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EULOPHIA HERBACEA USED FOR HEALTH BENEFITS. (ORCHIDACEAE) AMARKAND

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ABSTRACT

In India, the term "Amarkand" is commonly used for around 30 different plant species belonging to genus Eulophia (Orchidaceae). This single local name Amarkand to different taxonomical species creates uncertainty about its ethnomedical and nutritional claims. In the present article, we have reviewed available literature regarding ethnopharmacology, phytochemistry, taxonomy, nutritional, and pharmacological studies of different Amarkand species. The literature was searched using Google Scholar, PubMed, Scopus, and Web of Science databases. Some textbooks and reference books were also used to collect information about traditional and ethno pharmacological records. Amarkand species have been used as a remedy for the treatment of various diseases such as diarrhea, stomach pain, rheumatoid arthritis, cancer, asthma, bronchitis, sexual impotency, tuberculosis, and so on. Nutritionally, Amarkand is considered as an excellent food for children and convalescents. Recent studies confirm antioxidant, anti-inflammatory, anti-diarrheal, and so forth activities to Amarkand species. These species are reported to possess various phytoconstituents such as flavonoids, terpenoids, and penetrance derivatives. The present review will help to understand overall ethnopharmacology, nutritional aspects, and taxonomy of Amarkand species.

Keywords - Amarkand, ethnobotanical uses, pharmacology, phytochemistry.

1. INTRODUCTION

Traditional medicines with therapeutic utility have been used since antiquity and are still contributing a significant role in the primary health-care system. It is estimated that 70-80% of the world's population relies on traditional herbal medicines for their primary health care [1]. Parallel to traditional medicines, several ethnobotanical medicinal plants have also been validated for their therapeutic efficacy with the help of modern scientific tests. Some of these ethnobotanical plants are receiving merits as both food and medicine [2], and Amarkand is one of the best examples of this.

The word S Is composed of two different words "Amar" means immortal and "kand" stands for tubers. The word Amarkand is commonly used for 30 closely related plant species from genus Eulophia (Orchidaceae) and for one species from the genus Dioscorea (Dioscorea bulbifera, family: Dioscorea). Since ancient times, Amarkand is believed to be an excellent health-promoting agent. Rhizomes/tubers of Amarkand are routinely consumed by the tribal parts of India as food as well as a therapeutic entity for better health and longevity [2-3]. In Ayurvedic medicine, Amarkand is generally prescribed as expectorant, anabolic, tonic, diuretic, astringent, digestive, and soft purgative [4]. Moreover, the usefulness of these species for the treatment of ear discharge, blood clotting, joint edema, and debility has also been highlighted in some ancient texts [4]. However, this single local name, Amarkand to different taxonomical species creates confusion about its ethnomedical and nutritional claims. In the present article, we have reviewed the available literature regarding ancient therapeutic claims and recent chemical and pharmacological studies about Indian Eulophia species so as to link their ethnobotanical applications with recent scientific advances.

Distribution

Genus Eulophia is highly diverse, occurs in a wide range of habitats, and belongs to family Orchidaceae. This plant produces two shacks, reproductive and vegetative, firm their underground tuners. The genus Eulophia has a wide distribution and comprises aver 230 species, which are widespread from tropical and Southern Africa, Madagascar and from nootropics to throughout tropical and subtropical parts of Asia and Australia. Among these, one species occurs in tropical America. In India, this genus is particularly distributed in tropical Himalaya and Deccan peninsula region. There are altuent 723 records under Eulophia in Interactional Plant Name Index. However, 500 arm synonym and many of them are ornamental [5]Web of Science and Scopus pus showed about 247 and d5f documents, respectively, under the keyword "Eulophia" till October 2015.

Amend 25 species are recorded from all over India, out of these, 20 species have medicinal importance. The medicinal properties of these species are documented in Table 1 [6-10]Eulophia species are used for several therapeutic passages

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in different parts of Irudia [11], Amarkand is the most prevailing name to all Eulophia species in India, however, these species are also known by several vernacular names ach as Balakımıd, Manakamad Mumpatak, Amrite (Sanskrit), Amarkand. Salem (1 lindi), Andhra (Bengali), Solar (Galati), Amarkand, and Silliman (Marathi)

2. MORPHOLOGY

The Species under genus Eulophia are terrestrial herbs, autotrophic, or rarely heteromorphic [Figure La]. Parenting organs may be pseudo bulbs or tuber like. These pseudo bulbs are subterranean or born above ground, corm like, tuberous or rhizomatous, usually with several nodes and slender or thick fibrous roots at the base. Eulophia develops a chain of underground tubers [Figure 1b1. Leaves appear at or after an thesis, which are thin but tough, narrow, and grass like or lanceolate and plicate and are one to many, basal and having petiole-like leaf base, sometimes overlapping and forming a pseudo stem. Some species lack green leaves and are saprophytic. The inflorescence is erect, lateral, racemase or rarely pediculate, laxly to sub-densely many flowered or occasionally reduced to a solitary flower. Eulophia species are mostly identified by their flowers. Two types of flowers occur within Eulophia. In the first type, the sepals and petals are similar in size, shape, and color while in the other, sepals are smaller than petals and often recurved. In both types, the lip extends into a spur which can be very diverse in shape [12.16].



