

AN OVERVIEW OF SOME HERBAL ANTIDEPRESSANT PLANTS

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ABSTRACT

There are numerous ways to categorize and treat depression, which is a diverse mood disease. The illness is caused by factors such as 5-HT, NA, and MAO-A inhibition and stimulation. Reduced curiosity about pleasure, feelings of inappropriate guilt or worthlessness, a drop in hunger and sexual desire, sleeplessness, and persistent suicidal thoughts are some of the symptoms. There are several synthetic medications used to treat depression, but not all of them make patients happy, and some of them may have negative side effects. Many have turned to well-liked traditional herbal remedies to avoid the negative effects of allopathic therapy. Due to their broad application, therapeutic efficacy, and little to negligible adverse effects, herbal medications are currently used worldwide. Several medicinal plants and medicines derived from these plants have shown antidepressant properties by the combined effect of their medicinal constituents.

We discuss promising novel medicinal products targets for the management of major depressive illness in this review. We address the potential antidepressant benefits of selectively targeting receptors, including opioid, G-protein-coupled, and metabotropic glutamate receptors. Since they may also have therapeutic value, we also talk about substances that target biological processes, including inflammation, the gut microbiota, the cholesterol biosynthesis pathway, and the hypothalamic-pituitary-adrenal axis. Lastly, we offer a synopsis of all the plants displayed in graphical format, together with an overview of the antidepressant plants which currently are widely accessible.

Keywords: Depression, GABA, CNS, Mental health, Opioid receptors, Medicinal plant

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INTRODUCTION

A psychiatric condition that comes in mild to severe forms is depression. Depression is brought on by an imbalance in the neurotransmitter system [1]. Gamma amino butyric acid (GABA), noradrenaline, serotonin, and dopamine are examples of well-known neurotransmitters. Serotonin is the neurotransmitter linked to depression. Serotonin levels are being raised by prescribing a variety of allopathic medications. Depression was traditionally treated with tricyclic antidepressants (TCAs) and monoamine oxidase inhibitors (MAOIs). With time, new medications known as serotonin-norepinephrine reuptake inhibitors (SNRRI) and selective reuptake inhibitors of serotonin (SSRIs) became accessible [2].

There are two kinds of depression in the brain: unipolar depression, which is characterized by mood swings that always go in the same direction, is common (approximately 75% of cases), nonfamilial,

obviously linked to life events that are stressful, and comes with agitation and anxiety symptoms. The second type is bipolar depression (about 25% of cases), sometimes also called endogenous depression, which shows a familiar pattern, unrelated to external stresses and usually appears in early adult life, resulting in oscillating depression and mania over a few weeks [3]. The second kind, known as bipolar depression (about 25% of cases), is also known as endogenous depression. It typically manifests in early adulthood, exhibiting a recognizable pattern that is unconnected to outside stressors and causes alternating mood swings, such as mania over a few weeks [3]. Depression is a comprehensive disorder affecting not just emotions and moods but also the body and mind. Depression is characterized by strong emotions of melancholy, hopelessness, and despair as well as an unwillingness to enjoy routine tasks, changes in eating and sleeping habits, and a lack of energy. and suicidal thoughts [4].

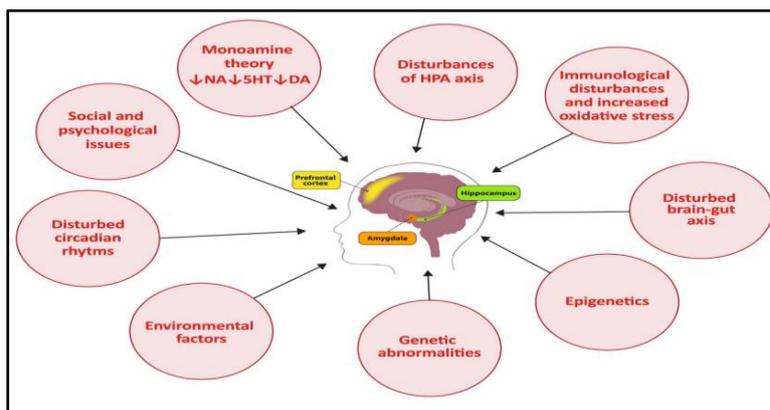


Fig. 1: The main pathogenesis of depression [5]

