



Vol. 5 Issue No. 3, July-September 2023

e-ISSN 2456-7701

Journal of Science and Technological Researches

A Peer Reviewed Journal

Origin of Innovation

Domain: www.jstr.org.in, Email: editor@jstr.org.in

COMPREHENSIVE REVIEW ON THE NUTRACEUTICAL POTENTIAL EFFECT OF AMARKAND TUBER (EULOPHIA ORCHIDACEAE)

Chandrakanta Mourya* and Usha Kahol

Food Science and Quality Control Department Institute for Excellence in Higher Education, Bhopal, India

Email: mouryacm@gmail.com



Date of Received

29 August, 2023



Date of Revised

22, September 2023



Date of Acceptance

28 September, 2023



Date of Publication

30 September, 2023

DOI Link : <https://doi.org/10.51514/JSTR.5.3.2023.14-20>



JSTR

"together we can and we will make a difference"

I-3 Vikas Nagar, Housing Board Colony, Berasia Road, Karond Bhopal-462038

Domain: www.jstr.org.in, Email: editor@jstr.org.in, Contact: 09713990647

© JSTR All rights reserved

COMPREHENSIVE REVIEW ON THE NUTRACEUTICAL POTENTIAL EFFECT OF AMARKAND TUBER (EULOPHIA ORCHIDACEAE)

Chandrakanta Mourya* and Usha Kahol

Food Science and Quality Control Department Institute for Excellence in Higher Education, Bhopal, India

Email: mouryacm@gmail.com

ABSTRACT

In this review, the article was carried out on extracts of *Eulophia nuda* for the Nutraceutical potential effect of Amarkand tuber. The authors reviewed the available literature regarding ethnopharmacology, phytochemistry, taxonomy, nutritional, and pharmacological studies of different Amarkand species. Proximate investigation and analysis of composition of mineral studies of tubers are also documented from India. Tubers of these plants are prosperous and rich of all nutrients such as antioxidant phenols, free sugars, starch, proteins, and oils are too a very good source of about all nutritive elements. The present review will help to understand the overall nutritional aspects and taxonomy of Amarkand species.

Keywords: *Amarkand tuber, nutritional, pharmacological, nutritional aspects and nutritive elements etc.*

INTRODUCTION

Amarkand is a collection of remedial and therapeutic plants, tubers of this plant are frequently used by the tribal community in India as a food and medicine as well. This word 'Amarkand' is generally applied for 30 species of plant *Eulophia* (Family-Orchidaceae) and *Dioscorea bulbifera* (Family-Dioscoreaceae) [1].

Amarkand is the utmost leading name to all *Eulophia* species in India, though, these species are too identified by numerous local names such as Balakand, Munjatak, Manakand, (Sanskrit), Ambarkand, Salam (Hindi), Amarkand, and Salibmisri (Marathi), Budbar (Bengali), Salab (Gujrati). Amarkand is poised of 2 words "Amar" which means eternal and "kand" means rhizome or tubers. It is generally used for around 30 closely correlated plant species from genus *Eulophia* which is extremely diverse, that occurs in a varied ranges of habitats, and goes to family Orchidaceae, which produces reproductive and vegetative shoots from their tubers [2-3]. The family Orchidaceae is the largest family amongst monocotyledons, to which orchid belongs which encompasses nearly 600 - 800 species. The genus *Eulophia* is earthly or terrestrial plant with nearly round virtual bulbs enclosed by a few cover, carrying 3- 4 lanceolate, plicate, acuminate,

long plicate, long grooved stalks having a number of leaf like bracts. The plant blossoms in springs with tall dense and heavy stalk [4-5].

Amongst the derived species of this genus, about 28 species are documented from all over India mainly distributed in the tropical Himalaya and Deccan peninsula area, of which 20 species have medicinal properties like cardio protective, hepato-protective, analgesic, antipyretic, immunomodulatory, nervine tonic, antidote, antiepileptic, nephroprotective, aphrodisiac, anti-fatigue, anti-fertility, vermifuge, health tonic, stomatitis, anti-malarial, relieving paralysis, and anticancer [6-8].

In this review article, author reviewed the Nutraceutical potential effect of Amarkand tuber literature regarding Phytochemistry, Nutraceutical properties, and Nutrition Studies about Indian *Eulophia* species.

