Herbal Sources of Antidepressant Potential: A Review

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ABSTRACT
The history of herbal medicines is as old as human civilization. The documents revealed that plants were used medicinally in China, India, Egypt and Greece long before the beginning of the Christian era. The human being appears to be afflicted with more diseases than any other animal’s species. They sought to alleviate their sufferings from injury and disease by taking advantage of plant growing around them. Depression is such a common mental disorder, which affects the personal and social relations of a person. There are variety of neuro chemical theories proposed and number of synthetic antidepressant drugs are available now a days, however their effectiveness does not come up the entire range of population suffering from this disorder. Moreover the side effects and the drug interactions are major restrictions in their clinical applications. Unlike, synthetic medications, herbal medicines are widely used across the globe due to their wide applicability and therapeutic efficacy associated with least side effects, which in turn has initiated the scientific research regarding the antidepressant activity. The aim of this review is to enlist those plants which have antidepressant activity and the various experimental models used to screen their antidepressant activity.

Keywords: Depression, Forced Swimming Test, Tail Suspension Test, Herbal Medications.

INTRODUCTION
The Indian subcontinent is enriched by a variety of flora both aromatic and medicinal plants. This is due to the wide diversity of climatic conditions in India ranging from deserts to swamplands. Numerous types of herbs have been well recognised and catalogued by botanist from the high ranges of the Himalayan tract up to the sea-shores of Kanyakumari. In recent years, focus on plants research has increased all over the world and a large body of evidence has been collected to show immense potential of medicinal plants used in various traditional systems.

According to World Health Report, about 450 million people suffer from a mental or behavioural disorder. This amounts to 12.3 % of the global burden of disease, and predicted to rise up to 15 % by 2020. Depression is a burdensome psychiatric disorder that affects a person’s mood, physical health and behaviour. Patients with major depression have symptoms that reflect changes in brain, monoamine neurotransmitters, specifically nor epinephrine, serotonin and dopamine. The disorder is also often associated with suicide and there are between 10 and 20 million suicide attempt every years. Depression is the most prevalent mental disorder and it is recognised to be symptomatically, psychologically and biologically heterogeneous.

Some features of depressive disorder overlap those of the anxiety disorders, including severe phobias, generalized anxiety disorder, social anxiety disorder, post traumatic stress disorder, and obsessive-compulsive disorder. The major disorders of mood or affect include the syndromes of major depression (formerly termed melancholia) and bipolar disorder (formerly termed manic-depressive disorder). Major depression is characterized by feelings of intense sadness and despair, mental slowing and loss of concentration, pessimistic worry, lack of pleasure, self-deprecation, and variable agitation or hostility. Physical changes also occur, particularly in severe, vital, or melancholic depression. These include insomnia or hypersomnia; altered eating patterns, with anorexia and weight loss or sometimes overeating; decreased energy and libido; and disruption of the normal circadian and ultradian rhythms of activity, body temperature, and many endocrine functions. Dysthymic disorder, also called dysthymia, psychotic depression, postpartum depression, and seasonal affective disorder are also kinds of depression. There is no single known cause of depression. Rather, it likely results from a combination of genetic, biochemical, environmental, and psychological factors. Some types of depression tend to run in families, suggesting a genetic link. However, depression can occur in people without family histories of depression as well.

![Figure 1: Mode of action of different antidepressant drugs](image-url)
The monoamine theory, suggests that depression results from functionally deficient monoaminergic (noradrenaline (NA) / 5- hydroxytryptamine (5-HT)) transmission in the central nervous system whereas an excess may result in mania. The theory was based on the ability of known antidepressant drugs (tricyclic antidepressants and monoamine oxidase inhibitors) to facilitate monoaminergic transmission, and of drugs such as reserpine to cause depression.\(^{13,14}\) But other theories were also established as permissive theory and receptor sensitivity theory to understand the actual cause of depression.

Herbal stuffs are often well thought-out as safe because they are “innate”. In current years, there is increased research on traditional Ayurvedic herbal medicines on the basis of their known effectiveness in the treatment of diseases for which they have been traditionally used. Herbal medicine is a major constituent in all conventional medicine systems. Substantial efforts have been directed towards the development of natural products from various plant sources which have antidepressant activity. This review aims to search those medicinal plants which have been reported for its antidepressant activity and also the screening model which have been used by the researcher to investigate the activity. This information will be beneficial for the researchers who want to work on the antidepressant activity as well as the patients of the depression who depend on Ayurveda for their healthcare needs.

