



An Overview on Medicinal Plants with Potential Antidepressant Activity

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Abstract: The application of complementary and herbal medicine in treating depression and mental disorders is currently on the rise globally. Depression is one of the most common challenges faced by medical practitioners due to its dynamics and variation between patients. The mental depression range is estimated to be 7.1 % among adults, 13.1% between 18 to 25 years of age, and 3 % among children. The prevalence rate is also higher amongst females compared to male. The cost of treating mental disorders and other mental challenges is rising. Many families are opting to use plant products and natural herbs as a cheaper and better tolerated alternative to their conditions, since the conventional drugs available in the market to treat depression are showing adverse life threatening side effects like suicidal tendency especially in adolescence because their brain is still maturing. So this article reviews medicinal plants with potential antidepressant activities; it considers the effects, mechanism of action, the appropriate dosage, and precautions that should be exercised when using these plant products. Phytochemicals in these plants show spectrum of application and teasing out these for its specific antidepressant properties is essential, so in this regard I have given emphasis to the chemical constituents which play an important role in the treatment of depression. Many researchers are working on the treatment of this condition using plant materials and poly herbal formulation. There are many publications in this field, which is not enough to treat depression hence more outcomes should come to light with the purpose of this study.

Keywords: Depression, stress, Antidepressants, Medicinal plants, Alternative medicine

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1. INTRODUCTION

Mental depression is a condition that affects one's behavior, mood and health, and interaction with others. Mental depression is of two types such as bipolar and unipolar depression. Those suffering from unipolar depression tend to exhibit mood swings in the same direction¹. It accounts for over 70% of the mental depression cases registered globally; the most common symptoms include agitation and anxiety². Life-time risk for major depression is roughly 5-12% for men and 10-25% for women. Major depression affects 3-5% of adolescents^{3,4}. The pathophysiology of depression has been traditionally attributed to a neurotransmitter imbalance and critical interactions between genetic and environmental risk factors. Stable alterations in gene expression that contribute to structural and functional changes in multiple brain regions have been implicated in the heterogeneity and pathogenesis of the illness^{5,6}. Bipolar mental depression also referred to as endogenous depression is usually caused by external stress conditions and is usually exhibited at an adult stage. Patients with bipolar depression usually exhibit reduced brain activity, especially in the brain monoamine neurotransmitters⁷. Recent data indicate that about 40% of adults in the United States and 15% of the children are likely to suffer from anxiety, depression and have used medicinal plants with antidepressant activities to resolve their conditions⁸. As depression continues to become a global challenge, the dependence on antidepressant drugs also rises; hence there is a need to conduct a review of some of the most preferred medicinal plants with antidepressant activities since plants and its products as a cheaper and better tolerated alternative to their conditions^{9,10}. The over-reliance on depressant drugs has led to many people using these treatment methodologies without notifying medics or seeking consent; the outcomes of such actions can either be positive or negative because more effects are accumulated or exhibited by patients suffering from mental disorders¹¹. While these plants are considered helpful in resolving depression, they are not risk-free and should only be consumed with the doctors' consent to avoid intoxication and adverse effects. To obtain the relevant data, this article did a literature analysis of previous works on mental depression. A wide search was performed using key terms such as mental depression, antidepressant reviews, mental therapy, and treatment, amongst other terms¹². Other sources like books, medical journals, and medical websites such as health line.com were also used. These sources were utilized without considering the year of publication but the validity of the data, case studies, and the presentations.

1.1 MEDICINAL PLANTS WITH POTENTIAL ANTIDEPRESSANT ACTIVITY

1.1.1 *Rhodiola rosea*

Family: Crassulaceae

Common name: rose root, golden root

This plant (Fig.1A) is widely available in mountainous and high altitude regions, specifically in Asia and Europe. It is also referred to as a golden root, a name given based on its ability to solve mental depression, fatigue, impotence, and sicknesses common in high altitude areas¹³. It contains a wide range of biological substances such as flavonoids, glycosides, phenolic acids, among other substances¹⁴. It acts as a

catecholaminergic system enhancer due to its adaptogenic properties, which influences the biogenic monoamines levels and inhibits activities of enzymes that facilitate monoamine degradation, thereby facilitating neurotransmitter transportation in the brain¹⁵. It also influences the opioid system's activities through induction of opioid peptide biosynthesis and activating the peripheral and central receptors, hence inducing an antidepressant effect into the body¹⁶. In animals, it increases the serum beta-endorphins hence preventing them from stress stimulated by increased endorphin levels; it also regulates the secretion of opioid peptides, which occurs as a response to stress. Regular experimentations reveal that it enhances physical fitness, reduces mental fatigue, increased mental performance, increased ability to concentrate, and general well-being¹⁷.

