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**Antidepressant Activity of Plants: A Review**

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**ABSTRACT**

Depression is the commonly reported disorder and conventional medicine is being used to treat depression. Most of the population in developing countries relies on alternative medicine. In an attempt to avoid side effects of allopathic medicine, people have been resorting to popular traditional herbal medicines to treat depressive disorders. This review provides an overview of the current knowledge state regarding a variety of natural plant products commonly used in depression. Herbal medicines discussed that have been used in traditional system of medicine to treat mild to moderate depression states include the popular *Scutellaria laterifolia*, *Paeonia lactiflora*, *Ginkgo biloba*, *Mimosa pudica*, *Hordeum vulgare*, *Rosarinus officinalis*, *Panax ginseng*, *Melissa officinalis*, *Lobelia inflata* and *Hypericum perforatum*.

**Keywords:** Depression, Medicinal Plants, Efficacy, Literature Review

**INTRODUCTION**

Depression is a psychological disorder that ranges from mild to severe form. Disturbance in balance of neurotransmitter results in depression<sup>1</sup>. Well known neurotransmitters are gamma amino butyric acid (GABA), noradrenaline, serotonin and dopamine. Depression related neurotransmitter is serotonin. Various allopathic medicines are being prescribed to increase level of serotonin. Monoamine Oxidase Inhibitors (MAOIs) and Tricyclic Antidepressants (TCAs) were more common in use to treat depression. With the passage of time, new medicine known as selective serotonin reuptake inhibitors (SSRIs) and the serotonin norepinephrine reuptake inhibitor are available<sup>2</sup>. All these drugs have side effects. Herbal

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medicines are famous due to their efficacy and fewer side effects to treat mental disorders since ancient time<sup>3</sup>. Various plants have antidepressant effects such as *Crocus sativus*<sup>4</sup>, *Borago officinalis*, *Trigonella foenum-graecum*, *Calluna vulgaris*<sup>5</sup>, *Hypericum perforatum*, *Echium amoenum*, *Crocus sativus*, and *Rhodiola rosea*, *Matricaria recutita*, *Ginkgo biloba*, *Passiflora incanata*, *E. amoenum*, *Salvia elegans*, *Centella asiatica L*, *Hypericum perforatum L*, *Rhodiola rosea L*, *Pfaffia paniculata*, *Rauwolfia serpentina*, *Rhododendron molle*, *Shizandra chinensis*, *Thea sinensis L*, *Uncaria tomentosa*, *Valeriana officinalis L*, *Withania somnifera*<sup>6</sup>. Medicinal plants have been used since centuries in all over the World. Various studies have shown that medicinal plants calm the brain and reduce anxiety. Medicinal plants are replacing the synthetic drugs in some particular

diseases such as depression and anxiety. Depression is more common in female as compared to males. Complementary medicines are being used by 40% of all Americans as psychotherapeutic agents<sup>7</sup>.

## METHODS

A review of the literature published in scientific journals, books, thesis and reports.

### *Medicinal plants with anti-depression and related beneficial properties*

#### *Paeonia lactiflora:*

**Family:** Paeoniaceae, **Parts used:** Root. **Chemical constituents:** Ursolic acid, oleanolic acid, paeoniflorin esters, suffruticosol A and B, gnetin H, trans-epsilon-viniferin, trans-resveratrol, cis-epsilon-viniferin, trans-resveratrol-4-O-beta D-galactopyranoside. Mao et al has reported the antidepressant-like effect of ethanol extract from *Paeonia lactiflora* in mice. Ethanol extract of this plant is used for study. This study was done in mice. Forced swim test, tail suspension test, open-field test and reserpine test were done. Study duration was seven days. Extract was administered intragastric and dose of extract was 250 and 500 mg/kg. Duration of immobility was reduced in both forced swim test and tail suspension test. Extract at dose of 500mg/kg was as effective as positive control chlorimipramine at dose of 20 mg/kg. Reserpine induced ptosis was antagonized by use of extract at dose of 250 and 500 mg/kg. This study showed the anti-depressant activity of plant in animal model. This activity is mediated via the central monoaminergic neurotransmitter system<sup>8</sup>. Lee et al has reported the cynandione A from *Cynanchum wilfordii* protects cultured cortical neurons from toxicity induced by H<sub>2</sub>O<sub>2</sub>, L-glutamate, and kainite<sup>9</sup>.