### Table 1: A brief description of plants having antidepressant property

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Plant Name</th>
<th>Common name</th>
<th>Family</th>
<th>Part used</th>
<th>Extract used</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Areca catechu(^{15,16})</td>
<td>Areca nut</td>
<td>Arecaceae</td>
<td>Bark</td>
<td>Dichloromethane, Ethanolic</td>
</tr>
<tr>
<td>2</td>
<td>Apocynum venetum Linn.</td>
<td>European dogbane</td>
<td>Apocynaceae</td>
<td>Leaves</td>
<td>Ethanolic</td>
</tr>
<tr>
<td>3</td>
<td>Albizia julibrissin (^{17})</td>
<td>Persian silk tree</td>
<td>Fabaceae</td>
<td>Bark</td>
<td>Ethanolic</td>
</tr>
<tr>
<td>4</td>
<td>Albizia lebeck (^{18})</td>
<td>Siris tree</td>
<td>Mimosaceae</td>
<td>Bark</td>
<td>Ethanolic</td>
</tr>
<tr>
<td>5</td>
<td>Aniba riparia (^{19})</td>
<td>St John's wort</td>
<td>Lauraceae</td>
<td>Unripe fruit</td>
<td>Ethanolic</td>
</tr>
<tr>
<td>6</td>
<td>Aloysia polystachya (^{20})</td>
<td>Tede burro</td>
<td>Verbeneaceae</td>
<td>Aerial part</td>
<td>Hydroalcoholic</td>
</tr>
<tr>
<td>7</td>
<td>Allium cepa (^{21})</td>
<td>Bulb onion</td>
<td>Liliaceae</td>
<td>Bulb powder</td>
<td>Alcoholic and aqueous</td>
</tr>
<tr>
<td>8</td>
<td>Asparagus racemosus (^{22})</td>
<td>Shatavari</td>
<td>Liliaceae</td>
<td>Root</td>
<td>Methanolic</td>
</tr>
<tr>
<td>9</td>
<td>Bacopa monniera (^{23})</td>
<td>Brahmi</td>
<td>Scrophulariaceae</td>
<td>Aerial part</td>
<td>Methanolic</td>
</tr>
<tr>
<td>10</td>
<td>Boophone distica (^{24})</td>
<td>Tumbleweed</td>
<td>Amaryllidaceae</td>
<td>Whole plant</td>
<td>Methanolic</td>
</tr>
<tr>
<td>11</td>
<td>Bupleurum falcatum (^{25})</td>
<td>Chinese thoroughwax</td>
<td>Apiaceae</td>
<td>Fruit</td>
<td>Methanolic</td>
</tr>
<tr>
<td>12</td>
<td>Citlora ternatea (^{26})</td>
<td>Butterfly- pea</td>
<td>Fabaceae</td>
<td>Plant powder</td>
<td>Ethanolic</td>
</tr>
<tr>
<td>13</td>
<td>Convolvulus brasilianus (^{27})</td>
<td>Brazilian jack bean</td>
<td>Fabaceae</td>
<td>Seed</td>
<td>Ethanolic</td>
</tr>
<tr>
<td>14</td>
<td>Curcuma longa (^{28})</td>
<td>Turmeric</td>
<td>Zingiberaceae</td>
<td>Root (rhizome)</td>
<td>Aqueous</td>
</tr>
<tr>
<td>15</td>
<td>Cercropia glaziou (^{29})</td>
<td>Embauba</td>
<td>Cercropiaceae</td>
<td>Leaves</td>
<td>Aqueous</td>
</tr>
<tr>
<td>16</td>
<td>Cimicifuga racemosa (^{30})</td>
<td>Black snakeroot</td>
<td>Ranunculaceae</td>
<td>Root (rhizome)</td>
<td>Ethanolic-aqueous</td>
</tr>
<tr>
<td>17</td>
<td>Crocus sativus L. (^{31})</td>
<td>Saffron</td>
<td>Iridaceae</td>
<td>Petals</td>
<td>Aqueous and ethanolic</td>
</tr>
<tr>
<td>18</td>
<td>Emblica Officinalis (^{32})</td>
<td>Amla</td>
<td>Euphorbiaceae</td>
<td>Fruit</td>
<td>Aqueous</td>
</tr>
<tr>
<td>19</td>
<td>Galphimia glauca (^{33})</td>
<td>Rain of gold</td>
<td>Malpighiaceae</td>
<td>Whole plant</td>
<td>Methanolic</td>
</tr>
<tr>
<td>20</td>
<td>Gentiana kochiana (^{34})</td>
<td>Trumpet gentian</td>
<td>Gentianaceae</td>
<td>Aerial parts</td>
<td>Diethylther</td>
</tr>
<tr>
<td>21</td>
<td>Gadostria elata (^{35})</td>
<td>Tian ma</td>
<td>Orchidaceae</td>
<td>Rhizome</td>
<td>Ethanolic</td>
</tr>
<tr>
<td>22</td>
<td>Glycyrrhiza uralensis (^{36})</td>
<td>Sweet root</td>
<td>Legumineaceae</td>
<td>Root</td>
<td>Hexane and ethanolic</td>
</tr>
<tr>
<td>23</td>
<td>Glycyrrhiza glabra (^{37})</td>
<td>Liquorice</td>
<td>Legumineaceae</td>
<td>Root</td>
<td>Ethanolic</td>
</tr>
<tr>
<td>24</td>
<td>Hypericum perforatum (^{38,39})</td>
