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Mexican medicinal plants used to alleviate the symptoms of anxiety: mini-review

Abstract

Anxiety is considered together with depression the most dangerous mental psychiatric disorders worldwide. In Mexico, the use of medicinal plants is growing very rapidly in the treatment of these disorders. It is very important to point out that the lack of scientific evidence to validate this is necessary to have the clinical evidence in order to support their use of these plants. This work deals with their identification of plants, to review the current preclinical and when the clinical information is available to present current status of these plants is use to alleviate the symptoms of anxiety.

Keywords: mexican plants, anxiety, medicinal herbs

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Abbreviations: EPM, elevated plus maze; GABA, gamma-aminobutyric acid; HBT, hole board; PTZ, pentylenetetrazole; CNS, central nervous system

Introduction

Plants produce a diverse range of bioactive molecules, making them a potentially rich source of different types of medicines. Higher plants, as sources of medicinal compounds, continue to play a dominant role in the maintenance of human health since ancient times.

Today to control the major diseases of the world, production of synthetic pharmaceutical products are not enough; they cannot expand or alter their abilities. Due to this limitation there is a need to discover new molecular structures in the plant kingdom. This can be done by encouraging people to track the plants that are used by indigenous people. The ethnobotanical approach is one of the common methods employed in choosing the plants for pharmacological study. In many cases, there remains a need for a detailed scientific study of traditional medical practices to preserve valuable therapeutic knowledge and supplement the scientific evidence of their efficacies.[1]

Mexican medicine plants were used by the ancient Mexican Indians base on empirical observation, as well as by their use on the magic and religious ceremonies to their gods. Dominguez et al.[2] mention that the arrival of the Spaniards modified the native medicine practices of the Aztecs and the use of medicinal plants. Diverse colonial documents, such as those of Martin de la Cruz, Juan Badiano, Bernardino de Sahagún and Francisco Hernández, provide examples of the use of Mexican plants from the point of view of the Aztecs such as *Libellus de Medicialibus Indorum* (Little Book of the Medicinal Herbs of the Indians). Additional information is describe by the actions of Mexican medicinal plants in the book Historia de las cosas de la Nueva España (General History of the Things of the New Spain) by Fray Bernardino de Sahagún.[3,4] The aim of this work is to identify the Mexican medicinal plants that are commonly in use in Mexico in order to alleviate the symptoms of anxiety.

Discussion

This work is based on the bibliographic search that identifies 49 plants used in Mexican traditional medicine for the treatment of anxiety.[5,6] Only the most representative plants are in this work. *Libellus de Medicialibus Indorum* was a manuscript completed in Mexico in 1552 which referred to native medicinal plants, the curative effects of which is indicated in the Latin language. This manuscript has the intention of showing the King of Spain, the rich variety of medicinal plants in Mexico. An elderly Indian physician and native of Tlatelolco, Martin de la Cruz described the use of each plant and provided drawings of them, and Juan Badiano (a young Indian) translated the material from Nahuatl into Latin. This book is housed in the archives of the Vatican Library in Rome and was rediscovered in the 20th century by US historians, who confused it with pre-Hispanic Aztec codex and renamed it the *Cruz-Badiano Codex* or the *Badiano Codex*.[7,8] This codex is currently at the National Museum of Anthropology in Mexico City.

Mexico is a country with a diverse flora, and many of its indigenous cultures have an extensive pharmacopeia of medicinal plants, knowledge from generation through generations. During the last few years, there is a revival of popular interest in plants use for the treatment of different diseases including anxiety disorder.[5,9] Recently in Mexico there is an increase interest in using alternative medicine among people with psychiatry disorders, such as anxiety.[10] The result of this study show that when people suffer emotional distress, 52.5% practice self-care and 28.2% look for alternative medicine approach.

Anxiety in laboratory rodents are often measured using crude behavioral assays, such as the elevated plus maze (EPM). Anxiety can also be modeled using both light-enhanced, and dark-enhanced startle paradigms, context conditioning, and by exploiting the unpredictability of aversive events, such as mild shock.[11]

The seeds of*Annona diversifolia*Saff, *A. CherimolaMill* and *A. purpurea*Moc &Sessé ex Dunalare in use of traditional medicine in order to alleviate the symptoms of anxiety and antidepressant –like effects.[12–14] These plants have a compound known as palmitone that has anti-anxiety response in experimental models in mice. Behavioral studies suggest an anti-anxiety effect produced by palmitone but its neuropharmacological profile differs from that observed for benzodiazepines such as diazepam.[14]

The leaves and bark of *Casimiroa edulis* La Llave & Lex are used as tranquilizer, for the treatment of anxiety and insomnia. In the Forced Swimming Test, the aqueous extract is as effective as fluoxetine shortening time of immobility and significantly increasing climbing time. However, the extract prolonged the pentobarbital-induced hypnosis in mice and partially protected the animals from the pentylenetetrazol-induced convulsions.[15]

Galphimia glauca Cav is a plant native to Mexico and widely distributed throughout the region. The branches and seeds of *Galphimia glauca* Cav are used for the treatment of nervous excitement[16] and it is the most studied species for the treatment of anxiety in Mexico.[17,18] An active compound, a nor-secotriterpene named galphimine-B, which also shows a sedative activity.[19] In clinical studies, a standardized herbal medicinal product was developed from the aqueous extract of *G. glauca*[20] and was tested on patients with generalized anxiety disorder. This compound demonstrates anxiolytic effectiveness very similar to Lorazepam, confirming the efficacy of this traditional herbal drug.[20]

