



**INTERNATIONAL JOURNAL OF
PHARMACEUTICAL SCIENCES**
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: <https://www.ijpsjournal.com>



Research Article

Evaluation Of Antidepressant Activity of Passiflora Edulis in Laboratory Animals

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ARTICLE INFO

Published: 23 May 2025

Keywords:

Passiflora edulis; Depressant disorders; symptomatology; hydroalcoholic extract

DOI:

10.5281/zenodo.15498381

ABSTRACT

Passion fruit, *Passiflora edulis*, is a plant with numerous medicinal properties, including antidiabetic, anxiolytic, antineoplastic, antioxidant, analgesic, and anti-inflammatory properties. It is native to Brazil, Paraguay, and Argentina and is widely grown in South America, the Caribbean, South Florida, South Africa, and Asia. Passion fruit comes in two forms, standard yellow and standard yellow, with an annual production of about 120 tons. In Bhutan, it is grown in purple and yellow varieties, with the purple variety being the most commonly grown. Passion fruit grows on various soil types and contains chemical components like volatile oils, flavonoids, lipids, triterpenoids, aldehydes, ketones, tridecone, palmitic acid, stearic acid, linoleic acid, quercetin, apigenin, and vitaxin, which can be used for various pharmacological activities. A study aims to assess the anti-depressant properties of Passion fruit in laboratory animals using acute oral toxicity and depression inducing in an animal model. Depressant disorders, characterized by arousal and a sense of terror, are behavioral inhibitions caused by external circumstances. Anxiety disorders are classified based on symptomatology and susceptibility to pharmaceutical and psychological therapies. Generalised anxiety disorder involves excessive worry and concern over life events, objects, and circumstances. The complexity of the central nervous system makes diagnosis, treatment, and mitigation difficult. Research in this field is crucial to reduce the effects of depressant-related disorders worldwide. Theories suggest that certain neurotransmitters, like serotonin, are deregulated. A study assessing the hydroalcoholic extract of *Passiflora edulis* leaves' hydroalcoholic extract and phytochemical analysis found anti-depressant properties. The study aimed to provide scientific support for these anti-depressant activities, with the hope of further research identifying the exact mechanism of action and isolated chemical responsible for its efficacy.

INTRODUCTION

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Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.



Passion fruit, *Passiflora edulis*, is a plant with numerous medicinal properties, including antidiabetic, anxiolytic, antineoplastic, antioxidant, analgesic, and anti-inflammatory properties. The *Passiflora* genus, the largest of the *Passiflora* family, has around 500 species. Passionflower is native to Brazil, Paraguay, and Argentina and is widely grown in South America, the Caribbean, South Florida, South Africa, and Asia. The fruit comes in two forms, standard yellow and standard yellow, with an annual production of about 120 tons (1-3). *Passiflora* comes in two varieties in Bhutan: purple and yellow. The purple type is the most commonly grown type in Bhutan, growing between 900 and 2000 meters above sea level. The temperature of 18-23 °C is conducive to flowering and fruit setting, but higher temperatures are needed for juice production and quality improvement. Passion fruit grows on various soil types, including light to heavy sandy loam of medium texture. It contains various chemical components, such as volatile oils, flavonoids, lipids, triterpenoids, aldehydes, ketones, tridecone, palmitic acid, stearic acid, linoleic acid, quercetin, apigenin, and vitaxin, which can be used for various pharmacological activities (4-6).



Figure 1: *Passiflora edulis*

The study aims to assess the anti-depressant properties of *P. edulis* in laboratory animals by conducting a acute oral toxicity of extracts will be

determined using OECD guideline 423, and the antidepressant activity will be tested by inducing depression in an animal model.

2. MATERIAL AND METHODS

2.1 Extraction of the Plant Materials

Leaves of *Passiflora edulis* were shade dried and grind coarsely and extracted using methanol through Cold Maceration technique to obtain Hydro alcoholic extract (HAPE) and the percentage yield was calculated.

2.2 Acute Toxicity Study

Total 6 rats of 10-12 weeks age were selected and randomly divided into 2 groups. Group I was vehicle control group which received vehicle (gum acacia 1% w/v in distilled water) while group II was test group that received MEPE. Each group consisted of 3 animals (females). Females were nulliparous and non-pregnant. Dose selected for the present study is limit test dose as mentioned in the guidelines. The starting dose for limit test 2000 mg/kg was selected on the basis of dose suggested in OECD guideline 423(7).

