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CULTIVATION PRACTICES AND THERAPEUTIC APPLICATIONS OF *HELIOTROPIUM PERUVIANUM L.* IN HOMEOPATHY

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Abstract

Heliotropium peruvianum L. commonly known as "Blue Heliotrope" or "Peruvian Heliotrope," is a species of flowering plant in the Boraginaceae family and is highly valued in homeopathy for its therapeutic properties. This review focuses on the cultivation practices and medicinal uses of *Heliotropium peruvianum* at the Center of Medicinal Plants Research in Homeopathy (CMPRH) and its significance in homeopathy medicine. It has traditionally been used to alleviate inflammation and pain associated with conditions such as arthritis and rheumatism. It may be indicated for certain types of skin conditions characterized by eruptions, itching, and inflammation, such as eczema and dermatitis. The genus Heliotropium contains toxic pyrrolizidine alkaloids, that can be harmful if ingested in large quantities. This review highlights the importance of *Heliotropium peruvianum* L. as a valuable homeopathic drug and provides comprehensive insights into its cultivation and medicinal utilization at the CMPRH Garden. This review contributes to the conservation and utilization of medicinal plants in homeopathic medicine by promoting sustainable cultivation practices and enhancing the awareness of their therapeutic potential.

Keywords: Cultivation practice, Homoeopathic morphology, Medicinal use, Therapeutic properties.

Introduction

The family Boraginaceae comprises100 genera and approximately 2000 species. Under its homotypic synonym, *Heliotropium peruvianum* L., *Heliotropium arborescens*[1,2]. *Heliotropium arborescens* (referred to as *H. peruvianum*) is a species originating from the Andes of Ecuador [3, 4, 5]. In contrast, the name *Heliotropium arborescens var. arborescens* (var. "genuinum")[6]. To a species native to the region surrounding Lima, Peru Heliotropium is a genus of approximately 250 species that is native to Peru and is also grown as an ornamental plant in Indian gardens[7]. Heliotropium is a plant with a permanent woody base, where herbaceous branches are perennial and annual herbs. They are identified by their partial inflorescences of scorpioid cymes and by the morphology of the greatly modified stigmatic head in flower [8]. In addition, the distribution of other species of*Heliophytum indicum* (L.) DC..*Heliotropium africanum* Schumach. & ton, *Heliotropium cordifolium* Moench, *Heliotropium foetidum* Salisb, *Heliotropium horminifolium* Mill., and *Tiaridium indicum* (L.) Lehm. Among the *Heliotropium. Indicum* (L.) DC. It is distributed throughout Bangladesh, Nepal, Sri Lanka, Thailand, India, and other areas of tropical Asia and some parts of Africa[9]. The introduction of *Heliotropium corymbosum* was introduced in 1808 [10, 11,12].

Plant Taxonomy

Kingdom	:	Plantae
Clade	:	Tracheophytes
Clade	:	Angiosperms
Clade	:	Eudicots
Clade	:	Asterids
Order	:	Boraginales
Family	:	Boraginaceae
Genus	:	*Heliotropium*
Species	:	*H. arborescens*

Plant Morphology

The heliotrope is a tender perennial shrub that grows as a summer annual or container plant. In its natural tropical range, it can grow to 2–6 feet tall and 6 – 8 feet wide. It is an herbaceous perennial plant that typically grows up to 1 m in height, and its leaves are simple, alternate, and lanceolate to elliptic in shape, with entire margins flowers being small and tubular with a five-lobed corolla. They are arranged in dense coiled clusters known as

cymes. The flowers are typically in a deep shade of violet or blue, although they can occasionally be white or pink, respectively. After flowering, the plant produces small, dry, nut-like fruits containing seeds. It is strongly fragrant, with a vanilla-like scent. *Heliotropium peruvianum* L., commonly known as "Peruvian heliotrope," has a distinctive plant morphology that appeals to botanists and gardening enthusiasts. This herbaceous perennial exhibits a compact bushy growth habit, making it an ideal choice for ornamental gardens and landscaping projects. The leaves are lanceolate in shape and feature a deep green hue,which adds vibrancy to any garden setting. In addition, the plant produces clusters of fragrant and lavender-colored flowers, further enhancing its visual appeal (Plate 1).

