

Research Article

Antidepressant Activity of *Juglans regia* L. Fruit Extract

B.P.Rath*, D.Pradhan

UDPS, Utkal University, Vani Vihar, Bhubaneswar, Orissa, INDIA

Received 23 May 2009; received in revised form 24 July 2009; accepted 10 September 2009
Available online 19 September 2009

ABSTRACT

In the present study the effect of *Juglans regia* fruit extract has been reported in animal models of depression. Forced swimming test and tail suspension test were used for assessing antidepressant activity. The extract was administered in doses of 100 and 150 mg/kg body weight. Both the doses significantly decreased duration of immobility in both models of depression. The effect of extract was less significant than standard drug fluoxetine. *Juglans regia* fruit may exert antidepressant activity due to the presence of omega 3 fatty acid in extract.

Keywords: *Juglans regia* L., antidepressant effect, tail suspension test, forced swimming test

Introduction - *Juglans regia* L. is a very popular nut fruit in India. It is traditionally cultivated both for fruit and high quality timber production. It is native in a region stretching from the Balkans eastward to the Himalayas and southwest China. Among dietary plants used worldwide, *Juglans regia* L were ranked second only to *Rosa canina* in their antioxidant activity^[1]. Phytochemical investigations on *Juglans regia* revealed the presence of naphthalene, naphthaquinol, glycoside, naphthaquinone, juglone, bisjoglone, regiolone^[2,3]. *Juglans regia* is a rich source of Omega-3 fatty acid.

Omega-3 fatty acids may have beneficial effects on many diseases such as heart disorders, cancer, diabetes, and neurological disorders. People at special stages in the lifecycle, such as pregnant/lactating women, infants, and children, may also benefit from consuming omega-3 fatty acids in adequate amounts.

Depression is an extremely complex and heterogeneous condition. The pharmacological approach to the treatment of depression includes a long-term employment of antidepressants, either in the form of monotherapy or as a combination of several antidepressants with various mechanisms of action. While much attention has been given to genetics and life stressors, only a small group of international researchers have focused on nutritional influences on depressive symptoms. Collectively, the results of this relatively small body of research indicate that nutritional influences on depression are currently underestimated^[4]. Omega-3 fatty acids in particular

represent an exciting area of research^[5]. Detailed reviews of the possible neurobehavioral mechanisms of omega-3 fatty acids have been previously published^[6, 7]. In the present study we therefore evaluated antidepressant activity using forced swim test and tail suspension test in rats.

MATERIALS AND METHODS

Extraction

Juglans regia fruits were collected locally from Bhubaneswar. Fruits were crushed and kept at room temperature. Crushed fruits were macerated with n-hexane for 8 days at room temperature with regular stirring. Extract was evaporated under vacuum and placed in well closed air tight container. Extract was dissolved in DMSO for further studies.

Animals

Male Wistar rats (300-450 gm, 14 weeks old) were obtained from animal house of Orissa University of Agriculture and Technology, Bhubaneswar, Orissa and were housed in group of 5 per cage in standard metal cages at 22 ± 2°C on 10:14 h light - dark cycle. All animals were given access to standard food pellet and water *ad libitum*. All conditions were maintained as per CPCSEA guidelines.

Drugs

Fluoxetine was used as standard drug. DMSO was used as solvent. From preliminary study, the doses of extract were selected as 100 mg/kg and 150 mg/kg body weight intraperitoneally (i.p.).

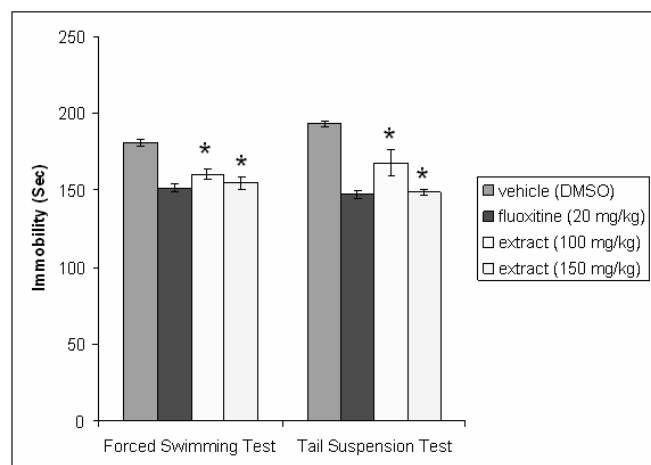
Experimental protocol

All rats were randomly divided into 4 groups. Each group contained 6 rats. The first group was control group treated with DMSO only which was used as vehicle. The second group was treated with the extract at dose of 100 mg/kg body weight i.p. The third group was treated with the extract at dose of 150 mg/kg body weight i.p.. The doses used in

