

A Review on *Plectranthus vettiveroides*: An Endemic to South Indian High Value Aromatic Medicinal Plant

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Abstract: *Plectranthus vettiveroides* (K. C. Jacob) N. P. Singh & B. D. Sharma is an endemic to South Indian aromatic medicinal plant which is at present extinct in the wild and cultivated only in Kollidam in Cuddalore district, Tamil Nadu by few farmers as part of fulfilling their religious customs and belief. Its root extract has been used as a single or an ingredient in more than 75 herbal drugs which are marketed by leading manufactures in all over the world. But when commensurate with its production it is obvious that the drug manufactures are using substitute or adulterants. There are several limitations encountered with its cultivation including the requirement of moist sandy soil, open sunlight, incidence to pest and disease, harvesting of thin and hairy roots, etc. National Medicinal Plants Board (NMPB), Govt. of India has identified the plant as a priority one for R & D. The present review is a comprehensive information about all aspects of this plant such as taxonomy, distribution, phenology, botanical name change, identification problems, traditional knowledge, religious belief and rituals, properties and uses, chemical constituents, details of herbal drugs, agrotechnological practices, incidence of pests and diseases and its remedies and also mention about tissue culture protocol and pharmacognostic and pharmacological investigation.

Keywords: Agrotechnology, Coleus, Essential Oil, Herbal Drug, Iruveli, *Plectranthus vettiveroides*

I. Introduction

Plectranthus vettiveroides (K. C. Jacob) N. P. Singh & B. D. Sharma (Syn. *Coleus vettiveroides*) belongs to the family Lamiaceae is an aromatic herbaceous plant. It is locally known as Iruveli in Malayalam, Vettiver and Kuru ver in Tamil, Kuriveru and Vettiveru in Telugu, Lavanchi and Muchivala in Kannada, Valak in Hindi and Valakam and Hriberam and Hribera in Sanskrit [1,2,3,4,5]. Its roots are aromatic, leaves are not scented [6] and the lamina is very thin. The essential oil present in the roots of this plant has been used for the preparation of more than 75 different Ayurvedic formulations available in the local and global markets (TABLE 1 & 2) but due to the unavailability of raw material the drug manufactures are forced to use substitutes or adulterants for drug preparation [7]. The plant will grow only under specific micro-agroclimatic conditions. Its floral characters are not so far described [1,7]. The plants brought from its native habitat Kollidam were established at Saraswathy Thangavelu Centre of Jawaharlal Nehru Tropical Botanic Garden and Research Institute, Puthenthope, Thiruvananthapuram (Figure 1a & b) in 2007 but till March, 2016 the plants have not been flowered. It has been propagated through vegetative cuttings and conserved at JNTBGRI, Puthenthope campus where the native habitat, (Kollidam) soil and most of the agroclimatic conditions are prevailing [7,8,9]. The plant is an endemic to South India and at present extinct in the wild [1,7,10,11]. Its cultivation is now confined among few farmers in Kollidam, Cuddalore district, Tamil Nadu where its cultivation is associated with some religious belief and rituals [1,7,8,12]. Considering its demand in the pharmaceutical and cosmetic industry, ethano-botanical importance, agroclimatic specificity, curiosity in floral and other specific genotypic, phenotypic and phytochemical characteristic features, its conservation and sustainable utilisation/commercial exploitation has become the need of the hour. Recognising the forgoing importance the National Medicinal Plants Board (NMPB), Government of India has identified this crop as a priority one and promoting its R & D and cultivation practice [13]. JNTBGRI and Indian Institute of Horticulture Research (IIHR), Bangalore have carried out R & D on various aspects of this crop with financial support of NMPB and JNTBGRI had standardised agrotechnological practices for its large scale cultivation. However, several limitations are still encountered with this crop when cultivating away from its natural habitat like Kollidam. One of the main obstacles reported by JNTBGRI was the incidence of the attack of *Fusarium*. Harvesting of roots from the soil is another obstacle in commercial scale cultivation [9]. Based on the R & D conducted at JNTBGRI and other information gathered about this crop the present review was evolved.

