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A PHARMACOGNOSTIC STUDY AND ETHNOBOTANICAL UTILITY OF VARAHIKANDA (*Dioscorea Bulbifera* LINN)-A REVIEW

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ABSTRACT

Since ages *kanda* (tubers) *dravyas* are being used as *ahara* and *oushadha*, *varahikanda* is one such kanda, which has various pharmacological actions and known to have ethnobotanical value throughout the world, botanically it is identified as *Dioscorea bulbifera Linn*. It grows wild in west coast and east coast regions in India; it is being used as *rasyana, vrishya dravya* and one of the ingredients in important formulations like *Panchanimba churna, Narasimha churna* and *Mahapaishachika ghrita* etc. Its major chemical constituent Diosgenin is used as precursor in the synthesis of various steroidal hormones. In this article an attempt is made to give information on literature review, botanical descriptions, pharmacognosy, and ethno botany.

KEYWORDS: Varahikanda, Dioscorea Bulbifera Linn, Ethno Botany, Pharmacognosy, Diosgenin

INTRODUCTION

Varahikanda is one among the *kanda dravys*, which is attributed with *balya, rasayana, vrishya, kushtaghna, varnya, dipana*, and *hridhya* etc *karmas;* and finds its use in the management of diseases like kushta, naadivrana, and mutravahasroto vikars etc along with other drugs and an important ingredient of various formulations. Botanically it belongs to the genus Dioscorea; different species of Dioscorea are known to have ethnobotanical value throughout the world, they are being used as famine food and medicine in folklore. Most of the species contains steroidal saponins such as diosgenin, which is the starting material for the synthesis of many steroidal hormones used as anti-inflammatory, androgenic, estrogenic and contraceptive drugs. The confirmed source of *Varahikanda* is *Dioscorea bulbifera L.*, commonly known as air potato; it has antioxidant, anti-inflammatory, cardio-protective etc activities. Hence in the current article an attempt is made to review on *Dioscorea bulbifera L.* from different classical texts with special reference to pharmacognosy and ethno botanical importance.

LITERARY REVIEW

Charaka Samhita[1]: Shukari is mentioned as one of the ingredients of Mahapaishachika Ghrita in Unmada chikitsa, Chakrapani commenting on it says Shukari is Varahikanda.

Sushrutha Samhita[2]:- Varahi kanda churna is explained in Sarvopaghatashamaniya Rasayana adhyaya. In Nivrittasantapiya adhyaya, Varahikada is described among the

Ashtadasha Soma samaveerya mahaoushadha dravyas and it is said that tuber is having the capacity to regenerate and looks like a black snake.

Ashtanga Hridaya[3]: Pindaalu is described in Annaswarupa vijnaneeya adhyaya. Arunadatta commenting on it says Pindaalu is Varahikanda. Varahikanda rasayana is explained in Rasayana adhyaya.

Sharangadhara Samhita[4]:-In the context of Ashtakavarga, Gudartha deepika has mentioned use of Varahi kanda in place of Rudhi and Vrudhi.It is stated that Charmakaraluka should be used in the abhava of Varahi kanda,Varahikanda growing in Anupadesha has hairs like that of wild boar.

Chakradatta[5]:-Commentator of Chakradatta described the Varahi kanda as a creeper having betel like leaves, has got many bulbils on its stem, has floweres like Sarja and Arjuna. Tubers look like the head of wild boar and are covered with stout hairs like that of the wild boar. Tubers have katu tikta rasa, and are aromatic like lotus. These creepers are found in mountains and forests.

NIGHANTU PERIOD[6, 7, 8] - According to Bhavaprakasha Varahikanda is pratinidhi dravya of Rudhi and Vrudhi. Kaiyyadeva nighantu mentioned 7 types of varahikanda.Varahikandadi varga have been mentioned in Nighantu adarsha.

NIRUKTI [9, 10]

Varahakanda - (varaha priyaha kandaha, varaha murdhavat kando varahikandaha) Tubers are liked by the wild boar or tuber resembles the head of the wild boar

SYNONYMS[6]

Ghrishti -it relieves diseases with burning sensation because of madhuradi gunas/the shape of the tuber resembles the face of the wild boar.

Shukarakanda -The tuber is liked and eaten by the wild boar.

Shukari -The tuber has hair on its surface just like that of wild boar

Badara -When the plant is cut it re grows

Vridhida -That helps in development of the tissues.