Approximately 450 million people worldwide are suffering from a mental or psychiatric illness, as reported by the World Health Organization [5]. After heart disease, depression is predicted to be the second leading cause of illness burden worldwide by 2020 [6]. These days, a wide range of synthetic medications are prescribed as the standard of care for patients who are clinically depressed. However, these medications have side effects that can make treatment more difficult to achieve. Some of these side effects consist of mouth dryness, nausea, gastrointestinal or respiratory issues, drowsiness, anxiety, and rhythm problems with the heart [7]. Moreover, there may be other drug-drug interactions. Certain antidepressants, such as benzodiazepines, have been linked to serious issues with the CNS (central nervous system) and mental health that are linked to cognitive decline and memory loss [8, 9]. These conditions create an opportunity for alternative treatment of depression by the use of medicinal plants [10].

Given that plant-based medicines are frequently associated with adequate protection and lack of adverse effects, there is no doubt about their potential benefits as a viable substitute for currently available chemical antidepressants [11, 12]. Much research is currently being done to characterize the possible antidepressant properties of some of the natural items under study, as well as the medical benefits of herbal sources [13, 14]. More targeted medications with minimal adverse effects, great therapeutic efficacy, and affordable prices are presently being sought after by researchers. New treatment approaches are, therefore beginning to emerge in favor of natural chemicals. Herbal medicines are becoming more popular these days because they are safe, natural, and have an unquestionable ability to address a wide range of health issues, such as cardiovascular problems, diabetes, and cancer, and they are included in the composition of several drugs [15, 16]. Because plants with medicinal properties have been employed for a long time to treat a variety of illnesses, including psychiatric disorders, and they cause fewer side effects than synthetic and chemical drugs, they have drawn the interest of scientists working in this field [17].

Since ancient times, herbal remedies have been used to treat mental problems because of their effectiveness and low adverse effects [18]. Throughout history, people have utilized medicinal plants all around the world. Numerous studies have demonstrated the calming and anxiety-reducing properties of medicinal herbs. In some specific conditions like depression and anxiety, medicinal plants are taking the place of synthetic medications. In comparison to men, women experience depression at a higher rate. Forty percent of Americans utilize complementary and alternative medicines as psychotherapy tools. [18]. Various plants have antidepressant effects, such as *Crocus sativus* [19], *Borago officinalis*, *Trigonella foenum-graecum*, *Calluna vulgaris* [20], *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*, *Schizandra chinensis*, *Thea sinensis L*, *Uncaria tomentosa*, *Valeriana officinalis L*, *Withania somnifera* [21].

Highlight on consumption of antidepressants in last decades

In 1996, 13.3 million Americans took antidepressant medications. The population increased to 23.3 million by 2010. The University of Pennsylvania, the New York State Psychiatric Institute, along Columbia University Medical Centre researchers reported that suicide rates amongst racial and ethnic minorities stayed low.

They contend that a change in public perception of the need for mental health therapy is the reason why antidepressant use has increased. Public awareness initiatives have become increasingly popular to promote mental health care. Treatments for mental illness are now more widely accepted.

In the United States, the usage of antidepressants among 12 y olds grew by 400%, as per data from the Centers for Disease Control and Prevention. Based on information gathered by public health authorities in Western Europe, Canada, and Australasia, the use of antidepressants has been on the rise in most industrialized nations. Since the second COVID-19 wave rocked the nation, mental health professionals have seen an overall 20% increase in the amount of antidepressants taken by individuals. According to data, antidepressant sales in April 2019 totaled roughly Rs 189.3 crores. It decreased to Rs 172.1 crores in June and then grew to Rs 196.9 crores in July 2020. It increased much further to Rs 210.7 crores in October 2020 and reached its peak in April 2021 at a record of rupees 217.9 crores [22].

