Review Article: A Short Review of Medicinal Plants Extract Accompanied by Potential Antidepressant Activity

Ahmed Jibrin Uttu* | **Maimuna Waziri** | **Abubakar Dauda** | **Karabade Musa Bida**

Department of Chemistry, Federal University, Gashua, Yobe State, Nigeria

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ABSTRACT

Depression has become burden to the society with millions of people suffering from annually. Symptoms of depression are including difficulties in concentration, sad mood, loss of interest, guilt, feeling of hopelessness, sleeping difficulty, restlessness, appetite loss, decreased energy, suicidal attempts among others. Therefore, the present work aimed to review the antidepressant activity of extracts from seventy six medicinal plants belonging to forty four plant families. Methodology such as open field test, force swim test, tail suspension test and beam walking assay were used for the determination of antidepressant activity in plants extracts. Different extraction techniques and solvents were utilized to extract phytochemicals from the plants materials. All information regarding the antidepressant medicinal plants in this research study were obtained from various research articles published in fifty nine Journals. The results indicated that the medicinal plants in this review possess significant antidepressant activity. These medicinal plants extracts may serve as a potential resource for natural psychotherapeutic agent against depression.

Introduction

Over 121 million people in 2008 and 350 million people in 2012 from the world population suffered from mental disorder known as depression [1-2]. Depression has been described as the second leading psychiatric disorder with almost 21 % of the world population suffering from it [3]. This disorder has become burden to the society and can affect any category of age group ranging from childhood to old age [4]. In another report, the worldwide age group suffering from depression has noticeably decreased to age range of 25–35 years from 40–50 years [5]. Resulting disorder from depression includes metabolic disorder, endocrine disorder, cardiovascular disease, inflammatory disorder, neurodegenerative disorder [6].

***Corresponding Author: Ahmed Jibrin Uttu** (jibuttu@yahoo.com)*

Selective serotonin reuptake inhibitors, tricyclic antidepressants, oxidase inhibitors, monoamine and specific serotonin-noradrenaline reuptake inhibitors are mostly the reported medications available for the treatment of depression, but do comes with side profile effect like loss of sex drive, sleep, losing body weight and cardiovascular problem [7-8].

Hence, the present work was aimed at reviewing the antidepressant activity of extracts of seventy six medicinal plants (**Table 1**) from forty four plants families (**Figure 1**).

