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Research Article

PHARMACOGNOSTICAL AND BIOLOGICAL ASPECT OF RUELLIA SIMPLEX: A REVIEW

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ABSTRACT

Ruellia simplex is a perennial plant having height up to 3 feet. This plant leaves and stem both are green in color however leaves are darker green. Plant is native to South America and fould in countries like Brazil, Paraguay, Uruguay, Argentina and Bolivia. The plants' branches from the ground into several woody-based stems with purple elongated leaves. Some species in the genus are suspected to be poisonous, especially those with reddish inflorescence or flowers. The genus Ruellia plants are reported to be used in traditional medicine as an antioxidant. Ruellia simplex lives in tropical and subtropical climate zones and thrives in riverine terrestrial habitats and contains secondary metabolites like flavonoids, alkaloids, tannins, glycosides and triterpenes. Ruellia simplex is reported to have antinociceptive, anti-inflammatory, and antidiabetic activities. This review will help to provide detailed information on recent research done on this plant.

Keywords: Ruellia simplex; Pharmacological; Pharmacognostical

INTRODUCTION

Herbal medicines, or also known as botanical medicines, refers to the utilization of the seeds, berries, roots, leaves, bark or flowers of a plant for medicinal purposes [1]. Recently, herbal medicines have become popular and important as health care choice. It is fair to say that most of the herbal medicines or their derivatives are safe for consumption without producing much side effects in the individuals. Many recent herbal medicines have been assessed and monitored appropriately before marketed for consumption or use. Herbal medicines or supplements must be prepared according to Good Manufacturing Practices (GMP). Thus, we can say that the quality and safety of most herbal medicines are assured, except those sold in an unregulated market [2].

Plants have been used for their medicinal purposes in ancient time. In the early 19th century, scientists began to extract the active ingredients from plants when chemical analysis had first become available. After that, chemists started to develop their own version of plant compounds. In many cases, those scientists are not sure which ingredients in the herbal medicines that works to treat an illness. The ingredients may work together to give a beneficial effect [2]. Some examples of some medicinal plants found in Malaysia are serengan plant (Flemingia strobilifera), kemunting Cina (Catharanthus roseus) and misai kucing (Orthosiphon aristatus) [3].

In Malaysia, there is a huge potential for herbal medicines. In fact, herbal medicines have been made into the first Entry Point Project (EPP1). This project was focused on the commercialization of five types of herbs, namely Tongkat Ali, Kacip Fatimah, Misai Kucing, Hempedu Bumi and Dukung Anak, with the aim of producing high-value products in the beginning. After that, six more herbal species have been added to the EPP1 project, which are mengkudu, roselle, ginger, Mas Cotek, belalai gajah and pegaga. These 11 herbs are being studied and developed. Herbs were recommended by the Natural Resources and Environment Ministry for medicinal uses, food, health care and beauty. The positive development of this herb industry is expected to generate more job opportunities and herb entrepreneurs, leading to increase income for some of the nation's farmers [4] (Figures 1 and 2).

Figure 1: Flowers and Leaves of Ruellia simplex collected from AIMST University campus

Ruellia simplex is also commonly known as Mexican-petunia, Mexican bluebell or Britton's petunia. It has many synonyms which include Ruellia brittoniana, Ruellia malacosperma, Ruellia tweediana and Ruellia coerulea, Ruellia microphylla and Ruellia ignorantiae. However, Ruellia simplex was the first name used to describe the plant species [5,6]. The taxonomy of Ruellia simplex is as follows [7].

Kingdom: *Plantae*

Phyllum: *Tracheophyta*

Class: *Magnoliopsida*

Order: *Lamiales*

Family: *Acanthaceae*

Genus: *Ruellia L.*

Figure 2: Ruellia simplex plant found in AIMST University campus

LITERATURE REVIEW

Operative technique

Ruellia simplex is a perennial plant located in Zones 8 to Zones 11 that is having height up to 3 feet. The stems are green in color and the leaves are dark green. It is oppositely arranged and lanced-shaped, with length approximately 6 inches to 12 inches and width 0.5 inches to 0.75 inches. The veins of the species are prominent on the underside of the leaf. The flowers are purple in color, and of trumpet shaped, which are attractive to insects, such as bees. The size of the flowers is roughly 1 to 2 inches. The capsules are having an explosive dehiscence, while the seeds are spread long distances. They can produce a gel-like substance during wet condition. This characteristic enables them to stick to surfaces when they dry. In addition, the seeds have high germination rates, which can germinate in both light and dark environments [5]. The species is also humidity and drought tolerant.