2.3 Evaluation of Antidepressant Activity of *Passiflora edulis* in Restraint Stress Model in Mice

The study involved five groups of Swiss albino mice for 30 days. The first group was a non-stressed control group without any chemical or treatment. The second group was an acute immobilization stress group given a single immobilization stress episode for 120 minutes daily without any chemical or treatment for five consecutive days. The third group received the standard drug treatment, Sertraline (5 mg/kg, orally). The fourth group was an acute stress + drug group given a single immobilization stress episode with a drug administered 30 minutes before stress exposure. After restraint stress, the

mice were returned to their cages for immediate consumption of water and food. During restraint sessions, unstressed control mice were handled for 5 minutes and kept in their cages without food or water (8, 9).

2.4 Parameters for the Evaluation of Antidepressant Activity

The study aimed to assess the effectiveness of a treatment using mice subjected to four behavioral tests for 20 minutes. The study used Elisa-based protein assays for BDNF (ELR-BDNF) and TBARS (TBARS) levels to estimate oxidative stress parameters in brain homogenate. The optical density of samples was measured using a microplate reader at 450nm, and the levels of GSH were estimated using a microplate reader at 412 nm. The study also estimated reduced glutathione levels at 412 nm using fixed concentrations ranging from 10–100 μ M. The results were expressed as μ M.g-1 of protein (10, 11).

3. RESULT AND DISCUSSION

3.1 Acute Toxicity Study

It was observed that the test drug's (HAPE) LD50 was more than 2000 mg/kg body weight. So, it can be concluded that HAPE were safe up to a dose of 2000 mg/kg body weight based on the observation made during the toxicity studies that an oral dose of 2000 mg/kg body weight did not cause drug-related toxicity and mortality, abnormal clinical signs, remarkable body weight, or gross pathological changes in the animals. According to the Globally Harmonised method, the test substance is classified as "unclassified" or "category - 5" since its LD50 was found to be more than 2000 mg/kg body weight.

3.2 Evaluation of Antidepressant Activity of *Passiflora edulis* in Restraint Stress Model in Mice

3.2.1 Elevated plus-maze (EPM) test

After drug administration, however these values got considerably reduced compared to that of standard anxiolytic agent Sertraline thereby showing significant antidepressant activity of the test drug (Table 1).

Table 1: Antidepressant Activity of *Passiflora edulis* using Elevated plus-maze test

Group	No. of entries		Time Spent (Sec)	
	Open arm	Closed Arm	Open arm	Closed Arm
G-I	20.89 $\pm$ 0.11	8.9 $\pm$ 0.99	100.01 $\pm$ 0.99	146.66 $\pm$ 1.99
G-II	3.23 $\pm$ 1.72	15.30 $\pm$ 1.60	14.50 $\pm$ 1.61	256.00 $\pm$ 7.91
G-III	14.91 $\pm$ 1.10***	7.82 $\pm$ 1.54**	98.00 $\pm$ 1.40***	142.33 $\pm$ 7.67***
G-IV	9.88 $\pm$ 0.12**	12.25 $\pm$ 1.03**	67.33 $\pm$ 1.25**	123.25 $\pm$ 0.15**
G-V	19.88 $\pm$ 0.12**	10.25 $\pm$ 1.03**	100.25 $\pm$ 0.69***	149.00 $\pm$ 0.25***

Values were expressed in mean $\pm$ SEM; n=6
***p<0.001, **p<0.01 and *p< 0.05 when compared to control

3.2.2 Open-Field (OFT) Test

In our present study all the parameters increase in dose dependent pattern showing the antidepressant activity of the test drug. However there is less significant change in number of fecal droppings (Table 2).