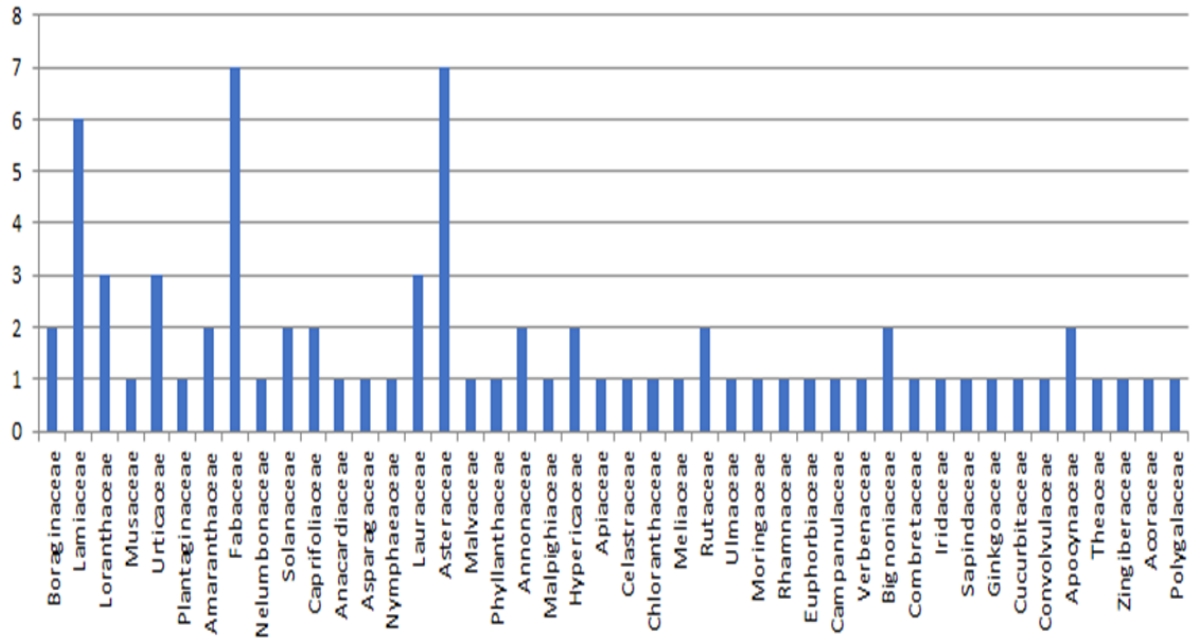

Figure 1. Distribution of families of medicinal plants with antidepressants activity results

Discussion

Plant materials have an important therapeutic role in the prevention and treatment of diseases of over 80% of the world's population and have been portrayed to be better compliance of patients, less adverse reactions and good efficiency [9]. Different plant extracts and some novel compounds isolated from medicinal plants have been reported to be effective against depressants [10-11].

In the present study, seventy six medicinal plants belonging to forty four plants' families were reviewed for antidepressant activities (**Table 1**). The plants showed significant antidepressant-like effect in some of the test model (open field test, force swim test, tail suspension test and beam walking assay). These test models of depression are widely used for screening antidepressant drugs [25].

Table 1. Details of selected medicinal plants with antidepressants activity

Botanical name of plants: (family)	Parts used: (solvent use)	Results	Ref.
Onosma bracteatum: (*Boraginaceae*)	Whole parts: (water-ethanol)	**Phytochemicals:** saponin, tannin, alkaloids. The results of the study shows that *O. bracteatum* have significant antidepressant effect in dose dependent way	[12-13]
Tapinanthus globiferus: (*Loranthaceae*)	Leaf: (methanol)	**Phytochemicals:** alkaloids, saponin glycoside, cardiac glycoside, unsaturated steroids, triterpenes, carbohydrates. The results shows that the plant extract possesses potential antidepressant activity on tail suspension test, beam walking assay and open field test	[14]

Melissa officinalis: (*Lamiaceae*)	Leaves: (ethanol)	Oral ingestion of the ethanol extract of *M. officinalis* has significant antidepressant-like properties in test animals and it is highly dependent on the treatment length	[15]
Musa paradisiaca: (*Musaceae*)	Fruit: (water-ethanol)	**Phytochemicals:** carbohydrates, proteins, amino acids, alkaloids, flavanoids, tannins and phenolic compounds. The study provides scientific evidence that the *M. paradisiaca* has antidepressant activity in forced swim test and tail suspension test	[16]
Pilea microphylla: (*Urticaceae*)	Whole plant parts: (methanol, chloroform and ethyl acetate)	The study indicates that *P. microphylla* produces a specific antidepressant-like effects (forced swimming test and tail suspension test) in animal models	[17]
Bacopa monniera: (*Plantaginaceae*)	Leaves: (methanol)	The methanol extract was found to possess significant antidepressant-like activity in the animal behavioural models such as forced swimming test, measurement of locomotor activity test, tail suspension test	[18]
Amaranthus spinosus: (*Amaranthaceae*)	Whole plant parts: (methanol)	**Phytochemicals:** carbohydrates, proteins, amino acids, fixed oils, steroid, cardiac glycosides, anthraquinone, saponin glycosides, phenolic compounds, flavonoids, alkaloids. The extract showed significant antidepressant activity in tail suspension test and force swim test models of depression	[19]
Griffonia simplicifolia: (*Fabaceae*)	Seed: (distilled water)	**Phytochemicals:** tannins, and flavonoids. The results obtained in this study suggest that aqueous extracts of *G. simplicifolia* may possess an antidepressant activity	[20]
Nelumbo nucifera: (*Nelumbonaceae*)	Leaves: (aqueous)	The present experiments confirm the antidepressant-like effects of *Nelumbo nucifera* leaves extract in the sucrose preference test, forced swimming test and tail suspension test	[21]
Withania coagulans: (*Solanaceae*)	Fruits: (alcoholic)	The result did not show the antidepressant activity on mood but showed depressive effect on the mood in the tail suspension test	[22]
Valeriana officinalis: (*Caprifoliaceae*)	Whole plant: (distilled water)	**Compounds:** 20-hydroxyecdysone, quercetin, hypericin, valerenic acid, bornyl acetate, rutin, hyperoside, rosmarinic and caffeic acid. The results shows that the plant possesses antidepressant effect and improves the recognition memory	[23]
Schinus molle: (*Anacardiaceae*)	Aerial part: (ethanol)	**Compound:** rutin. The ethanolic extract and rutin showed specific antidepressant-like effect in animal model predictive of antidepressant properties, the tail suspension test but not in the forced swimming test.	[24]
Asparagus racemosus: (*Asparagaceae*)	Root: (methanol)	Methanolic extract of *Asparagus racemosus* showed significant antidepressant-like activity	[25]
Asperugo procumbens: (*Boraginaceae*)	Aerial parts: (water-ethanol)	The results of the present study indicate the low antidepressant activity of the hydroalcoholic extract of *Asperugo procumbens* aerial parts in mice	[26]
Micromeria myrtifolia: (*Lamiaceae*)	Aerial part: (*n*-hexane, ethyl acetate, methanol)	**Compounds:** rosmarinic acid, myricetin, apigenin and naringenin. The results indicated that the compounds are statistically significant activity on forced swimming test while only rosmarinic acid showed statistically significant activity on tail suspension test	[27]
Cinnamomum tamala: (*Lauraceae*)	Leaves: (aqueous)	The study shows that the *C. tamala* possesses significant antidepressant activity	[28]
Nymphaea Lotus: (*Nymphaeaceae*)	Leaf: (aqueous)	The results indicate that *Nymphaea Lotus* may possess anxiolytic properties	[29]

