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AN ETHNOBOTANICAL SURVEY ON ADULTERANTS OF MEDICINAL PLANTS USED BY TRADITIONAL PRACTITIONERS OF PALAKKAD DISTRICT, KERALA, INDIA

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ABSTRACT

Adulteration of medicinal plants is a crucial issue in the present scenario and the study of adulteration in medicinal plants is the most relevant in the present context. As we depend on local markets for medicinal plants there are chances for adulteration. So, adulteration can be defined as the addition of low grade or harmful substances with a crude drug which does not conform with the official standards. The details documented here are collected by having oral communication and interview with the local people, native herbalists, traditional practitioners and Ayurveda practitioners of Palakkad district in Kerala, India. In this study, we have documented 124 plants of which 82 are adulterants of about 41 crude drug plants belongs to 39 families. Majority of the plant species belongs to the family LEGUMINOSAE with 13 species and then in EUPHORBIACEAE with 9 species. This article deals with adulteration in medicinal plants prevalent in Palakkad district Kerala, India.

Keywords: Ethnobotany, Medicinal plant, Adulteration and Adulterant.

INTRODUCTION

Plants have been used as medicine since time immemorial. Practitioners used these plants as a medicinal commodity to cure simple cuts to complex ailments from prehistoric times. So, a plant which contains chemical compounds that can be used for therapeutic purposes or which are precursors for the synthesis of drugs is termed as medicinal plants.

An aggressive human intervention in the ecosystem has resulted in a significant decrease in the medicinal plant population. The key threats that faced by the medicinal plant aficionado community are that the losses due to deforestation, extinction of plants by anthropogenic interference and the erroneous identification of plants. This resulted in practising adulteration.

In Indian traditional system of medicine since raw materials (*i.e*. whole plant or plant parts) are used for treatment there are chances for adulteration. This practice may be intentional or accidental.[1] A drug is treated as adulterant if it consists of any putrid, decomposed or filthy substances. So, Adulteration is a practice of substituting the original crude drug partially or fully with other substances which is either free from or inferior in therapeutic and chemical properties or addition of low grade/ spoiled/ entirely different drug similar to that of original drug substituted with an intention of enhancement of profits.[2,3] Such inferior/low grade/spoiled substances are termed as adulterants.

This is the first time that a survey on the practice of Adulteration in Medicinal Plants conducted in Palakkad district and it helped to gain knowledge on different adulterants used with medicinal plants. It is very difficult to trace adulterants from the crude drug for a common man. So, providing information on adulterants in the common market is most relevant in such a context.

The deforestation, massive exploitation and extinction of many plants, incorrect identification of plants and intentionally mixing inferior/ low-grade substances resulted in adulteration of raw drugs. Adulteration lead to

the decline of faith in herbal drugs and its impact was negative on Ayurveda, Siddha and Unani system of medicines as the faith lost and followers decreased.

MATERIALS AND METHODS

In the present study ethnobotanical investigations were carried out in the rural and urban areas of the district especially Attappady to the north, Peringottukurussi to the south, Kozhinjampara to the east, Mannarkkad to the west and central Palakkad. The people of the rural area of Palakkad widely follow traditional medicines and customs related to their religious beliefs. The methods are very much varied within different communities.

Oral communication with the local people and interviews with traditional Ayurvedic practitioners in this region were adopted to collect information about the plants used as Adulterants. The interviewers include laymen, native herbalist, local pharmacists and Ayurvedic doctors.

Vernacular name mentioned by the local people was clarified with the help of Ayurveda Practitioners and related literature.[4,5,6,7] The plants used were further authenticated using flora of the region and valid reference obtained by Ayurvedic practitioners of that region.[4,5,8,9]

RESULTS AND DISCUSSION

TABLE

To our knowledge, the present study is the first report documenting adulterants used along with medicinal plants in various localities of Palakkad district, Kerala, South India. We had tried to approach people of various age groups and most of the respondents were of the age group between 50 to 60 years with 34% of total respondents and then of the age group between 60 to 70 years with nearly 23% of total respondents. The young generation which consist of the age group between 20 to 30 years old have least adequate knowledge about traditional medicinal practises. The majority of respondents who have knowledge about the traditional medicines are either herbalists/traditional practitioners/house wives by occupation and females constitute the 60% of total respondents.