ANATOMICAL STUDIES :-

There are Intragenic classification of Eulophia R. Br. Ex Lindl. Was carried out based on methods of taxonomy, particularly the examination of generative and vegetative characters, followed by their comparison based on the data obtained from molecular studies and scanning electron microscopy [6]. Study on Eulophia Andamanese's Rich. F. found that 0.1% colchicine is effective to induce mutations to increase flower size [17]. E. gamine Lindl, was also studied for its unique storage structure of the rhizome, brief juvenile stage, in vitro flowering and automatous mating system, which explains its strong colonization ability [18]. An anatomical study has been carried out on Eulophia alta to investigate the pollination biology, breeding system, nectar production, and floral scent composition of the plant. This study clearly showed that flowers of E. alta were self-compatible, partially automatous and effectively pollinated by five bee species. The nectar sugar content was reported to be highest on the third day after flower opening. Floral fragrance analyzes revealed 42 compounds, of which monoterpenes and benzoids are predominant [19]. Studies on symbiotic and symbiotic seed germination of the same plant revealed that the symbiotic seed culture is a more efficient way of propagation [20]. An optimized method was devised for asymbiotic in vitro seed germination, seedling development, and field establishment of Eulophia nude[22.25], a similar study was carried out with E culling [27].

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Nutritional Studies

analysis of Eulophia herbacea Lindl. tubers				
Parameters	Composition*			
Physicochemical analysis				
Moisture	$8.3 \pm 0.152 \%$			
Total ash	$7.6 \pm 0.208 \%$			
Phytochemical analysis				
Phenolics	$12.60 \pm 0.028 \ \mu g$ equivalent gallic acid			
Flavonoids	$7.746 \pm 0.023 \ \mu g$ equivalent rutin			
Proanthocynidin	$2.1 \pm 0.002 \ \mu g$ equivalent catechin			
Saponin	3.5 ± 0.011			
Nutritional analysis				
Protein	5.23 ± 0.012 %			
Fat	$1.53 \pm 0.250 \%$			
Fibre	31.5 ± 1.322 %			
Carbohydrate	$43.42 \pm 0.004 \%$			
Reducing sugar	$1.467 \pm 0.001 \ \%$			
Glucomannan	51.82 ±0.123 %			
Calorific value	2747 Kcal/kg			
Vitamin C	2.84 µg/mL			
Vitamin B6	0.22 µg/mL			

Table 2 — Minerals and heavy metal composition of <i>Eulophia</i> herbacea Lindl. tubers			
Parameters	Results (Unit)		
Calcium (Ca)	1.71 %		
Magnesium (Mg)	2.48 %		
Iron (Fe)	164 mg/kg		
Sodium (Na)	3.42 %		
Potassium (K)	2.48 %		
Arsenic(As)	N.D		
Cadmium(Cd)	0.85 mg/kg		
Lead (Pb)	2.5 mg/kg		

PHYTOCHEMISTRY

The Medicinal plants produce thousands of patho-physiologically active principles that have been exploited over the years in the treatment of various ailments [29]. The qualitative and quantitative estimation of the phytochemical constituents of the medicinal plant is considered to be an important step in the herbal drug standardization [30].

Metabolic extracts of tubers of E. epidendrea (JKoen) Schltr. Showed the presence of several classes of phytochemicals such as flavonoids, reducing sugars, cyanogenic glycosides terpenoids, and tannins [31]. Thin-layer chromatography (TLC) studies of the isolated fractions from leaves and tubers indicated the presence of flavonoids, sterols, and terpenoids [Table 3] [571]

Bhandari et al. [32] have detected the presence of phenanthrene nodal (2, 7- dihydroxy-3, 4-dimethoxyphenanthrene) in the fresh tubers of E. node Lindl. In the subsequent study, another six phenanthrene derivatives were also isolated from the same plant tubers [Table 2] [24]. Among these derivatives, the therapeutic potential was largely attributed to 9, 10-dihydro-2, 5- dimethoxyphenanthrene-1, 7-diol. Kshirsagar er al. [33] validated the ethnobotanical rejuvenating claim of E. orchestra Lindl. By studying its antioxidant activity. Two radical scavenging molecules were isolated from dichloromethane and ethyl acetate extracts of tubers of E. orchestra Lindl.