Sukandaka -Tubers are beautiful

Vishwaksena priya-It is liked by lord Vishnu

Veera-That which is powerful or strong

Mahaveerya/mahoushadhi - highly potent medicine

Vara - which is shreshtha (best/excellent?)

Magadhi- grows in Magadha region

Vanya/vanamalini - grows abundantly in forest

Kharakhanda - the tuber has rough surface

Kushtha vinashini - which alleviates skin disorders

Vyadhihanta - destroys diseases

Kaanti - which improves lustre

VARIETIES OF VARAHIKANDA ACCORDING TO KAIYYADEVA NIGHANTU[11]

Shabarakanda, Kharakanda**,** Snukchadopama**,** Kiri**,** Mulakamulabha**,** Shoukara**,** Vadavaanala

RASAPANCHAKA [6, 7]

Rasa- katu tikta rasa
Guna – laghu, snigdha
Ushna veerya
katu vipaka
Vata-kaphaghna

KARMA- Kushtaghna, Krimighna, Rasayana, Balya , Deepana , Swarya, Shukrala, Varnya, Vrushya , Jeevaniya, Vishaghna ,Hridhya

ROGAGHNATA – krimi, kushta, prameha, visha

THERAPEUTIC USES[2, 3, 12]

-Varahi kanda churna consumed with madhu every day followed by ksheera and shali bhojana for one month acts as rasayana (S.U).

-Ardra (fresh) varahi kanda should be taken along with ksheera for one month with ksheera as pathya, followed by one more month with ksheera and anna as a pathya to postpone jara. (AH U 58-59).

-Varahikanda churna is given bhavana with varahikanda swarasa and cosumed with madhu and ghrita or varahi kanda siddha ghrita acts as rasayana. (AH.U)

-Varahikanda churna is applied externally in Naadi vrana with taila (Su.Chi).

-Varahikanda along with laksha, manjishta, sariva, gunjaphala etc drugs prossessed in katu taila is used as external application for savarnikarana in shwitra.(AS U)

TOXICITY [13, 14, 15,] -In spite of their nutritional importance, they possess some ant nutritional factors and secondary metabolites, which make them bitter in taste and reduce the palatability. Wild tubers, when fresh are bitter and cultivated tubers are less are non-bitter .Acute, subacute and chronic toxicity study of Dioscorea bulbifera showed that for mice the intra peritoneal LD50 was 25.49g/kg and the oral LD50 was 79.98g/kg. The toxicity was mainly manifested as damage to liver and kidney. The degree of damage was related to the dose and time of drug administration.

METHODS OF DETOXIFICATION[13-] The bitter compounds are water soluble. It can be made edible by cooking, baking, frying and leaching of the sliced tubers for 12 hours in running water or by coursing with ashes and steeping in cold water

PART USED[7]**:** - Kanda (tubers)

DOSE[7]**:** 3-6 Gms

SUBSTITUTES AND ADULTERANTS- Vrinda Madhava mentioned Charmakaraluka as substitute for Varahikanda. Tacca aspera Roxb. of Taccaceae family is also reported as Varahikanda in some regions[16]. Tacca aspera is distributed in Peninsular India, Central India, Arunachala Pradesh, Assam, Meghalaya and it is short stemmed, rhizomatous herbaceous plant[17].

CONTROVERSY[18, 19] The controversy of Varahikanda might have started with the word Aluka. Aluka has been mentioned in Charaka samhita as well as Sushrutha samhita.Aaluka is different from aalu or potato.Charaka has told aluka as ahitatama among kanda dravyas. Sushrutha has mentioned Aluka in kanda varga and has mentioned 6 varieties. Both the commentators of Charaka and Sushrutha Samhita have given limited information regarding the morphological descriptions. P.V Sharma has correlated the varieities mentioned in Sushrutha samhita and Rajanighantu with different species of Dioscorea. According to PV Sharma **Dioscorea deltoidea** is ghrishti and **Dioscorea bulbifera** is Varahikanda.

TAXONOMICAL CLASSIFICATION[20]

Table no: 1 taxonomical classification

Kingdom	Plantae
Sub kingdom	Viridiplantae

Infra kingdom	Streptophyta
Super division	Embryophyta
Division	Tracheophyta
Sub division	Spermatophytina
Class	Magnoliopsida
Super Order	Lilianae
Order	Dioscoreales
Family	Dioscoreaceae
Genus	Dioscorea L.
Species	Dioscorea bulbifera L.

GEOGRAPHICAL DISTRIBUTION OF DIOSCOREA BULBIFERA LINN[16]

World- This Species is native to the tropics of the Old world, globally distributed in the Paleotropics, introduced to tropical America probably from Africa.

