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# ANTIPSYCHOTIC PROPERTY OF GREWIA HIRUSTA VAHL ETHANOLIC LEAF EXTRACT IN ALBINO MICE

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## ABSTRACT
The antipsychotic qualities of *Grewia hirusta Vahl* leaves were examined in this study. *Grewia hirusta Vahl* is a plant that is known to have ethno medical importance and is a member of the Malvaceae family. The leaves were gathered, shade-dried, and ground into a powder.70% ethanol was used for the extraction process, and stirring was done occasionally (Maceration).This study looked into the extract's initial Phytochemical screening. Antipsychotic efficacy was assessed using the Tail Suspension method and haloperidol-induced catalepsy. The Phytochemical such as phenols, flavonoids, glycosides, phenolics, saponins, and tannins make up the majority of the extract**.** The outcome demonstrated a substantial reduction in cataleptic time and a dose-dependent effect in mice using the Tail Suspension technique. In mice, *Grewia hirusta Vahl's* ethanol extract had strong antipsychotic effects. To examine the plant drug's mechanism of action regarding anti-dopaminergic function and to establish it as an antipsychotic medication, more neurochemical research and in vitro investigations are required**.**

**KEYWORDS:** *Grewia hirusta Vahl***,** antipsychotic**,** Catalepsy**,** Haloperido**l,** Imipramine.

## I. INTRODUCTION
Traditional medicine plays a significant role in developing world. According to WHO nearly 80% of people prefer natural plant extracts as medicine for primary health care because these products does not produce adverse effects. The traditional system of medicine has brought knowledge to the development of new valuable drugs. The health care system in India from past decades includes Ayurveda, Siddha, and Unani & Folk medicine which are completely from natural sources. The use of medicinal plants is mandatory in alternative medicine. Medicinal plants are the main source of numerous valuable phytochemicals with a wide range of application in human life. Many of these natural chemical compounds such as monoterpenes, flavanoids, isoflavones, saponins, alkaloids etc., possess biological and pharmacological activities, which are intensively studied.

*Grewia hirusta Vahl* –Family: Malvaceae is a Traditional herb used in Ayurveda and folk medicine for its use in Kshya (TB), Dysuria, Neurological disorders, useful in cholera, antihelmenthic (Bhakoni DS, Dhar MC MM BN Gupta B.) *Grewia hirusta vahl* small tree or shrub found in East Asia such as India, Srilanka, Thailand & Myanmar. A variety of phytoconstitents was found such as Alkaloids, Glycosides,. Psychosis a severe psychiatric mental illness with serious distortion of thought, behavior, capacity to recognize reality and perception. The person is unable to meet ordinary demands of life.3% of the people of the U.S experience at least 1 Psychotic episode during their lives. 100,000 teens each year experience their 1st psychotic episode. Average age of Psychosis onset is 24. In the present study, an attempt has been made been made to explore the psychoactive potential of ethanolic extract of *Grewia hirusta Vahl* in Haloperidol-induced catalepsy & Tail Suspension method.

**Fig 1: *Grewia hirusta Vahl* leaves.**

**Activity of antioxidants**
*Grewia hirusta Vahl* has been shown in earlier research to have antioxidant properties.

**Antioxidant assay in vitro**
DPPH scavenging activity: According to Zhenbao et al. (2007), DPPH radicals are commonly used to assess an antioxidant's ability to scavenge free radicals. It was found that *Grewia hirusta Vahl's* ethanolic extracts had DPPH radical scavenging activity. 90% of the extract's scavenging activity was observed at 200 µg. *Grewia hirusta Vahl's* ethanol extract demonstrated strong antioxidant and free radical scavenging properties.

## II. MATERIALS AND METHODS

**Plant material**
The leaves were collected in January 2023, in Hi-tech city Hyderabad. The plant was identified and authenticated by Dr.A.Vijaya Bhaskar Reddy, Assistant Professor, Department of Botany, University College of Science, Osmania University, Hyderabad, with wide voucher number no: **OUAS-96**. A herbarium specimen of plant was prepared and kept at herbarium botany for future reference.

**Extraction**
For a basic maceration procedure, 50 g of leaf powder were added to a 1000 ml beaker containing ethanol. For approximately a week, this was done by shaking the mixture periodically. After additional filtering, the filtrate is stored for evaporation in a Rota-evaporator, producing a residue that is greenish (7.2% yield).

**Phytochemical Analysis**
Phytochemical Analysis: Standard analytical techniques were used to assess the results of the preliminary phytochemical inquiry. The purpose of the experiment was to test its chemical components.

