0.35 ± 0.03	11.57 ± 0.23
Group – II	Imipramine	1.30 ± 0.20	4.61 ± 0.19
Group – III	Test 1 (Fenugreek – 200 mg/kg)	0.52 ± 0.06	10.43 ± 0.41
Group – IV	Test 2 (Fenugreek – 400 mg/kg)	0.63 ± 0.03	9.71 ± 0.16
Group – V	Test 2+Imipramine	0.79 ± 0.04	8.56 ± 0.28
Group – VI	Test 2+Imipramine+Vit C	0.88 ± 0.01	6.63 ± 0.24

Trigonella foenum-graecum L. seeds have great medicinal values in the indigenous system of medicine. It is used for medicinal purpose, fenugreek is one of such plants whose leaves and seeds are widely consumed in Indian subcontinents as well in other oriental countries as a spice in food preparations and as an ingredient in traditional medicine [29,30].

Depression is one of the most common psychiatric disorders. According to WHO, depression is expected to become the second leading cause of disease related disability by the year 2020, following heart disease [31].

In Tail suspension test and forced swim test immobility time was taken for evaluation of anti-depressant activity. In standard group immobility time was reduced when compared to control group. In treatment with plant extracts (fenugreek-200 mg/kg and fenugreek-400 mg/kg) immobility time was significantly reduced when compared to control group as shown in Table 1 and Table 2.

Antioxidants have been reported to prevent oxidative damage caused by reactive oxygen species (ROS) which readily attack and induce damage to various biologic compounds, These oxidative damages are considered as crucial etiological factor implicated in the initial phase of several chronic diseases, such as diabetes mellitus, pulmonary diseases, cancer, neurodegenerative diseases [32,33]. There is a growing interest of antioxidant considered as alternative opportunity to prevent chronic diseases.

Oxidative stress levels were evaluated by using SOD and MDA methods. SOD levels were reduced and MDA levels were increased during the stress. SOD levels were decreased and MDA levels were increased in control group. When treatments with standard and different doses of plant extract SOD levels were increased and MDA levels were decreased, test groups SOD levels are increased as shown in the Tables 3 and 4.

CONCLUSION

The above observations indicates that plant extract having potent anti depressant and anti oxidant activity. It is due to the presence of phytochemical constituents like trigonelline, gentianine, carpaine, 4-hydroxyl isoleucine, galactomannan.

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