TRADITIONAL AND ETHNOBOTANICAL USES

In Ayurvedic medicine, Amarkand is generally prescribed as expectorant, anabolic, tonic, diuretic, astringent, digestive, and soft purgative, and also recommended for the treatment of ear discharge, blood clotting, joint edema, and debility [5]. In addition, it is also considered as a general tonic to promote strength and alleviates all the three "doshas" [34]. These are also used in stomatitis, purulent cough; and in the heart problems, dyscrasia, and scrofulous diseases of the neck; bronchitis, blood diseases, and as a vermifuge [35].

Different Eulophia species have been extensively used in the traditional system of medicines in many countries [36,37]. In India, several ethnopharmacological uses/application have been reported for different species of Eulophia in different parts of the country.

RECENT PHARMACOLOGICAL STUDIES

Pharmacology is the science of drug action on biological systems. Pharmacological characters can provide a better understanding of active principles in plants and their mode of action. Pharmacological trials are needed to investigate the unexploited potential of plants.

Tubers of E. campestris Wall. Are well known for its binding properties [23]. Ghule et al. [38] pointed out that large quantity of mucilage from tubers of this plant is used as binding agent in tablet formulation. This mucilage produces a

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sticky film of hydration on the surface of prepared tablets, which ultimately reduces drug release rate. Thick jelly of this mucilage is also reported to be highly nutritious [39]. Glycation inhibitory activity of sales (E. campestris Wall.) extract was assessed by trichloroacetic acid treatment. In this study, the formation of glycated products/AGEs was decreased at the highest concentration of salep, i.c., at 25 mg/ml [10]. Mucilage isolated from tubers of E. herbacea Lindl. Has a potential as a suspending agent. It has a low rate of sedimentation, high viscosity, weak acidic pH and is easily redispersible. Thus, it can also be used as pharmaceutical adjuvant [40].

Methanol extract of tubers of E. epidendrea (JKoen) Schltr could significantly inhibit castor oil-induced diarrhea in rats, which was assessed by reduction in the frequency of defecation and the wetness of the fecal droppings compared to untreated control rats. The extract also significantly inhibited intestinal fluid accumulation (enteropooling). In addition, the extract appears to act on all parts of the intestine. Thus, it inhibited the propulsive movement of the intestinal contents in the charcoal meal treated model. These finding suggested that the methanol extract of the tubers of E. epidendrea (JKoen) Schltr may have an anti- diarrheal effect. This study validates the use of this plant as a non-specific anti-Diarrheal agent in folk medicine [41].

The crude drug in the powder form prepared from tubers of E. nude Lindl. Has aphrodisiac potential [42]. Phenanthrene compounds, such as 1- phenanthrene carboxylic acid, 1, 2, 3, 4, 4a, 9, 10, 10a-octahydro-1, 4a-dimethyl-. Methyl ester, were isolated from Eulophia herbacea were found to have anticancer potential [43]. Pure compounds such as phenanthrene derivative, 9, 10-dihydro-2, 5-dimethoxyphenanthrene-1, 7-diol isolated from fresh tubers of E. nude Lindl. Showed good anti-proliferative activity against human breast cancer cell lines MCF-7 and MDA-MB-231 at concentration of 1000 μ g/ml [44] The same compound was isolated from tubers of E. ochreata Lindl. In the pure form and was analyzed for its anti-inflammatory activity using cell line and carrageenan-induced rat paw edema model. The compound inhibited the release of several pro-inflammatory mediators, particularly cytokines and could be a promising anti-inflammatory agent [45].

Similarly, anti-inflammatory and antioxidant activities were attributed to the methanolic extract of tubers of E. ochreata Lindl [25]. Moreover, different solvent extracts of this tuber were found to have potent antibacterial activity against Bacillus subtilis, Staphylococcus Aureus, and Escherichia coli [46]- Tubers are also reported to have promising antioxidant, antiglycation, and alpha- amylase inhibitory activity and may have potential in the treatment and management of the Type II diabetes [47]. Recently, we have studied seven Amarkand species for its phytochemical profile, polyphenolic content, and free radical scavenging activity and found that D. bulbifera and E. ochreata had the highest antioxidant potential [46.48]. Similarly, tubers of E. ochreata and bulbils of D. bulbifera have shown a high antifatigue potential among different Amarkand species [48]. Among different Eulophia species. E, ochreata has the highest score for biological activities [34].

3. CONCLUSION

The conclusions for Eulophia herbacea include :-

- 1. Antioxidant potential :- Eulophia herbacea is a rich source of secondary metabolites, including flavonoids and phenols, and has strong antioxidant potential.
- 2. Antimicrobial and anthelmintic activity :-Eulophia herbacea can be a safe and alternative remedy for treating bacterial, fungal, and helminthic infections.
- 3. Phytochemical synthesis of silver nanoparticles The tuber extract of Eulophia herbacea can be used to synthesize silver nanoparticles that have antibacterial and antifungal activity.
- 4. Traditional medicinal plant :- Eulophia herbacea is a traditional medicinal plant that is used by tribes to treat a variety of diseases.

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