Benefits of herbal drugs over allopathic drugs

Herbal therapy is becoming more and more popular, although allopathic medications remain the most commonly used form of treatment. The following side effects of allopathic medications are connected to this. It simply relieves symptoms of illnesses. It is quite expensive and has unpleasant side effects.

The following reasons make herbal medicine the recommended option. qualities like more affordable and sensible. directly aligns with the patient's worldview. more reachable. tested in time. regarded as secure and natural. thought to have fewer or no adverse effects [23].

Herbal drugs for depression and anxiety

Because herbal medications are seen to be safer and more natural, they are utilized as antidepressants and have no negative side effects. Depression is a prevalent mental condition that has detrimental effects on a person's fitness. A growing number of people are progressively looking to herbal therapy to identify low-toxicity, multi-target antidepressants [24].



Fig. 2: Areca catechu plant/fruit

Plants

Areca catechu

The thin monoecious palm *Areca catechu* Linn. is one of the members of the *Arecaeae* family. Since the beginning of time, people have

utilized this Southeast Asian native plant for its medicinal and psychedelic qualities [45,46]. Biochemical compounds found in areca fruits and seeds include lipids, vitamins, polyphenols, and parasympathomimetic alkaloids. Consuming areas can have a psychostimulant impact (euphoria, for example) that increases one's

ability to work [47]. Areca catechu nut ethanol extract and its various fractions have been the subject of numerous behavioral (acute as well as sub-chronic forced swim tests) and biochemical processes. (monoamines and their respective positions metabolite levels using high-performance liquid chromatography) studies investigating their potential antidepressant efficacy. Rat behavioral tests were used in an experiment to look at the antidepressant-like effects of Areca catechu

nut extract using ethanol (ACEE). The tail suspension test (TST) and forced swim test (FST) were utilized to evaluate the antidepressant-like properties of ACEE rats. Rats that were given the ethanolic extract of Areca catechu nuts (ACEE) did not develop motor incoordination. Findings imply that the 50 mg/kg ethanolic extract of Areca catechu nut may have an antidepressant effect without causing widespread central nervous system depression [48].

Table 1: Listed some plants with antidepressant activity

S. No.	Plant name	Part used	Extract used	Result	Reference
1.	<i>Areca catechu</i>	Palm, Fruit	Dichloromethane, Ethanolic	Decreases the duration of immobility time (sec) in FST and TST tests.	[25]
2.	<i>Albizia lebbbeck</i>	Bark	Ethanolic	Shows antidepressant effect in mice in both the FST and TST tests.	[26]
3.	<i>Allium cepa</i>	Bark	Ethanolic	Onion exerted antidepressant activity in a behavioural model that acted independently of the hypothalamic-pituitary-adrenal axis.	[27]
4.	<i>Asparagus racemosus</i>	Root	Methanolic	Found one or two measures of memory to have a statistically significance difference	[28]
5.	<i>Bacopa monniera</i>	Aerial part	Methanolic	Methanolic extract of <i>Bacopa monniera</i> possesses antidepressant-like activity in animal behavioural models	[29]
6.	<i>Clitoria ternatea</i>	Plant powder	Methanolic	<i>Clitoria ternatea</i> may be served as a potential resource for natural psychotherapeutic agent against depression.	[30]
7.	<i>Curcuma longa</i>	Root (rhizome)	Methanolic	It increase monoamines and brain-derived neurotrophic factor level may inhibit the production of proinflammatory cytokines and neuronal apoptosis in the brain.	[31, 56]
8.	<i>Cimicifuga racemose</i>	Root	Ethanolic	Improvement of menopausal symptoms assessed by the total KIM score and its sub-item scores with an effect size	[32]
9.	<i>Crocus sativus</i>	Petals	Aqueous and Ethanolic	It is found to be effective as similar to fluoxetine in the treatment of mild-to-moderate depression.	[33]
10.	<i>Cucurbita pepo</i>	Leaves	Alcoholic and Aqueous	Decline in immobility with associate degree improvement in swimming time or better physical activity	[44]
11.	<i>Emblica officinalis</i>	Fruit	Aqueous	It decreases the duration of immobility.	[34]
12.	<i>Glycyrrhiza uralensis</i>	Root	Aqueous	It produces the anti-depressive effect on chronic unpredictable stress of depression model rats and its mechanism may be associated with its neurogenesis protective effect.	[35]
13.	<i>Glycyrrhiza glabra</i>	Root	Aqueous	Increase of brain norepinephrine and dopamine, but not by increase of serotonin. Monoamine oxidase inhibiting effect of liquorice may be contributing favorably to the antidepressant-like activity	[36]
14.	<i>Hypericum perforatum</i>	Aerial part	Aqueous and Ethanolic	Decreased the immobility times of mice in the FST and TST.	[37]
15.	<i>Momordica charantia</i>	Seed, Root	Methanolic	Significantly decreasing the immobility time in Tail Suspension test	[38]
16.	<i>Macrotyloma uniflorum</i>	Seeds	Ethanolic	The extract confirmed accelerated in mobility degrees in rats in contrast to control	[42]
17.	<i>Nardostachys jatamansi</i>	Root, Rhizome	Methanolic	Statistically significant result with increasing dose and had synergic effect when given along with fluoxetine	[39]
18.	<i>Rosemarinus officinalis</i>	Leaves	Methanolic	decreased the immobility time of mice in each the TST and the FST, indicating associate degree antidepressant-like impact	[43]
19.	<i>Tinospora cordifolia</i>	Whole plant	Aqueous	Increasing the levels of monoamines like noradrenalin, serotonin, and dopamine and decreasing the levels of GABA.	[40]
20.	<i>Zingiber officinale</i>	Rhizome	Hydro-alcoholic	Showed antidepressant activity in FST test model.	[41]