We had documented 123 plants of which 82 are adulterants of 41 crude drug medicinal plants which belongs to 39 plant families. Most of the plants are herbaceous in nature and they are wholly used as dried products. Adulteration is most common when the bark and roots are used as medicinally useful parts and it is severe when they are used as dried products. The most popular adulterant is *Polyalthia longifolia* (Sonn.) Thwaites which is used as adulterant for medicinal plant *Saraca asoca* (Roxb.) Willd. Some of the other popular adulterants are *Pinus palustris* Mill adulterant of *Cedrus deodara* (Roxb.ex D.Don) G.Don ,*Ichnocarpus frutescens* (L.)W.T.Aiton adulterant of *Hemidesmus indicus (*L.)R.Br.ex Schult , *Sida spinosa* L. adulterant of *Sida rhombifolia* L.

Adulteration had become a popular practise in herbal industry; particularly during drug production, along with dried specimens, powdered and used with other formulations, etc. Various reasons for adulteration includes the least availability and high cost of drug plants, commercial benefit by using cheap products, more expense in processing medicinal plant or sometimes it may happen inadvertently due to changes in vernacular name, resemblance in morphology, colour, negligence in collection, lack of information about authentic species, etc. An adulterant doesn't have any therapeutic effect that of the main plant and sometimes they may cause side effects due to the presence of harmful chemical constituents and it also dilutes the effect of major plants. Adulteration is mainly practised for commercial benefits and it is neither useful nor beneficial for the society and such a practise should be banned by law since it is a malpractice.

A detailed information about the adulteration in medicinal plants is not available as the herbalists and traditional practitioners are unwilling to disclose their secrets and refuses to respond to our questions. Further phytochemical studies can be conducted in this topic to find the ill effects of adulterants over human population.

SUMMARY AND CONCLUSION

Adulteration had become a popular practice in the herbal industry. Various reasons for adulteration include;

***Least availability of drug plants**

Due to the massive explosion of medicinal plants the availability of Drug plants is decreasing day by day. So instead of drug plant, other plants are collected and mixed with the crude drug which is considered as a type of adulteration.

***Commercial benefit by using cheap products**

Some drug plants are very costly and are distributed to specific geographic regions. So, in such cases, other plants or artificial substances are added to the crude drug

***Expensive processing procedure of medicinal plants**

The extraction of some volatile oils and some chemicals from medicinal plants are complicated processes and require more time to get the resultant products. For the ease, plants are substituted with other harmful chemicals which have the almost similar chemical constitution.
May happen inadvertently due to

***Changes in the vernacular name**
Sometimes different plants will be known by a common name in different locations.
E.g. Iris germanica L. and *Inula racemosa Hook.f* are commonly known as Pushkaramula in Malayalam.
So the plants may be wrongly used in herbal preparations which cause the quality of the drug.

***Resemblance in morphology, colour**
The plants which are similar in morphology or colour are adulterated with crude drug plants which are either costly or are least available.

***Negligence in the collection**
When collecting herbaceous plants, especially grasses there are chances for mixing other plants or plant parts which affect the quality of the drug.

***Lack of information about authentic species**
The plants prescribed in Ayurveda texts may be wrongly interpreted in cases of differences in vernacular names, availability and distribution in various geographical locations etc. Since the crude plant gets substituted in such cases it is considered as adulteration.

Types of Adulterants
Drugs are adulterated mainly with inferior low-grade, spoiled or artificial substances.[2,10,11]

***Mixing with Superficially Similar Substances**
Here the adulterant used along with the crude drug resembles only morphologically and it doesn't have any therapeutic effect. It is difficult to separate such similar substances from the crude drug.