II. Distribution

The plant is endemic to South India and now it is extinct in the wild. There are many reasons prevailing to its extinction from the wild. They include non flowering and lack of seed sets, requirement of specific habitat i.e., river beds or plain area having water rich sandy or sandy loam soil and open sunlight [1,7, 8,11]. The plant has been seen only under cultivation at Shiyali, Tanjore district, Palani in Madura district Canjeevaram in Chengalpattai district etc. [1]. During early 20th century this plant was cultivated on large scale in North Arcot, Coimbatore, Madurai, Thanjavur, Tirunelveli and Chengalpattu districts in Tamil Nadu [1,6]. The recent field survey conducted by the authors revealed that the plant has been cultivated by 4-5 farmers' family members in Kollidam as part of their commitment to perform religious belief and customs. It was also reported that the plant has been cultivated in Palakkad district of Kerala during later part of 20th century. In 2007 the authors noted that few plants have been conserving at the Centre for Indian Medicinal Heritage, a unit of Arya Vaidya Pharmacy (AVP), Kanjikkod in Palakkad district. In 1986 Vasudevan Nair et al. [14] reported that in addition to the forgoing locations it was also grown in the Medicinal Plants Gardens of Kerala Agricultural University, Arya Vaidya Pharmacy, Coimbatore and many home gardens of Vaidyas in the vicinity of the nearby area. Saraswathy et al. [6] and Khare [15] reported that the plant was reported in Sri Lanka but according to Murugan et al. [12] the plant was not reported from Sri Lanka and also not included in the Flora of Ceylon [16]. The plant is currently conserved at Saraswathy Thangavelu Centre of JNTBGRI, Puthenthope, Thiruvananthapuram.

III. Taxonomic Description

A profusely branched pubescent succulent herb grows up to 1 m tall. Roots fibrous, 30-90 cm long, form a tuft, slender, very thin, easily cut-off, strongly aromatic, straw colour when fresh, changing dark brown on drying. Stem slightly quadrangular, light brown or purple, pubescent and sub succulent. Leaves simple, opposite, decussate, estipulate, petiolate; petiole 2-10 cm long, sub-succulent, minutely hairy with a central groove; leaf lamina sub-orbicular to egg shaped, 5-7 × 5-9 cm, base and apex almost rounded, margin toothed with triangular teeth, sub-fleshy to leathery, with dense white minute hairs on both surfaces; lateral nerves 6-8 pairs, less prominent above, prominent below, all nerves starting from the midrib join along the margins just below the dentations. Each dentation about 3- 6 mm long with 1 or 2 minute lateral serrations [1,3,11,15,17,18].

Flower and fruit/seed have not been observed even after nine years of cultivation at JNTBGRI and in the native habitat. The author first identified and named the species had not described the floral characters [1]. According to Sivarajan and Indira Balachandran [19] flowers in close paniculate or racemose 6-10 flowered cymes. Calyx 2-1 lipped, upper lip widest not decurrent. Corolla 2-1 lipped, tube exerted, recurved, throat equal or obliquely swollen, upper lip short, broad, 14-fid, recurved. Lower lip much longer, entire, boat shaped narrowed at the base. Stamens 4, didynamous, connate below into a sheath separate from the corolla; as these cells are usually confluent. Disk enlarged in front. Ovary 4 partite, style equally 2-fid fruit 4 orbicular or ovoid, smooth dry nutlets, basal scar small. Soni et al. also reported that blue flowers borne on terminal racemes [4]. The botanical description with pharmacognostic characteristics were well described [6,20].

IV. Phenology

The plant has not seen flowered anywhere at any time [1]. The germplasm collected from Kollidam and established at STEC-JNTBGRI, Puthenthope in 2007 have not flowered till March, 2016 and during this period the authors have not been observed flowers in its native habitat at Kollidam.

V. Botanical Name Change

The plant was originally described and authenticated as *Coleus vettiveroides* by K.C. Jacob [1]. Later N.P. Singh and B.D. Sharma changed the plant name as *Plectranthus vettiveroides* (K.C.Jacob) N.P. Singh & B. D. Sharma [21].

VI. Identification Problems and Adulteration

This problem was well discussed by many authors [1,2,11,14,19]. The roots of almost members belong to the genus *Plectranthus* formerly known as *Coleus* have aromatic property and therefore it is difficult to identify *Plectranthus vettiveroides* from its closely related other species such as *Plectranthus forskohlii*, *P. comosus* and *P. barbatus* [6]. In Tamil both *Plectranthus vettiveroides* and *Vetiveria zizanoides* are referred in the same names, Kuruver or Vettiver literally meaning 'the scented roots'. Due to the non availability of *P. vettiveroides* the root of *Vetiveria zizanoides* is being used as an adulterant [11]. The dry root of *P. forskohlii* is also used as an adulterant. In Sanskrit the name Hrivera is referred to several species including *P. vettiveroides* and in South Indian drug markets the roots of *P. zeylanicus*, *P. barbatus*, *P. amboinicus* and stout tap root portions of stem of *Pavonia odorata* are selling in the name of Hrivera [14]. *Plectranthus vettiveroides* and *P. amboinicus* are also known as Pashanbhed in Sanskrit. In Kerala *Limnophila aromatica*, *L. gratissima*, *L. indica*, *L. gratioides*, *L. repens*, *Hattonia indica* and *Stemodia repens* are sold under the name Pashanbhed.

Patharchur is the Sanskrit name for *P. vettiveroides* and the same name is referred to *Coleus barabatus*, *Coleus forskohlii* and *Plectranthus forskohlii* in Hindi.