Sonchus oleraceus: (*Asteraceae*)	Aerial parts: (ethanol (50%), dichloromethane)	The study showed that the extracts produced a significant antidepressant-like effect in mice as assessed by both the forced swimming test and the tail suspension test	[30]
Anthemis wiedemanniana: (*Asteraceae*)	Flowers: (*n*-hexane, ethyl acetate, and methanol)	**Compounds:** germacranolides, eudesmanolides, and guaianolides. The study showed that the extract of *A. wiedemanniana* and its sesquiterpene lactones exerted significant *in vivo* antidepressant activity	[31]
Xanthium orientale: (*Asteraceae*)	Leaves: (*n*-hexane, ethyl acetate, and methanol)	**Compounds:** xanthatin, xanthinosin. The results of the present study suggest a potential antidepressant efficacy of *xanthium orientale*	[32]
Lafoensia pacari: (Lythraceae)	Stem bark: (hexane, chloroform and ethyl acetate, ethanol)	**Phytochemicals:** saponins, flavonoids, tannins, triterpene. This study provides evidence that the ethanolic extract of the stem barks of *L. pacari* possesses antidepressant-like effect in mice	[33]
Hibiscus sabdariffa: (*Malvaceae*)	Calyces: (petroleum ether, chloroform, ethanol, distilled water)	**Phytochemicals:** flavonoids, terpenoids, tannins, anthocyanins, and glycosides. The present study demonstrates that out of the four extracts, the ethanol extract exhibited significant antianxiety and antidepressant activity	[34]
Tagetes lucida: (*Asteraceae*)	Aerial parts: (hexane, dichloromethane, methanol, distilled water)	**Phytochemicals:** alkaloids, flavonoids, glycosides, phenols and protein. The study shows that the aqueous extract of *T. lucida* possesses antidepressant-like effects in the forced swimming test, with no adverse effects when administered intragastrically	[35]
Dendrophthoe falcate: (*Loranthaceae*)	Leaves: (ethanol)	**Phytochemicals:** proteins, steroids, flavonoids, tannins. The result obtained from the study indicates that the leaves extract of *D. falcata* possesses significant antidepressant activity	[36]
Litsea glaucescens: (*Lauraceae*)	Leaves: (distilled water)	**Compounds:** β-pinene, linalool. The result of the study show that the essential oil of *L. glaucescens*, and linalool and *β*-pinene, show antidepressant activity	[37]
Phyllanthus amarus: (*Phyllanthaceae*)	Whole plant: (alcoholic)	Present study showed that *Phyllanthus amarus* has significant antidepressant activity at doses of 50, 100 mg/kg in acute models of depression (tail suspension test and force swimming test)	[38]
Annona vepretorum: (*Annonaceae*)	Leaves: (aqueous)	**Compounds:** α-pinene, camphene, β-pinene, myrcene, limonene, spathulenol, bicyclogermacrene, δ-cadinene, germacrene D, *β*-elemene. The present study showed that the acute treatment of essential oil antidepressant activity	[39]
Galphimia glauca: (*Malpighiaceae*)	Aerial parts: (*n*-hexane, methanol)	The results presumed that the plant has depressant activity	[40]
Hypericum perforatum: (*Hypericaceae*)	Whole plant: (aqueous)	Acute administration of *H. perforatum* plant extract using two antidepressant models (forced-swimming test and tail suspension test) show that the extract displays an antidepressant activity	[41]
Erythrina variegate: (*Fabaceae*)	Stem: (petroleum ether, ethanol)	**Phytochemicals:** hexose sugars, steroids, alkaloids, tannins. The present study demonstrated the antidepressant activity in	[42]