The species is native to Mexico and South America such as south-eastern Brazil, Bolivia, Argentina, Paraguay and also Uruguay [8]. It is best grown in soils with medium to wet condition, in full sun to partial shade. In fact, the best flowering condition is in full sun [9].

Biological activities of Ruellia Simplex

Ukwubile CA et al (2023) isolated new fatty acid, 2,4-PHPBEa, from the leaf extract of Ruellia simplex, which shown antinociceptive (analgesics), anti-inflammatory, and antidiabetic properties. Animal models induced by acetic acid, carrageenan, and alloxan were employed. With IC50 values of 12.5 g/ml-1.08 g/ml and 10.21 g/ml-1.02 g/ml, respectively, and reduced paw volume in rats with carrageenan-induced paw edoema, respectively, the isolated fatty acid demonstrated pain inhibition by decreasing abdominal writhing, while the antidiabetic activity demonstrated a dose-dependent decrease in blood sugar levels with IC50 values of 6.02 g/ml-0.01 g/ml. According to a study, R. simplex extract included a novel fatty acid that may be useful in the treatment of diabetes, inflammation, and pain [10].

Tejaputri NA et al (2019), studied the anti-cervical cancer activity of Ruellia brittoniana flower. The IC50 values for the R. brittoniana flower extracts of ethanol, ethyl acetate, and n-hexane were found to be 116.55 ppm, 52.62 ppm, and 123.09 ppm, respectively which further confirms that the ethanol extract has a moderate anticancer activity, while ethyl acetate and n-hexane extract have a weak anticancer activity. R. brittoniana flower extracts in ethanol, ethyl acetate, and n-hexane may have potential to become natural anti-cervical cancer [11].

Nadzila Anindya Tejaputri et al (2019), studied the antioxidant activity of the species Ruellia brittoniana. The three extracts phytochemical analyses demonstrated that Ruellia brittoniana contain triterpenes, alkaloids, tannins, glycosides, and flavonoids. The Ruellia brittoniana flower's ethyl acetate extract had the highest level of antioxidant activity, with an IC50 value of 68.42 ppm. Ruellia brittoniana flower ethyl acetate extract have the potential to be the natural source of antioxidants [12].

Rosanna Freyre et al (2015) has carried out breeding and genetic studies of Ruellia simplex (Mexican petunia). Breeding was done by ploidy manipulation and hybridization with the objective to obtain sterile Ruellia cultivars with variety of flower colours and growth habits. The currently commercially accessible first three sterile hybrids are ‘Mayan White’, ‘Mayan Pink’ and ‘Mayan Purple’. These hybrids shown excellent performance in flowering and growth habit. Besides, genetics and anthocyanins responsible for flower color were also investigated in Ruellia simplex. Based on HPLC study, pink corolla colour was caused by pelargonidin derivatives while purple corolla colour was caused by delphinidin derivatives [13].

Elgindi MR et al (2015) investigated about phytochemical and biological studies of Ruellia brittoniana. The result is Ruellia brittoniana consists of 21 components. The main sterol was β-sitosterol (8.51%). GLC analysis of fatty acid methyl esters showed that myristic acid is found to be the main fatty acid (57.25%). On the other hand, arachidonic acid is found to be the least concentration fatty acids (0.35%). Besides, phytochemical study revealed the presence of 5, 2’, 3’trihydroxy 7-O-glucoflavone, 5, 7, 4’trimethoxy 3-O-Rhamnoflavone and 2, 2’,4’, 6’-tetrahydroxy-chalcone in Ruelllia brittoniana. Furthermore, this study dealt with in vitro determination of its antioxidant activity using the stable free radical DPPH. 100 µg/ml of sample of Ruelllia brittoniana gave 4.2% antioxidant activity using positive control and vitamin C with sample concentration 50 value 4.8 µg/m. The study of anti-inflammatory is based on nitrite accumulation used as an indicator of nitrous oxide (NO) production using a microplate assay based on the Griess reaction. Ruellia brittoniana showed anti-inflammatory effect as shown in the amount of NO produced with a level of 6.7 µM/ml leading to 5 % inhibition, in comparison to the potent anti-inflammatory drug Dexamethasone (45% inhibition) [14].