VII. Traditional Knowledge, Religious Belief and Rituals

According to the farmers of Kollidam, 10-15 years ago the plant was cultivated by 100-150 farmers in the village but currently only 4-5 farmers' family members are cultivating the plants as a commitment to their religious customary fulfilment. Information regarding the traditional method of cultivation, crop management, harvesting and preparation of value added products and marketing strategy followed by the local people in Kollidam was recorded [9]. At Kollidam, currently an organized marketing facility for this crop does not exist. Those who want the material directly approach the farmers and purchase the roots. The price of the roots may vary depending on the availability. A bunch of roots from a single plant varies from Rs. 50-100. It is interesting and scientifically sound to note the rituals, believes and myths related to the cultivation of the plant and the method of cultivation practices followed by the traditional farmers in Kollidam. Some of the strong believes and practices of the villagers with regard to cultivation of this plant are:

- (1) The plant was gifted by 'Chidambara Bhagavan', the God Siva to the village and its root system represents the hairs of the God Siva when performing Thandava Nirtham. It was given to them for providing its roots for God's daily poojas and rituals.
- (2) Cultivation of this plant in the village following the traditional way makes blessings of the God and they will get better yields from their all agricultural fields.
- (3) If anybody from the village gives out the plant for cultivating outside the village, the God's blessings will lose and the villagers have to face natural calamities as well as crop lose. Therefore, they will not give out the plant for cultivation. If anybody among the villagers supports others to take away the plant from their village, the villagers will enforce "Ooruvilakku" to that person and his family.
- (4) If the plants are allowed to flower, the sacredness of the village will lose, which lead to poverty.
- (5) The *Plectranthus vettiveroides* cultivated area should be kept as sacred place as temple.

VIII. Properties and Uses

The root has bitterness, antipyretic, diuretic and trichogenous activity. It has been used as antibacterial [22,23], deodorant, cooling agent [2,7,11] and also used against eye burning, head ache, diarrhoea, fever [24] intrinsic haemorrhage, hyperdipsia, strangury, leprosy, ulcer, vomiting, nausea [25,26,27], skin diseases, genitourinary diseases [2,26] giddiness, insanity and quenching thirst [28,29,30]. The essential oil extracted from the root is preferred by the physicians as a herbal hand sanitizer [31,32].

It's antioxidant [6,33,34,35], anticancer [35, 36], antidiabetic [37,38] and hepatoprotective [39] activities were demonstrated. It is used as a single medicine or as one of the ingredients in more than 78 commercial ayurvedic/herbal preparations (TABLE 1 & 2). In temples of Tamil Nadu, Karnataka and Andhra Pradesh, the root has been used for decorating and worshiping the deity [1,7,40,41]. Also the root has been used for the preparation of several household products such as bathing soap, agarbathi, etc. [8]. Triazole compounds have both fungi-toxic and plant growth regulating properties [42,43]. Triazole treatment altered morphological characteristic and increased photosynthetic pigments, which indicated the potentiality of this plant as a multipurpose medicine [43]. The alcoholic extract of this plant can be used as adulticidal for mosquito control [44].

IX. Chemical Constituents

Beesha and Padmaja reported the presence of carbohydrates, steroids, proteins, amino acids, phenolic compounds, tannins and alkaloids in various extracts [28]. Simultaneously, a total 36 chemical molecules were reported from the root extract. The major compounds are androstan-17-one 3-ethyl-3-hydroxy- (5 α)- (25%) and (-) spathulenol (9%). The other compounds include α - bisabolol (7%), Z-valerenyl acetate (7%), megastigma-4,6(E),8(Z)-triene (6%), 1H-cycloprop(E)azulen-7-ol, decahydro-1,1,7-trimethyl-4-methylene- (5%), myrtenol (2%), 1-naphthalenol (2%), caryophyllene oxide (2%), abieta-9(11),8(14),12-trien-12-ol (2%). All other compounds were found to be less than 2% [22]. Phytochemical screening of methanolic extract showed presence of triterpenoids, phenolic compound, proteins, flavonoids, alkaloids and tannins [34].

X. Herbal Drugs

Plectranthus vettiveroides has been used as one of the ingredients in several commercial preparations. A list of commercially available drug formulations is depicted in table 1. Several home remedies have been also used for the treatment of many ailments and some of these preparations are depicted in table 2.