Corresponding Author: B.P.Rath

UDPS, Utkal University, Vani Vihar, Bhubaneswar,
Orissa, INDIA

E-mail: bibhutorath2006@yahoo.com



Graph 1. Duration of immobility (Sec) after various treatments in forced swimming test and tail suspension test. The observations are mean \pm SEM of 6 animals. * $P < 0.05$ compared to the vehicle treated group (One way ANOVA followed by Dunnett's test).

this study are based on the preliminary studies on extract. Fourth group was treated with fluoxetine (20 mg/kg i.p.). The duration of immobility was assessed 30 min after administration.

Methods

Forced-swimming test – Measurement of immobility time was carried out by observing the motoric activity of the rats, which were placed in a pool of water. A glass cylinder, 25 cm in diameter, height 23 cm, was filled with water to a height of 12 cm. The temperature of water was 23 ± 1 °C. Each rat was injected once with a respective dose of the extract. Thirty minutes later, the animals were subjected to the test. Measurement was carried out for six minutes; the first two minutes the animal was allowed to adjust to the new conditions; after these two minutes, the immobility time that alternated with conditions of enhanced motor activity was measured. Immobility time was measured with a stopwatch for the next four minutes^[8,9]. Each time animals were removed from the water, dried with a soft towel and placed in separate cage. The water of cylinder was changed after each test.

Immobility time is the time during which the animal floated on the surface with front paws together and made only those movements which were necessary to keep afloat. Shorter immobility time is an indicator of the stronger antidepressant effect of the tested substance.

Tail-suspension test – The tail-suspension test was the second method for assessing the antidepressant effect of the extract. Thirty minutes after the single drug or vehicle injection, rats were subjected to the test. A cord of about 50 cm in length was stretched between two metal tripods at a height of 70 cm, to which the rats were attached by the tail with sticky tape. After the initial period of vigorous motor activity, the rats became still and the immobility time was measured with a stopwatch, for a total duration of 4 minutes^[10]. Rats were considered immobile when they hung passively and completely motionless.

Statistics

Results are presented as means \pm SEM and were evaluated by One way ANOVA followed by Dunnett's test using primer software.

RESULTS

Effect on immobility in forced swim test – Mean duration of immobility in control group was found to be 188.33 ± 2.16 s, whereas for the group treated with fluoxetine it was 151.16 ± 2.56 s. The decrease in immobility was found to be significant ($P < 0.05$). In the groups treated with extract decrease in immobility was also found significant ($P < 0.05$) for both dose. The total duration of immobility was found to be 160.66 ± 3.76 s and 154.83 ± 4.32 s respectively for 100 mg/kg and 150 mg/kg body weight (Graph 1).

Effect on immobility in tail suspension test - In control group mean duration of immobility was found to be 193.33 ± 1.96 s, whereas in the group treated with fluoxetine it was 147.16 ± 2.48 s. The decrease in immobility was found to be significant ($P < 0.05$). The total duration of immobility was found to be 168 ± 8.39 s for 100 mg/kg body weight and 148.66 ± 1.75 s for 150 mg/kg body weight (Graph 1). In the groups treated with extract decrease in immobility was also found significant ($P < 0.05$) for both dose as compared to that of vehicle treated group.

DISCUSSION

In this study, hexane extract of *Juglans regia* fruit was evaluated by forced swimming and tail suspension test. Extract produced significant antidepressant activity at both doses of 100 mg/kg and 150 mg/kg body weight. The observations are in congruence with previous reports^[8,9]. A number of studies have found decreased omega-3 content in the blood of depressed patients^[11-14]. Current research supports the theory that omega-3 fatty acid supplementation may be useful as an adjunct to current antidepressant therapy or alone^[15]. Fruits of *Juglans regia* were reported to have omega-3-fatty acids. The possible explanation of antidepressant activity *Juglans regia* fruit extract may be due to presence of omega-3-fatty acid. Further research is necessary to understand the mechanism of antidepressant activity.

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