Fig. 3: Albizia lebbbeck plant

Albizia lebbbeck

Large deciduous tree *Albizia lebbbeck* Linn. is a member of the mimosaceae family of plants. The antidepressant properties of *Albizia lebbbeck* leaves were investigated in a study using a variety of animal depression models. A single daily injection of an alcoholic extract (70% v/v ethanol) of *Albizia lebbbeck* leaves (200 and 400 mg/kg, p. o.) was given to two different groups of young male Swiss albino mice for seven consecutive days. Using the forced swim test (FST) and tail suspension test (TST), two behavioural despair models, the immobility times for both control and treated mice were noted. An actophotometer was used to examine the extract's impact on the mice's ability to move around. The plant has CNS depressant properties. [49, 50]. Acute toxicity was investigated up to a dosage of 1 g/kg (two times more than the active dose). We should point out that the extract showed no signs of toxicity even at this dosing level. As a result, *Albizia lebbbeck* had an antidepressant-like effect in mice in both the FST and TST tests [51].

Allium cepa

Allium cepa, commonly referred to as onion, is a perennial herb whose stem emerges from an underground bulb. While some authors refer to onions as members of the Alliaceae family, onions actually belong to the Liliaceae family. The bloom stalks of common onions are either single or double leafless and can reach heights of 75–180 cm (2.5–6 feet) [52]. There isn't much research that proves onions have antidepressant properties. Samad *et al.* cited various research that evaluated the beneficial effects of using *Allium cepa* powder for the single immobilization of biochemical and behavioral benefits. Mice in a research group were given 200 mg/kg/day of *Allium cepa* powder dissolved in water, while the control group received 14 d of water to consume. The mice treated with *Allium cepa* were divided back into stressed classes after 14 d of observation. Results show that *Allium cepa* could be useful for the treatment of anxiety, depression, and memory control [53].