Freyre R et al (2014) conducted a study of breeding Ruellia and trialing for sterility at University of Florida. Among Acanthaceae, Ruellia is one of the largest genera and it is usually found in tropical and subtropical areas. Ruellia was first brought to Florida around 1940, and ever then, it has become a very well-known landscaping plant in the southern United States. This is as a result of its abundant and continuous flowering and low maintenance needs. Since 2007, when "Purple Showers," which has purple flowers and a tall habit, became the only sterile commercial cultivar, the breeding goal at the University of Florida has been to create sterile cultivars with various flower colours and prospective growth behaviours. These sterile cultivars were breed by interspecific hybridizations and ploidy manipulations [15].

Rosanna Freyre et al (2012) investigated about fruitless Ruellia simplex R10-102 (‘Mayan Purple”) and R10-108 (‘Mayan White”). The results of R10-102 and R10-108 had a higher landscape performance rating than ‘Purple Showers’ and ‘Snow White’. For flower rating, R10-108 had a higher rating than ‘Purple Showers’ and R10-102. Both wild R. simplex and ‘Snow White’ had significantly less flowers. Besides, R10-102 and R10-108 were fruitless, had very low pollen viability and were not successful either as female or male parents in the manual hybridizations, confirming their sterility [16].

Cecilia Ezcurra et al (2007) identified Ruellia simplex as an older and overlooked name for Ruellia tweediana and Ruellia coerulea (Acanthaceae). Ruellia simplex has a wide amphitropical distribution in moist to wet, tropical and subtropical regions of Southern United States, Mexico, the Antilles (Cuba, Dominican Republic, Puerto Rico, and Trinidad and Tobago), western Bolivia, southwestern Brazil, Paraguay, Uruguay, and northeastern Argentina. The older name such as Arrhostoxylon microphyllum, Cryphiacanthus angustifolius, Ruellia coerulea, Ruellia malacosperma and Ruellia longipes were reduced to the synonym of Ruellia simplex [17].

M. Farid Akhtar et al. (1992) reviewed the cardiovascular assessment of Ruellia patula and Ruellia Brittoniana. All the fractions of both plants showed an increase in contractile force and a non-significant decrease in heart rate and coronary flow except n-butanolic fraction of R. brittoniana which exhibited depression in all parameters hence concluded as cardiotonic in nature [18].

Ahmad VU et al (1990) isolated of 2-O-α-D-galactopyranosyl glycerol hexaacetate from Ruellia brittoniana. Spectral and x-ray diffraction analysis were used to determine the structure of 2-O-α-D-galactopyranosyl glycerol hexaacetate. 2-O-α-D-galactopyranosyl glycerol hexaacetate was isolated from a natural source for the first time [19].

Robert W. Long (1966) conducted a study about the artificial intersectional hybrid of the tropical species Ruellia brittoniana with Ruellia occidentalis and its taxonomic significance. According to the study, a vigorous but highly sterile F1 hybrids (95-100% non-stainable pollen) was produced with the intersectional hybrid of Mexican species R. brittoniana with Mexican-Texan R. occidentalis. In addition, the taxonomic significance of the intersectional hybrid of R. brittoniana with R. occidentalis was at least three-fold. Extensive breeding studies in Ruellia was apparently needed [20].

CONCLUSION

Ruellia simplex is least explored plant as it has huge therapeutic potential. Presented review highlighted on the morphology and distribution of the plant mainly in south America and Southeast Asia. Ruellia simplex chemical compounds shown to have the anti-inflammatory, antidiabetic, anti-oxidant and anti-cancer potential. Further investigations on various pharmacological activities will be interesting to note as this plant still has lots of potential and till now remain unexplored.

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