E.g. *Saraca asoca* (Roxb.) Willd. adulterated with *Polyalthia longifolia* (Sonn.) Thwaites

***Substitution with substandard varieties**
The adulterant used with the crude drug resembles morphologically and chemically. They have the least therapeutic effect and are cheap in cost. *E.g. Sida cordifolia* L. adulterated with *Sida rhombifolia* subsp. alnifolia (L.)Ugbor.

***Adding other vegetative parts of the same plant**
If the morphologically useful part of a plant is rhizome it may be substituted with other plant parts like stem, root etc. Such parts used may not have the chemical composition similar to the useful part. So, they will be therapeutically ineffective. *E.g.* Tuber of *Hemidesmus indicus* (L.)R.Br.ex Schult. substituted with roots.

***Using exhausted drug**
Sometimes the crude drug used may be already used for extracting medicinally active substances and volatile oils, such substances used for the preparation of medicine will be therapeutically ineffective and this can be considered as adulteration. *E.g*. Oil extracted Clove using for medicines
In the above kind of adulterations either the whole plant or plant parts are used as adulterant, but we came to know that, there are instances where other substances which are not plant origin were used as adulterants, such kind of adulteration are mentioned below;

***With Artificially manufactured substances**
If the crude drug is costly it will be adulterated with artificially prepared substances which are similar to morphology with the crude drug and without having any quality of it. *E.g. Crocus sativus* L. adulterated with artificially prepared substances and coloured stamens of other flowers.

*** Adulteration by Synthetic Chemicals**
This method is employed when the collected drug lost its chemical quality and freshness. In such case, the synthetic chemicals are used for maintaining its natural character and qualities. *E.g*. Citral using with Citrus oil.

***Using Harmful adulterants**
Sometimes the crude drug may be adulterated with waste materials which may not be of plant origin and they can enhance the weight, colour and flavour of the crude drug and it will chemically harmful to us. *E.g*. *Ferula assa-foetida* L. adulterated with stones for increasing weight.

***Adulteration in powder**
If we are using the powdered drug, there are a lot of chances for getting it adulterated with other substances which are similar in colour and can increase the weight of the product. *E.g*. *Pterocarpus santalinus* L.f. adulterated

with brick powder.

The increasing demand for medicinal plants and more people is holding faith in Ayurveda and similar kinds of treatments, the requirements for medicinal plants has been increasing. These leads to the over exploitation of plants and which resulted in their least availability. So as to meet the current requirement of medicinal plants in the market, their increasing demand, tremendous increase in their price etc. made the traders to sell them adding with adulterants. Now this had become a kind of business in the herbal market which paved a huge profit for the traders. Since the medicines of Ayurveda, Siddha and Unani systems are completely prepared from plants, the practise of adulteration will adversely affect the quality of drugs.

The adulterant used will have a completely different or partially different chemical composition, for e.g. in this work we documented *Cinnomomum cassia* (L.) J. Presl as the adulterant of *Cinnamomum verum* J.Presl, *Cinnomomum cassia* (L.) J. Presl contains many benzene derived compounds which cause many diseases in man. So, this survey is just a gateway to explore the adulterants used in herbal industry and further studies can be done on phytochemical analysis to determine the ill effect of chemicals present in the adulterant.

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Conflict of interest statement

We declare that we have no conflict of interest.