The Composition of Amarkand Phytochemistry

This only name, Amarkand is used for various taxonomical species, which even generates confusion about its ethno-medical and nutritional properties. These species are testified to have numerous phyto-constituents such as terpenoids, phenanthrene, and flavonoids derivatives. Phytochemical testing

discovered the presence of phytochemical elements like steroids, alkaloids, tannins, flavonoids, glycosides and saponins and carbohydrates in three types of extracts from tuber which is arranged by using the solvents like acetone, ethanol and chloroform).

List of organically active complexes separated from *Eulophia* species are as follows [9-10]:

Table 1:

S.No.	<i>Eulophia</i> Species	Plant part
1	<i>Eulophia epidendrea</i>	Leaves, Tuber fractions
2	<i>Eulophia nuda</i> Lindl	Fresh tubers
3	<i>Eulophia ochreata</i> Lindl	Fresh tubers

Bhandari *et al.* [11] have marked the existence of phenanthrenudol (2, 7-dihydroxy-3, 4-dimethoxyphenanthrene) in the juvenile tubers of *E. nuda* Lindl. In some other significant researches, products of an additional 6 phenanthrene were too separated from the similar tubers of the plant. Amongst these derivative, beneficial and healing efficiency was mainly endorsed to 9, 10-dihydro-2, 5-dimethoxyphenanthrene-1, 7-diol. Kshirsagar *et al.* [12] authenticated the ethno-medicinal revitalizing assertion of *E. ochreata* Lindl. by its antioxidant property.

Nutraceutical properties of Amarkand

Traditionally, medications with their therapeutic value have been used from the ancient times and are statically participating as a significant part in providing the major health care system and it is also expected that the 70-80% of the population of world trusts on these herbal and natural medicines. These herbal medicines are natural plant derived ingredient like berries, seeds, roots, leaves, tubers or barks, flowers with negligible or no industrial processing, these medicines are also using a plant is referred to as botanical or phyto-medicine for their medicinal purposes.

Equivalent to herbal medicines, numbers of ethnobotanical therapeutic (medicinal) plants have

also been authenticated for their therapeutic effectiveness with the help of modernized technical tests. Tubers of Amarkand are broadly consumed by most of the Indian tribal community as a resource of food and particularly as medicine. It is one of the supreme examples of nutraceutical food as it possesses the properties of medicine as well as food.

From the prehistoric period, *Amarkand* is supposed to be a brilliant health supporting agent. Tubers or rhizomes of *Amarkand* are regularly used by the tribal community of India as a food, because of its therapeutic and healing properties for the better health. In Ayurved, Amarkand is usually approved and prescribed as anabolic, expectorant, tonic, astringent, diuretic, purgative, and digestive. Furthermore, the value and usefulness of these species are effective for the healing of blood clotting, ear discharge and joint edema has also been emphasized in some ancient manuscript [13-14].

The biological activity of *Eulophia nuda* tuber extracts as hepatoprotective antibacterial and antifungal agents that could be utilized for the creation of effective formulations has been established. IR and NMR studies can be used to determine the structural elucidation of components that have been isolated from the extracts of *Eulophia nuda*.

Amarkand is also considered as a universal stimulant as tonic to encourage strength and alleviates all the three “doshas” [22]. So, these are also prescribed for the treatment of purulent cough, stomatitis, and also used for the treatment in the dyscrasia, heart problems, scrofulous diseases of the neck, blood diseases, bronchitis and also used as a vermifuge [28].

Many countries' traditional or customary medical systems make extensive use of various *Eulophia* species [29-30]. Table 2 lists the several ethnopharmacological applications for various species of *Eulophia* that have been described in India's various regions;