A. *Heliotropium peruvianum* L. - Flowering twigs ; B. Selected Cuttings; C. Cuttings treatment with Aloe vera gel ; D. Cuttings placed in Polybags; E.Main field Photo; F. Fresh raw drugs; G. Dried raw drugs.

Heliotropium arborescens (synonymous with *Heliotropium peruvianum* L. and *Heliotropium corymbosum* Ruiz & Pav.) is the most widely cultivated heliotrope, predominately for its violet to white fragrant floral cymes. Technically, the plant is a shrubthat is typically cultivated annually and available from several seed companies. In the 1950s, the heliotrope was a popular cut flower in the United States due to its fragrance and striking appearance. However, breeding emphasis has focused on larger, more brightly colored flowers, and much of the fragrance has been lost[13]. The common heliotrope remains a relatively obscure floriculture crop, on which little research has been published. An initial attempt to access the volatiles produced by *Heliotropium arborescens* flowers using solid-phase microextraction identified three major compounds (benzaldehyde, benzyl acetate, and *p*-anisaldehyde) [14].

Biologically active volatile compounds, such as fragrances and pheromones, originate from myrid sources and exert diverse effects on living organisms [15]. Some act as semiochemicals, functioning in communication and interaction within or among organisms [16]. Plants are a significant source of volatiles [17]. Volatile compounds have critical biological roles; for example, specific floral volatiles act as synomones, attracting pollinators, kairomones, or allomones [17]. This interaction often involves a mixture of compounds in relatively specific proportions, and the relationships among organisms can be relatively complex. In some instances, the three trophic levels may respond to air-borne chemical information. For example, Nicotiana attenuata Torr. ex Wats plants under attack by several herbivores release volatile phytochemicals that attract natural predators of insects, significantly reducing (up to 90%) the herbivore population. Floral volatiles are also key tothe enjoyment of certain species (e.g.,*Gardenia jasminoides* Ellis) [18].

Becauseof the importance of the fragrance of *Heliotropium arborescens* and the potential for breeding new cultivars with improved aroma, we isolated and identified the major volatile compounds emanating from the flowers as a preliminary inquiry.

Agro techniques

Heliotropium peruvianum L., grown in the CMPRH Herbal Garden for its significant homeopathic medicinal applications, possesses numerous therapeutic properties. This plant is cultivated with nutrient-rich organic manure and Good Agricultural Practices (GAP) to ensure successful mass production.

Soil

Heliotropium peruvianum L. Thrives in well-drained, sandy loam soils with a PH ranging from 6.0 7.5. It is most diverse in moderately dry to arid regions of warm-temperate to tropical latitudes, although some species occur in moist, evenly, or seasonally wet habitats [19, 20].

Climate

The plant prefers warm climates with ample sunlight, which supports robust growth and flowering. The cultivar Marine is day neutral, with flower initiation advanced by exposure to cool temperatures (i.e., 10 °C) before forcing[21].

Propagation

Heliotropium peruvianum, propagated usingsemi-hard wood cuttings, is an effective method of propagation in the Herbal Garden. In *Heliotropium europaeum* L. In rotation crop systems, the fallow year provides a condition in which the population of this plant increases at a high rate because it has a massive seeding potential, and the seeds are viable for many years in the soil seed bank. Seeds germinate underwarm, moist conditions after late spring or early summer [22]. *H. indicum* seeds are produced for a long period, and the flowers continue to produce new seeds,whereas mature seeds are still falling[23].