#### *Ginkgo biloba:*

**Family:** Ginkgoaceae, **Part used:** Leaves. This herb improves the circulation of brain and its ability to tolerate low oxygen levels, inhibits brain swelling due to trauma or toxins, and inactivates damaging substances called free radicals. Ginkgo is effective in preventing altitude sickness. Cohen et al has reported

that *Ginkgo biloba* is for antidepressant-induced sexual dysfunction<sup>10</sup>. Hemmeter and his colleagues conducted a study to investigate the efficacy of *Ginkgo biloba* in patients with depression. Trimipramine was given to sixteen patients. Dose of trimipramine was 200 mg. This drug was given for six weeks. Extract of *Ginkgo biloba* was given to eight patients out of sixteen patients was applied for four weeks after a baseline week. Dose of *Ginkgo biloba* extract was 240mg/day. Other eight patients remained on trimipramine monotherapy (200 mg) during the entire study. After treatment with *Ginkgo biloba* sleep pattern was increased. There was significant improvement in sleep in patients with depression as compared to trimipramine group<sup>11</sup>.

#### *Mimosa pudica:*

**Family:** Mimosaceae, **Parts used:** Roots and leaves. **Chemical constituents:** Tannin, minosine, turqorins, phytohormone, tubulin, glycosyl flavone, rhamnosylorientin, and rhamnosyliso-orientin. It is carminative, aphrodisiac, antiseptic, alterative and blood purifier. It is prescribed in itching, scabic patches, diarrhea, fever, headache, hemorrhage and vomiting. **Study:** Molina et al. has reported that *Mimosa pudica* may possess antidepressant actions in the rat. This study was conducted in Mexico. Aqueous extracts of this plant was used for activity. Various concentrations of extracts of this plant were used to alleviate depression. This study was 30 day duration. Saline, various concentrations of extracts, desipramine and clomipramine were administered to rats. Extract was administered at four levels 2, 4, 6 and 8mg/kg. Parameters for assessment were forced swimming test and rate of reinforcers in the DRL-72s test. Anti-anxiety effect of extract at different concentrations was noted in comparison with diazepam at a dose of 1.3 mg/kg intra-peritoneal in the elevated plus-maze test. Reduction in immobility in the forced swimming test was observed by use of *M. pudica* at dose of 6 and 8 mg/kg. Same activity was observed by use of clomipramine and desipramine at dose of 1.25 mg/kg and 2.14 mg/kg respectively. These all drugs were administered intraperitoneally. This study showed that this plant has antidepressant activity in

the rat. Furthermore, it was concluded that activity of this plant is just like tricyclic antidepressants<sup>12</sup>.

*Hordeum vulgare L.:*

**Family:** Poaceae, **Part used:** Grains. **Study:** Awatef et al (2012) reported the antidepressant effects of Barley grains on skeletal muscle of depressed mouse model. Barley grain was administered intraperitoneally at a dose of 0.06 mg per day for 30 days. Hypoglycemia and low concentrations of lactate dehydrogenase was observed. There was normal neuromuscular junction and normal motor nerve trunk that demonstrate normal appearance. This study indicated that Barley prevents risk factors and can be prescribed in the prevention or treatment of many psychiatric and emotional disorders<sup>13</sup>. Katsunori et al reported the efficacy of this plant in depression. In this study, young green barley leaves were orally administered. Anti-depressant activity was examined on the forced swimming test in mice. An open cylindrical container was used and mice were forced to swim. Barley leaves (400mg or 100mg/kg) and imipramine (100mg/kg) was administered one hour before the test. Barley leaves at dose of 400 and 100mg exhibited significant antidepressant activity in the forced swimming test. Imipramine at dose of 100mg/kg reduced the immobility duration as compared to vehicle group. This study indicated that plant has antidepressant activity in the forced swimming test and this activity may be mediated by an inhibition of the increase in the hippocampus levels of NGF<sup>14</sup>.