The roots of *Ipomeas stans* Cav. Is a plant widely used in Mexico for the treatment of nervous breakdown and epileptic seizures.[21] The ethyl acetate extract (AcOEt) from the roots of *I. stans* has anxiolytic effect in mice. However at higher doses (20.0 and 40.0mg/kg), this extract significantly reduced the spontaneous motor activity. The ethyl acetate extract was able to increase GABA release in the anterior brain cortex of mice.[22]

The leaves and branches of *Loeselia mexicana* have an anxiolytic effect of methanol extract. Its effect is due to its interaction with the GABAergic system by administering a GABAA antagonist. The anxiolytic effect of methanol extract is evaluated in mice on the EPM test and standardized based on its daphnoretin concentration. The anxiolytic activity of 200mg/kg of extract was inhibited by picrotoxin, bicuculline and flumazenil but not by PTZ, the effect that appears to be mediated in part by activation of GABAergic system.[23]

The bark and leaves of *Magnolia dealbata Zucc* are used in a decoction as tranquilizer and to treat epilepsy.[24] The ethanol extract of the leaves induced a significant and dose-dependent (30-300mg/kg) decrease in the anxiety response in mice in the elevated plus maze (EPM), hole board (HBT) and exploratory rearing tests. *M. dealbata* not only prolonged the time of sodium pentobarbital-induced hypnosis and delayed the onset of pentylenetetrazole (PTZ)-induced myoclonus and clonus, but also hindered the presence of tonic seizures without mortality.[25]

Early descriptions about the use of *Montanoa frutescens* Mairet ex DC aqueous crude extract describe it as a traditional labor inducing remedy, which is mentioned in the book "Libellus de Medicinalibus Indorum Herbis" written in 1552,[26] where traditional recipes and prescriptions are listed. The mood and nervous disorders are treating with the aqueous crude extract of *Montanoa frutescens* Mairet ex DC leaves. The aqueous extract of *M. frutescens* showed anxiolytic-like activity in rats on the EPM experimental model, in a similar manner to 2mg/kg of diazepam, without disruption of general motor activity. The anxiolytic-like effect is blocked by picrotoxin, indicating that GABAA receptors are involved in the modulation of this effect.[27]

The flowers of *Tilia americana* var. mexicana (Schltdl.) Hardin are used in Mexican traditional medicine for treating nervous disorders, insomnia and headaches.[28-30] The n-hexane and methanol extracts of the inflorescences have an anxiolytic-like effect, and at higher doses it produced a decrease in the ambulatory activity.[31] The anxiolytic activity was determined by EPM, hole board test (HBT), and exploratory rearing. These researchers suggest that the hexane extract elicits a depressant action on the CNS, at least in part by the presence of β-sitosterol and some fatty acids that remain to be identified.[32] To assess the anxiolytic-like response, methanol extracts of Tilia inflorescences were tested in mice using open-field, hole-board and plus-maze tests, as well as sodium pentobarbital-induced hypnosis. Nevertheless, quercetin and kaempferol aglycons were tested and showed anxiolytic-like response, therefore the authors suggest that the pharmacological effect of Tilia inflorescences involves quercetin and kaempferol but is independent of the kind of glycosides present in the samples.[33]

The roots of several species of genus *Valeriana*(*Caprifoliaceae*) are used by the traditional medicine of many cultures as mild sedative, and tranquilizer, and as a sleep inducing aid.[34] The genus is comprised of about 200 species, and has been used medicinally before Christianity in the Mediterranean area, India, and China.

In México, the native Valerian specie *Valeriana edulis* subsp. procera (Kunth) Meyer (V. procera Kunth), is also important in the medicinal plant market.[35,36] Both the European and Mexican *Valerian* species have similar effects on CNS. It was described the sedative and enhanced pentobarbital effect of valerenic acid isolated from *V. Officinalis*,[37] but it has been reported that valerenic acid is absent in Mexican *V. edulis*[38] and the valepotriates concentration is higher in comparison with other *Valeriana* species.[39] Dihydroisovaltrate is the main valepotriate in *V. edulis* hydroalcohol extract.[40]

The anxiolytic activity of ethanol extract (70%) of Mexican Valerian roots was assessed in mice using the exploratory rearing as behavioral model. The roots were obtained by a micropropagation method, and the extract shows anxiolytic and anticonvulsant activity at 100, 300 and 1000mg/kg. The pharmacological effects have been attributed to their valepotriates content, which include valtrate and isovaltrate as major components.[35] The anxiolytic activity of valepotriates has been tested in patients using a mixture of 80% dihydrovaltrate, 15% valtrate and 5% acevaltrate using diazepam as placebo. The preliminary data obtained from this study suggested that the valepotriates may have a potential anxiolytic effect on the psychic symptoms of anxiety.[41] On the other hand, it has been described that valepotriates act in the brain through gammaaminobutyric acid (GABA) receptors.[42]

Conclusion

There is a large number of Mexican medicinal plants used for the treatment of diseases, injuries, infections, health benefits and disease management in order to alleviate the symptoms, prevent and eliminate several metabolic disorders which are had been handed over from generation to generation.

This work attempts to bring some useful information of currently Mexican plants that alleviate the symptoms of anxiety. Some of these plants have been studied in preclinical research, in most cases these studies are preliminary, and the understanding of the mechanism of action is inconclusive. The need for systematic studies in preclinical and clinical research is evident, and efforts should be done to fulfill this research.[5]

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Conflicts of interest

The authors declare no conflicts of interest related to this article.

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