India -It is common throughout India ascending up to 1800m, in the Himalayas, Chota Nagpur, Bihar, and Orissa, cultivated in Konkan, wild on the west Coast, in Coimbatore and along the whole of the East Coast districts. It is reported to be threatened in North Eastern Region of India. It does not thrive in the drier parts of India. **Karnataka:** Coorg, Chikamagaluru, Dakshina Kannada, Udupi.

MORPHOLOGY OF DIOSCOREA BULBIFERA L.[21]

Habit- A large glabrous climber growing 70 feet or more in length. Frequent in hedges. **Stem-** Twining to the left, unarmed, often with bulbils in the leaf-axils. **Leaves-** Alternate, up to 30cm long and broad, broadly ovate to sub orbicular, acuminate, cuspidate or caudate at apex, base cordate, 7-11 nerved; petiole up to 15cm long. **Flowers-** Male spikes in axillary pendulous panicles. Stamens 6. Female spikes solitary or fascicled, pendulous. Flowering season: August-October. **–Fruit-** Capsule quadrately oblong. **Seed-** Winged only at base. **Bulbils-** Abundant and of different sizes and shapes. **Tubers-** Solitary, not stalked, very variable globose to pyriform, usually small and round. Skin purplish black or earth colored. Usually coated with abundant, small feeding roots, but smooth in some cultivated varieties; flesh white to lemon yellow, sometimes marked with purple flecks and very mucilaginous.

Dioscorea alata is easily mistaken for Dioscorea bulbifera

❖ **Table no: 2 major differences between Dioscorea bulbifera and Dioscorea alata[22]**

DIOSCOREA BULBIFERA	DIOSCOREA ALATA
Stems twining to the left	Stems twining to the right
un armed stem	Acutely angled or Winged stem
Alternate leaves	Opposite leaves
Bulbils are dark-brown and round to irregularly round	Bulbils are dark brown and elongate to pear shaped

IMAGES OF DIOSCOREA BULBIFERA

Dioscorea bulbifera climber

Dioscorea bulbifera bulbils

Dioscorea alata winged stem with bulbil

Dioscorea bulbifera tuber

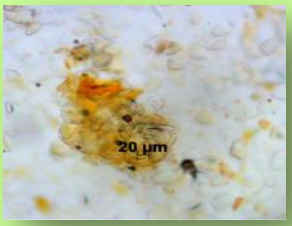
PHARMACOGNOSY[23]

Macroscopic characters- Drug occurs in cut pieces, a few roots and root scars present. **Color: - outer** surface dark brown and inner surface is yellow to light brown. **Odour: -** Indistinct **Taste:-**Bitter**. Size: -** 0.5-0.7 cm thick, 2-3 cm in diameter

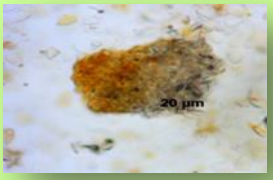
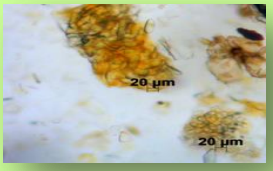
Microscopic characters-Rhizome shows a cork composed of 10-15 layers of thick walled, tangentially elongated rectangular cells; outer few cells filled with reddish-brown contents. Cortex consists of oval to elliptical, thin -walled parenchymatous cells. Ground tissue, forming major portion of drug composed of oval to polygonal cells having a few scattered closed vascular bundles. Starch grains found in both cortex and ground tissues, but abundant in ground tissue, rounded to oval, three sided with rounded angles or rod shaped, simple, solitary or in groups, 11 to 28 μ in diameter; hilum present at the narrower extremity.

Powder microscopy- Slightly yellowish – brown in colour, Shows parenchymatous cells; varying sizes of cone and rod shaped starch grains measuring 11 to 28µ in dia.

