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Unlocking nature’s potential: Neuropharmacological effect of Polyherbal fruit peel extracts against depression

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Abstract

Problem statement: Depression is distinguished by a depressive mood, a loss of interest or pleasure, a sense of guilt, low self-esteem, sleep problems, loss of appetite, low energy, and difficulty concentrating. This widespread mental condition can affect anyone regardless of gender, age, or background. People treat it with psychotherapy and medicines. Alternatively, some people employ herbal therapies for treatment. Natural herbal remedies with antidepressant properties have recently gained popularity in the marketplace. Banana peel (*Musa paradisiaca*) is often used to treat warts, as a diuretic, to aid in detoxification, and to relieve hangovers, while pineapple peel (*Ananas comosus*) has antifungal, antibacterial, anti-inflammatory, and anti-coagulant properties. The current study investigated the anti-depressant efficacy of a polyherbal extract derived from banana and pineapple peels.

Approach: Acute Toxicity Studies (ATS) were conducted with Swiss albino mice of either sex weighing approximately 28-30 gms. Six rats from four groups received four different treatments (normal saline 5 mL kg−1, polyherbal peel extract 200 and 400 mg kg−1, and Imipramine 20mg kg−1, p.o.) for 7 days before being submitted to Forced Swim Test (FST) and Tail Suspension Test (TST).

Results: The result were shown that polyherbal peel extract 400 mg kg−1 significantly matches the standard in terms of duration of immobility.

Keywords: *Musa paradisiaca, Ananas comosus*, antioxidant, antidepressants and polyphenols

Introduction

Depression is a critical public health issue that can affect anyone, although it most generally affects grown-ups between the periods of 20 and 50 who have no connection to their plutocrat, education, civil position, or fighting style [1]. The World Health Organization (WHO) estimates that depression affects 121 million people encyclopedically and ranks among the top causes of impairment encyclopedically in terms of times lived with disability (YLDs). As of the time 2000, depression ranks as the fourth most common cause of complaints worldwide. By 2020, depression is anticipated to move up to a different position in the Disability shaped Life Times (DAYLs) ranking, which is determined for all ages and both relations [2]. A number of causes, including inheritable, physiological, environmental, and neurological factors, frequently contribute to depression, although it can also occasionally manifest for no apparent reason or detector. Depression is divided into three orders mild, moderate, and severe, depending on the inflexibility and type of symptoms. numerous traditional antidepressants are used to treat depression, but they've substantial side goods, including agitation, blurred vision, sexual problems, restlessness, and self-murder studies. Natural gravies with antidepressant parcels have lately drawn further attention as an essential treatment for depression because to the rise in depressive cases [3]. The antidepressant parcels of dried pineapple and banana peel excerpts are the reason for their addition in this study. Dried banana peels have 20 - 30 fiber and 6 - 9 protein. The polyphenols were in the range of 200 - 850 mg fellow of tannic acid/ 100 g. The banana peel is rich in chemical mixes as antioxidant and antimicrobial exertion. Riped banana peel along with main mixes also contains other mixes anthocyanins (Delphinidin and cyanidin) and catecholamines [4]. The polyphenolic contents of the pineapple peel having antioxidant property.

The presence of phenolic content in both the fruits peel are responsible to act against depression [5]. The peels were collected from original request and dried, the peel cream is pulled with a solvent ethanol by using maceration system. In this present study, the effect of poly herbal peel extract on depressed mice was being delaved by using popular styles analogous as Forced Blackout Test (FST) and Tail Suspension Test (TST). The standard drug Imipramine was used as positive control to compare the efficacy of polyherbal extract as antidepressant [6, 7].

Materials and Methods

Materials: Banana, Pineapple, Alcohol, Swiss mice, transparent Plexi glass cylinder, Rotavapor and tail suspension maze etc.

- **Polyherbal peel extraction:** Banana and pineapple fruits were purchased from local market and the plants were identified as *Musa paradisiaca* & *Ananas comosus* in the Department of Pharmacognosy, Aditya College of pharmacy. The peels were collected and separated from the fruit and thoroughly washed. The peels were dried at 550C for hrs. in hot air convection oven. Dried peels were ground to make a coarse powder. 300 grams of each powder were soaked separately in 70% ethanol for 72 hours in maceration chamber [8]. Filtered extracts are evaporated and concentrated by using rotavapor to give a final yield of 7 & 6.8 grams respectively.
- **Experimental animals:** Twenty four Swiss albino mice of either commerce (28-30g) were attained from the laboratory [9]. Mice were housed in PVC pounds at an ambient temperature (25 ± 2 °C). A 1212 hr light-dark cycle is maintained during the trials. The mice were feed with balanced rodent pellet diet and water ad libitum throughout the experimental period. Mice were acclimated to experimental terrain for at least one week before trial. The brutes were erratically separated into different groups.