		both acute and chronic forced swimming test models of depression, the plant showed excellent antidepressant activity	
Nepeta cataria: (*Lamiaceae*)	Leaves: (*n*-hexane, ethanol)	The present study indicated that *N. cataria* extract have antidepressant properties	[43]
Perilla frutescens: (*Lamiaceae*)	Leaf: (distilled water)	Oral administration of the extract exert significant antidepressant-like effects in the forced swimming test, tail suspension test, open-field test, and sucrose consumption test in the CUMS-induced depression model in mice	[44]
Maytenus macrocarpa: (*Celastraceae*)	Leaves: (ethanolic)	It was demonstrated in this study that the *M. macrocarpa* leaves ethanolic extract has antidepressant-like activity	[45]
Foeniculum vulgare: (*Apiaceae*)	Leaves: (ethanol)	**Compounds:** p-Propenylanisole, α-thujone, Benzene, 1-methoxy-4-(2-propenyl), limonene, benzaldehyde, 4-methoxy. The results showed that the plant partly demonstrated the antidepressant-like effects in the forced swim test model	[46]
Cecropia glaziovii: (*Urticaceae*)	Leaves: (aqueous)	The research shows that the *C. glaziovii* aqueous extract is endowed with antidepressant activity	[47]
Xanthium strumarium: (*Asteraceae*)	Whole plant: (methanol)	Administration of methanol extract of *X. strumarium* significantly decreased the immobility periods of mice when compared to the control group, indicating significant antidepressant-like activity	[48]
Amaranthus caudatus: (*Amaranthaceae*)	Whole plant: (methanol)	*Amaranthus caudatus* possess antidepressant activity in tail suspension test and forced swim test models	[49]
Vigna Unguiculata: (*Fabaceae*)	leaf and stem: (*n*-hexane, ethyl acetate, *n*-butanol and aqueous fractions)	**Phytochemicals:** total alkaloid, total phenols, tannin, total flavonoids. This study confirm the antidepressant activity of *V. Unguiculata* extract using forced swim test and tail suspension test models	[50]
Artemisia absinthium: (*Asteraceae*)	Aerial parts: (methanol)	The result of the study suggests the antidepressant activity of *A. absinthium* in forced swim test and tail suspension test models of depression	[51]
Valeriana fauriei: (*Caprifoliaceae*)	Root: (Methanol, ethyl acetate, chloroform and n-hexane)	**Compounds:** bicyclo [8, 1, 0] 5*β*-hydroxyl-7*β*-acetoxyl5*α*,11, 11′-trimethyl-*E*-1(10)-ene-4α, 15-olide and 8*α*-acetoxyl-3*α*,4*α*,10-trihydroxyl-guaia-1(2)-ene-12, 6*α*olide. The results of the study shows that the compounds have significant antidepressant activity in force swim test model	[52]
Hedyosmum brasiliense: (*Chloranthaceae*)	Leaves: (distilled water-ethanol)	**Compound:** podoandin. This study suggests that the compound and may also be responsible for the antidepressant-like effect of *H. brasiliense* extract	[53]
Trichilia catigua: (*Meliaceae*)	Stem bark: (ethanol–water)	The present study provides convincing evidence for the antidepressant-like effect extract of *T. catigua*	[54]
Murraya koenigii: (Rutaceae)	Leaf: (aqueous)	*M. koenigii* aqueous leaf extract reduced the despair behavior in experimental animal models, suggesting an antidepressant like activity	[55]
Micromelum pubescens: (*Rutaceae*)	Leaves: (methanol)	**Phytochemicals:** carbohydrate, alkaloids, phenol, glycoside and saponins. The result indicate that, *M. pubescens* have possess moderate antidepressant activity in force swim test model	[56]
Hypericum montbretti: (*Hypericaceae*)	Flowers: (methanol)	**Compounds:** rutin. This study has established the antidepressant activity of rutin from methanol flowers extract isolated from *H. montbretti*. The antidepressant activity was	[57]