XI. Standardisation of Agrotechnological Practices

The agrotechnological practices for the commercial cultivation of *Plectranthus vettiveroides* was standardised [9]. The experimental results regarding the influence of soil texture, bed preparation, position of

stem cuttings, spacing, group planting, light, irrigation schedule and harvesting period on growth performance and root yield were published [7,8]. According to Krishnan and Sreekumar [9] among the six accessions established at JNTBGRI, the accession from Kollidam showed marked difference from others and produced better biomass and oil yield. Shoot tips (10-15 cm length) planted at a spacing of 35 cm × 35 cm with four cutting/pit (160,000 plants/ha) on raised sandy soil beds of 60 cm height supplemented with fertilizer ratio @20 Kg N, @50 Kg P₂O₅ and @20 Kg K₂O /ha under open sunlight (3000-6000 lux) and irrigated twice daily during morning and evening hours for a period of 70 days produced better root /shoot biomass (Figure 1 b & c) and oil yield. It was also observed that the roots should be harvested between 70 and 90 days of planting afterwards the roots growth will be arrested and deteriorated in accordance with ageing. About 4-6 t/ha roots can be harvested after 70-90 days of cultivation and maximum essential oil was extracted from fresh roots. The application of NPK level was tested simultaneously and similar results were published [45,46]. The effect of farmyard manure with biofertilizers such as *Azotobacter*, *Bacillus megaterium* and *Glomus mosseae* (1:1:1) were also tested [47]. The effect of Biovermi (an enriched product of vermi compost with *Trichoderma viridae* and *Pseudomonas fluorescense*) and *Azospirillum* alone and in combination were also tested [48]. The uptake of NPK level along with farmyard manure was also reported [49]. The major obstacle is the harvesting of the thin hair like roots from the soil. The authors have recommended cultivating this crop as inter crop among the coconut plantations [9]. The common pests and diseases were recorded and its remedies were also suggested. The common pests and diseases identified includes *Pycnarmon cribrata* (leaf folder), *Nupserha vexator* (stem borer), Mealy bug, Spittle bug, White grub, Root knot and *Fusarium* wilt disease [9]. Estelitta et al [50] reported that *Pseudomonas solanacearum* was also causing wilt, however, *Fusarium* wilt is a major cause for crop loss. Micropropagation technique for this crop was also reported [51,52].



Figure 1. *Plectranthus vittiveroides* (a) cultivated farmer's field at Kollidam, Chidambaram, (b) germplasm collected from Kollidam cultivated at Saraswathy Thangavelu Centre of JNTBGRI, (c) roots harvested after 70 days of cultivation following the standardised agrotechnological practice developed by JNTBGRI.

Table 1: A list of commercially available drug formulations using *Plectranthus vittiveroides* as single or as an ingredient

Sl. No.	Ayurvedic preparation	Manufacture	Uses	Source of information*
1	Anu Thailam	AVS Kottakkal	Preventive medicine in Ayurveda which helps in preventing diseases of upper parts of the body. Effective for sinusitis, drug resistant head ache, rhinitis, nervous disorders which occur due to the dysfunction of the brain cells, improve memory and functioning of four sense organs (nose, ear, eyes and tongue)	http://www.avskottakkalastralia.com/uploads/2/1/6/4/21641008/australia-ing.list_workshop-1.pdf
2	Aswagandathi Leghyam	Aravindh Herbal Labs (P) Ltd.	Nervous weakness, general body health, sexual weakness and increasing vigour.	http://www.aravindhherbal.com/aswakandhi-legiyam.html
3	Aathma Massage Oil	Bipha Drug Laboratories	Regular use balances pitta dosha and protects the skin.	http://www.bipha.com/ProductDetails.aspx?ProductId=2
4	Ajara Thailam	Omved	Delay greying, nourish and strengthen hair roots, soothe the mind and nerves	http://www.shophealthy.in/omved-ajara-thailam-125ml
5	Arimedadi Thailam	SKM Siddha and Ayurveda	Diseases of the oral cavity, gingivitis, stomatitis, aphthos, ulcer, glossitis	http://www.skmsiddha.org/sites/default/files/Therapeutic/Ayurveda%20Therapeutic%20Index%20(English).pdf
6	Ayushman Ayurvedic Soap	Arya Vaidya Pharmacy	Ayurvedic bathing cake	http://mall.coimbatore.com/bnh/avp/ayushman-ayurvedic-soap.htm
7	Balatailam (Capsules)	AVS Kottakkal	To treat cough, cold, fever, vomiting, bloating, wound, emaciation, spleen diseases, epilepsy, asthma and all vata diseases.	http://www.avskottakkalastralia.com/uploads/2/1/6/4/21641008/australia-ing.list_workshop-1.pdf
8	Brahmi Thaila	Dabur	Burning in the head, fatigue and mental tension, insomnia, irritability, difficulty of concentration, eye strain and to the sense organs, restlessness, instability, irregularity in sleep patterns, anxiety	http://www.starbene.it/parafarmaciaci/brhmi-taila-benef-150ml-913448371
9	Chandanadi Thailam	Arya Herbal Products Ltd.	Cooling oil which is useful for shirodhara, restore vitality to the vata skin, cool the body of pita people, eliminate toxins and to improve blood circulation. Also useful for arthritis, hypertension, sleeplessness and nervous tension.	http://www.aryaherbal.com/chandanadi-tailam.php
10	Chandanasava	Dabur India Ltd.; AVS Kottakkal	Used against urinary diseases, kidney failure, leucorrhea, poly cystic kidney disease and as an appetizer.	http://www.dabur.com/Product-s-Ayurvedic%20Specialities-Product%20Details?cate=ASAVA%20AND%20ARISHTA%20%20&prodid=41&prod=inc_CHANDANASAVA.htm
11	Chandanbala Laxadi Tail	Dabur India Ltd.	It is used against cough, asthma, jaundice, bleeding disorder, disease due to pitta and kapha and vata disorder, oligospermia etc.	http://www.bimbima.com/health/post/2013/12/13/chandanbala-laxadi-tail.aspx
12	Dasamoolarishtam	TriHealth; AVS Kottakkal	It is a nerve tonic. Used against respiratory diseases, cough, liver diseases, jaundice, anemia, piles, skin disorders, urinary calculi, male and female infertility, gastric disorders, pneumonia, cardiac disorders etc.	http://ayurvedinfo.com/2011/06/18/dasamoolarishtam-ingredients-uses-dose-and-side-effects/ http://www.trihealthayurveda.com/product/dasamoolarishtam/
13	Dhanwantaram Massage Oil	Arya Herbal Products	It rejuvenates the body and skin, increases immunity, tones up the muscles, eases muscular tensions, and promotes relaxation. It is also beneficial in case of neurological and rheumatic diseases, weakness, and chronic vata conditions and in pre- and post-natal care.	http://www.aryaherbal.com/dhanwantaram.php