Acute toxicity studies

Swiss albino mice were fasted for 3hrs prior to the experiment. Acute toxicity study was being carried out by injecting 4 dose (100, 200, 400 mg/kg p.o) [10] of polyherbal peel extract to mice groups. The mortality and general behavior of the animal was observed for 48hrs with special attention to first 30min after dose administration.

Phytochemical Screening

Preliminary phytochemical screening was performed to know the presence of phytoconstituents individually for each extract. Phytochemical tests such as solubility test, flavanoid test, Ninhydrine test, test for tannins & polyphenol test etc.

- **For Musa paradiascia peels extract**

1. **Solubility test**
2. In water: take a few amounts of extract and put it in the test tube and then take water then mix it with the help of a glass rod. It is not dissolved.
3. In alcohol: take a pinch of the extract then add some amount of alcohol in it then mix this with the help of glass rod it gets soluble.
4. **Flavonoid test**
5. 2 ml of extract taken and then added to Magnesium ribbon then 2 ml of hydrochloric acid were added the presence of pink, or red colour indicates presence of flavonoid [11].
6. **Ninhydrin test:** It is used to detect amino acids and we are here to detect tryptophan. Take 2-3 ml of extract then add 1-2 ml of ninhydrin solution then mix it in heat at 100°C in a hot plate for 5-10 minutes. Then a yellow or brown color is seen in solution that indicates the presence of tryptophan.
7. **Polyphenol test:** The extract was dissolved in a solvent, then filtered and then 1 ml of 3% FeCl3 is added to the filtrate; the greenish or blackish deposits indicate the presence of polyphenols [12].
8. **Tannins test:** 2 ml of extract taken in a suitable solvent then add a few drops of 0.1% or 1% of ferric chloride; the bluish black color indicates the presence of tannin [13].

- **Screening of Phytochemicals compound present in *Ananas comosus***

1. **Solubility test- In water:** Take a pinch of extract of *Ananas comosus* in a test tube and dissolve it in 10ml of water and it gets un dissolved indicates its solubility. 23 In alcohol: -Take a small quantity of pineapple peel in a test tube and dissolve it in 10 ml of alcohol. The dissolution indicates solubility.
2. **Ferric chloride test:** 2mm of extract were treated with 3-4 drops of 0.1% or 1 m ferric chloride solution. Formation of bluish black color indicates presence of phenolic compounds [12].
3. **Saponin test:** 2 ml of extract was shaken with 5 ml of distilled water in a test tube. If foam persisted for 10 minutes which indicates the presence of saponins.
4. **Terpenoid test:** 2 ml of extract were treated with 2 ml of chloroform, then added 3 ml of or few drops of sulfuric acid. Reddish brown coloration in the interface indicates the presence of terpenoid [14].
5. **Coumarin test:** It is done by using Folin Wu test Take 1-2 ml of extract in the test tube then add a few drops of sodium hydroxide to extract, then add a few drops of sodium nitrite. The red colour of solution indicates presence of coumarin.

- **Thin layer chromatography of individual extract of *Ananas comosus* and *Musa acuminata***

a) **Preparation of Solvent Systems:** Prepare the following solvent systems with varying proportions: 1. Chloroform: Methanol (e.g., 9:1, 8:2, 7:3, etc.) 2. Hexane: Ethyl acetate (9:1, 8:2) Spotting the TLC Plate: Draw a baseline (1 cm from the bottom of the plates) using a pencil. Use a capillary tube to apply a small amount of banana peel extract onto the baseline and Pine apple peel on the baseline of another TLC plate. Allow the spots to dry before repeating to ensure a concentrated spot.
b) **Developing the Plate:** Place the TLC plate in a chamber with the prepared solvent system (ensure the baseline is above the solvent level). Close the chamber with a lid and allow the solvent to rise until it is 3/4th of the plate's height. Remove the plate and let it dry.
c) **Visualization:** View the plate under a UV lamp (254 nm or 365 nm) for fluorescent compounds. Alternatively, use an iodine chamber for staining the components.
d) **Analysis:** Measure the distance traveled by each spot (from the baseline). Calculate the Retention Factor (Rf) for each compound using the formula [15].

Behavioral analysis

Experiments were carried out on adult males of two highly inbred mouse strains and frequently used in preclinical study of antidepressant. The strains are maintained for more than 50 generations with close inbreeding. All animals were selected with 8-12 weeks of aged and weighing 25 ± 2 gm. After weaning males were kept in groups of 5-8 in cage of 40 cm × 30 cm × 20 cm. Two to three days prior to the experiment animals were isolated in separate cages of the same size. All experimental procedures were in compliance with the standard procedures. All efforts were made to minimize the number of animals used and their sufferings [16, 17].