Medicinal Plants and their Adulterants

Sl. No.	Botanical name of plant/ adulterant plant		Family	Common name	Habit	Part used
1	***Acacia leucophloea (Roxb.)Willd.***		Leguminosae	Vellavelam	Tree	Gum of stems
	1.1	*Acacia ferruginea* DC.	Leguminosae	Karivelam	Tree	Gum of stems
2	***Terminalia cuneata* Roth**		Combretaceae	Nirmaruthu	Tree	Whole plant
	2.1	*Terminalia elliptica* Willd.	Combretaceae	Karimaruthu	Tree	Whole plant
	2.2	*Firmiana simplex* (L.) W. Wight	Malvaceae	Paravakka	Tree	Whole plant
	2.3	*Lagerstroemia speciosa* (L.) Pers.	Lythraceae	Manimaruthu	Tree	Whole plant
3	***Clerodendrum indicum* (L.) Kuntze.**		Lamiaceae	Periyalam	Shrub	bark of roots and leaves
	3.1	*Rotheca serrata* (L.) Steane & Mabb.	Lamiaceae	Kanakabharani	Shrub	bark of roots and leaves
	3.2	*Ceriscoides turgida* (Roxb.) Tirveng.	Rubiaceae	Malankara	Tree	bark of roots and leaves
	3.3	*Cassine glauca* (Rottb.) Kuntze	Celastraceae	Thonnimaram	Tree	bark of roots and leaves
4	***Achyranthes aspera* L.**		Amaranthaceae	Kadalody	Herb	Slender twigs & roots
	4.1	*Cyathula prostrate* (L.)Blume	Amaranthaceae	Cherukadalody	Herb	Slender twigs & roots
	4.2	*Pupalia lappacea* (L.) Juss.	Amaranthaceae	Pypal valli	Herb	Slender twigs & roots
5	***Cinnamomum verum* J.Presl**		Lauraceae	Karuva	Tree	Bark and leaf
	5.1	*Cinnomomum cassia* (L.) J. Presl	Lauraceae	Chinese patta	Tree	Bark and leaf
6	***Peucedanum grande* C.B.Clarke**		Apiaceae	Wild carrot	Herb	Fruit
	6.1	*Elettaria cardamomum* (L.)Maton	Zingiberaceae	Elam	Herb	Fruit
	6.2	*Amomum subulatum* Roxb.	Zingiberaceae	Kattuelam	Herb	Fruit
7	***Acorus calamus* L.**		Acoraceae	Vayambu	Herb	Rhizome
	7.1	*Iris×germanica* L.	Iridaceae	Pushkaramulam	Herb	Rhizome
	7.2	*Alpinia galanga* (L.) Willd.	Zingiberaceae	Chittaratta	Herb	Rhizome
	7.3	*Zingiber zerumbet* (L.) Roscoe. ex Sm.	Zingiberaceae	Mala inji	Herb	Rhizome
8	***Iris × germanica* L.**		Iridaceae	Pushkaramulam	Herb	Rhizome
	8.1	*Inula racemosa* Hook.f	Compositae	Pushkaramula	Herb	Rhizome
	8.2	*Saussurea costus* (Falc.) Lipsch.	Compositae	Kottam	Herb	Rhizome