1.1.2 *Crocus sativus*

Family: Iridaceae

Common name: Saffron crocus, Autumn crocus

This plant (Fig.1B) is commonly known as saffron crocus, it is recommended for treating depression majorly in the Persian region. Limited tests carried out using the supplements from this plant showed improvement in depression; these available results were, however, limited due to the few numbers of patients experimented and the levels of supplements administered to the subjects^{18,19}. The chemical constituent of the plant, kaempferol was tested in mice using a forced swimming test, which showed reduced immobility and the study confirmed the antidepressant property of kaempferol²⁰. The time taken to immobile was diminished by the aqueous extract of crocus, at 40 and 160mg/kg body weight. It has been demonstrated that brain-derived neurotrophic factor (BDNF), VGF Neuropeptide, CyclicAMP Response Element Binding Protein (CREB) and phospho-CREB (p-CREB) may play roles in depression²¹.

1.1.3 *Abies pindrow*

Family: Pinaceae

Common name: Himalayan silver fir, silver fir, West Himalayan fir

This is one of the most preferred antidepressant plants (Fig.1C). Ethanolic extract of this plant showed anxiolytic property²². Flavonoids and terpenoids are the main chemical constituents which exhibit anxiolytic properties of the aerial parts of the plant. Study on Methanolic extract and Ethyl Acetate fraction of *Abies pindrow* showed significant reduction in immobility parameter in forced swim test but no locomotive behavior increased as seen in open field, which confirms the antidepressant quality²³. The studies also recommended that the plant be a suitable means of treating depression²⁴.

1.1.4 *Hypericum perforatum*

Family: Hypericaceae

Common name: St John's-wort

This plant (Fig.1D) is also referred to as St. John's worth. It is one of the oldest antidepressant herbs available worldwide, especially in Europe, North Africa, Asia, and North America.

It is also recommended for other medical needs such as healing wounds, treating malaria, and use as an antibiotic. The experiment was conducted to understand the effect of oral administration of the herbal extract 120 mg/kg body weight to 20 mice. The results indicated a strong antidepressant activity. The Indian *Hypericum perforatum* Linn has effects similar to induced imipramine; it also has a significant antioxidant activity level²⁵. A test on human beings indicated that it was suitable for treating amnesia and depression with minimal side effects. Further tests were carried on patients with depression by administering 612mg of Hypericum extract for 24 weeks, and the effects were similar to that of 50mg of Sertraline in patients exhibiting moderate depression²⁶. In conclusion, is effective for treating patients with moderate depression disorders, but not patients with major disorders.

1.1.5 *Ocimum sanctum*

Family: Lamiaceae
Common name: Tulsi, Holy Basil

This plant (Fig.1E) is commonly found in India, and it is also referred to as Tulsi or holy basil. It is suitable for relieving agitation and anxiety that is commonly associated with depression. It exhibits calming and anti-aggressive effects on depression patients²⁷. An extract from the leaves is not as effective as that from the root. In a lab experiment, methanol extract from the plant roots showed an antidepressant effect in mice during a tail suspension and forced swimming test²⁸. The antidepressant effect is caused by the interaction with the dopaminergic and glutamatergic systems.

1.1.6 *Apocynum venetum*

Family: Apocynaceae
Common name: Sword-leaf, Dogbane

This plant (Fig.1F) is popular in China. In a forced swimming test, it exhibited decreased immobility after administration of different doses (30, 60, 125 mg/kg) of *Apocynum* extracts. The impacts were similar to that of 20 mg/kg dosage of synthetic imipramine. The antidepressant effect is due to some of the main flavonoids in the extract, such as isoquercitrin and hyperoside²⁹. Various doses (36, 60, 125 mg/kg) of this plant extract showed antidepressant-like effects in chronic unpredictable mild stress exposed rat models and was validated with fluoxetine (10 mg/kg). This treatment also reduced the serum corticosterone which is a good indicator of stress³⁰.