<td>Goatweed</td>
<td>Hypericaceae</td>
<td>Aerial part</td>
<td>Aqueous-ethanolic</td>
</tr>
<tr>
<td>25</td>
<td>Hypericum reflexum L. (^{40})</td>
<td>Hypericum</td>
<td>Hypericaceae</td>
<td>Aerial part</td>
<td>Methanolic</td>
</tr>
<tr>
<td>26</td>
<td>Kaempferia parviflora (^{41})</td>
<td>Peacock ginger</td>
<td>Zingiberaceae</td>
<td>Whole plant</td>
<td>Alcoholic</td>
</tr>
<tr>
<td>27</td>
<td>Lepidium meyenii (^{42})</td>
<td>Maca</td>
<td>Brassicaceae</td>
<td>Hypocotyls</td>
<td>Aqueous</td>
</tr>
<tr>
<td>28</td>
<td>Marsilea minuta Linn. (^{43})</td>
<td>Dwarf water clover</td>
<td>Marsileaceae</td>
<td>Whole plant</td>
<td>Ethanolic</td>
</tr>
<tr>
<td>29</td>
<td>Momordica charantia (^{44})</td>
<td>Karela</td>
<td>Cucurbitaceae</td>
<td>Seed, root</td>
<td>Methanolic</td>
</tr>
<tr>
<td>30</td>
<td>Magnolia officinalis (^{45})</td>
<td>Beaver tree</td>
<td>Magnoliaceae</td>
<td>Bark</td>
<td>Aqueous</td>
</tr>
<tr>
<td>31</td>
<td>Morinda officinalis F.C How (^{47,48})</td>
<td>Mulberry</td>
<td>Rubiaceae</td>
<td>Root</td>
<td>Ethanolic</td>
</tr>
<tr>
<td>32</td>
<td>Mimosa pudica Linn. (^{49})</td>
<td>Humble plant</td>
<td>Mimosaceae</td>
<td>Leaves</td>
<td>Aqueous</td>
</tr>
<tr>
<td>33</td>
<td>Nardostachys jatamansi (^{50})</td>
<td>Nard</td>
<td>Baleriaceae</td>
<td>Root, rhizome</td>
<td>Methanolic</td>
</tr>
<tr>
<td>34</td>
<td>Ocotea dusci (^{51})</td>
<td>Sweetweed</td>
<td>Lauraceae</td>
<td>Whole plant</td>
<td>Hydroalcoholic</td>
</tr>
<tr>
<td>35</td>
<td>Piper methysticum Forst (^{52,53,54})</td>
<td>Kava</td>
<td>Piperaceae</td>
<td>Root</td>
<td>Aqueous</td>
</tr>
<tr>
<td>36</td>
<td>Piper laetispicum (^{55})</td>
<td>Xiao Chang-feng</td>
<td>Piperaceae</td>
<td>Stem, root</td>
<td>Ethyl acetate</td>
</tr>
<tr>
<td>37</td>
<td>Paonia lactiflora (^{56})</td>
<td>Garden peony</td>
<td>Paeoniaceae</td>
<td>Root</td>
<td>Ethanolic</td>
</tr>
<tr>
<td>38</td>
<td>Pteleopetalum olaicoides (^{57})</td>
<td>Marapama</td>
<td>Olacaceae</td>
<td>Bark, root</td>
<td>Ethanolic</td>
</tr>
<tr>
<td>39</td>
<td>Rhazya stricta (^{58})</td>
<td>Senhwar</td>
<td>Apocynaceae</td>
<td>Leaves</td>
<td>Aqueous</td>
</tr>
<tr>
<td>40</td>
<td>Radix puerariae (^{59})</td>
<td>Kudzu root</td>
<td>Legumineaceae</td>
<td>Whole plant</td>
<td>Ethanolic</td>
</tr>
<tr>
<td>41</td>
<td>Rosmarinus officinalis (^{60})</td>
<td>Rosemary</td>
<td>Lamiaceae</td>
<td>Leaves</td>
<td>Hydroalcoholic</td>
</tr>
<tr>
<td>42</td>
<td>Siphonophyllum verticillatus (^{61})</td>
<td>Mufumbo</td>
<td>Campanulaceae</td>
<td>Aerial part</td>
<td>Hydroalcoholic</td>
</tr>
<tr>
<td>43</td>
<td>Salvia elegans (^{62})</td>
<td>Pineapple sage</td>
<td>Lamiaceae</td>
<td>Aerial parts</td>
<td>Hydroalcoholic</td>
</tr>
<tr>
<td>44</td>
<td>Schinus molle L. (^{63})</td>
<td>Brazilian peppertree</td>
<td>Anacardiaceae</td>
<td>Leaves</td>
<td>Hexanic</td>
</tr>
<tr>
<td>45</td>
<td>Tinospora cordifolia (^{64})</td>
<td>Giloe</td>
<td>Menispermaceae</td>
<td>Whole plant</td>
<td>Aqueous</td>
</tr>
<tr>
<td>46</td>
<td>Thymus pubescences (^{65})</td>
<td>Firefly thyme</td>
<td>Lamiaceae</td>
<td>Root</td>
<td>Methanolic</td>
</tr>
<tr>
<td>47</td>
<td>Tabebula avellanedae (^{66})</td>
<td>Moreton bay chestnut</td>
<td>Bignonaceae</td>
<td>Bark, leaves</td>
<td>Ethanolic</td>
</tr>
<tr>
<td>48</td>
<td>Zingiber officinale (^{67})</td>
<td>Ginger</td>
<td>Zingiberaceae</td>
<td>Rhizome</td>
<td>Hydroalcoholic</td>
</tr>
</tbody>
</table>
Plants possess antidepressant activity