*Rosarinus officinalis:*

**Family:** Lamiaceae, **Part used:** Leaves. The tea is good for gas, colic, indigestion, nausea and fevers. It will promote liver function, the production of bile and improve circulation and digestion. It will raise the blood pressure. The oil added to liniments and salves is good for rheumatism, eczema, arthritis and wounds. The tea is a good hair rinse and makes a useful mouthwash for halitosis. Sasaki et al reported the anti-depressant of this plant. It contains active constituents such as rosmarinic acid, luteolin and carnosic acid. Neurotrophic efficacy of this plant has

been observed. It enhances cholinergic functions in PC12 cells. A study has been conducted to investigate its antidepressant activity. Tail suspension test (TST) in ICR mice and PC12 cells as in vitro neuronal model was used for study. There was significant upregulation of tyrosine hydroxylase and pyruvate carboxylase. These findings were observed on proteomics analysis of PC12. This plant protected neuronal cells against corticosterone-induced toxicity<sup>15</sup>.

*Panax ginseng:*

**Family:** Araliaceae, **Parts used:** Root and leaves. Ginseng is used as a general tonic affecting the whole body. It promotes appetite and is useful in digestive disturbances. The tea taken hot is effective for colds, chest troubles and coughs. It is used to normalize blood pressure, tone the heart, increase circulation and reduce cholesterol. It reduces blood sugar which makes it useful for diabetics. As a nutritive tonic it has been used to treat anemia. Yamada et al reported the antidepressant effects of this plant<sup>16</sup>. **Study:** Dang et al reported antidepressant components from this plant. Ginseng total saponins (GTS) are found in this plant and are used as brain tonic, Ginseng total saponins were investigated for their antidepressant activity in two classic animal models: the forced swimming test (FST) and the chronic mild stress (CMS) model. Ginseng total saponins were given at doses of 50 and 100 mg/kg that was able to reduce the immobility time in the forced swimming times in mice after 7-day treatment. Ginseng total saponins exhibited antidepressant in both models of depression. This activity may be due to enhancing the monoamine neurotransmitter concentration<sup>17</sup>.

*Melissa officinalis:*

**Family:** Lamiaceae, **Part used:** Leaves. This plant is prescribed to treat fever, flu and cold. It is mixed with honey to sweeten it and is given to children. It is also given in nervous fevers and digestive disturbances. **Study:** Adefunmilayo et al reported the antidepressant effects of this plant. Ethanol extract of this plant was used or study. Duration of study was ten days. Extract was administered orally. Male and female rats were selected for study. Diazepam at dose

of 1 mg/kg and fluoxetine at dose of 10mg/kg was also used to assess their efficacy. In the elevated plus maze test, efficacy of extract was significant in both male and females as compared to vehicle-treated animals but was comparable to diazepam group. In the forced swimming test, immobility duration was significantly reduced with use of extract as compared to vehicle-treated counterparts. Same anti-depressant effect was observed in fluoxetine treated animals. Fluoxetine was more effective than plant extract. This study indicated that *M. officinalis* has psychoactive activity and can be used in depression<sup>18</sup>.

*Withania somnifera:*

**Family:** Solanaceae, **Parts used:** Roots. Bhattacharya et al., reported anti-depressant activity of *Withania somnifera*. A study was conducted to investigate antidepressant activity of the bioactive glycowithanolides. This compound is isolated from *Withania somnifera*. Rats were selected for study. Study duration was 5 days. Dose of *Withania somnifera* glycowithanolides was 20 and 50 mg/kg. This drug was administered orally once daily. This study was conducted in comparison with imipramine (10 mg/kg, i.p.). *Withania somnifera* glycowithanolides exhibited an antidepressant activity, comparable to imipramine, in the forced swim-induced 'behavioral despair' and 'learned helplessness' tests. This study showed that *Withania somnifera* has antidepressant activity<sup>19</sup>.