**Animals**
Swiss albino mice, weighing between 18 and 22 g, were acquired from Mahaveer Enterprises Ghatkeshkar in Hyderabad, Telangana's Animal House Facility. Pulla Reddy Institute of Pharmacy, Domadugu's Institutional Animal Committee (IAEC). Has given his approval to the experimental procedures used to assess *Grewia hirusta Vahl's* antipsychotic properties.

The animals spent almost a week getting used to the lab environment. For this investigation, 20–22g adult mice in good health were selected. The Institutional Animal Ethical Committee approved the use of the animal house at Pulla Reddy Institute of Pharmacy (PRIP), where the animals were housed under Protocol 02, with registration number IAEC-III_PRIP-FEB-2023. The animals were housed in a constant habitat with 22 ± $^{O}$C temperature, 55% humidity, and 12 hours of light and darkness. They were housed in cages made of polypropylene and given unrestricted access to water along with a routine pellet feed**.**

**Chemicals & Drugs**
Ethanolic extract of *Grewia hirusta Vahl* and Haloperidol and Imipramine was prepared as suspension using 2% Gum acacia and administered intraperitoneally (*i.p*). The drugs, crude extract were freshly prepared on each day of the experiments. Haloperidol and Imipramine was obtained from Neuheit Laboratory Aleap Industrial area Hyderabad.

**Methods**
Two In vivo models were used for evaluating antipsychotic models:
- Haloperidol-induced Catalepsy
- Tail Suspension Method

**Haloperidol-induced Catalepsy**
Haloperidol was used to produce cataplexy, and for 120 minutes, the condition was measured using a standard bar test conducted at 30-minute intervals. The investigation was carried out using the Ferre et al. (1990) described methodology, which Salam (2011) modified. A total of thirty mice were split up into five groups, each with six members. First, second, and third groups were given graduated dosages of ethanol extracts of GHV at body weight *i.p.* of 100 mg and 200 mg, respectively, whereas the first group got 10 ml/kg of normal saline. Haloperidol (1 mg/kg) is given to the fourth group, and trihexyphenidyl (10 mg/kg) is given to the fifth. Mice in each group received an intraperitoneal injection of 1 mg/kg bodyweight of haloperidol thirty minutes following the *i.p*. treatment. The mice were arranged such that their rear ends were facing 30 minutes after the haloperidol was administered, the patients were placed on a bench with their forelimbs resting on a 1 cm diameter horizontal bar 4 cm above the bench. When a mouse maintained this posture for a maximum of 180 seconds, it was determined that the mouse was cataleptic. The point at which the mouse's cataleptic state ended was when both of its front paws were taken off the bar.

**Mice's tail suspension test**
The study was carried out using Steru et al. (1985)'s methodology. Adult mice were split into four groups of six at random. First group mice are given normal saline (10ml/kg) intraperitoneally, whereas second group mice are given standard imipramine medication (4mg/kg) intraperitoneally. Groups three and four receive S is given GHV at graded doses of 100 and 200 mg/kg of body weight intraperitoneally, respectively. Each mouse was placed by the tail on a shelf that was 58 centimeters above a table top thirty minutes after the *i.p*. treatment, and the duration of immobility was measured for six minutes after the activity during the first two minutes, during which the mice attempted to escape, was discarded. When a mouse is hanging motionless, it is said to be immobile.

**Statistical Analysis**
Mean ±SEM (n = 6) was used to express the results. Using Graph Pad Prism, statistical analysis was carried

out using one-way analysis of variance (ANOVA) and the Turkey Multiple Comparison Test's values that were equivalent to or less than 0.05 were regarded as statistically significant**.**

## III. RESULTS AND DISCUSSION

## RESULTS

### Extractive values

The extraction values of *Grewia hirusta Vahl* in various solvents are shown in the following table.

Using a straightforward maceration procedure over the course of seven days and four different solvents, the extract was made from powdered GHV leaves. The resulting crude extract contained 6.4% w/w of water, 3.2% w/w of ethyl acetate, 22.4% w/w of methanol, and 64% w/w of ethanol. It was discovered that the amounts of ethanol solvent were considerable, at 64%. Hence, ethanol extract is applied.

**Table: 1 The values of *Grewia hirusta Vahl* leaves using different solvents, as well as their color and consistency, are described in the table below.**

| Solvent | Color | Consistency | Extractive values (g) |
|---|---|---|---|
| Water | Green | Semisolid | 6.4%w/w |
| Ethyl-acetate | Green | Semisolid | 3.2%w/w |
| Methanol | Greenish yellow | Semisolid | 22.4%w/w |
| Ethanol | Dark green | Semisolid | 64%w/w |

### Preliminary-Phytochemical Analysis

Estimated by Standard Analytical Procedures .Phytochemical study of the ethanol extract of *Grewia hirusta Vahl* revealed the presence of valuable chemical constituents such as alkaloids, flavanoids, saponins, tannins, Phenolic compounds.