14	Dhanyapanchaka Kvatha Curma	Chitrakoot Ras Shala Pharmacy	Pain, diarrhoea due to indigestion and tastelessness.	[53]
15	Drakshadi Kashayam	Chamakkatt Herbal Products	It avoids vata and pitha, predominant fever, toxicity due to excessive alcoholism, vomiting, fainting, giddiness, thirsty feeling, jaundice, burning sensation of whole body.	http://www.indiamart.com/chamakkatt-herbal/herbal-ayurvedic-medicines.html
16	Dineshavladi Keram	Seva	Used for quick wound healing, skin diseases and to improve skin complexion.	http://www.cheap-deals.com/ayurveda101-de/body-care-hygiene-massage-le/seva-ayurveda-dineshavladi-keram-1000-ml/1889.html
17	Eladi Kera Thailam	Arya Vaidyasala	Skin ailments, dryness, relief dandruff from the head. Children and infants can benefit from massages with this oil as it is very gentle with a base of coconut oil. Use to improve skin luster and keep dryness and peeling away from the skin.	http://www.kottakkalusa.com/Eladikera-Thailam-p/o014.htm
18	Elakanadi Kashayam	Chamakkatt Herbal Products	Cough, wheezing, hiccup pain on ribs and body slimming	http://www.exportersindia.com/chamakkatherbalproducts/elakanadi-kashayam-thrissur-india-23142.htm
19	Gandha Thailam	AVN Ayurveda Formulations Pvt. Ltd.; AVS Kottakkal	Improve bone mass and strengthen bone, joints and ligaments. To treat arthritis, osteoporosis, fracture, dislocation and ligament injuries.	http://ayurvedinfo.com/2012/04/23/gandha-thailam-uses-dosage-side-effects-ingredients-reference/ http://www.avskottakkalastralia.com/uploads/2/1/6/4/21641008/australia-ing.list_workshop-1.pdf
20	Herbal Drink	Isha Ruchi	Invigorate body and mind	http://www.zolamart.com/Ayurveda-%26-Siddha/Other-Health-Products/Isha-Arogya/Herbal-Tea---100Gms/Herbal-Tea/2_10.action
21	Herbal Bath Powder	Vallalar Herbal Center	Cleans the sweat glands and keeps the blood clean, heals psoriasis, dandruff and removes the bad smell from sweat.	http://www.indiamart.com/vallalarherbalcentre/herbals-in-day-to-day-life.html
22	Pure Hands Herbal Hand sanitizer	Himalaya	Antiseptic, antimicrobial, moisturiser and deodorant	http://www.himalayawellness.com/products/wellness/purehands.html
23	Jeevanthyadi Kashayam	AVS, Kottakkal	To treat conditions associated with boils or blisters like herpes, itching, diabetic carbuncle and burning sensation.	http://www.ayurpages.com/jeevanthyadi-kashayam-indication/
24	Jephyr Hair Oil	IMIS Pharmaceuticals Pvt.Ltd.	Checks falling hair, induces fresh growth, add luster and colour to hair, prevents dandruff, improves blood circulation to hair roots and delays greying.	http://www.imispharma.com/Medicine-Jephyr-Hair-Oil.htm
25	Kachooradi Churnam	Sreedhareeyam Ayurvedic Medicines Pvt. Ltd	Pramehajanya netra roga, pittaja netra roga	http://indianmedicine.nic.in/writeraddata/linkimages/4061686904-STANDARDIZED%20MEDICINES%20USED%20IN%20THE%20TREATMENT%20OFF%20RETINITIS%20PIGMENTOSA-%20SREEDHAREEYAM.pdf
26	Kachooradi Vattu	SKM Siddha and Ayurveda	Headache, diseases of head, fever, diseases of eye, diseases of throat.	http://www.skmsiddha.org/sites/default/files/Therapeutic%20Ayurveda%20Therapeutic%20Index%20%28English%29.pdf
27	Kadaleekalparasay	Santhigiri	Leucorrhoea, burning micturition,	http://www.santhigiriashram.c