		observed in both tests model of forced swim test and tail suspension test	
Bauhinia blakeana: (*Fabaceae*)	Leaves: (ethanol)	*B. blakeana* had a significant antidepressant effect, measured on healthy mice in the forced swim test	[58]
Clitoria Ternatea: (*Fabaceae*)	Root: (ethanol)	**Phytochemicals:** alkaloids, glycosides, flavanoids, resins, saponins, phenols, triterpenes, proteins and carbohydrates. ethanolic root extracts of *C. ternatea* show a significant antidepressant activity in tail suspension test and forced swim test models	[59-60]
Holoptelea integrifolia: (*Ulmaceae*)	Leaf: (petroleum extract, Methanol)	**Phytochemicals:** steroids, terpenoids, alkaloids, glycosides, flavonoids, proteins, tannins, carbohydrates. **P**etroleum ether and methanolic extracts of *H. integrifolia* leaves produced antidepressant like effect as it decreases the immobility time during depression in animal model (forced swim test and tail suspension test).	[61]
Mimosa pudica: (*Fabaceae*)	Leaves: (aqueous)	*M. pudica* produces antidepressant effects in the rat	[62]
Moringa oleifera: (*Moringaceae*)	Leaf: (ethanol, chloroform)	**Phytochemicals:** Alkaloids, glycosides, flavonoids, tannins, saponins, phenols, sterols, carbohydrate, terpenoids. The study suggest that ethanol leaf extract of *M. oleifera* possess antidepressant activity in both tail suspension test and forced swim test in mice while chloroform fraction possesses antidepressant activity in mice tail suspension test only.	[63]
Ziziphus xylopyrus: (*Rhamnaceae*)	Leaves: (ethanol, ethyl acetate)	The present study clearly demonstrated that *Z. xylopyrus* exerts an antidepressant effect in forced swimming test and tail suspension test models.	[64]
Emblica officinalis: (*Euphorbiaceae*)	Fruit: (aqueous)	In this study, the antidepressant efficacy of *E. officinalis* fruit extract was established and it is found to be superior to that of the standard drug imipramine	[65]
Siphocampylus verticillatus: (*Campanulaceae*)	Stems and leaves: (hydroalcoholic)	The study demonstrated that the extract of *S. verticillatus* elicited a significant antidepressant effect on tail suspension test and forced swim test models	[66]
Verbena officinalis: (*Verbenaceae*)	Leaves: (methanol)	**Phytochemicals:** alkaloids, flavonoids, diterpenes, proteins, amino acids, tannins, saponins, phytosterols, and phenolic. This study showed the methanolic leaves extract of *V. officinalis* possesses potential antidepressant effect in animal models of depression	[67]
Achillea millefolium: (*Asteraceae*)	Whole plant: (hydroethanolic)	The preliminary results presented here indicated that hydroethanolic extract of *Achillea millefolium* L. has a potential antidepressant and anxiolytic effect	[68]
Tabebuia avellanedae: (*Bignoniaceae*)	Stem barks: (ethanol)	The present study first indicates that *Tabebuia avellanedae* is able to produce an antidepressant-like effect in the forced swim test and tail suspension test	[69]
Crocus sativus: (*Iridaceae*)	stigmas and corms: (petroleum ether fraction and dichloromethane)	**Compounds:** Hexadecanoic acid and octadecadienoic acid. The study suggest that the corms extracts of *C. sativus* produce antidepressant-like activity in behavioral models	[70]
Glycyrrhiza glabra: (*Fabaceae*)	Whole plant: (water-chloroform)	In conclusion, our results suggest that aqueous extract of G. glabra produced antidepressant-like effect in mice in both forced swim test and tail suspension test	[71]