Table 2: Ethnobotanical uses of *Eulophia* species

S. No.	Botanical names	Part utilized	Form of drug	Uses
1	<i>Eulophia campestris</i> Wall	Tubers	Fresh Juice	Gastro-intestinal disorders such as diarrhea, dysentery, stomach pain, laxative, taken as an appetizer [23]
		Rhizome	Not mentioned	As atonic, stomach problem, as an aphrodisiac and for cough and cold [17]
		Tubers	Mucilage	Worm infestation and scrofula [18]
2	<i>Eulophia dabia</i> (D.Don) Hochr	Tubers	Not mentioned	Cough and cold [17]
3	<i>Eulophia epidendrea</i> (J Koen) Schltr.	Tubers	Paste	Applied externally on boils and on breast of feeding mother to control pain due to milk clotting [25]
		Tubers	Not mentioned	To treat tumor and Diarrhea [26]
		Tubers	Not mentioned	As an appetizer, anthelmintic, aphrodisiac, stomachic, alterative, worm infestation, commonly, give it to stimulate appetite and to purify blood in heart troubles [27]
4	<i>Eulophia graminea</i> Lindl.	Tubers	Extract	To treat ear problems as an ear drop [28]
5	<i>Eulophia herbacea</i> Lindl.	Tubers	Extract	To reduce liver swelling [29]
		Tubers	Roasted	To increase sperm count
		Tubers	Crushed tubers fried in Mustered oil	Applied externally for rheumatism [30]
		Tubers	Not mentioned	Belly-ach [31]
		Tubers	Paste	To treat pimples [32]
		Seeds	Power	Weakness [33]
6	<i>Eulophia nuda</i> Lindl.	Tubers	Extract	Worm infestation and scrofula [18]
		Tubers	Not mentioned	To treat skin rash, acidity, piles, anorexia, and stomach complaints [34]
		Tubers	Raw tubers	Rheumatoid arthritis [35]
		Tubers	Extract	Anticancer, antiasthmatic, and antibronchitics activity [36]
		Whole plant	Paste	Applied externally for boils and abscesses [22]
		Root	Root juice	To treat snakebite [30]
		Tubers	Extract	Anti-inflammatory activity [15]
		Tubers	Whole tuber	Abdominal pain due to non-menstruation, Spermatorrhea, Leukorrhoea [37]
7	<i>Eulophia ochreatea</i> Lindl.	Tubers	Salep	Treatment of sexual impotency and male sterility [22, 32]
		Tubers	Paste	Asthma and acute bronchitis [39,40]
		Tubers	Powder	To increase the stamina for physical activities [13]
		Tubers	Tonic	For restoring general health strength and vigor [20]
		Tubers	Decoction	Antinode in snakebite and to cure leukemia [35]
8	<i>Eulophia pratensis</i> Lindl.	Tubers	Paste	Applied externally and given internally to remove scrofulous gland in the neck [22]
9	<i>Eulophia ramentacea</i> Lindl. Ex. Wight	Tubers	Not mentioned	Impotency related problems [41]

Nutrition Studies of Amarkand

The nutraceutical qualities of several *Eulophia* species have been investigated. [42]. Rhizomes of *E. ochreatea* Lindl were found to have low levels of anti-

nutrients such as phytates and trypsin inhibitors, and near ground level values of all free carbohydrates, according to studies on the equilibrium between nutrients and anti-nutrients of various species [43].

These rhizomes are an excellent source of proteins, dietary fiber, and carbs, according to the nearby composition and mineral components [44].

There are other published case studies from India involving close examination and composition analysis of minerals found in tubers. These plants' prolific tubers are full of nutrients, including free sugars, carbohydrates, proteins, lipids, and antioxidant phenols. They are also an excellent source of nearly all other nutrients. Atomic absorption spectroscopy and flame photometer were used to assess the basic structure of some plants that were exposed to micronutrients, but zinc and iron were identified in large amounts. The nutritional values of the rhizomes of *E. ochreatea* Lindl. (Amarkand) were calculated by Jagtap et al. [21] using data on total protein and fat content, reducing sugars, total carbohydrates, and vitamin C. It was found that the rhizomes contain all of the nutritional elements in modest amounts, with the exception of the highest amount of lipids (9 mg/g) among all the plants in the study. Additionally, studies revealed that these rhizomes can be beneficial and nutritious additions to the diets of India's rural and impoverished populations [45].

Recent Pharmacological Studies

The study of how drugs interact with biological systems is known as pharmacology. An enhanced comprehension of the active ingredients in plants and their method of action is possible because to their pharmacological characteristics. In order to investigate the untapped potential of plants, pharmacological studies are required.

Because of their ability to bond, *E. campestris* Wall. rhizomes are easily recognized [19]. Ghule et al. [46] noted that a significant quantity of mucilage from this plant's tubers is utilized as a binding agent for making tablets. The thick jelly of this mucilage is also said to be incredibly nutritious [47]. It creates a sticky and slurry film of hydration on the surface of prepared tablets, which eventually lowers the release rate of the medicine.