Cortical cells containing starch



Isolated stone cells and starch grains

 **cortical parenchyma cells with bunch of starch**	 **Sclereids**
 **Starch grain**	 **Starch grains in groups**

Chemical Constituents Of Dioscorea Bulbifera[19]

Table no: 3 Chemical constituents of different parts of Dioscorea bulbifera[19]

PART	CHEMICAL CONSTITUENTS
Tuber	Major- **Diosgenin** (different parts of plant) - diosgenin is a steroidal saponin belonging to the sapogenin group, is the principle active constituent of Dioscorea bulbifera Linn. Three furanoid norditerpenes- diosbulbins A, diosbulbinoside D and F, Sinodiosgenin, β sitosterol, D-sorbitol, disobulbin B, Bitter and related non bitter compounds – terpenoids, Lutein, neoxanthin, violaxanthin, zeaxanthin, auroxanthin, cryptoxanthin, an anthocyanin and unidentified phenols, Quercetin, Quercetin -3-galactopyranoside, , Kaempferol, Kaempferol-3-0-β-D-galactopyranoside, (+catechin), (-)-epicatechin
Bulb	Diosgenin ,Smilagenone, Epismilagenin , Kaempferol

NUTRITIONAL VALUE[24]**-** carbohydrate-73.62%, protein-7.47%, fiber-0.35% and minerals like, Ca, Mg, K, P, Na

PHARMACOLOGICAL ACTIVITY[25]**-** Anorexiant, Aphrodisiac, Stomachic, Anthelmintic, Diuretic, Hunger suppressant, Tonic, Expectorant, Antioxidant, Anticancer, Anti hyperglycemic, Analgesic, Anti-inflammatory.

ETHNO BOTANICAL AND ETHNO MEDICINAL USES [26, 27]

-Tubers are roasted cooked as vegetable and pig fodder.

-In Kumaon region, western Himalayan regions of India, axillary tubers are cut into pieces, steeped in water and boiled and eaten.

-In Maharashtra state, the Warli tribe eats roasted roots.

-In Rajasthan tubers are boiled, mixed with flour and eaten. Fresh tuber decoction relieves ring worm.

-Tuber paste is used for application in infectious skin diseases.

-Fresh tuber decoction reduces laryngitis in children, insect bite, goiter, and fever.
-Tubers are also used as aphrodisiac and rejuvenator. Tender shoots and twigs crushed and rubbed on wet scalp to remove dandruff.
-Tuber powder used to kill hair lice. Powdered tuber is used for diarrhea with buttermilk.
-Root paste is used with cow milk in cough and asthma. Tuber is used to treat wounds and leucoderma.

TRADE AND COMMERCE[28]-The tubers are used as famine food. The tubers are used for the preparation of starch in Japan. In Kashmir the tubers are used for washing wools and fish bait. It contains the steroid, Diosgenin, which is the principle material used in the production of a number of synthetic steroidal hormones, such as those used in the manufacture of birth –control pills.

RESEARCH PROFILE

Table no: 4 research profile of *Dioscorea bulbifera*

SL. NO	TITLE	PART USED	CHEMICAL CONSTITUENTS	RESULT
1.	Screening of antioxidant potentials in Dioscorea bulbifera	Tuber	Reduced glutathione (GSH), Vitamin C, Vitamin E.	The ethanolic extract of the tuber was screened for their enzymatic and nonenzymatic antioxidants. The level of enzymatic antioxidant namely Glutathione peroxidase (GPx), Catalase (CAT), Superoxide dismutase (SOD), Glucose -6- phosphate dehydrogenase (G6PD) and Glucose –s-transferase (GST) was found to be very impressive. Dioscorea bulbifera contains good and commendable store of non-enzymatic antioxidant namely reduced glutathione (GSH), Vitamin C, Vitamin E.
2.	Wound healing activity	Tubers		The present study was undertaken to verify the effect of the tubers of Dioscorea bulbifera on experimentally induced excision wound model in rats for the period of 22 days. Study revealed significant wound healing activity, high rate of wound contraction and decrease in the period of epithelization.

3.	Analgesic and Anti-inflammatory activity	Aerial bulbils	Quercetin and its derivative	The aqueous and methanol extracts from the dry bulbils of Dioscorea bulbifera L. var sativa – evaluated orally at the doses of 300 and 600 mg/kg against pain induced by acetic acid, formalin, pressure and against inflammation induced by carrageenan, histamine, serotonin and formalin in mice and rats, showed a dose dependent inhibition of pain and inflammation with a maximum effect of 56.38%, 73.06% and 42.79% produced by the aqueous extract, respectively on pain induced by acetic acid, formalin and pressure. While the methanol extract at the same dose respectively inhibited these models of pain by 62.70%, 84.54% and 47.70%. The oral administration of aqueous and methanol extracts caused significant anti-inflammatory activity on paw oedema induced by histamine, serotonin and formalin. The results show that the bulbils of Dioscorea bulbifera var saiva possess potent analgesic and anti-inflammatory activities.
4.	Protective role of air potato (Dioscorea bulbifera Linn.) of yam family in myocardial ischemic reperfusion injury	Aerial bulbils	-	Hydroalcoholic extract of Dioscorea bulbifera was tested for its protective effect on myocardial ischemic/ reperfusion injury in rats due to apoptosis and necrosis. Myocardial I/R injury was induced by 30 min ischemia followed by 2 hour reperfusion by perfusing isolated rat hearts with Krebs Henseilet bicarbonate buffer in a Langendorff set up. Pretreatment of DB (150mg kg(-1) body weight) for 30 days significantly reduced myocardial infarct size and improved the ventricular function role of DB on