Below table reveals the presence the of various Phytochemical constituents

**Table: 2 The phytoconstitents of the GHV leaf extract are shown in the table below.**

| S.No | Phytochemical Constituents | GHV Ethanolic leaf extract |
|---|---|---|
| 1 | Test for Alkaloids<br>Hager's test<br>Wagner's test | <br>+<br>+ |
| 2 | Glycosides<br>Legal's test | <br>+ |
| 3 | Flavonoids<br>lead acetate | <br>+ |
| 4 | Phenols<br>Ferric Chloride test | <br>+ |
| 5 | Tannins<br>Ferric Chloride test | <br>+ |
| 6 | Saponins<br>Froth test | <br>+ |
| 7 | Proteins<br>Biurette test | <br>- |

**Note :-** (+) Indicates Presence; (-) Indicates Absence in Leaves of *Grewia hirusta Vahl* Ethanolic extract.

### In-vitro Anti-Psychotic Activity

The anti-psychotic potential of an ethanolic extract of *Grewia hirusta Valhi's* leaves was investigated in Albino mice.

### Haloperidol Induced Catalepsy in mice

Haloperidol (1mg/kg) *i.p* tends to produce the typical cataleptic symptoms in mice. GHV ethanolic extract (100,200mg/kg *i.p* dose dependently reduced the cataleptic score compared to that of standard trihexyphenidyl (10mg/kg) group, Haloperidol which inducing catalepsy in mice Extra pyramidal effects these effects was reduced by the GHV plant extract significantly (P<0.0001) thus it possess antipsychotic activity with a Mean± SEM of n=6.

Below table describes the effect of GHV ethanolic extract of catalepsy time

**Table: 3 Haloperidol-induced catalepsy in mice of Ethanolic leaf extract of GHV.**

| S.NO | Groups | | Cataleptic time | | |
|---|---|---|---|---|---|
| | | 30min | 60min | 90min | 120min |
| 1 | Control NS (10ml/kg) | 35±1.82** | 25±1.6 | 17.33±1.68*** | 13±2.13*** |
| 2 | GHV (100mg/kg) | 33±1.43 | 26±1.2** | 25±3.48** | 20±4.06 |
| 3 | GHV (200mg/kg) | 35.6±2.1*** | 24.66±3.60*** | 24.66±3.6*** | 15±1.82** |

| | | | | | |
|---|---|---|---|---|---|
| 4 | Haloperidol(1mg/kg) | 150±5.47 | 153±11.15*** | 180±0.23 | 180±0.24 |
| 5 | Trihexyphenidyl(10mg/kg) | 19.3±3.45** | 16.66±2.69 | 12.6±1.83** | 8.33±1.02** |

NS=Normal Saline, GHV=*Grewia hirusta Vahl*, Values are expressed in Mean±SEM n=6.Statistical analysis performed using one way ANOVA followed by Brown-Forsythe test. ****p<0.0001 significantly reduces the mean cataleptic time compared to extract GHV to control and standard group.

**Tail suspension test in mice**

Table 4 illustrates the impact of imipramine and GHV 100 and 200 mg/kg plant extracts and control on active behavior in the tail suspension test. Immobility time was significantly reduced when imipramine (4 mg/kg) and plant extracts (GHV) were administered intraperitoneally at doses of 100 and 200 mg/kg ****p<0.0001 significantly reduces the mean immobility time.

**Table: 4 Tail suspension in mice of ethanolic leaf extract of GHV.**

| S.NO | Treatment | Immobility time (Seconds) |
|---|---|---|
| 1 | Control NS (10ml/kg) | 111±7.57*** |
| 2 | GHV (100mg/kg) | 80.33±3.72** |
| 3 | GHV(200mg/kg) | 75±1.46 **** |
| 4 | Imipramine(4mg/kg) | 71±2.80*** |

NS=Normal Saline, GHV=*Grewia hirusta Vahl*, Values are expressed in Mean ± SEM n=6 Statistical analysis performed using one way ANOVA followed by Bartlett's' test, ****p<0.0001 significantly reduces the mean immobility time compared to Control and Standard.