By treating the salep (*E. campestris* Wall.) extract with trichloroacetic acid, the glycation inhibitory action of the extract was assessed. In this investigation, the generation of glycated products/AGEs was reduced at the highest concentration of salep, which is 25 mg/ml [16]. One

possible use for the mucilage that was separated from *E. herbacea* Lindl. tubers are as a suspending agent. Its weakly acidic pH, low rate of sedimentation, high rate of viscosity, and ease of re-dispersibility are all present. As such, it is also suitable for use as a pharmacological adjuvant [47].

Rats with castor oil-induced diarrhea were shown to be considerably less likely to defecate and to have wet feces when compared to untreated control rats when methanol extract of *E. epidendrea* (JKoen) Schltr tubers was administered. Additionally, the extract dramatically reduced enteropooling, the buildup of intestinal fluid. Furthermore, it seems that the extract affects every section of the gut. As a result, in the model fed charcoal meal, it prevented the intestinal contents from moving propulsively. These results suggested that the *E. epidendrea* (JKoen) Schltr tubers' methanol extract might have anti-diarrheal properties. The use of this plant in folk medicine as a general anti-diarrhea agent is supported by this investigation [48].

Aphrodisiac properties may be present in the crude medication in powder form that is made from *E. nuda* Lindl. tubers [49]. It was shown that phenanthrene compounds isolated from *Eulophia herbacea*, such as 1-phenanthrenecarboxylic acid, 1, 2, 3, 4, 4a, 9, 10, 10a-octahydro-1, and 4a-dimethyl-methyl ester, had anticancer potential [50]. At 1000 µg/ml, pure chemicals extracted from fresh tubers of *E. nuda* Lindl., such as phenanthrene derivative, 9, 10-dihydro-2, 5-dimethoxyphenanthrene-1, and 7-diol, shown strong anti-proliferative activity against human breast cancer cell lines MCF-7 and MDA-MB-231 [34]. The same chemical was purified from *E. ochreatea* Lindl. tubers and tested for anti-inflammatory properties in rat paw edema models induced by carrageenan and cell lines. The substance may have potential as an anti-inflammatory agent because it prevented the release of various pro-inflammatory mediators, namely cytokines [51].

Similarly, the methanolic extract of *E. ochreatea* Lindl's tubers was reported to have antioxidant and anti-inflammatory properties [20]. Furthermore, it was discovered that several solvent extracts of this tuber had strong antibacterial activity against *Escherichia coli*, *Bacillus subtilis*, and *Staphylococcus aureus*

[52]. Additionally, tubers have demonstrated encouraging antioxidant, anti-glycation, and alpha-amylase inhibitory activities, suggesting that they may be useful in the management and treatment of Type II diabetes [53]. After examining the phytochemical profile, polyphenolic content, and free radical scavenging activity of seven Amarkand species, we discovered that *D. bulbifera* and *E. ochreatea* exhibited the highest potential for antioxidants [52, 53]. Comparably, among other Amarkand species, the tubers of *E. ochreatea* and the bulbils of *D. bulbifera* have demonstrated a strong anti-fatigue potential [55]. *E. ochreatea* receives the best grade for biological activity among the several species of *Eulophia* [26].

Conclusion

All the approximately 28 species of Amarkand documented in India possess the various medicinal properties like cardio protective, hepato-protective, analgesic, antipyretic, immunomodulatory, nervine tonic, antidote, antiepileptic, nephroprotective, aphrodisiac, anti-fatigue, anti-fertility, vermifuge, health tonic, stomatitis, anti-malarial, relieving paralysis, and anticancer. The parts of this plants are also good source of free sugars, carbohydrates, proteins, lipids, and antioxidant phenols, and some parts of these plants are exposed to micronutrients, specifically zinc and iron were identified in large amounts. So, this plant is a good source to possess nutraceutical properties to cure many diseases as well providing the abundant amount nutrient.