*Lobelia inflata:*

**Family:** Campanulaceae, **Part used:** Leaves. It is both a relaxant and a stimulant. It acts as tonic, stimulant and sedative. It is used for spasmodic lung and respiratory conditions to relieve spasms and to act as an expectorant. It is a good herb to add to all cough medicines. It is used as a wash for infected or itchy skin diseases. It is an excellent emetic. It is prescribed in sore muscles, pains and rheumatism. It is anticonvulsant and is used to treat convulsions. It is expectorant and is useful in all respiratory treatments, especially the spasmodic type. It is prescribed in tetanus and lock jaw. It is smooth muscle relaxant and is prescribed to treat intestinal pain. It is used in

hypertension. It is effective in fevers associated with meningitis, pneumonia, pleurisy, hepatitis, peritonitis and nephritis. It is excellent for cramps, epilepsy, hysteria, chorea and convulsions. **Study:** Subarnas et al reported the antidepressant activity of this plant. A study conducted by Subarnas showed that *Lobelia inflata* has anti-depressant activity. Antidepressant was investigated in mice. Methanol extract of plant was used for this study. After confirming its efficacy as antidepressant drug, an active compound named beta-adrenergic palpitant was found most active constituent having anti-depressant activity<sup>20</sup>.

*Hypericum perforatum:*

**Family:** Hypericaceae, **Parts used:** Flowers, leaves and stem. This is a good blood purifier and is used for boils, uterine pain, suppressed urine, diarrhea, dysentery and jaundice. It can be taken for uterine cramping, insomnia, bedwetting and other nervous conditions<sup>21</sup>. The extracted oil makes a good external application for burns, wounds, bruised and other sensitive skin problems. It is also prescribed to treat swollen breasts, hard tumors, wounds, ulcers and burns. **Mechanism of action:** It is a potent uptake inhibitor of gamma amino butyric acid (GABA), serotonin, dopamine, noradrenaline. Effective dose of GABA, dopamine, noradrenaline, and 5-hydroxytryptophan is with IC50 values of about 0.05-0.10 microg/ml and effective dose of glutamate is 0.5 microgram/ml in synaptosomal preparations. **Study:** Rahimi et al reviewed a comparative analysis of efficacy of *Hypericum perforatum* in comparison with selective serotonin reuptake inhibitors that are standard drugs used in depression and concluded that *Hypericum perforatum* is useful in depression with fewer or no side effects<sup>22</sup>. A study was conducted to investigate efficacy of *Hypericum perforatum* in comparison with placebo and standard antidepressant drug. Papers were searched for depression and its treatment. Patient information, interventions and outcome of treatment were noted. Two independent reviewers extracted the results of study. Reviewers concluded that extracts of hypericum are more effective than placebo in mild to severe depression. But reviewers stated that evidence is inadequate to



establish whether hypericum is as effective as other antidepressants. Further studies should be carried out to investigate the efficacy of hypericum with standard drugs at different dosage from designs<sup>23</sup>.

*Bupleurum falcatum:*

**Family:** Apiaceae. **Study:** A study was conducted to investigate anti-depressive effect of Bupleurum falcatum. This extract was administered in repeated restraint stress-induced behavioral responses in rat. This study was carried out in 15 days. Dose of extract was 20, 50, or 100 mg/kg. This extract was given daily. This drug was administered 30 minutes before inducing restraint stress. This study indicated that administration of extract before restraint stress is effective in reducing depression and anxiety in rat<sup>24</sup>.

### CONCLUSION

This review indicated that plants have significant anxiolytic and antidepressant activities. These activities may be due to increase in monoamines concentration or other via other mechanism. Hence medicinal plants may be served as a potential resource for herbal origin antidepressant agents against stress and other associated disorders. Medicinal plants are effective to treat mild to moderately severe depressive disorders. These medicines are effective and have fewer or no side effects. Further studies should be carried out to search out active constituents that are responsible for their efficacy to treat the disease.

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