Forced Swim Test (FST)

The animals were arranged into four groups, each consisting of six mice. Prior to the trial day, the therapy was administered once every day for seven days in a row. Imipramine and banana peel extract were dissolved in regular saline. After 60 minutes of the previous dose being administered, the mice were made to swim individually on the first day of the test in a glass jar (25×12×25 cm3 sub) filled with fresh water that was 15 cm high and kept at 29°C (± 2°C) (Bergner *et al*., 2010; Cryan *et al*., 2005). In order to test two mice at once, the equipment was positioned side by side and obscured from the mice's view by a nontransparent screen. After an initial 2 min period of vigorous activity, each animal assumed a typical immobile posture [18]. A mouse was observed to be immobile when it remained floating in the water without struggling, making only minimum movements of its limbs necessary to keep its head above water. The total time period for duration of immobility was recorded with a webcam during the next 4 min of a total 6 min test. The changes in duration of immobility were studied and compared after administering drugs in separate groups of animals. The water was changed to fresh water after each session to eliminate excrement, urine and fur. Each animal was used only once.

Table 1: Treatments for forced swim test (FST)

Groups	Treatment/ dose
I	Normal saline
II	Polyherbal peel extract 200mg/kg
III	Polyherbal peel extract 400mg/kg
IV	Imipramine

Tail Suspension Test (TST):

The animals were split up into six groups, with six mice in each group. Prior to the trial day, the therapy was administered once every day for seven days in a row. Imipramine and banana peel extract were dissolved in regular saline. On the test day, 60 minutes after the last dose was administered, the mice were hung on a horizontal rod 50 cm above the table's surface using adhesive tape positioned about 1 cm from the tip of their tails [19]. A simple way to assess possible antidepressants was to evaluate the entire amount of time that tail suspension caused immobility. A camera was used to record the immobility time for six minutes. Animal was considered to be immobile when it did not show any movement of body and hanged passively [20].

Table 2: Treatment for Tail Suspension Test (TST)

Group	Treatment/dose
I	Normal saline
II	Polyherbal peel extract 200mg/kg
III	Polyherbal peel extract 400mg/kg
IV	Imipramine

Results

Phytochemical screening

Table 3: Phytochemical Analysis of Ethanolic Peel Extract of Musa paradiasia

Compounds /test	Chemical test	Ethanolic extract
Solubility	In water	-ve
Solubility	In alcohol	+ve
Carbohydrates	Molisch's test	+ve
Tryptophan	Ninhydrin test	+ve
Polyphenol	Ferric chloride test	+ve
Tannins	Ferric chloride test	+ve
Flavanoids	Ferric chloride test	+ve

Table 4: Phytochemical Analysis of Ethanolic Peel Extract of *Ananas comosus*

Compounds/ test	Chemical test	Ethanolic extract
Solubility	In water	-ve
Solubility	In alcohol	+ve
Carbohydrates	Molisch's test	-ve
Saponin	Forth formulation	+ve
Terpenoid	Salkowski test	+ve
Coumarins	FolinWu test	+ve
Phenolic	Ferric chloride test	+ve

Anti-depressant activity

Table 4: The effect of anti-depressant by duration of immobility

Treatment	Tail Suspension Test	Forced Swim Test
	Duration of immobility (In sec)	Duration of immobility (In sec)
Vehicle (Water)	170.48±2	148.5±1
Polyherbal extract (200 mg/kg)	120.48±3	125.3±2
Polyherbal extract (400 mg/kg)	65.50±2	70.87±4
Imipramine	76.92±2	73.45±2

Discussion

The present study was carried to investigate the antidepressant potential of polyherbal peel extracts using established behavioral models. The polyherbal peel extract exhibits comparable efficacy to standard drug i.e., Imipramine in reducing immobility time in the forced swim test and tail suspension test. The observed effect indicates that the extract may influence the monoaminergic pathways like commonly used antidepressants. The main phytochemical compound polyphenol exerts neuroprotective effect through its antioxidant property. The polyherbal extracts are advantageous than single plant extract due to their possible synergistic effect. The results demonstrated significant antidepressant activity due to the presence of phenolic compounds which modulate neurotransmitter systems which regulate mood. During study there are no significant behavioral abnormalities or toxic effects were observed with testing doses. However further investigation should be conducted for chronic administration effects, histopathological evaluation to ensure long term safety of the therapy.