REFERENCES

- [1]. Jagtap, Suresh D., S. S. Deokule, P. K. Pawar, and A. M. Harsulkar. "Traditional ethnomedicinal knowledge confined to the Pawra tribe of Satpura Hills, Maharashtra, India." *Ethnobotanical Leaflets* 2009, no. 1 (2009): 12.
- [2]. Abhyankar, Ravindra Kumar, and Ravi Upadhyay. "Ethnomedicinal studies of tubers of Hoshangabad." *MP Bulletin of Environment, Pharmacology and Life Sciences* 1, no. 1 (2011): 57-59.
- [3]. Jagtap, S. D., S. S. Deokule, and S. V. Bhosle. "Some unique ethnomedicinal uses of plants used by the Korku tribe of Amravati district of Maharashtra, India." *Journal of ethnopharmacology* 107, no. 3 (2006): 463-469.
- [4]. Shroti R and Upadhyay R: In vitro micropropagation of *Eulophianuda* Lind, an endangered terrestrial orchid through PLB (Protocorm like bodies), *International Journal of Plant, Animal and Environmental Science* 2014; 4-1.
- [5]. <https://en.wikipedia.org/wiki/Herb>
- [6]. Patil, Manisha C., and Raghunath T. Mahajan. "Ethnobotanical potential of *Eulophia* species for their possible biological activity." *Int. J. Pharm. Sci. Rev. Res* 21, no. 2 (2013): 297-307.
- [7]. Donald PR, Lamprecht JH, Freestone M, Albrecht CF, Bouic PJD, Kotze D, and Van Jaarsveld PP: A randomized placebo controlled trial of the efficacy of α -sitosterol and its glucoside as adjuvants in the treatment of pulmonary tuberculosis, *International Journal Tuberculosis Lungs Diseases* 1997; 1(5): 518-522.
- [8]. Nagulwar, V. P., M. Nandgave, M. S. Mahajan, and S. A. Deshpande. "Phytochemical screening and evaluation of pharmacological activities of *Eulophianuda* Lind. Tuber extracts." *Int J Pharm Sci Res* 8 (2017): 3516-3523.
- [9]. Jagdale, S. P., S. Shimpi, and D. Chachad. "Pharmacological studies of 'Salep'." *Journal of Herbal medicine and toxicology* 3, no. 1 (2009): 153-156.
- [10]. Tuchinda, Patoomratana, JindaUdchachon, KanjaiKhumtaveeporn, Walter C. Taylor, Lutz M. Engelhardt, and Allan H. White. "Phenanthrenes of *Eulophianuda*." *Phytochemistry* 27, no. 10 (1988): 3267-3271.
- [11]. Bhandari, S. R., A. H. Kapadi, P. L. Mujumder, MuktaJoardar, and J. N. Shoolery. "Nudol, a phenanthrene of the orchids *Eulophianuda*, *Eriacarinata* and *Eriastricta*." *Phytochemistry* 24, no. 4 (1985): 801-804.
- [12]. Kshirsagar, Rajendra D., Yogesh B. Kanekar, Suresh D. Jagtap, Shakti N. Upadhyay, Rajesh Rao, Sandip P. Bhujbal, and Jagdish N. Kedia. "Phenanthrenes of

