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A. J. Al-Achi

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Brief Review



Psychoactive Botanicals and Their Constituents: A Brief Review

Antoine Al-Achi

College of Pharmacy and Health Sciences, Campbell University, USA

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Correspondence should be addressed to Antoine Al-Achi, USA

E-mail: alachi@campbell.edu

Since ancient times botanicals that affected moods and produced a feeling of relaxation have been used as sleep aids (for insomnia), to overcome anxiety, and to induce stillness [1]. A list of these plants, along with their chemical composition, is found in table 1. Specific therapeutic applications of psychoactive botanicals include their use for insomnia, as anti-depressive agents, to induce an anxiolytic action, as a treatment for headaches and migraines, to control menopausal symptoms associated with mood issues, and for various neurodegenerative diseases, among others (Table 2).

Botanical	Chemical composition	References
Chamomile (<i>Matricaria recutita</i>)	<ol style="list-style-type: none"> 1. It contains apigenin, a flavonoid, that is mostly found in its glycosylated form, apigenin-7-glucoside. Overall, chamomile contains 36 flavonoid compounds. 2. The mechanism of action of apigenin is through an antagonist effect at $\alpha 1\beta 1\gamma 2S$ Gamma-aminobutyric Acid (GABA_A) receptors and at $\rho 1$ GABAC receptors. 3. The essential oil of chamomile contains azulenes and proazulenes. 4. The plant other constituents are various sesquiterpenes, terpenoids, flavonoids, coumarins, tannin, and polyacetylenes. 5. Chamomile contains various minerals including, potassium, magnesium, sodium, and calcium. 6. <i>Matricaria recutita</i> also contains trace elements such as chromium, zinc, iron, and manganese. 7. Chamomile may be found contaminated with cadmium, lead, copper, rubidium, vanadium, cobalt, barium, copper, aluminum, and strontium. 8. Chamomile inhibits the CYP3A4 hepatic enzymes which are responsible for metabolizing medicinal agents (e.g., Cyclosporine). 	<ol style="list-style-type: none"> [2] [3] [4] [5] [6] [7] [8] [9] [10]
<i>Ginkgo biloba</i>	<ol style="list-style-type: none"> 1. The leaves of this plant contain ginkgolic acids (alkyl phenols). 2. Among other compounds found in Ginkgo are the terpenes and trilactones (ginkgolides and bilobalides), and flavonoids (flavonol glycosides). Several ginkgolides are recognized such as the terpene trilactones, ginkgolide A, B, C, and J. 3. Other constituents in this herb are the, biflavones, proanthocyanidins, alkylphenols, simple phenolic acids, 6-hydroxykynurenic acid, 4-O-methylpyridoxine, and polyprenols. 	<ol style="list-style-type: none"> [11] [12] [13] [14]