	anam		weakness, general debility and postnatalcare.	om/INDUSTRIALDIVISION/Kadaleekalparasayanam_details.html
28	Kayarajanka Thailam	Santhigiri	Muscle relaxant and rejuvenate the cells.	http://www.santhigiriashram.com/INDUSTRIALDIVISION/KayarajankaThailam_details.html
29	Kasturyadi Gutika	SKM Siddha and Ayurveda	Abnormality of vata dosa, influenza, asthma.	http://www.skmsiddha.org/sites/default/files/Therapeutic/wor ddoc.pdf
30	Khadiradi Gutika	SKM Siddha and Ayurveda	Halitosis, stomatitis, disease of tooth, dental cavity, dental caries, diseases of throat, tastelessness, loose tooth, restricted movement of jaw and diseases of buccal cavity.	http://www.skmsiddha.org/sites/default/files/Therapeutic/Ayurveda%20Therapeutic%20Index%20%28English%29.pdf
31	Kumkumadi Lepam	Amrita Drugs	Acne and allied facial diseases, regular use promotes a fair complexion to the face.	https://www.eayur.com/ayurvedic/lepams/amrita-kumkumadi-lepam.htm http://www.amritadrugs.com/Ingredient/t-tila-taila.php
32	Lumbatone Soft Gel Capsules	Dhanalekshmy & Co Ayurvedic Ltd.	Back pain related problems like lumbar spondylosis.	http://easyayurveda.com/2009/11/16/lumbatone-soft-gel-capsules/
33	Lumbaton Drops	Kai Natural Care	To reduce spine, back and neck pain, lumbar spinal degeneration, reduce disc abnormalities, provide essential nutrients for healthy spine, support joint and muscle health, tendon, ligament and cartilage health, maintain strong and dense bones, can improve blood circulation.	http://madhyamgram.quikr.com/HAWAIIAN-LUMBATON-DROPS-MAY-SUPPORT-JOINT-MUSCLE-HEALTH-W0QQAdIdZ250389733
34	Manjisthadi Kwath	Dabur India Pvt. Ltd.; AVS Kottakkal	Immune modulator and blood purifier, helps to control itching and burning sensation, reduce fat in body, reduce the pains of joints due to vitiated air in blood, control numbness and tingling sensation of feet, hands and fingers and disorders of lipid metabolism.	http://www.avskottakkalastralia.com/uploads/2/1/6/4/21641008/australia-ing.list_workshop-1.pdf
35	Mahamanjisthadi Tablet	Bipha Drug Laboratories	Immune modulator and blood purifier, helps to control itching and burning sensation, reduce fat in body, reduce the pains of joints due to vitiated air in blood, control numbness and tingling sensation of feet, hands and fingers and disorders of lipid metabolism.	http://www.mfda.gov.mv/DOCS/1375850625.pdf
36	Marma Gutika	SKM Siddha and Ayurveda	Disorders of vital point, trauma	http://www.skmsiddha.org/sites/default/files/Therapeutic/Ayurveda%20Therapeutic%20Index%20%28English%29.pdf
37	Medimix Sandal Soap	Cholayil Pvt.Ltd	Keep skin fresh and glowing	http://www.jayimpex.co.in/medimix-sandal-2339636.html
38	Mandara Taila	IMIS Pharmaceuticals Pvt.Ltd.	Checks falling hair and induces fresh growth, gives coolant effect to the body particularly eyes, adds luster and color to hair, improves blood circulation to hair roots, increase hair melanin content and delays greying.	http://www.imispharma.com/Medicine-Mandara-Taila.htm
39	Nasiroga Nasa Thailam	Annai Aravindh Herbals	Sinusitis and migraine	http://annaiaravindhherbals.com/moredetail.php?&pid=223
40	Nasika Chooranam	SKM Siddha and Ayurveda	Diseases of the upper part of the body, headache, tremor	http://www.skmsiddha.org/sites/default/files/Therapeutic/Ayurveda%20Therapeutic%20Index%20%28English%29.pdf
41	Nilavembu Kudineer Chooranam	SKM Siddha and Ayurveda	Polyherbal siddha formulation that combat majority of fevers, prevent multiplication of virus in humans.	[54] http://www.skmsiddha.org/sites/default/files/Therapeutic/wor ddoc.pdf
42	Patoladi Grithum	Sreedhareeyam	Thimiram, Kacha	http://indianmedicine.nic.in/wr