				apoptosis was also evaluated by determining caspase 3 as well by examining proapoptic anti –apoptotic proteins Bax and Bcl2 by Western blot analysis followed by TUNEL assay. DB also prevented I/R-mediated down regulation of survival protein Akt and HO-1
5.	Anti-cancer activity	Tuber	Diosbulbin B	Antitumor activity of water extract (fraction A), ethanol extract (fraction B), ethyl acetate extract (fraction C) and non-ethyl extract (fraction D) and compound diosbulbin B isolated from Dioscorea bulbifera Linn. Investigated in vivo this present study the result showed that fractions B and C both decreased tumor weight in S 180 and h22 tumor cell bearing mice, while fraction A and D had no such effect. Furthermore, fraction C altered the weight of spleen and thymus and the amount of total leukocytes, lymphocytes and neutrophils in tumor bearing mice. Further result showed that compound diosbulbin B demonstrated antitumor effect in the dose dependent manner at dosage of 2 to 16 mg/kg without significant toxicity in vivo. Furthermore on the basis of chemical analysis of the above extracts by HPLC with diode array detector (DAD), diosbulbin B was found to be the major antitumor effects which may be related to influencing the immune system for the first time, and the compound diosbulbin B is the major antitumor compound of Dioscorea bulbifera.

DISCUSSION

As the tubers resemble the head of the wild boar in shape it is known as *Varahikanda*, it is a creeper with round stem and aerial bulbils and grows wild in west coast and east coast regions, may be based on this the synonym vanya /vanamalini has been given to this plant, the synonym shukari might be based on the presence of abundant feeding roots on the outer surface of the tubers. It is rich in starch grains which can be confirmed through powder microscopy and hence it is used in the preparation of starch. Its therapeutic utility can be traced from almost all classical texts and *nighantus*, *a*s tubers and aerial bulbils are rich in nutrients etc, and one of the important drugs in ethnobotany, it can be used in the treatment of various disorders and also as food. Its *kushtaghna*, vrushya, and *rasyana karmas* have been given utmost importance in the management of diseases, and which are evident by the yogas like, varahi churna, panchanimba churna and narasimha churna, etc; in folklore mainly its utility is seen in skin diseases, which can be attributed to katu tikta rasa, krimighna and kushtaghna karmas; also used as aphrodisiac and rejuvenator. Along with *balya*, *jeevaniya* and *vrushya* etc karmas it has *prabhavajanya karma*, *vishaghna* which makes it even more potent. Hence it is rich in vitamin C and E and Glutathione peroxidase it showed good antioxidant activity, it is proved for analgesic and anti-inflammatory activity, this action is might be due the presence of quercetin. Diosbulbin B extracted from the aerial bulbils showed antitumor activity. Based on the folklore claim on its use in vrana , in a research carried out on wound healing activity in rat model, showed significant wound healing activity with high rate of wound contraction and decrease in the period of epitilialization within in 22 days; this activity can be attributed to katu tikta rasa and laghu guna.

CONCLUSION

Varahikanda is known to have different important chemical constituents including steroidal saponins; a proved drug for various pharmacological activities in vitro and in vivo, being a rich source of nutrients and a rasayana dravya, and commonly available drug it can be utilized in maintaining the health, treatment of different diseases and in food preparations. In clinical practice its administration is seen more for rasayana and vajikaranarta, but its therapeutic utility in rest of the diseases like infectious skin and prevention of, cardiac disorders, wound, yoniroga, mutravahasroto vikaras,cancer etc is yet to be explored.

REFERENCES

1.Agnivesa, Charaka Samhita, Charaka and Dridhabala with the Ayurveda – Dipika Commentary of Chakrapanidatta, Edited by Vaidya Jadavaji Trikamji Acharya, New Delhi: Chaukhambha Publications; Reprint 2014.