Hops (<i>Humulus lupulus</i>)	<ol style="list-style-type: none"> 4. It contains bitter acids (α- and β-acids), essential oils, and polyphenols. 5. Also present are amino acids, cellulose, proteins, lipids, and waxes. 6. Xanthohumol is a natural prenylated chalcone derived from hops. This substance was found to have anti-inflammatory, anticancer, and antimutagenic effects. 7. Hops herb also contains a resin (humulones and lupulones). 8. A phytoestrogen substance was also discovered in hops, namely 8-prenylnaringenin. Due to the use of hops in beer, an insignificant amount of this plant estrogen is also found in beer-containing hops. 9. This plant contains chalcones, similar to kava. 	<p>[15] [16] [17] [18] [19] [20]</p>
Kava (<i>Piper methysticum</i> Frost F.)	<ol style="list-style-type: none"> 1. Over 40 compounds have been isolated from this plant. 2. The major constituents may be classified into three categories: (a) aryethylene-α-pyrones, (b) flavones (chalcones), and (c) conjugated diene ketones. 3. The primary active constituents with the highest psychoactive effects of <i>Piper methysticum</i> are known as kavalactones (kavapyrones) (3% to 20% dry weight). 4. Among the 18 kavalactones found in Kava roots are kavain, dihydrokavain, methysticin, dihydromethysticin, yangonin, and desmethoxyyangonin. Those six kavalactones account for about 95% of the biological activity in the plant. 5. Some of the kavalactones are found in other plants as well. For instance, the biologically active kavalactones, desmethoxyyangonin, is present in <i>Renalmia alpinia</i>. 6. Kavain was shown to change the sleep characteristics in animal models compared to other sedatives. 7. The mechanisms of action of kavalactones may be summarized as exerting an inhibition on norepinephrine uptake, altering the calcium and sodium channels, and modifying the binding of ligands to GABA_A receptors. 8. Kava also functions by reducing norepinephrine and increasing serotonin levels, similar to benzodiazepines. 9. Pipermethysticine (a hepatotoxic alkaloid) found in Kava leaves and stem peelings. 10. Flavokavain B is a cytotoxic component presents in the plant's root and is found in the aqueous and organic extracts obtained from Kava. 	<p>[21] [22] [23] [24] [25] [10]</p>
Lavender (<i>Lavandula officinalis</i> L.)	<ol style="list-style-type: none"> 1. The major two constituents in Lavender are Linalyl acetate and Linalool. 2. Other minor constituents are (Z)-A-Ocimene, Lavandulyl acetate, Terpinen-4-ol, (E)-A-Ocimene, and 3-Octanone, among others. 	<p>[26]</p>
Lemon balm (<i>Melissa officinalis</i> L.)	<ol style="list-style-type: none"> 1. Lemon balm leaves contain caffeic acid, luteolin, monoterpene glycosides, monoterpene aldehyde, oleanolic acid, protocatechuic acid, quercitrin, rhamnocitrin, rosmarinic acid, sesquiterpenes, tannins, and ursolic acid. 2. Compounds present in the essential oil obtained from this plant are citral (neral and geranial), polyphenols, and flavonoids. 3. Mainly, the essential contained oxygenated monoterpenes, sesquiterpene hydrocarbons, and oxygenated sesquiterpenes. 	<p>[27] [28] [29]</p>
Passionflower (<i>Passiflora incarnata</i> L.)	<ol style="list-style-type: none"> 1. The plant contains the flavonoids isoschaftoside, schaftoside, isovitexin and isovitexin glucoside as its major constituents. 2. Other components present in this plant are tannins, coumarin alkaloids, flavonoids, glycine, and tyrosine. 	<p>[30] [31]</p>
St. John's Wort (<i>Hypericum perforatum</i> L.)	<ol style="list-style-type: none"> 1. The major active constituents in St. John's wort are the naphthodianthrones hypericin and pseudohypericin and the acylphloroglucinols hyperforin and adhyperforin. 2. Other ingredients present include flavonoids, bioflavonoids, and phenylpropanoids 3. The plant contains kynurenic acid (an antagonist of ionotropic glutamate receptors) and protocatechuic acid (antioxidant, antibacterial, anticancer, antiulcer, antidiabetic, antiaging, antifibrotic, antiviral, anti-inflammatory, analgesic, antiatherosclerotic, cardiac, hepatoprotective, neurological, and nephron- protective activities). 4. <i>Hypericum perforatum</i> contains caffeic acid and apigenin. 	<p>[32] [33] [34] [35] [36]</p>

Valerian (<i>Valeriana officinalis</i> L., s.l.)	<ol style="list-style-type: none"> 1. It contains essential oils, iridoids, flavonoids, alkaloids, amino acids, and lignanoids. 2. Valerian contains the active components valepotriates, baldrinals, valerenic acid, valeranal, and valeranonone. 3. Components in the essential oils include a total of 150 compounds; the main ones are the monoterpenes and sesquiterpenes. The monoterpenes are borneol, bornyl acetate, and isobornyl acetate. Approximately 30 sesquiterpenes (guaiane and valerian types) are also present in valerian. 	[37] [38]
Table 1: The chemical composition of various psychoactive botanicals.		

Botanical	Activities/Folk Uses	References
Chamomile (<i>Matricaria recutita</i>)	<ol style="list-style-type: none"> 1. Anti-anxiety 2. Antiseptic 3. Depression 4. Diaphoretic 5. Gastrointestinal discomforts 6. Hay fever, 7. Hemorrhoids 8. Inflammatory conditions 9. Insomnia (sleep aid) 10. Menstrual disorders 11. Migraine headaches (essential oil; applied topically) 12. Muscle spasms (antispasmodic effect) 13. Rheumatic pain 14. Ulcers 15. Wounds (topically; slow- to-heal injuries) 	[39] [40] [9] [41]
<i>Ginkgo biloba</i>	<ol style="list-style-type: none"> 1. Acute mountain sickness 2. Antagonizes the action of platelet activating factor and platelet aggregation is reduced. 3. Anti-angiogenic 4. Antioxidant, 5. Anti-tumor 6. As an alternative hormone replacement therapy 7. Cardiovascular dysfunctions 8. Enhances blood flow 9. Eye health: Age-related macular degeneration and some types of glaucoma 10. Gene regulatory effects 11. Hypertension 12. Migraine with aura treatment 13. Neurodegenerative disorders (Alzheimer’s disease) and cognitive impairment (short-term memory loss) 14. Neurosensory problems (tinnitus) 15. Peripheral vascular dysfunctions (claudication) 16. Resolution of ischemia-reperfusion injuries (through scavenging of the excess free radicals) 17. Stimulates the release of prostacyclines and nitric oxide 	[42] [43] [44] [45]
Hops (<i>Humulus lupulus</i>)	<ol style="list-style-type: none"> 1. Antimicrobial activities 2. Antiparasitic activity (due the chalcones constituents) 3. As a flavoring agent and preservative in beer (the female flowers) 4. Hops has sedative effects due the presence of bitter acids 5. It exhibits an estrogenic activity due to the presence of 8-prenylnaringenin, a phytoestrogen 	[15] [16] [18] [46] [19]