Terminalia bellirica: (*Combretaceae*)	Fruits: (distilled water, ethanol)	The study suggest that aqueous and ethanol extract produce antidepressant-like effect in mice in both forced swim test and tail suspension test	[72]
Solanum nigrum: (*Solanaceae*)	Leaves, fruit: (hydro-ethanolic)	**Phytochemicals:** alkaloids, flavonoids, saponins, carbohydrates, phenols, glycosides, tannins, proteins. The extract showed moderate anxiolytic and good antioxidant and hence the plant might possess antipdepressant activity in forced swim test model.	[73]
Ginkgo biloba: (*Ginkgoaceae*)	Leaves: (aqueous)	This research showed that the leave extract of *G. biloba* is confirmed for antidepressant-like activity	[74]
Cardiospermum halicacabum: (*Sapindaceae*)	Root: (ethanolic)	**Phytochemicals:** flavonoids, tannins and saponins. The present study results of ethanolic root extract of *C. halicacabum* roots may possess the CNS activity.	[75]
Lindera obtusiloba: (*Lauraceae*)	Whole parts: (ethanol)	The results showed that *L. obtusiloba* extracts have antidepressant-like effects in forced swim test models	[76]
Convolvulus pluricaulis: (*Convolvulaceae*)	whole plant: (ethanol, petroleum ether, chloroform, and ethyl acetate)	The chloroform fraction of the total ethanolic extract of *C. pluricaulis* elicited a significant antidepressant-like effect in mice	[77]
Cucurbita pepo: (*Cucurbitaceae*)	Seed: (alcohol and distilled water)	**Phytochemicals:** alkaloids, flavonoids, saponins, carbohydrates, steroids, glycosides, resins, tannins. In this study, the seed extract of *C. pepo* showed that it possess antidepressant-like activity	[78]
Alafia multiflora: (*Apocynaceae*)	Stem bark: (aqueous)	The extracts possess antidepressants properties in rodents with no significant decrease in locomotor activity	[79]
Ajuga bracteosa: (*Lamiaceae*)	Aerial parts, root: (chloroform, methanol)	Both extracts (chloroform and methanol extract) of *A. bracteosa* showed significant antidepressant activity	[80]
Newbouldia laevis: (*Bignoniaceae*)	Leaves: (hydroethanol)	The hydroethanol leaf extract of *N. laevis* possesses antidepressant-like activities	[81]
Urtica dioica: (*Urticaceae*)	Aerial parts: (hexane, chloroform, ethyl acetate, methanol)	The study indicates that *U. dioica* produces a specific antidepressant-like effect in animal such forced swimming test and tail suspension test	[82]
Annona cherimolia: (*Annonaceae*)	Aerial parts: (hexane and methanol)	**Phytochemicals:** Alkaloid. The results of the present study provided evidence of the antidepressant-like effect produced by an alkaloid extract from the aerial parts of *A. cherimolia*	[83]
Camellia sinensis: (*Theaceae*)	leaves and buds: (Ethanol)	The study finding out the ethanol extracts of *C. sinensis* have demonstrate significant antidepressant activity	[84]
Hedranthera barteri: (*Apocynaceae*)	Root: (hexane and dichloromethane)	**Phytochemicals:** alkaloids, cardenolides, flavonoids and saponins. In the study, the extract of *H. barteri* shows significant antidepressant activities	[85]
Curcuma longa: (*Zingiberaceae*)	Rhizomes: (aqueous)	This study suggested that *C. longa* may be as a possible therapeutic and protective use in the immune-associated depression	[86]