2.Sushrutha, Sushruthasamhita, with the Nibandhasangraha Commentary of Sri Dalhanacharya and the Nyayachandrika Paanjika of Sri Gayadasacharya on Nidanasthana, edited by Vaidya Jadavji Trikamji Acharya and Narayan Ram Acharya Kavyatirtha , Varanasi:Chaukambha Surabharathiprakaashana; print 2012.

3.Vagbhata, Ashtangahridayam, with the commentaries, Sarvangasundara of Arunadatta and Aturveda Rasayana of

Hemadri, Varanasi:Chaukambha Sanskrit Sansthan; Reprint 2014.
4.Pandit Sharagadharacharya, Sharangadhara Samhita with Adhamalla's Dipika and Kashirama's Gudartha –Dipika commentary, edited with foot notes by Pandith Parashurama Shastri, Vidyasagar, Varanasi:Chaukambha Orientalia; reprint edition-2018, Tpg- 398
5.Chakradatta, Edited and Translated by Priya Vrat Sharma, Varanasi:Chaukhambha Publishers; third edition 2002
6.http://niimh.nic.in/ebooks/e-Nighantu/?mod=read (cited 2020 sep 29)
7.Sharma P v, Dravyaguna Vijnana, vol 2, Choukambha Orientalia, 2018
8.Shri Baplal G Vaidya, Nighantu Adarsha, Uttarardha, second edition, Varanasi, Chaukambha Bharathi Academy.
9.Sri Bhavamishra, Bhavaprakasha Nighantu, Commentary by Padmaashri Prof. K C Chunekar, edited by Late Dr. G S Pandey, Varanasi:Chaukhambha Bharathi Academy; Reprint 2015.
10.Shrimannaraharipanditha, Raja Nighantu, commentary by Dr. Indradeva Tripathi Ayurvedacharya, Varanasi:Chowkambha Krishnadasa Academy; third edition 2003.
11.Acharya Kaiyyadeva, Kaiyyyadeva Nighantu, edited by Prof. P V Sharma, Dr. Guruprasad Sharma,Varanasi:Chaukambha Bharati Academy; first edition 1979, Tpg-696
12.Vriddha Vagbhata, Ashtanga Sangraha, with commentary of Indu, New Delhi, Central Council for Research In Ayurveda and Siddha; print 1988,Volume 1 and 2
13.https://www.frontiersin.org/articles/10.3389/fphar.2017.00052/full (cited 2020 sep 29)
14.www.stuartxchange.com/Ubi-ubihan.html (cited 2020 sep 29)
15.https://link.springer.com/article/10.1007/s11101-017-9505-5 (cited 2020 sep 29)
16.Database on medicinal plants used in Ayurveda, vol 2, Documentation and Publication Division, CCRAS, New Delhi, Reprint 2005, Pg-531
17.http://www.plantsrescue.com/tacca-integrifolia/
18.Sharma Priya Vrat, Dravyaguna Vijnana, Volume 5, Varanasi: Chaukhambha Bharathi Academy; Reprint 2017.
19.Vaidya Bapalal, Some controversial drugs in Indian medicine, Varanasi:Chaukhambha Orientalia; Re-print 2014, Tpg-571
20.https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=43369#null (cited 2020 sep 29)
21.Gopalakrishna K, Flora of South Kanara (Dakshina Kannada) & Udupi, Aakrithi Printers, 2014 Pg- 82
22.https://www.fdacs.gov/content/download/76447/file/Air%20Potato%20Quick%20Identification%20Guide.pdf (cited 2020 sep29)
23.The Ayurvedic Pharmacopoeia of India part 1. Volume 1V, first edition, Delhi, Government of India, Ministry of Health and Family Welfare, Department of ISM &H
24.https://www.projecttopics.org/nutritional-value-dioscorea-bulbifera-aerial-yam.html (cited 2020 sep 29)
25.Kirthikar K R and Basu B D, Indian Medicinal Plants, Revised by E Blatter, J F Caius, K S Mhaskar, volume 1V, Dehradun, M/S Bishen Singh Mahendra Pal ;Singh Reprint 1975.
26.http://www.phytojournal.com/vol3Issue5/Issue_jan_2015/7.1.pdf (cited 2020 sep 29)

27.https://www.purdue.edu/hla/sites/famine-foods/famine_food/dioscorea-bulbifera-2/ (cited 2020 sep29)
28.The Wealth of India (Raw materials) vol.4, publication and information director, edited by Chadha Y.R., Maheshwari J.K.) CSIR, New Delhi, 1976, pg- 71.

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