Kava (<i>Piper methysticum</i> Frost F.)	<ol style="list-style-type: none"> 1. A sleep aid 2. An anxiolytic action 3. As a ceremonial drink in native Pacific Basin countries 4. for treatment of nervous disorders such as stress and restlessness 	[47] [23]
Lavender (<i>Lavandula officinalis</i> L.)	<ol style="list-style-type: none"> 1. An anxiolytic action 2. Antidepressant 3. Anti-parasitic 4. Antispasmodic 5. For relaxation against stress 6. For sternotomy-related pain after open heart surgery (as inhaled lavender oil) 7. Topically, for minor burns and insect bites 	[48] [49] [50]
Lemon balm (<i>Melissa officinalis</i> L.)	<ol style="list-style-type: none"> 1. An anxiolytic effect 2. Anti-inflammatory 3. Antimicrobial 4. Antioxidant 5. Antiviral 6. As a modulator of mood and cognitive function 7. Topically, extracts of lemon balm reduce the amount of intracellular reactive oxygen species and enhance cell viability in human keratinocytes in oxidative stress conditions 	[51] [52]
Passionflower (<i>Passiflora incarnata</i> L.)	<ol style="list-style-type: none"> 1. Anti-inflammatory 2. Antioxidant 3. Anxiety 4. Attention-deficit Hyperactivity Disorder (ADHD) 5. Epilepsy 6. Menopausal symptoms 7. Sedative (for insomnia) 	[53] [30] [31]
St. John's Wort (<i>Hypericum perforatum</i> L.)	<ol style="list-style-type: none"> 1. Antidepressant (mild and moderate depression only) 2. Antifungal 3. Anti-inflammatory 4. Antimycobacterial 5. Antiviral 6. Asthma 7. Bronchitis 8. Burns 9. Diseases of the gastrointestinal tract (ulcers, gallbladder diseases, gastritis, diarrhea) 10. Eczema 11. Gout 12. Headaches 13. Hemorrhoids 14. Insomnia 15. Nervous conditions 16. Obsessive-compulsive disorder 17. Premenstrual syndrome 18. Promotes wound healing (slow or delayed wound healing) 19. Rheumatism 20. Skin ulcers 21. Uterine inflammation and endometriosis 	[54] [55] [56] [57] [58] [36]
Valerian (<i>Valeriana officinalis</i> L., s.l.)	<ol style="list-style-type: none"> 1. A sleeping aid 2. Antimicrobial Activities (essential oil) 3. Anxiety 4. Restlessness and tremors 5. Skeletal muscle relaxant 	[59] [60] [61]
Table 2: Some of the recognizable pharmacological activities of psychoactive botanicals commonly used in folk medicine.		

The purported pharmacological activities of these herbs are summarized in table 2. Much of these effects are taken advantage of in folk medicine. Potential herb-drug interactions are often recognized, in particular when the herb is taken concurrently with the medications, in large doses, and for prolonged periods. Moreover, the “therapeutic” action of the herb cannot always be explained by the chemistry of the herbal material, a matter that requires further investigations. While some of the activities of the botanicals may be scientifically documented, the majority of these purported effects are folkloric. Folk medicine often relies on traditional ethnic use, anecdotal accounts, and occasional case reports. As shown in table 2, although the actions of the botanicals discussed in this brief editorial are mainly for psychological disorders, these herbs possess tremendous potentials for beneficial applications in many other pathological conditions.

It should be noted that the use of herbal supplements during pregnancy, for children, or while breast-feeding is contraindicated unless prescribed by a physician. Besides, herbal dietary supplements differ significantly in their chemical composition among manufacturers, in particular, those products that are not standardized. The use of standardized preparations, although it does not guarantee efficacy, it assures consistency in the manufactured product.

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