1.1.7 *Perilla frutescens*

Family: Lamiaceae
Common name: Perilla, Korean perilla

It is primarily used for treating anxiety and depression disorders³¹. An experiment through oral administration of the plant essential oil in mouse model showed a significant decline in the duration of immobility in forced swim test and tail suspension test³². Based on the results, it was concluded that essential oil of this plant (Fig.1G) was highly involved in the antidepressant effects during the forced swimming tests.

1.1.8 *Rhazya stricta*

Family: Apocynaceae
Common name: Senhwar, Sahaer, Dogbane

It is common in the Arab peninsula and Afghanistan regions, usually very common near oases. This plant's (Fig.1H) antidepressant effects are due to various alkaloids and flavonoids present in the aqueous extract of leaves, which exhibited antidepressant effects during forced swimming test³³.

1.1.9 *Ginkgo biloba*

Family: Ginkgoaceae
Common name: Ginkgo, Maidenhair tree

A native Chinese plant (Fig.1I) is useful in treating mental depression while eliminating the side effects of synthetic antidepressants. Its combination with venlafaxine is suitable for protecting neurons and reducing any brain damage³⁴. It is suitable for improving moods amongst older people and restoring stress induced in the brain.

1.1.10 *Withania somnifera*

Family: Solanaceae
Common name: Ashwagandha, Indian ginseng, Poison gooseberry, Winter Cherry

The drug is obtained from the roots of the plant and is common in India (Fig.1J). It effectively handles a wide range of conditions, such as environmental-induced illnesses and physical and mental health. An experiment involving 100 mg/kg. p.o. of the plant extract exhibited reduced mobility in mice in 6 minutes forced swimming experiment³⁵. A 20 and 50 mg/kg. p.o. dosage exhibited antidepressant effects compared to a 10 mg/kg—i.p. of imipramine during a similar forced swimming test³⁶.

1.1.11 *Curcuma longa*

Family: Zingiberaceae
Common name: Turmeric

This plant (Fig.1K) is having various medicinal applications, which includes protective effect on the brain. WKY rats showed a dose-dependent reduction in immobility during Forced swim test by curcumin in both acute and chronic studies, higher chronic curcumin dose effect in FST was still evident after one week and it is also resulted in a dose-dependent increase in hippocampal BDNF. This data shows an antidepressant-like effect of curcumin possibly through increased neurotrophic activity in the WKY rat model of depression. Curcumin may be an effective and lasting natural antidepressant³⁷. It has been proved to possess' antidepressant action in various animal models of depression. 10-80 mg/kg, i.p. curcumin dose demonstrated reduced immobility in forced swim tests. Moreover, curcumin at doses of 40 and 80 mg/kg also reversed the reserpine-induced behavioral despair in mice³⁸. This study also shows the role of monoamine oxidase enzyme in the antidepressant property of curcumin. In an unpredictable chronic stress model, curcumin at doses of 20 and 40 mg/kg has demonstrated the protective action³⁹. Studies carried out by⁴⁰, showed curcumin produced

beneficial effects on the stressed rats, by effectively improving chronic unpredictable mild stress -induced low sucrose consumption and reducing serum corticosterone levels in rats. Curcumin has poor oral bioavailability, if it is administered along with piperine (bioavailability enhancing agent) enhances the antidepressant-like activity³⁹.

Based on the indigenous knowledge on the medicinal plants alternative therapies are tried. The more active phytochemical components of each plant are not sufficient to achieve therapeutic effects since it is present in a minute amount. These aforementioned plants shows more pharmacologically active phytochemical constituents such as saponins, tannins,

alkaloids, alkenyl phenols, flavonoids, terpenoids which works synergistically with each other in creating pharmacological action. Scientific study revealed that preparation of polyherbal formulations based on the traditional knowledge, produce a greater result but synergistic effect of these may also show adverse effect, hence more scientific search is necessary in this field. Some studies have shown combining the multiple herbs in a particular ratio will show better therapeutic effect, fewer side effects and reduce the toxicity. As described in Charaka Samhita, Ayurvedic formulations have adverse effect when prepared or used inappropriately.