Acorus calamus: (Acoraceae)	Rhizomes: (methanolic and hydroalcoholic)	the extracts revealed dose-dependent antidepressant activity in mice, and the higher dose of both extracts was found to have the highest effect in depression	[87]
Polygala sabulosa: (*Polygalaceae*)	Whole plant: (ethanol)	**Compound:** scopoletin. The present study indicates that the coumarin scopoletin produces a specific antidepressant-like effect in the tail suspension test, an animal model predictive of antidepressant activity	[88]
Salvia elegans: (*Lamiaceae*)	leaves and flowers: (distilled water-ethanol)	The results of the research have provided support for the potential antidepressant activity of extracts from *S. elegans*.	[89]

Natural products having antidepressant activities are of major concern for many reasons. The current review has revealed the therapeutic importance of medicinal plants in the treatment of major depression (**Table 1**). The use of medicinal plants for curing depression have successfully lead to improvement of quality of life by normalizing mood, increasing awareness of personal pleasures and interests, reversing the functional and social disabilities associated with depression, as well as to reduce suicide rates [70].

Some flavonoids have been shown to be effective in the modulation of serotonergic activity by attenuating mitochondrial MAO-A activity in the brain and attenuate oxidative stress by interrupting the generation of hydrogen peroxide accompanying the MAO-A reaction [6].

Various plant alkaloids have been reported to have antidepressant effect. [90] reviewed the mechanisms of some alkaloids having antidepressant-like activities which include either decreasing plasma corticosterone level, increasing monoaminergic turnover, interfering with MAO-A and several cell-surface receptors, reducing the release of corticosterone, inhibiting 11-b-hydroxysteroid dehydrogenase, modulating monoamine transmitters, improving serotonergic system and inhibition of 5HT reuptake.

Terpenoids represent another group of phytochemicals that have been studied to produce antidepressant effects by induction of P-glycoprotein, influences hepatic cytochrome, improving the multidrug-resistant profile of cells, reduction of plasma concentration of immunosuppressant and interaction with indinavir [91].

Low levels of monoamines such as noradrenaline, dopamine and serotonin in the brain have been hypothesized to cause depression. Hence, saponins are reported to increase the levels of monoamine neurotransmitters in the brain. In addition, over-activity of hypothalamus pituitary adrenal (HPA) axis is ascribed to causes depression. However, some saponins are reported to normalization the level of the HPA [92].

The antidepressant activities of medicinal plants extracts reported in this study may be due to the presence of phytochemicals like saponins, flavonoids, phenols, alkaloids and tannins found to be present the in plants extracts.

Conclusion

This review has provided information on the basis of available literature and suggested that medicinal plants could play a potential role as natural antidepressants. Seventy six medicinal plants belonging to forty four plant families were extensively review for their potency as antidepressants agents. In conclusion, plant-based products and its metabolites can serve as leads for discovery of antidepressant drugs.

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Conflict of Interest

The authors declare that this article content has no conflict of interest.

Orcid

Ahmed Jibrin Uttu: https://orcid.org/0000-0002-4089-5529

Maimuna Waziri: https://orcid.org/0000-0002-9695-4428

Abubakar Dauda: https://orcid.org/0000-0001-7290-9465

Karabade Musa Bida: https://orcid.org/0000-0003-1234-708X

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Ahmed Jibrin Uttu: Corresponding author and a lecturer with Federal University Gashua, Yobe State. He holds Bachelor of Science degree in chemistry and Master of Science degree in organic chemistry. He is member of chemical society of chemistry.

Maimuna Waziri: A co-author and current vice chancellor of Federal University Gashua, Yobe State, Nigeria. She is a professor of analytical chemistry and follow of both chemical society of chemistry (CSC) and institute of chartered chemist of Nigeria (ICCON).

Abubakar Dauda: He is a co-author and an undergraduate student of chemistry in Federal University Gashua, Yobe State, Nigeria. He is presently a student.

Karabade Musa Bida: He is a co-author and an undergraduate student of chemistry in Federal University Gashua, Yobe State, Nigeria. He is presently a student.