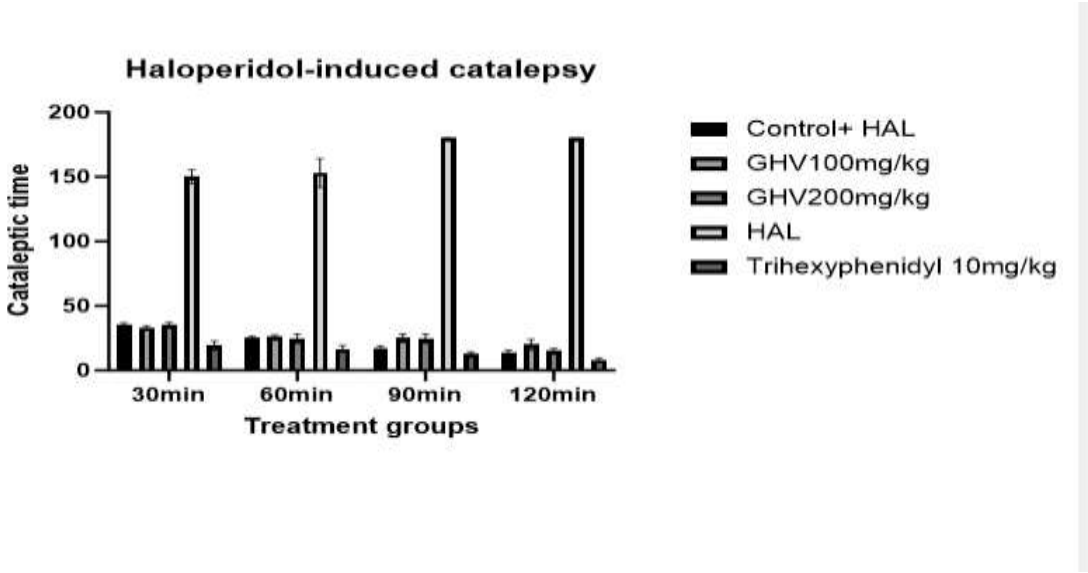


**Fig: 2 Effect of GHV ethanolic leaves extract on Haloperidol-induced catalepsy in mice.**

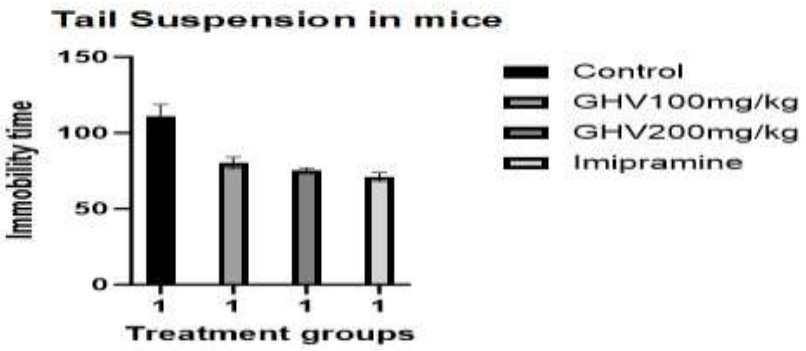


**Fig: 3 Effect of GHV ethanolic leaves extract on Tail suspension in mice.**

**DISCUSSION**

Previous research on the GHV plant indicates that it may have antioxidant properties. The results of this investigation indicate that GHV's ethanolic leaf extract has antipsychotic properties. According to experimental research, phenolic substances like the flavanoids found in GHV are significant antioxidants and superoxide scavengers. The positive antipsychotic effect of GHV might be attributed to its antioxidant activity. A common neuroleptic medication, haloperidol, causes extra pyramidal side effects in humans and catalepsy in rodents. One of the animal models used to assess the extra pyramidal adverse effects of antipsychotic medications is haloperidol-induced catalepsy. The main cause of catalepsy brought on by haloperidol (a D2 antagonist) is the blockage of dopamine receptors in the stratum. Anti-psychotic-induced brain damage has been linked mostly to the stratum and nucleus acumens have been identified as the main brain regions impacted by anti-psychotic-induced catalepsy, which develops as a result of dopamine neurotransmitter blockade. A further model that is utilized in the testing of antipsychotic models is the tail suspension approach.

In this present study GHV 200mg/kg significantly ($P<0.0001$) reduces the mean cataleptic ratings in comparison to the Control and trihexyphenidyl standard medication. The ethanolic extract of GHV 100, 200 mg/kg showed a significant ($P<0.0001$) influence on the length of immobility in mice suspended by tail, in comparison to the tail suspension method. Mice's period of immobility was significantly decreased when imipramine was employed as a positive control. The findings imply that GHV has antipsychotic properties.

**IV. CONCLUSION**

The present study concludes that the *Grewia hirusta Vahl* has a protective effect against Haloperidol-induced Catalepsy and Tail Suspension in mice test comparable to that of Standard drugs Trihexyphenidyl, Imipramine. The constituents in this extract GHV contain major phytoconstitents that responsible for antipsychotic activity of this plant. Our study indicates that GHV could be used as an alternative/adjuvant drug in preventing and treating symptoms of psychiatric illness. However, it requires further pre-clinical and clinical studies to prove it.

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