		Ayurvedic Medicines Pvt. Ltd		itereaddata/linkimages/4061686904-STANDARDIZED%20MEDICINES%20USED%20IN%20THE%20TREATMENT%20OF%20RETINITIS%20PIGMENTOSA-%20SREEDHAREEYAM.pdf
43	Pachanamrithum Kashayam	Arya Vaidya Pharmacy; Vaidyaratnam Oushadhasala.	Fever and associated complaints.	http://www.ayurpages.com/pachanamrithum-kashayam/
44	Prabhat Back Pain Oil	Auro Health Care Pvt. Ltd	Pain relief oil	http://cd.indiabizclub.com/qxztptd/index.php?q=21;;;Rope;;;india
45	Parangipattai Rasayanam	Medisiddh Pharma Pvt. Ltd.	Cervical cancer, cancer of the testes, cervical adenitis, skin diseases, syphilis, leucorrhoea, pain, 96 types of kapha diseases and tumors.	http://www.siddhapapers.org/index.php/literary-reviews.html?start=4
46	PROVIN _R	Kalan Drugs & Remedies	Lack of breast milk, general weakness, improving physical strength and rheumatic complaints.	http://kalandrugsandremedies.com/product_detail/provin/
47	Puluvettu Thailam	Aravindh Herbal Labs Pvt.Ltd.	Prevent hair falling due to fungal infection.	http://www.aravindhherbal.com/puluvettu-thylam.html
48	Punarnavarishta	Baidyanath Herbal Product	Diuretic, alterative and haematinic, indicated in beri beri, oedema, abdominal disorders and liver complaints.	http://mall.coimbatore.com/bn/h/baidyanath/punarnavarishta.html
49	Rasnadi Choorname	AVN Ayurveda Formulations Pvt. Ltd.; AVS Kottakkal	Apply over scalp to relieve headache and sinusitis, headache, cold, chills allergy, mucous infection.	http://ayurvedinfo.com/2012/05/11/rasnadi-choornam-benefits-how-to-use-dosage-ingredients/
50	Rasnaerandhadi Kashaya Chooranam	SKM Siddha and Ayurveda	Diseases due to vata, gout.	http://www.skmsiddha.org/sites/default/files/Therapeutic/Ayurveda%20Therapeutic%20Index%20%28English%29.pdf
51	Sarasa Syrup	IMIS Pharmaceuticals Pvt. Ltd.	Antifungal and anti microbial, natural blood detoxifier, immunomodulatory property, controls dermatitis, itching, urticaria, skin patches, eczema and fungal infections.	http://www.imispharma.com/Medicine-Sarasa-Syrup.htm
52	Sarivadyasava	Dabur India Pvt.; AVS Kottakkal; Vaidyaratnam Oushadhasala	Blood purifier, improves blood circulation, main action on urinary system, useful in curing diseases of reproductive system, favouring regeneration of bone tissue, increases blood components especially platelets, curing dengue fever, improves digestion and assimilation, cure skin diseases with burning sensation, syphilis, fistula, weakness etc.	http://www.bimbima.com/health/post/2014/02/25/sarivadyasava-benefits-ingredients-dosage.aspx
53	Sahacharadi	Chamakkatt herbal products	Vata imbalance disorders, muscle and joint stiffness and convulsions, psychosis, gynaecological disorders.	http://www.chamakkatt.com/our-products/medicated-oils-2/sahacharadi-kuzhambu-oil/
54	Sarivadyasava	Maharishi Ayurveda	Urinary disorders, carbuncle, gonorrhoea, gout, anal fissure, blood disorders, anorexia, weakness etc.	http://www.exoticindiaart.com/product/ayurveda/maharishi-ayurveda-sarivadyasava-ayurvedic-medicine-AMC55/
55	Snanachoorname	Dhathri	Skin rashes and dandruff.	http://www.dhathri.com/skin-care.html#
56	Saribadyasavam	Dabur India Pvt. Ltd.; AVS Kottakkal; Vaidyaratnam Oushadhasala	Blood purifier, improves blood circulation, curing diseases of reproductive and urinary system, improves digestion and assimilation, rheumatic diseases etc.	http://www.bimbima.com/health/post/2014/02/25/sarivadyasava-benefits-ingredients-dosage.aspx
57	Shadangam Jala	Anaril Ayurvedics	Any form of jvara	http://www.ayurvedaforall.com/1677/shadangam.html