Manure application

For stem cuttings, a manure mixture of red soil, coco peat, Farm Yard Manure and Neem cake as the required quantity and poly-bag inserted cuttings were kept in a shade net house for better rooting and sprouting. Then, 45 days after the rooted seedlings were transferredto the main field. An advantage of phosphate-solubilizing microorganisms is their propagation rate,which can remove the plant requirements for phosphorus in the root region[24, 25]. Application of bio-fertilizers Azospirillum and Azotobacter in the medicinal plant *Salvia officinalis* was reported to increase plant height and shoot dry and wet weights [26].

Pest and disease control

Heliotropium peruvianum L., where resistance to pests and diseasesmainly damagestheleaf-eating caterpillar, root grub, and sucking pests, is damaging this plant, and damping off is a major problem in the seedling stage. The black cutworm Agrotisipsilon (Hufn.) attacks plants at the ground level and feedson tender seedlings and cut plants [27]. The

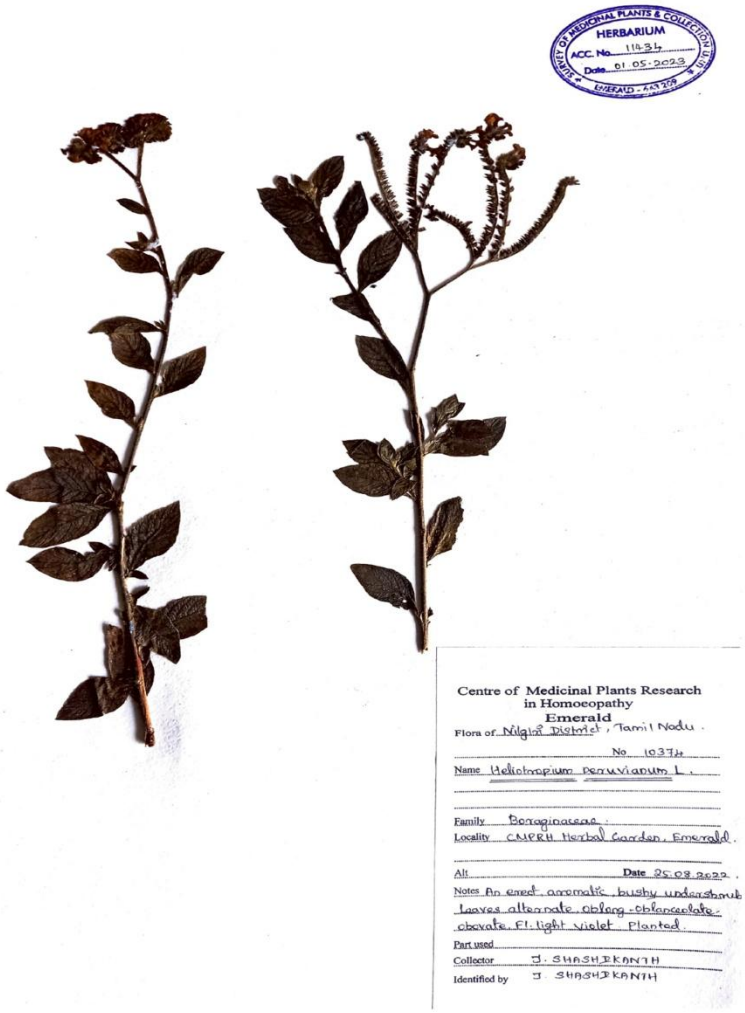
components undergo deep plowing in summer to expose the larvae and pupae to damagethe worms. To introduce predators, 1-2 light traps per hectare or 20 pheromone traps per hectare were used to trap the moths and drenchthe collar region of the plants in the evening hours with chlorpyriphos (20 EC) solution at 2 ml per lit of water to kill larvae. In Indian ginseng, pests can be effectively controlled by integrating hand picking of larvae, poison baiting to lure and then killing them, and spraying with 5% neem seed kernel extract (NSKE) at 500 lit of water per hectare [28]. Listed several botanical pesticides and reported that they were highly effective and safe fornatural enemies and suggested the use of Neem, Nicotine, Tobacco, Sabadilla, and rotenone in pest control [29].