Fig. 4: *Allium cepa* plant

Clitoria ternatea

Famous for its white or blue flowers, *Clitoria ternatea* is a tropical perennial climbing herb belonging to the Fabaceae family. It grows wild and in gardens across the tropical regions of India. In Bengali, it is referred to as "Aparajita," in Hindi as "Koyal," and in English as "Butterfly pea." *Clitoria ternatea* extracts are a component of "Medhya Rasayanas," a revitalizing herbal remedy that has been used to heal a variety of neurological conditions and boost cognitive function. Regarding its

laxative, purgative, diuretics, inflammatory, indigestion, constipation, fever, osteoarthritis, eye conditions, sore throat, and anthelmintic properties, the root portion of *Clitoria ternatea* has been utilized [54]. The methanolic extract of *Clitoria ternatea* at doses of 100-400 mg/kg, p. o. has shown an antidepressant effect in tail suspension test in mice. The extract of *Clitoria ternatea* significantly decreased the duration of immobility at the doses of 100-400 mg/kg. The decrease in the duration of immobility was more at the dose of 400 mg/kg of *Clitoria ternatea* as compared to fluoxetine, 10 mg/kg [55].



Fig. 5: *Clitoria ternatea* plant

Curcuma longa

Epidemiological analysis have discovered that human beings ingesting curcumin in each day life have sharper brain abilities and better cognitive skills. Curcumin possesses a number of interesting features that justify its use in essential melancholy. These encompass: curcumin is an inhibitor of monoamine oxidase (MAO) enzymes, Curcumin modulates the volume of numerous neurotransmitters, and promotes hippocampal neurogenesis. The

Curcumin was examined in two different behavioural models, Forced swim test (FST) and Tail suspension test (TST) utilizing swiss mice weighing 26-34g and rats of wistar strain weighing 160-220 g. The study showed that curcumin diminished the stability time each in FST and TST. The impact of *Curcuma longa* (100 mg/kg) was comparative to it of Fluoxetine 20 mg/kg and Tricyclic Imipramine 15 mg/kg utilizes as standard drug. The antidepressant activity of Curcumin can be due to expand in serotonin, nor adrenalin and dopamine level in brain [56].

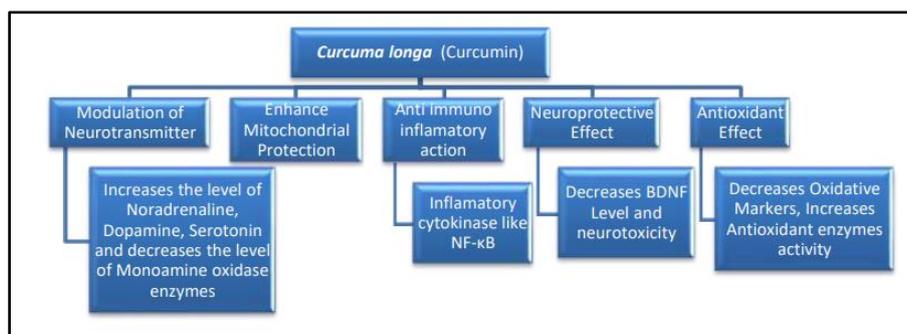
Fig. 6: *Curcuma longa* plant

Fig. 7: Shows potential antidepressant mechanisms of curcumin

Crocus sativus

The plant *Crocus sativus* Linn., a member of the Iridaceae family, is often used to make saffron. It is a perennial herb that is extensively grown in Iran as well as other nations like Greece and India. Commercial saffron is an ingredient in spices made from dried crimson stigma that has a tiny bit of yellowish style still adhering to the *Crocus sativus* flower. Saffron has been utilised for decades in traditional Chinese medicine due to its antispasmodic, aphrodisiac, and expectorant properties. It was discovered that *Crocus sativus* worked just as well for treating mild-to-moderate depression as fluoxetine. Melnyk *et al.* (2010) found that kaempferol, the active ingredient in saffron petals, lowers depression symptoms in mice and rats at dosage of 100 and 200 mg/kg and 50 mg/kg, respectively. These results are comparable to those of fluoxetine

[57]. According to the study conducted by Murray and Lopez, depressive disorder is one of the most prevalent psychiatric diseases and has been estimated to affect up to 21% of the world's population. Majority of patients are often reluctant to take synthetic antidepressant drugs in their appropriate doses because of the anticipated side effects such as the inability to drive a car, dry mouth, constipation, and libido. Hence, plant extracts are some of the most attractive sources of new drugs and have been shown to produce a better result with low side effects in the treatment of depression [58]. In the placebo-comparison trials, saffron had large treatment effects and when compared with antidepressant medications, it had similar antidepressant efficacy. Saffron's antidepressant effects potentially are due to its serotonergic, antioxidant, anti-inflammatory, neuro-endocrine and neuroprotective effects [59].