Table 2: Antidepressant Activity of *Passiflora edulis* using Open-Field (OFT) Test

Group	Time Spent (Sec)			
	Ambulation	Rearing	Grooming	Activity at centre
G-I	8.66 ± 1.01	6.58 ± 0.67	0.25 ± 0.21	2.58 ± 2.37
G-II	15.64 ± 1.5**	10.16 ± 0.83*	5.00 ± 0.41**	2.02 ± 0.81*
G-III	10.33 ± 1.80*	7.68 ± 0.50*	3.66 ± 1.16**	2.22 ± 0.25*
G-IV	14.56 ± 0.95	11.11 ± 0.99	4.9 ± 0.15	2.00 ± 0.99
G-V	16.56 ± 0.95	12.11 ± 0.99	5.9 ± 0.15	1.09 ± 0.99

Values were expressed in mean±SEM; n=6
 ***p<0.001, **p<0.01 and *p< 0.05 when
 compared to control

3.2.3 Staircase Exploration (SET) Test

To quickly screen for anxiolytic action in mice, the test was altered. The test drugs at 200 and 400 mg/kg had a noticeable impact on the number of rearing. The common medication Sertraline (5 mg/kg) had a notable antidepressant activity (Table 3).

Table 3: Antidepressant Activity of *Passiflora edulis* using Stair case Exploration Test

Group	Time Spent (Sec)	
	Rearing test value	Climbing test value
G-I	8.66 ± 1.01	7.58 ± 0.67
G-II	19.64 ± 1.5**	14.16 ± 0.83**
G-III	9.33 ± 1.80*	9.68 ± 0.50*
G-IV	11.36 ± 0.95	14.51 ± 0.99
G-V	10.76 ± 0.02**	9.02 ± 0.04*

Values were expressed in mean±SEM; n=6
 ***p<0.001, **p<0.01 and *p< 0.05 when
 compared to control

3.2.4 Social Interaction (SIT) Test

When the animals are in a familiar setting, there is more interaction; in a strange arena, there is less. Anxiolytics generally promote social contact as demonstrated by our current investigation, which demonstrates the test drug's antidepressant activity (Table 4).

Table 10: Antidepressant Activity of *Passiflora edulis* using Social Interaction Test

Group	Social interaction Time Spent (Sec)
G-I	23.66 ± 1.01
G-II	5.64 ± 1.5**



G-III	21.33 ± 1.80*
G-IV	11.56 ± 0.25
G-V	19.76 ± 0.02**

Values were expressed in mean±SEM; n=6
 ***p<0.001, **p<0.01 and *p< 0.05 when compared to control

3.2.5 Estimation of Oxidative Stress Parameters (BDNF, TBARS and GSH) in Brain Homogenate

The study found that hydro alcoholic extract of *Passiflora edulis* significantly influenced the

Oxidative stress parameters levels in mice. The experimental control mice showed significant changes in Oxidative stress parameters compared to normal control mice. Concurrent treatment with hydro alcoholic extract of *Passiflora edulis* also showed a significant decline in Oxidative stress parameters levels compared to EC group mice (Figure 2-4).

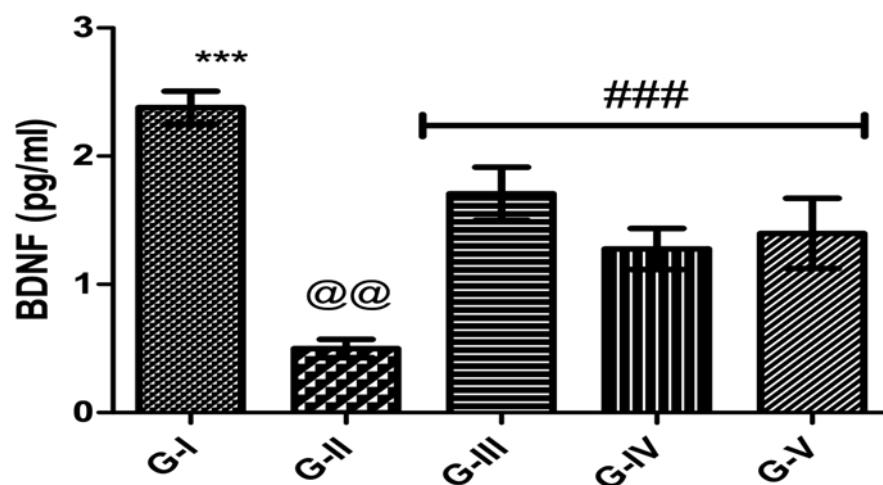


Figure 2: Estimation of BDNF in Brain Homogenate

Values were expressed in mean±SEM; n=6
 ***p<0.001, **p<0.01 and *p< 0.05 when compared to control