Materials and methods

The Nilgiri District, located in the northwestern region of Tamil Nadu, is part of the Western Ghats' mountain range. It lies between the coordinates 11°12' to 11°43' North latitude and 76°14' to 77°1' East longitude. This region is celebrated for its diverse plant lives, many of which have medicinal and economic value. Impressively, this district accounts for 60% of India's homeopathic medicinal plant resources.

The Herbal Farm and the CMPRH office are situated Southwest of Udhagamandalam, in the Emerald region, near the western edge of the Avalanche Reservoir Forest. The location spans latitudes 11°18' to 11°41' north and longitudes 76°37' to 76°49' east, with an elevation ranging from 1,970 m near the office to 2,028 m above sea level, showing a total altitude difference of 58 m. The soil in this area varies in composition and appearance, ranging from brown clay loam to black loam, with a pH level between 4 and 5.

Collected plant specimens were pressed, poisoned, and mounted on herbarium sheets. Herbarium specimens were prepared using a standard methodology[30].(Plate: 2). Plant species were identified using Floras [31-38]. Homeopathic uses of Materia Medica [39-47]. The classification and names of plants were checked using The Plant List database [48]. The herbarium sheets of this plant have been deposited in the Centre of Medicinal Plants Research in Homeopathy (CMPRH) herbarium at Emerald Acronym SMPRGH, The Nilgiri District, Tamil Nadu, under CCRH, Ministry of AYUSH [49].



***Heliotropium peruvianum* L. -**
Herbarium Specimen

Heliotropium Medicinal Importance

The aerial parts were used for the preparation of homeopathic medicines. The young aerial parts are used in sore throat, uterine displacement with an active bearing-down sensation and dysmenorrhoea [50]. It is also used for pain in the forehead, feeling of tension in the left inner canthus, pressure in the pit of the stomach, pressure and oppression of the external parts of the chest, and pain in the outer portion of the leg above the ankle[51]. The homeopathic authority is given in archiv. f. Hom, 19, pt. 1 p. 188. This is also mentioned in the Homeopathic Pharmacopoeia of the United States[52]. Chemically, it contains heliotropin, vanillin, cynoglossin, heliotrine, benzaldehyde, benzyl acetate, p-anisaldehyde, lithospermic acid, lithospermic acid B and caffeic acid[53, 54]. Pyrrolizidine alkaloids, viz., heliotrine, present in the plant, are reported to possess hepatotoxic effects in humans and are also responsible for causing “Gulran disease,” an epidemic in Afghanistan[55].

Result and Discussion

The potential of *Heliotropium peruvianum*to serve as both an ornamental plant and a valuable medicinal resource highlights its dual-purpose utility. Its fragrant flowers, historically prized in floriculture, provide opportunities for commercial cultivation aimed at enhancing aromatic properties through selective breeding programs. Integrating modern horticultural advancements with traditional knowledge could revitalize the interest in this species and expand its applications beyond homeopathy. Furthermore, the toxicological aspects associated with pyrrolizidine alkaloids necessitate the developmentof safer extraction and processing methods to minimize health risks. Regulatory frameworks for medicinal plant use should be reinforced by scientific studies that establish clear guidelines for dosage, preparation, and long-term effects. Public education initiatives can also play a crucial role in promoting awareness of the safe handling and consumption of plants containing toxic compounds.

From an ecological perspective, the cultivation of H. peruvianum using organic and eco-friendly practices contributes to sustainable agriculture and biodiversity conservation. The adoption of Good Agricultural Practices (GAP) and natural pest control methods aligns with global efforts to reduce chemical pesticide dependence, thereby supporting environmental health.

Conclusion

In conclusion, *Heliotropium peruvianum* L. exemplifies the rich intersection between botany, medicine, and sustainability. By leveraging its therapeutic benefits, while addressing safety and cultivation challenges, this plant can continue to make significant contributions to homeopathic medicine and the broader agricultural sector. Future interdisciplinary collaborations between botanists, pharmacologists, and agricultural scientists will be key to unlocking its full potential, ensuring that it remains a sustainable and beneficial resource for future generations.

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