Fig. 8: *Crocus sativus* linn plant

Cimicifuga racemose

One species of the *Cimicifuga* genus is *Cimicifuga racemose* Linn., an established medicinal plant that is found across China. *Cimicifuga*

racemose Linn. is employed to treat anxiety, depression, hot flashes, insomnia, and other symptoms, according to the Compendium of Materia Medica. The China State Food and Drug Administration approved the use of the alcohol extracted of *Cimicifuga racemose*

Linn. (Brand name: XIMINGTING, State Drug Approval Number: Z20050748) in 2005 for the treatment of perimenopausal symptoms. Its primary active ingredients are thought to be Triterpenoid saponins (Li *et al.*, 2002). When used to treat women with approaching menopause symptoms, XIMINGTING (XMT) had antidepressant-like effects in clinical trials conducted in China (unpublished data). On the other hand, no studies on the pharmacological mechanisms and antidepressant-like effects of XMT

in rodents have been published [60]. Under routine practice settings, 442 unselected ambulatory female outpatients experiencing menopausal symptoms were investigated in relation to Cimicifuga racemose (CR) extract Ze 450. Menopausal symptoms measured by the total KMI score and its sub-item ratings significantly improved after treatment with CR in unselected patients with climacteric complaints in the context of daily practice. The effect size was comparable to that of a prior randomised, controlled clinical trial [61].



Fig. 9: Cimicifuga racemosa linn. plant

Emblca Officinalis (Amla)

For thousands of years, various plants and herbal remedies have been utilised in traditional medical systems to alleviate depression. Tannic acid, the primary constituent of *Emblca officinalis* (EO), has been demonstrated to possess non-selective monoamine oxidase activity. According to a phytochemical examination, *Emblca officinalis*'s dried powder contains amino acids, carbohydrates, polyphenols, tannins, and alkaloids. In the acute study, this medication was given to the laboratory animals 60 min before the behavioural assessment. A fresh batch of animals were employed for the long-term investigation. They were given these medications for ten days while being categorised as part of an acute trial. On the tenth day, behavioural assessment was conducted sixty minutes after the medicine was administered [62]. Swiss young male albino mice were used to investigate the antidepressant-like properties of *Emblca officinalis* fruit (The family: Euphorbiaceae) using the tail suspension test and the forced swim test. Mice were given an aqueous extract of the fruits (200 and 400

mg/kg) orally over the course of 14 d. The tail suspension test, including the forced swim test, were administered to the animals on day 14, 60 min after the extract was administered.

In the forced swim test and tail suspension test, the extract dramatically shortened the immobility period, suggesting strong antidepressant-like effects. The extract's antidepressant-like effects were more pronounced at the lower dosage of 200 mg/kg. Through its interactions with $\alpha(1)$ -adrenoceptors, dopamine D(2)-receptors, serotonergic, and GABA(B) receptors, the aqueous extract may have an antidepressant-like effect. Ascorbic acid content in aqueous extract was determined to be 2.94% in this investigation. Therefore, the aqueous extract of the herb *Emblca officinalis* may have antidepressant-like properties due to the presence of ascorbic acid and other components such as flavonoids, tannoid principles, and polyphenolic compounds. Because of its antioxidant properties, the aqueous extract of the plant *Emblca officinalis* had antidepressant-like effects, most likely by blocking MAO and GABA [63].



Fig. 10: Emblca officinalis plant with fruit



Fig. 11: Glycyrrhiza glabra plant

Glycyrrhiza glabra

When compared to the conventional medication Imipramine 15 mg/kg, the ethanolic as well as aquatic extracts of *Glycyrrhiza glabra* significantly reduced the amount of time that albino rats were immobile employing the antidepressant models Forced swim (FST) and Tail suspension test (TST). Rats given ethanol extract had lower brains MAO-A as well as MAO-B activity than the control group. When compared to MAO-B activity, the proportion of inhibition of MAO-A was greater [64].