- Eulophiaochreata Lindl." *International Journal of Green Pharmacy (IJGP)* 4, no. 3 (2010).
- [13]. Vaidya, Bapalal G. "Nighantuadarsha." *Chaukhambha Vidyabhavan*, (1968): 551-4.
- [14]. Adarsha, Vaidya B. Nighantu. "Varanasi." *India: SarvaSeva Sangha* (2004).
- [15]. Abhyankar, Ravindra Kumar, and Ravi Upadhyay. "Ethnomedicinal studies of tubers of Hoshangabad." *MP Bulletin of Environment, Pharmacology and Life Sciences* 1, no. 1 (2011): 57-59.
- [16]. Prasad YD, Chandra CR, Kumar L, Singh B. Effect of Salep (*Eulophiacampestris*) on glycation of IgG in vitro condition. *Int Res J Pharm* 2012; 3:194-6.
- [17]. Medhi, R. P., and Syamali Chakrabarti. "Traditional knowledge of NE people on conservation of wild orchids." (2009).
- [18]. Singh, Amritpal, and Sanjiv Duggal. "Medicinal orchids-an overview." *Ethnobotanical leaflets* 2009, no. 3 (2009): 3.
- [19]. Zhu, Yan Qiu, Rong Yi Zhang, Rui Meng, Zhi Qiong Tan, and Yu Jie Wang. "Endophytic fungi of roots of *Eulophia flava*." *Southwest China Journal of Agricultural Sciences* 22, no. 3 (2009): 675-680.
- [20]. Jagtap, S. D., S. Gilda, P. Bhondave, A. Paradkar, P. Pawar, and A. Harsulkar. "Validation of the potential of *Eulophiaochreata* tubers for anti-inflammatory and antioxidant activity." *Pharmacol Online* 2 (2009): 307-16.
- [21]. Jagtap, S. D., S. S. Deokule, S. Mukharjee, Aniket Kuvalekar, Santosh Devkar, and A. M. Harsulkar. "Assessment of nutritional value of some wild edible plants from Satpura hills of Maharashtra, India." *J Herb Med Toxicol* 4, no. 1 (2010): 77-82.
- [22]. Hossain, Mohammad Musharof. "Therapeutic orchids: traditional uses and recent advances—an overview." *Fitoterapia* 82, no. 2 (2011): 102-140.
- [23]. Chanda, Ranabir, J. P. Mohanty, N. R. Bhuyan, P. K. Kar, and L. K. Nath. "Medicinal plants used against gastrointestinal tract disorders by the traditional healers of Sikkim Himalayas." (2007).
- [24]. Joshi, G., Lalit M. Tewari, Nidhi Lohani, Kanchan Upreti, Jeevan S. Jalal, and Geeta Tewari. "Diversity of orchids on Uttarakhand and their conservation strategy with special reference to their medicinal importance." *Rep Opin* 1, no. 3 (2009): 47-52.
- [25]. Rajendran, A., N. Rama Rao, K. Ravi Kumar, and A. N. Henry. "Some medicinal orchids of southern India." *Ancient Science of Life* 17, no. 1 (1997): 10-14.
- [26]. Patil, Manisha C., and Raghunath T. Mahajan. "Ethnobotanical potential of *Eulophia* species for their possible biological activity." *Int. J. Pharm. Sci. Rev. Res* 21, no. 2 (2013): 297-307.
- [27]. Maridass, M., B. Victor, and U. Ramesh. "Ethnobotanical information of *Eulophiaepidendraea* (Retz) Fischer (Orchidaceae) in the Kambli Malaikovil Forest, Tirunelveli district, Tamil Nadu." *Journal-Bombay Natural History Society* 102, no. 2 (2005): 255.
- [28]. Malhosia, Aarti, and Anjali Shukla. "Potential Health Implications of Amylase-Rich Flour in Wheat and Barley-Based Gruel." *Journal of Science and Technological Researches* 5, no. 1 (2023): 20-25.
- [29]. Silawat, Roma, and Rajendra Chauhan. "Analysis of Water Quality of River Kaliyasot Bhopal, (MP) India." *Journal of Science and Technological Researches* 3, no. 1 (2021): 30-33.
- [30]. Malhosia, Aarti, Nitul Singh, and Sadhna M. Singh. "Determination of Therapeutic Effect of Fenugreek Seed on the Patients Suffering from Type II Diabetes Mellitus." *Diabetes* 1 (2022): 4.
- [31]. Dey, Abhijit, and Jitendra Nath De. "A survey of ethnomedicinal plants used by the tribals of Ajoydha hill region, Purulia district, India." *American-Eurasian Journal of Sustainable Agriculture* (2010): 280-291.
- [32]. Patil SL, Patil DL. Ethnomedicinal plants of Dhule District, Maharashtra. *Nat Prod Radiance* 2007; 6:148-51.
- [33]. Tayade, S. K., and D. A. Patil. "Hitherto untapped plantlore from Nandurbar district (Maharashtra)." (2005).
- [34]. Shriram, Varsha, Vinay Kumar, PB Kavi Kishor, Sharad B. Suryawanshi, Ankur K. Upadhyay, and Manoj K. Bhat. "Cytotoxic activity of 9, 10-dihydro-2, 5-dimethoxyphenanthrene-1, 7-diol from *Eulophianuda* against human cancer cells." *Journal of ethnopharmacology* 128, no. 1 (2010): 251-253.