Medications of plant origin are attaining popularity and are explored for a number of diseases, including CNS related disorders like depression.

Antidepressant activity of some medicinal plants

Areca catechu

It is cultivated in different parts of the world such as India, Sri Lanka, South Eastern Asia, Malaysia, Indonesia, Philippines, and East Africa etc. It contains a number of Alkaloids, belonging to pyridine piperidine group and derived from amino acid lysine. The various alkaloids are Arecoline, Arecaidine, Guvacine (tetracyclonic acid) and Guvacoline. These alkaloids showed significant antidepressant activity in Forced Swimming Test (FST) and Tail Immersion Test (TST). 15, 16

Apocynum venetum Linn

This shrub is mainly found in the mid and north western China. It contains hyperoside and isoorcetin, the main flavonoids which are found in the extract. The leaf extract of the plant showed significant decrease in immobility time in FST at the dose of 125 mg/kg. 17

Aniba riparia

Aniba riparia (Nees) Mez showed its anti-depressant like activity due to its phytoconstituent riparin III; which at the dose of 25 and 50 mg/kg, i.p., showed antidepressant-like activity in mice when tested in Tail Suspension Test (TST) and FST. 20

Aloysia polystachya

Hydro-alcoholic extract of the leaves of Aloysia polystachya (Griseb.) at the dose of 12.5, 25 and 50 mg/kg, i.p. produced antidepressant like action in female Sprague-Dawley rats when tested in Forced Swim Test (FST). Thujone and carvone was the main phytoconstituent responsible for antidepressant-like action. The efficacy of the extract was comparable to fluoxetine (10 mg/kg, i.p) and imipramine (12.5 mg/kg, i.p.). 21

