

Evaluation of Anti-Depressant Effect of Banana Pulp on Mice

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Abstract

Background: The prevalence of depression is alarming all over the world afflicting billions of individuals. Depression is a common mental disorder and is one of the major causes of morbidity worldwide. Although, there are known effective treatment for depression, but antidepressant therapy usually causes a wide range of undesirable adverse effects and also increases the risk for suicide in individuals with ongoing treatment. So in order to reduce the risks associated, a study was conducted to evaluate the antidepressant potential of *Musa paradisiacal* Linn, commonly known as Banana fruit and to assess whether the natural source could be used to treat depression.

Methodology: Banana pulp was administered to the mice (n=6) i.e. 0.3ml calculated according to weight and given daily for one month and compared with control group of mice. To evaluate the activity, forced swim test was performed.

Results: The results showed highly significant anti-depressant effect at day 14 which was then gradually reduced at day 21.

Conclusion: It was concluded from the results that banana pulp has an antidepressant effect, as it is a rich source of neurotransmitter like serotonin, catecholamine and its precursor amino acid and tryptophan, which provides mood and energy boosting condition. It could be recommended as a non-pharmacological diet in individuals suffering from depression as it is cheap and easily available.

Key words: Depression; Forced Swim Test; Musa pulp; Selective serotonin reuptake inhibitors;

Introduction

Depression is a state of dejection, gloom, sadness. Major depressive disorder is a serious and very common medical illness. It is a self-directed hatred, feeling of helplessness, negative feelings like disappointment, weakness, frustration, grief and sorrow or situation in which one accuses oneself for being helpless [1].

The symptoms of depression affect the daily activities or the way person reacts. It can cause multiple physical and emotional problems that can result in low state of functional activity. Clinical depression is a diverse term that cannot be defined in nosological class [1-2].

Manic Depression is also known as bipolar depression having serious swings in mood, behavior, thinking and energy to the extreme level resulting in decreased activity it may last from days to months. Psychotic Depression is a depressive psychosis that causes severe illness of depression with some form of psychosis like delusions, hallucinations with a depressive theme such as delusion of poverty, sickness, and regrets [3].

Dysthymia is also known as persistent depressive disorder as it remains for at least two years having less severe symptoms but lasts for minimum two years [4]. Perinatal Depression is encountered by the women after giving birth or during pregnancy. It often includes episodes of insomnia, tiredness, and weight gain and mood changes.

Seasonal Disorder appears every year in the winter season. Winter depression associated with increased sleep, social withdrawal and weight gain. About one among 15 individuals encounter depression in one year and 1 in 6 individual affected at some stages in their life [5].

Numbers of factors that can cause depression include emotional abuse, death or loss, genetic, certain medications, conflicts with family members or can be due to serious illness from other medical condition [6].

According to the study people prefer non pharmacological treatment to overcome depression which results in positive mental health and able to perform their usual functioning. Many effective non pharmacological activities have been approved to lower the effects of depression which include interpersonal psychotherapy, physical activity programs, light therapy, behavioral activation and healthy food that decreases the symptoms of depression and causes feeling of euphoria like walnuts, berries, onions, mushrooms, dark green leaf, tomatoes.

Banana is the common name of fruit belonging to family Musaceae and genus Musa. It is an energy booster, rich source of vitamins, minerals and fibers and considered to be a chief food. As it is a rich source of neurotransmitter like serotonin, catecholamine and its precursor amino acid and tryptophan, it provides mood and energy boosting effect. Banana is helpful in treating blood pressure especially as it is rich in potassium. Traditionally it was consumed in gastric irritations, constipation, and other digestive problems. Banana also gives a good effect in diabetic patients and improves electrolyte imbalance. It is a rich source for vitamin B which is helpful in production of new cells [7-8]. In our study we have evaluated the antidepressant activity of banana pulp, according to the previous study in which some of its nutrients were found helpful against the depressive symptoms [9].

Methodology

Banana Pulp Extraction

The bananas were purchased from the local market in Karachi, Pakistan and were identified by Department of Pharmacognosy, Faculty of Pharmacy, Jinnah University for Women. The pulp of banana was obtained using mortar and pestle by crushing the banana, five to ten minutes before the administration of pulp so that it does not show black coloration.

Experimental Animal

Twelve Swiss Albino mice, either male or female were selected for the experiment weighing 16-28 grams, provided by the animal house of Jinnah University for Women. The mice were kept in plastic cages at least for a week prior to experimentation in order to make them used to the lab environment. The study was conducted after

approval from the institution. The animals were kept at normal room temp. ($25 \pm 2^\circ \text{C}$) and fed with proper diet and water. The experimental animals were divided into two groups containing 6 mice in each (A and B) randomly. Group mice were labelled as control and Group B were administered banana pulp. The animals were handled as per the specification provided by Hubrecht and Kirkwood 2010 [10].

Duration/Dosing/Protocol

The study was conducted for a month. The resources required for the study were collected within 2 days approximately. The administration of banana pulp was done on daily basis for one month and results were noted every week. The mice in group B were given 0.3ml of banana pulp according to mice weight daily for a month. The mice in group A were administered 0.3ml distilled water.

Screening Test

Forced Swim Test: The antidepressant effect of banana pulp was checked using this test. The apparatus comprises of a cylindrical glass container in which water of specific temperature i.e. $20\text{o}-22^\circ\text{C}$ is filled. The test was conducted once a week that is first reading was taken at Day 7th, 14 and last on day 21st after 40 minutes of administration of banana pulp. The mice were placed in the container individually and allowed to swim freely and using a stopwatch the time period of swimming was recorded for each mouse that is when the mouse stops swimming freely, it was taken out and time was recorded [11], (Figure-1).