Macrotyloma uniflorum

In the past, the plant *Macrotyloma uniflorum*'s seeds were used to treat a variety of illnesses, including neurological conditions. In the past, *Macrotyloma uniflorum*, also known as Horse Gramme, was used to treat a wide range of conditions, including fever, painful intervals, increased bile production, diarrhoea, vomiting, disturbed stomach, constipation, diarrhoea, snake chunk, maximal cancers, depression, and infertility. The two antidepressant actions were assessed using the tail suspension test, forced swim test, and enhancement of nor-epinephrine toxicity in wistar rats of both

genders weighed 150–180g. Rats' faster mobility levels were validated by the extract in comparison to the control group [65].

Rosemarinus officinalis

The majority of these studies concerned assessments that are used to version antidepressant-like results in mice the Tail Suspension Test (TST) and Forced Swimming Test (FST). The control of rosemary constantly decreased the immobility time of mice in each the TST and the FST, indicating an associate degree antidepressant-like impact. Rosemary's antidepressant capability emerged as equally strengthened at the same time as it has become found to lower exploratory and anhedonic-like conduct in bulbectomized mice. There is a lot of evidence that the antidepressant effect of *R. Officinalis* relies upon interactions with the monoaminergic system. Rosemary is conceived to improve dopaminergic, serotonergic, noradrenergic, and cholinergic features within the brain, in all likelihood explaining its antidepressant. Rosemary has furthermore been determined to grow the attention of neurotransmitters inside the brains of mice. Several compounds in rosemary extract and essential oil are chargeable for their antidepressant activity, along with carnosol, betulinic acid, ursolic acid, and polyphenols [66-68].



Fig. 12: *Macrotyloma uniflorum* plant



Fig. 13: *Rosemarinus officinalis* plant

***Zingiber officinale* (Ginger)**

The well-known spice plant ginger, also called *Zingiber officinale* Roscoe has long been used to cure a wide range of illnesses. The primary aim of this study is to assess the antidepressants and antinociceptive properties of *Zingiber officinale* ethanolic extract in Swiss albino mice [69]. *Zingiber officinale*'s antidepressant qualities, how they interact with traditional antidepressants using the forced swim test, and any potential mechanisms underlying its activity. In a forced swim test paradigm, *Zingiber officinale* plant extract demonstrated strong antidepressant effects [70].

***Asparagus racemosus* (Shatavari)**

The current study assesses the antidepressant effect of an *Asparagus racemosus* methanolic extract standardised to saponins (62.2% w/w). After seven days of daily administration of 100, 200, and 400 mg/kg of *A. racemosus*, the animals underwent a Forced Swim Test (FST) and a Discovers Helplessness Check (also known as Learned

Helplessness, or LH). The results shown that *A. racemosus* methanolic extract reduced immobility in FST [71, 72].



Fig. 14: *Zingiber officinale*



Fig. 15: *Asparagus racemosus* (Shatavari) plant

Bacopa monniera

Known by most as Brahmi, *Bacopa monniera* (Family: Scrophulariaceae) is an aquatic herb found in Bangladesh and other warmer parts of the world. This plant is widely used in Bangladeshi

traditional medicine as a powerful neurotonic to improve intellectual growth, as well as a treatment for toothaches, cardiac, pulmonary, and digestive issues, epilepsy, and blood purification. Brahmi is used to cure rheumatism and prevent miscarriages in various regions of this country. Its antidepressant properties were also discovered [73].