Bacopa monnieri Linn

This is commonly found in wet, damp and marshy places in India and subtropical region. It is also known as Brahmi and its main constituents are Brahmine, herpestine and mixture of 3 alkaloids and also saponin like bacoside A and B. At the dose of 20 and 40 mg/kg: p.o possesses significant antidepressant activity in FST and Learned helpless Test (LTH). 24

Clitoria ternatea

This herb is mainly found in tropics. The methanolic extract of the plant showed significant decrease in immobility time in TST. 27

Canavalia brasiliensis

The lectins isolated from plant significantly reduced immobility time of male Swiss albino mice in FST. 28

Curcuma longa

This plant is commonly known as turmeric and it is native of Southern Asia and mainly cultivated in India, China. The aqueous extract of the plant was found to reduce immobility time in dose dependent manner in a 14 days chronic treatment. Its mode of action is due to inhibition of MAO-A enzyme. 29

Cecropia glazioui

Aqueous extract of Cecropia glazioui Sneth and butanolic fractions significantly reduced the immobility of rats in FST. The butanolic fractions (Catechin and epicatechin) significantly increased hippocampal monoamines levels and inhibited the uptake of serotonin, dopamine and noradrenaline by synaptosomes of different brain regions. 30

Cimicifuga racemosa

It is widely cultivated in temperate Himalayas from Kashmir to Bhutan, Eastern Europe and Siberia. The ethanol-aqueous extract of the plant found to reduce time period of immobility in TST. Hence it has a good antidepressant property. 31

Gentiana kochiana

Diethyl ether extract of aerial parts of Gentiana kochiana at the dose of 20 mg/kg s.c. significantly decreased immobility period of mice in FST. Gentiacauline, the active component of the extract strongly inhibited rat microsomal MAO-A. 35

Hypericum reflexum L.

The methanol extract obtained from the aerial part of Hypericum reflexum L. fill. was found to decrease in immobility time in forced swimming test. 41

Lepidium meyenii

Aqueous extract of hypocotyls of Lepidium meyenii Walp. at the dose of 1g/kg/day, p.o. to Swiss female ovariectomized mice for 21 consecutive days, showed significant anti-depressant like activity. 43

Magnolia officinalis

The active phytoconstituent such as magnolol and dihydroxydihydromagnolol obtained from the aqueous extract of Magnolia officinalis bark, at dose of 50-100 mg/kg, i.p. to mice, showed anti-depression like activity. 46

Morinda officinalis

The ethanol extract and oligosaccharides from plant have antidepressant activity in both mice and rats in FST model. The aqueous extract (50 mg/kg) of the roots showed antidepressant-like activity in male mice in FST model. 47, 48
**Mimosa pudica** Linn

This plant is probably native of tropical America and found more or less throughout India. The aqueous extract of leaves of the plant showed decrease immobility time in FST. 49

**Piper methysticum** Forst.

Aqueous extract of the plant root is commonly known as kava- kava and is used as ritual stimulant in south pacific islands. The standardized extract of kava –kava was found to be effective in anxiety and tension. It inhibit MAO-B enzyme and hence used as a psychotropic agent. It also activates mesolimbic dopaminergic neurons. 58-60

**Rhazya stricta**

This plant is mainly found in Arabian Peninsula, Sindh, Afghanistan and Baluchistan. It contains some alkaloids like –akuammidine, rhazimine and tetra hydro secamine, flavonoids like-isorhamnetine etc. The aqueous extract of the leaves of this plant showed antidepressant activity in FST. It is due to inhibition of MAO enzymes both (A and B). 64

**Siphocamphylus verticillatus**

This plant is native of south Brazil. It contains flavonoids (3 methoxy luteolin), triterpines (alpha-amirim and beta- amirin), steroids (campesterol, beta-sitosterol) .The hydroalcoholic extract of this plant possess antidepressant activity in TST and FST. 67

**CONCLUSION**

India has a rich assortment of medicinal plants distributed in different geographical and ecological conditions widespread in the country. Plants have been used since prehistoric times for treatment of various ailments. 73 In this review, The few herbal plants have been discussed which are previously explored by the various researchers for their antidepressants activity. By this study, it can be concluded that in the heart of the nature there are still so many plants which are remain to explore and need to study for their therapeutic value, so that they can also be used as herbal medication for betterment of human being. Herbal medications are free from side effects and frequent toxicity unlike the allopathic medicines. So this review is merely an initiation to provide wide options of herbal source for the treatment of depression.

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