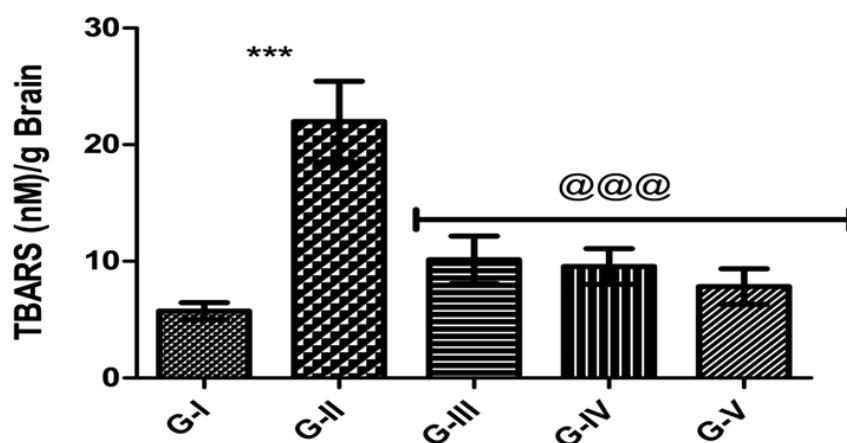


Figure 3: Estimation of Catalase in Brain Homogenate

Values were expressed in mean±SEM; n=6

***p<0.001, **p<0.01 and *p< 0.05 when compared to control

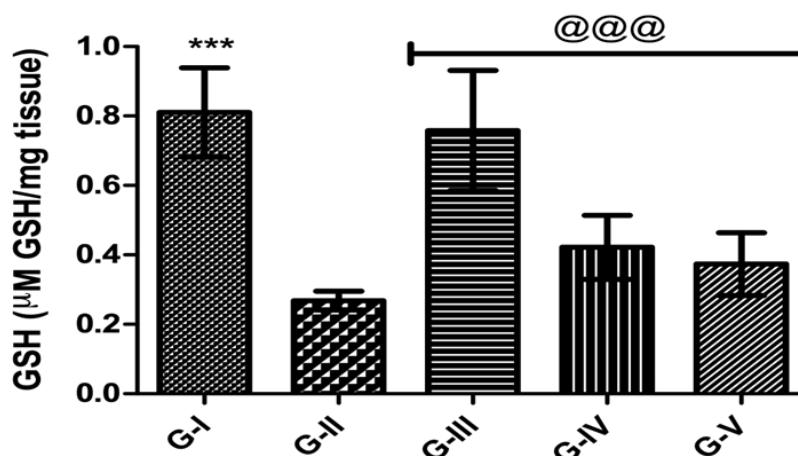


Figure 4: Estimation of Reduced Glutathione (GSH) in Brain Homogenate

Values were expressed in mean±SEM; n=6
 ***p<0.001, **p<0.01 and *p< 0.05 when compared to control

4. CONCLUSION

All of the main forms of depressant disorder share arousal and a subjective sense of terror. It is thought to be a specific type of behavioural inhibition brought on by outside circumstances. Based on symptomatology and susceptibility to

pharmaceutical and psychological therapies, anxiety disorders in humans are broadly classified. The hallmarks of generalised anxiety disorder include excessive, persistent worry and concern over general life events, objects, and circumstances. The central nervous system's complexity makes it extremely difficult to diagnose, treat, and mitigate these crippling conditions. Developments in this field would be crucial to the attempt to lessen the effects of

depressant-related disorders on a worldwide scale. There have been theories suggesting that certain neurotransmitters, like serotonin, are deregulated. Based on the aforementioned study, it can be stated that assessing hydro alcoholic extract of leaves of *Passiflora edulis* has the anti-depressant properties in conjunction with phytochemical analysis has produced good results, and the substances discovered may be the cause of the anti-anxiety properties. The goal of the current study was to give scientific support for anti-depressant activities. Hopefully, additional research will pinpoint the precise mechanism of action of the extract and isolated chemical responsible for its anti-depressant efficacy, allowing for the eventual use of them as therapeutic treatments following clinical trials.

5. Conflict of Interest

None.

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HOW TO CITE: Pratiksha Mhalsane*, Dr. Gopal Bihani, Dr. Pavan Folane, Dr. Kailash Biyani, Evaluation Of Antidepressant Activity of *Passiflora Edulis* in Laboratory Animals, Int. J. of Pharm. Sci., 2025, Vol 3, Issue 5, 3943-3949. <https://doi.org/10.5281/zenodo.15498381>