58	Sudarsanasavam	AVS Kottakkal	Blood purifier, anti- infective, anti-pyretic and anti periodic. To cure fever especially viral fever, relapsing fever, enteric fever.	http://www.avskottakkalaustrialia.com/uploads/2/1/6/4/21641008/australia-ing.list_workshop-1.pdf
59	Sudarsana Choomam	SKM Siddha and Ayurveda	Hepato-spleeno megaly, fever, intermittent fever, chronic fever, abdominal lump.	http://www.skmsiddha.org/sites/default/files/Therapeutic/Ayurveda%20Therapeutic%20Index%20(English).pdf
60	Sudarsana Vati	SKM Siddha and Ayurveda	Helpful for headaches, fever, body pains, nausea, anorexia fatigue or diaphoretic, improve appetite and liver disorder	http://www.skmsiddha.org/sites/default/files/Therapeutic/Ayurveda%20Therapeutic%20Index%20(English).pdf
61	Tridosha Massage Oil	Seva	Balance and alleviate aggravations of three doshas where symptoms are complex and variable.	http://www.satnam.de/tridosha-ayuro-massage-oel-seva-100-ml-p-1879.html
62	Triphaladi Keram	Sree Ram Herbal Remedies Pvt.Ltd	To treat split hairs and grey hairs, improves hair strength, headache, sinusitis, and rhinitis, all diseases pertaining to neck, eyes, ear and throat. It balances vata, pitta and kapha.	http://www.indiaabundance.com/shopping/sp196_pr3218_dr/Triphala_Oil.html
63	Usirasavam	Kottakkal Ayurveda	Bleeding disorders, skin diseases etc.	http://www.indianproducts.be/kottakkal-ayurveda-usirasavam.html
64	Vasarishtam	Kerala Ayurveda	Potent mucolytic, anti asthmatic, anti inflammatory, bronchodialator, pulmonary tuberculosis and chest trauma.	www.indiaabundance.com/.../Vasarishtam_(Kerala_Ayurveda).html
65	Vastyamayantaka Ghrta	SKM Siddha and Ayurveda	Dysuria, urinary calculus, increased turbidity of urine, calculus, vatapittaja vastiroga.	http://www.skmsiddha.org/sites/default/files/Therapeutic/Ayurveda%20Therapeutic%20Index%20(English).pdf
66	Valiya Karpooradi Choomam	Kairali Ayurvedic Products Pvt. Ltd.	Upper respiratory tract infections like cough, sneezing, hoarseness of voice and systemic diseases like indigestion, asthma and consumption etc.	http://www.ayurpages.com/valiya-karpooradi-choornam/
67	Valiya Narayana Tailam	Kairali Ayurvedic Products Pvt. Ltd.; AVS Kottakkal	Disorders related to arthritis. facial palsy, paralysis, deafness, ailments of tongue, gum and teeth are also cured good medicine to help women conceive, male impotency and insanity. External application like abyangam, pichu, kativasti, nasyam and dhara.	http://www.avskottakkalaustrialia.com/uploads/2/1/6/4/21641008/australia-ing.list_workshop-1.pdf http://www.probudjenie-baikal.ru/valya-narayana-maslo-valiya-narayana-tailam
68	Vatagajungusa Rasa	SKM Siddha and Ayurveda	Proper movement of vata, hiccup, diseases due to vata	http://www.skmsiddha.org/sites/default/files/Therapeutic/Ayurveda%20Therapeutic%20Index%20(English).pdf

*cited web pages last viewed on 22nd March, 2016

Table 2: List of house hold preparations which uses *Plectranthus vettiveroides* as single or one of the ingredients.

Sl No.	Preparation	Disease	Source of information*
1	Seenthil Kudineer	Fever	http://www.nhp.gov.in/pitha-suram-dengue-fever-_mtl
2	Chukku Kudineer	Dysentery in pithasuram	http://www.nhp.gov.in/pitha-suram-dengue-fever-_mtl
3	Maruthampattai Kudineer	Antidiabetic (Siddha medicine)	[38, 55]
4	Gomutra Haritaki	All kinds of mouth disease	[56]
5	Maha Manjistathyasava	On skin diseases, itching, vatarakta and elephantiasis	http://www.bdu.ac.in/schools/biotechnology/industrial_biotechnology/sekardb/pdf/medicine/4.pdf
6	Maha Amritarishta	Fever, enlargement of liver and spleen	http://www.bdu.ac.in/schools/biotechnology/industrial_biotechnology/sekardb/pdf/medicine/4.pdf
7	Dashanga Lepa	Treat skin ailments and rheumatoid arthritis	[57]

*cited web pages last viewed on 22nd March, 2016

XII. Conclusion

Considering its commercial importance, development of conservation and sustainable utilization strategy for this crop attain *prima face* importance. Its taxonomic entity could not be clearly described due to the lack of flowering stage and some of the authors may have conducted various experiments without taxonomic authenticity. Its emergence as separate taxa is still a curiosity to science. It is a potential source of drugs for many ailments but R&D on this line is meagre. As followed by NMPB promoting R & D on various aspects of this crop is become the need of the hour.

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