Conclusion

In this present study the results revealed the antidepressant activity of polyherbal peel extracts due to the presence of bioactive phytochemical constituents like polyphenols and flavonoids. The polyherbal extract influences neurotransmitter system and reduced immobility time in behavioral models. With their synergistic effects polyherbal extracts in future can be a promising natural alternative for managing depression. The absence of toxic effects during test treatment in animals highlights its safety. At the end of study, the findings support the use of polyherbal extract as a natural antidepressant creating the way for the development of herbal based formulations to treat mental health conditions.

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References

1. Hermman H, Patel V, Kieling C, *et al*. Time for united action on depression: a Lancet-World Psychiatric Association Commission. Lancet. 2022;399(10328):957-1022.
2. Kessler RC, *et al*. The WHO World Mental Health Surveys: Global perspectives on the epidemiology of mental disorders. https://www.ncbi.nlm.nih.gov/books/NBK82926/
3. Vu HT, Scarlett CJ, Vuong QV. Maximising recovery of phenolic compounds and antioxidant properties from banana peel using microwave-assisted extraction and water. Journal of Food Science and Technology. 2019 Mar;56(3):1360-1370. DOI: 10.1007/s13197-019-03610-2.
4. Sahu D, Yadav B, Verma S, Yadav AP, Tilak VK, Maurya SD. Antioxidant activity and phytochemical analysis of leaf extracts of pineapple. Journal of Drug Delivery and Therapeutics. 2020;10(5):165-167. https://doi.org/10.22270/jddt.v10i5.4397
5. Nanjappa K, Shalam M, Harish M, Prabhu S, Kutty B. Pharmacological and neurobiochemical evidence for antidepressant-like activity. Kumari R, Agrawal A, Ilango K, Singh GPI, Dubey GP. *In vivo* evaluation of the antidepressant activity of a novel polyherbal formulation.
6. Millan MJ. Multi-target strategies for the improved treatment of depressive states? Conceptual foundations and neuronal substrates. Drug Discovery and Therapeutic Application. 2006;110:135-370.
7. Elfalleh W, Hannachi H, Tilili N, Yahia Y, Nasri N, Ferchichi A. Total phenolic contents and antioxidant activities of pomegranate peel, seed, leaf and flower. Journal of Medicinal Plants Research. 2012;6(23):4724-4730.
8. Rodgers RJ, Cao BJ, Dalvi A, *et al*. Animal models of anxiety: an ethological perspective. Brazilian Journal of Medical and Biological Research. 1997;30:289-304.
9. Shankar TNB, Shantha NV, Ramesh HP, Murthy IAS, Murthy VS. Untitled. Indian Journal of Experimental Biology. 1980;18(1):73-75.

10. Sumathy V. *In vitro* bioactivity and phytochemical screening of *Musa acuminata* flower. Pharmacologyonline. 2011;2:118-127.
11. Prashant T. Phytochemical screening and extraction: a review. Internationale Pharmaceutica Sciencia. 2011;1:98-106.
12. Chung KT, Wong TY, Wei CL, Huang YW, Lin Y. Tannins and human health: a review. Critical Reviews in Food Science and Nutrition. 1998;38(6):421-464.
13. Ajani OO, Owoeye FT, Owolabi FE, Akinlabu DK, Audu OY. Phytochemical screening and nutraceutical potential of sandbox tree (*Hura crepitans* L.) seed oil. Foods and Raw Materials. 2019;7(1):143-150.
14. Carole J, George B. Untitled. Journal of Chromatography A. 2007;1140:95. Available from: www.sciencedirect.com
15. Porsolt RD, Bertin A, Jalfre M. Behavioral despair in mice: a primary screening test for antidepressants. Archives Internationales de Pharmacodynamie et de Thérapie. 1977;229(2):327-336.
16. Ye L, Hu Z, Du G, Zhang J, Dong Q, Fu F, Tian J. Antidepressant-like effects of the extract from *Cimicifuga foetida* L. Journal of Ethnopharmacology. 2012;144(3):683-691.
17. Huda K, Dilnawaz SS, Baqir S, Naqvi Ishaq H. Antidepressant activity of methanolic extract of *Ananas comosus* Linn. peel (MeACP) by using forced swim and tail suspension apparatus in mice. Science International (Lahore). 2016;28(3):2525-2531.
18. Cryan JF, Mombereau C, Vassout A. The tail suspension test as a model for assessing antidepressant activity: review of pharmacological and genetic studies in mice. Neuroscience and Biobehavioral Reviews. 2005;29(4):571-625.
19. Colla AS, Oliveira ÂG, Pazini FL, Rosa JM, Manosso LM, Cunha MP, Rodrigues ALC. Serotonergic and noradrenergic systems are implicated in the antidepressant-like effect of ursolic acid in mice. Pharmacology Biochemistry and Behavior; 2014.