Fig. 16: *Bacopa monniera* plant

Cucurbito pepo

Using an example of forced swimming exercise, male Wistar rats with albino colouring weighing 150-200g were given oral access to alcoholic and aquatic extracts, which showed antidepressant action. Compared to the usual medicine Imipramine 30 mg/kg, the results showed a drop in immobility with an accompanying degree of improvement in swimming duration or greater physical activity, and the extract's efficacy was determined to be nearly identical to Imipramine. Alkaloids, glycosides, as well as flavonoids may be responsible for the antidepressant-like properties, based on the

results of phytochemical testing and the literature [74]. At some point in the future, following the removal of the absorption device, bacterial and mucosal enzymes in the intestines totally hydrolyze flavonoid glycosides into their aglycons, which are then converted into conjugated metabolites. Therefore, one of the antidepressant mechanisms of *C. pepo* is the notion to involve flavonoids and glycosides which reach the brain tissues via the metabolizing technique, protecting brain features from Central nervous system disturbance and exerting an antidepressant impact. Thus, extracts of *C. pepo* might also have potential therapeutic worth for the management of depressive issues [75, 76].



Fig. 17: *Cucurbito pepo* plant

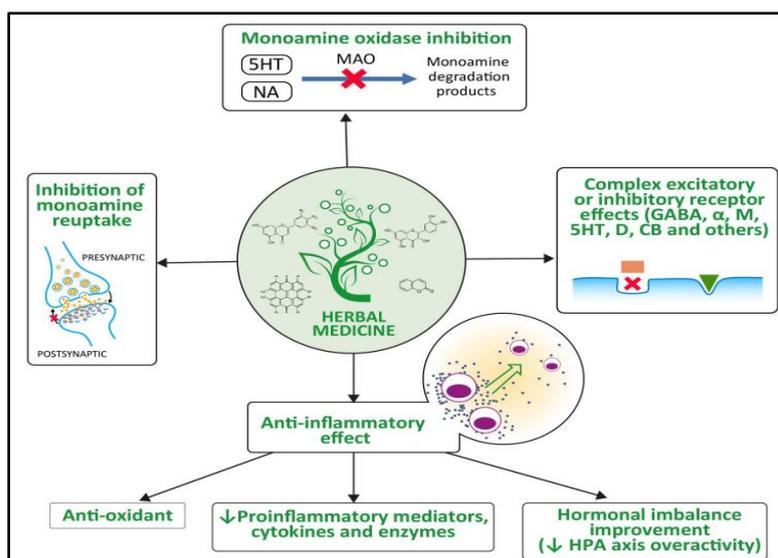


Fig. 18: The summary of the elements of the mechanisms of action of plants with antidepressant activity [77-81]

The antidepressant effect is the consequence of the activity of multiple co-occurring active compounds, according to the hypothesis of synergistic and polyvalent action of active substances present in plants used for medicinal purposes (symbolically marked in the fig. with selected chemical formulas) [77, 78]. These substances' pharmacodynamics involve mechanisms that are comparable to those of synthetic antidepressants. But unlike synthetic antidepressants, herbal remedies' anti-inflammatory properties also play a significant role in their antidepressant effects [79-81].

CONCLUSION

Numerous medicinal plants offer a range of psychotherapeutic effects, including hypnotic, sedative, antidepressant, and anxiolytic, along with cognitive benefits because of their impact on central nervous system activity. Additionally, it is believed that medicinal plants with toning and adaptogenic qualities enhance resistance to outside stressors through complex and pleiotropic neuroendocrine pathways, which makes them important in the field of phytopharmacotherapy. This review focuses on phytotherapy's pharmacological efficacy in addressing pathophysiological disturbances and reducing symptoms associated with depression. It is confirmed that the pharmacodynamics of active compounds derived from antidepressant-exhibiting herbs, as described in this narrative review, are the same as those of synthetic antidepressants.

An increasing number of people are experiencing numerous psychological disorders daily, with sorrow, despair, anxiety, and insomnia being the most common. Not only do these mental illnesses affect people's daily lives, but they also have a big financial impact on society. The psychological medication of plants has been the subject of an increasing amount of study in recent years. As was previously mentioned, there are a lot more therapeutic plants that can be employed as excellent depression therapies that have fewer adverse effects than synthetic medications. As we can see, herbal plants are an extremely abundant source of chemicals that are responsible for boosting antidepressant activity. A collection of herbal plants exhibiting antidepressant activity was collated from many journals and was presented above.

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AUTHORS CONTRIBUTIONS

All the authors have contributed equally.

CONFLICTS OF INTERESTS

The authors declare no conflicts of interest.

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