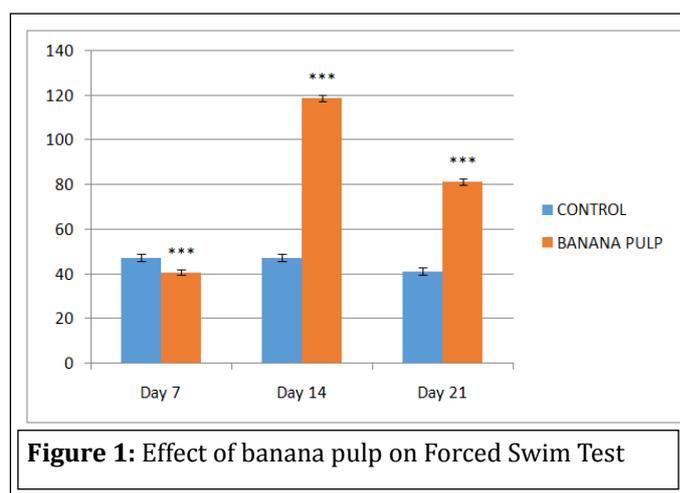


Figure 1: Effect of banana pulp on Forced Swim Test

n=6, values are Mean \pm S.D using Statistical analysis SPSS 21. Using one way Anova and Post hoc Tukey's test applied according to which P values *** $p \leq 0.001$ is considered as significant as compared to control.

Statistical Analysis

The data was analyzed using SPSS 21. Mean \pm S.D (n=6) was used for presenting the data. Statistical analysis was performed using one-way Anova (analysis of variance) followed by Post hoc Tukey's test.

Result and Discussion

An obligatory stress developed to rodents by Forced Swim Test (FST) which reflects a state of behavioral despair that is similar to human depression [12-13]. Animal model for preclinical screening of antidepressants are generally used [14]. Animals that are treated with antidepressants struggle more even in desperate situation and spend less time with immobility [15].

Forced swim test is a drug screening test for antidepressants; it is able to recognize the activity of broad spectrum of clinically effective antidepressants. Forced swim test has a high degree of predictive validity to major class of antidepressants such as Tricyclic antidepressants (TCAs), Monoamine oxidase inhibitors (MAOIs), atypical antidepressant, Selective serotonin reuptake inhibitors (SSRIs) and electroconvulsive therapy [16].

Banana has proven to give many beneficial effects like antidepressant effect, improve electrolyte balance. It is a rich source for Vitamin B. Banana belonging to family Musaceae has been used since many centuries for its non-pharmacological activity [17].

Banana is a rich source of neurotransmitters like serotonin, catecholamine which helps in energy boosting and mood boosting effect by elevating low levels of tryptophan [17].

According to the experimental design, forced swim test was performed on equal numbers of mice belonging to two groups' i.e. Control and Treatment (Banana). Dose of 0.3ml was administered to each group of mice on daily basis while the effect was observed on Day 7th, 14 and 21st.

According to the results, the treatment group shows positive results. At Day 7 when readings were taken the struggling time of control group was higher as compared to treated group but as the day passed the struggling time of treatment was increased as compared to the control group on Day 14 and Day 21 which shows the positive effect of banana in treating Depression.

Constrained swim test isn't just a marker of energizer impact of medications however it is additionally utilized as a pointer of dejection in rodents [18].

Depression is clinically defined as complex of mental and neuroendocrine effects. It is a widely prevailing neurological disorder in modern paced life. Stressful lifestyle promotes the progression of depressive disorder as the stress can significantly effects the function of central nervous system by modifying a number of neurotransmitters, endocrine and neuroendocrine systems [19-21].

Tryptophan is the sole precursor of peripheral and centrally produced serotonin. Tryptophan and 5 Hydroxytryptophan (5-HTP) are natural alternatives to conventional antidepressants used in the treatment of unipolar depression and dysthymia [22].

Several studies have shown that people with depression may have lower than normal tryptophan levels [23].

The consumption of a diet or solution that contains large number of neutral amino acids but lacks tryptophan, results in an immediate and effective reduction of plasma tryptophan. The fact that dietary removal of tryptophan results in protein synthesis in the liver which uses the tryptophan available in the plasma and thus lowers its level [24].

Large number of dietary neutral amino acids in addition to increase hepatic protein synthesis, compete with tryptophan for transportation across the blood brain barrier thus limiting the entry of tryptophan into the brain, resulting in decreased levels of centrally acting tryptophan and thus serotonin.

The above outcomes demonstrate increased struggling time which is like same impact delivered by standard medication. In contempt of the extensive use of synthetic drugs to treat depression which often correlate with adverse effects and limitations. Research for a natural product with fast onset of action, wide safety margin and less side effects is now under consideration [25].

Conclusion

From our study it is concluded that banana pulp possess an anti-depressant activity. Since it is very commonly consumed and preferred in all populations as a useful nutrient. It can also be recommended to counteract stressful life style and depressive episodes occurring at different phases of our life by virtue of its antioxidant, MAO inhibitory and pro-serotonergic and pro-adrenergic activities. Additional benefit being that banana fruit is available everywhere and considered safer and cheaper than antidepressant medicines. Future studies should target the exact molecular mechanism by which this effect is observed.

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