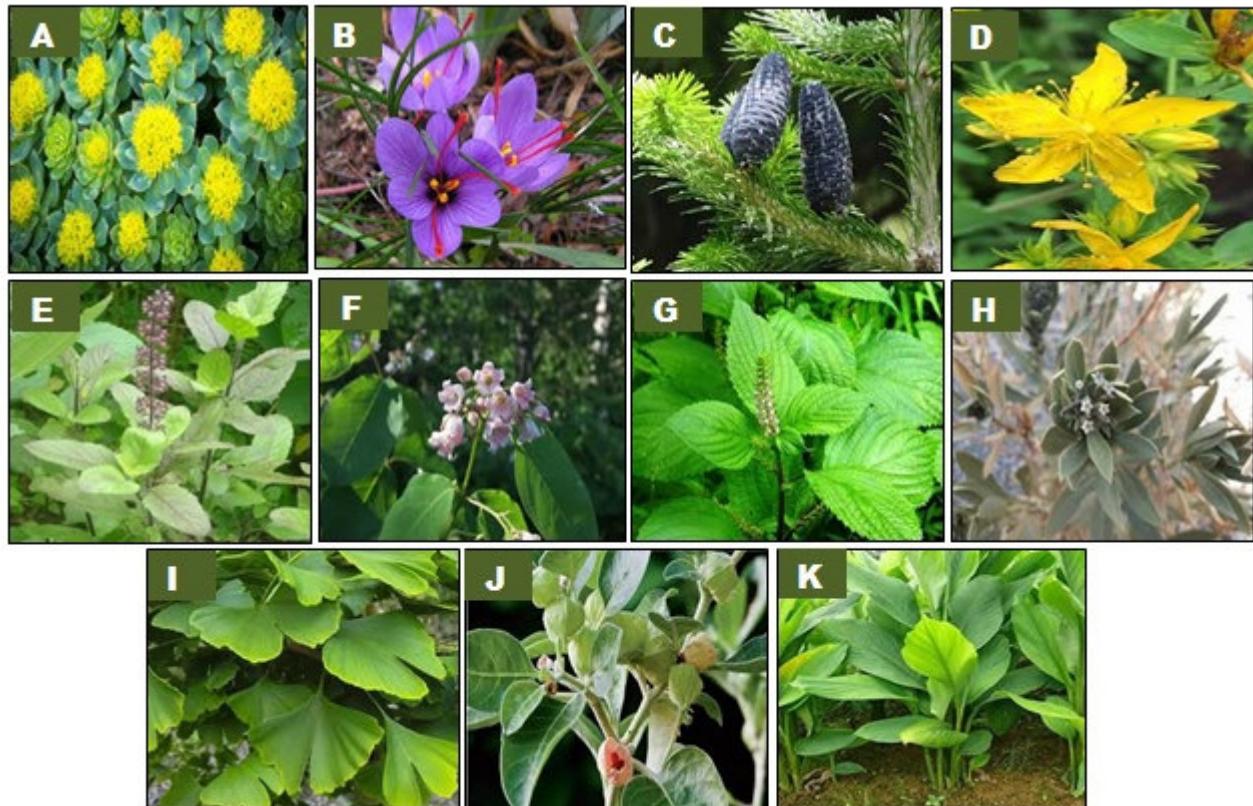


Fig.1.A. *Rhodiola rosea*, B. *Crocus sativus*, C. *Abies pindrow*, D. *Hypericum perforatum*, E. *Ocimum sanctum*, F. *Apocynum venetum*, G. *Perilla frutescens*, H. *Rhazya stricta*, I. *Ginkgo biloba*, J. *Withania sonnifera*, K. *Curcuma longa*.

2. CONCLUSION

There are more than 60 species of plants that exhibit antidepressant activities; however, only a few are very effective and reliable according to the numerous laboratory experiments⁴¹. Large number of chemical constituents present in these plants has wide application; screening each one of them in detail for its antidepressant property is

essential and only these should be utilized with the consent of medical personnel.

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4. CONFLICT OF INTEREST

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