- [35]. Mali, Prashant Y., and Vijay V. Bhadane. "Some rare plants of ethnomedicinal properties from Jalgaon district of Maharashtra." *International Journal of Green Pharmacy (IJGP)* 2, no. 2 (2008).
- [36]. Jain, Jitendra B., Sheetal C. Kumane, and S. Bhattacharya. "Medicinal flora of Madhya Pradesh and Chattisgarh—a review." (2006).
- [37]. Das, Sarita, S. K. Dash, and S. N. Padhy. "Ethno-medicinal informations from Orissa State, India, A review." *Journal of Human Ecology* 14, no. 3 (2003): 165-227.
- [38]. Kirtikar KR, Basu BD. *Indian Medicinal Plants*. Allahabad, India: Springer; 1918. p. 1242-3.
- [39]. Jain, Anita, S. S. Katewa, P. K. Galav, and Pallavi Sharma. "Medicinal plant diversity of Sitamata wildlife sanctuary, Rajasthan, India." *Journal of ethnopharmacology* 102, no. 2 (2005): 143-157.
- [40]. Jain, Anita, S. S. Katewa, and P. K. Galav. "Some phytotherapeutic claims by tribals of southern Rajasthan." (2005).
- [41]. Bhagaonkar PY, Kadam VN. Ethnopharmacology of Bajara tribe of Umarkhed taluka, district Yavatmal, Maharashtra for reproductivedisorders. *Indian J TraditKnowl* 2006; 5:336-41.
- [42]. Ward, Artemas, ed. *The encyclopedia of food*. Artemas Ward, 1923.
- [43]. Aberoumand, A. "Balance between nutrients and anti-nutrients in some plant food." *Asian Journal of Food and Agro-Industry* 2, no. 3 (2009): 330-335.
- [44]. Aberoumand, A. "Balance between nutrients and anti-nutrients in some plant food." *Asian Journal of Food and Agro-Industry* 2, no. 3 (2009): 330-335.
- [45]. Aberoumand, Ali, and S. S. Deokule. "Determination of elements profile of some wild edible plants." *Food Analytical Methods* 2 (2009): 116-119.
- [46]. Ghule, B. V., G. D. Darwhekar, D. K. Jain, and P. G. Yeole. "Evaluation of Binding Properties of Evaluation of Binding Properties of *Eulophiacampestris* Wall. Mucilage all. Mucilage." *Indian journal of pharmaceutical sciences* (2006): 566. Nadkarni, KM. In: *Indian MateriaMedica*. 2nd ed., Vol. I. Mumbai: Popular Prakashan; 1998. p. 519.
- [47]. Bhurat, Mayur R., Pravin S. Kawatikwar, Rupal S. Sanghavi, Prafull P. Patil, Poonam A. Salunke, and Suhas V. Kapure. "Evaluation of *Eulophiaherbacea* tubers mucilage as an innovative suspending agent." *J Pharm Res* 5, no. 1 (2012): 321-323.
- [48]. Maridass, M. "Anti diarrhoeal activity of rare orchid *Eulophiaepidendraea* (Retz.) Fisher." *Nat Pharm Technol* 1 (2011): 5-10.
- [49]. Jagdale, S. P., S. Shimpi, and D. Chachad. "Pharmacological studies of 'Salep'." *Journal of Herbal medicine and toxicology* 3, no. 1 (2009): 153-156.
- [50]. Tatiya AU, Bari N, Surana SJ, Kalaskar MG. Effect of bioassay guided isolation of 1-phenanthrene carboxylic acid from *Eulophiaherbacea* Lindl. Tubers on human cancer cell lines. *Res J Phytochem* 2014; 8:155-61.
- [51]. Datla P, Kalluri MD, Basha K, Bellary A, Kshirsagar R, Kanetkar Y, et al. 9, 10-Dihydro-2, 5-dimethoxyphenanthrene-1, 7-diol, from *Eulophiaochreatea*, inhibits inflammatory signalling mediated by toll-like receptors. *Br J Pharmacol* 2010; 160:1158-70.
- [52]. Devkar, S., S. D. Jagtap, Y. Kale, and D. Kasote. "Antibacterial activity of *Eulophiaochreatea* L. tubers." *J Herb Med Toxicol* 3 (2009): 31-3.
- [53]. Narkhede, A. N., P. S. Nirmal, Rashmi Tupe, O. P. Kulkarni, A. M. Harsulkar, and S. D. Jagtap. "In vitro antioxidant, antiglycation and alpha amylase inhibitory potential of *Eulophiaochreatea* L." *Journal of pharmacy research* 5 (2012): 2532-2537.
- [54]. Narkhede, A. N., and S. D. Jagtap. "Screening of Amarkand species with respect to their polyphenolic content and free radical quenching potential." *Int J Pharma Biosci* 6, no. 1 (2015): 1122-33.
- [55]. Narkhede, Aarti N., Suresh D. Jagtap, Pallavi S. Nirmal, Shital A. Giramkar, Bhagyashri E. Nagarkar, Omkar P. Kulkarni, and Abhay M. Harsulkar. "Anti-fatigue effect of Amarkand on endurance exercise capacity in rats." *BMC Complementary and Alternative Medicine* 16 (2015): 1-7.