	8.3	*Hedychium spicatum* Sm.	Zingiberaceae	Kacholam	Herb	Rhizome
9	**_Salvia canariensis_ L.**		Lamiaceae	Salvia	Herb	Root
	9.1	*Inula royleana* DC.	Compositae		Herb	Root
	9.2	*Iris × germanica* L.	Iridaceae	Pushkaramulam	Herb	Rhizome
10	**_Embelia tsjeriam-cottam_ (Roem. & Schult.) A.DC.**		Primulaceae	Ammimuriyan	Shrub	Seed, Bark of root
	10.1	*Maesa indica* (Roxb.)A.DC.	Primulaceae	Kuttivizhal	Shrub	Seed, Bark of root
11	**_Holarrhena pubescens_ Wall.ex G.Don**		Apocynaceae	Kutagappala	Tree	Bark
	11.1	*Wrightia tinctoria* R.Br	Apocynaceae	Manthappala	Tree	Bark
	11.2	*Wrightia arborea* (Dennst.) Mabb.	Apocynaceae	Ayyappala	Tree	Bark
12	**_Terminalia chebula_ Retz.**		Combretaceae	Kadukka	Tree	Bark, Fruit
	12.1	*Terminalia pallida* Brandis	Combretaceae		Tree	Bark, Fruit
	12.1	*Terminalia citrina* Roxb.ex Fleming	Combretaceae		Tree	Bark, Fruit
13	**_Aquilaria agallocha_ Roxb.**		Thymeleaceae	Karakil	Tree	Wood, Extracted oil
	13.1	*Dysoxylum malabaricum* Bedd.ex C.DC.	Meliaceae	Vellakil	Tree	Wood, Extracted oil
14	**_Premna serratifolia_ L.**		Lamiaceae	Munja	Shrub	Root, Leaves
	14.1	*Premna mollissima* Roth	Lamiaceae	Knappa, Nappa	Shrub	Root, Leaves
	14.2	*Clerodendrum phlomidis* L.f	Lamiaceae	Kozhiappa	Tree	Root, Leaves
15	**_Merremia emarginata_ (Burm.f.) Hallier f.**		Convolvulaceae	Elicheviyan	Climber	Leaves
	15.2	*Hemionitis arifolia* (Burm.f.) T.Moore	Pteridaceae		Climber	Leaves
16	**_Cuscuta reflexa_ Roxb.**		Convolvulaceae	Moodillathali	Climber	Whole plant
	16.1	*Cassytha filiformis* L.	Lauraceae	Neyyuvalli	Climber	Whole plant
17	**_Juglans regia_ L.**		Juglandaceae	Acrot	Tree	Whole plant
	17.1	*Aleurites moluccanus* (L.) Willd.	Euphorbiaceae	Akshotam	Tree	Whole plant
18	**_Limnophila aromatica_ (Lam.)Merr.**		Plantaginaceae	Manganarri	Herb	Rhizome
	18.1	*Limnophila indica* (L.) Druce	Plantaginaceae	Cheriya manganarri	Herb	Rhizome
19	**_Saraca asoca_ (Roxb.) Willd.**		Leguminosae	Ashokam	Tree	Bark of tree
	19.1	*Bauhinia variegate* L.	Leguminosae	Chuvanna mandaram	Tree	Bark of tree
	19.2	*Polyalthia longifolia* (Sonn.) Thwaites	Annonaceae	Aranamaram	Tree	Bark of tree
20	**_Aconitum heterophyllum_ Wall.ex Royle**		Ranunculaceae	Ativitayam	Herb	Root
	20.1	*Cryptocoryne spiralis* (Retz.) Fisch.ex Wydler	Araceae	Thakaram	Herb	Root
21	**_Paederia foetida_ L.**		Rubiaceae	Thaalaneeli	Climber	Whole plant
	21.1	*Merremia tridentata* (L.) Hallier f.	Convolvulaceae	Sitarmudi	Climber	Whole plant
	21.2	*Leptadenia pyrotechnica* (Forssk.)Decne.	Apocynaceae		Shrub	Whole plant
	21.3	*Convolvulus arvensis* L.	Convolvulaceae		Climber	Whole plant
22	**_Sphagneticola calendulacea_ (L.) Pruski**		Compositae	Kadal kayyonni	Herb	Whole plant
	22.1	*Eclipta prostrata* (L.) L.	Compositae	Kayyunni	Herb	Whole plant
23	**_Ailanthus excelsa_ Roxb.**		Simaroubaceae	Matti	Tree	Leaves, Bark
	23.1	*Justicia adhatoda* L.	Acanthaceae	Aadalodakam	Shrub	Leaves, Bark
	23.2	*Justicia gendarussa* Burm.f	Acanthaceae	Vathamkolli	Shrub	Leaves, Bark
	23.3	*Justicia carnea* Lindl.	Acanthaceae		Herb	Leaves, Bark
24	**_Berberis aristata_ DC.**		Berberidaceae	Kuthiramanjal/Maramanjal	Shrub	Rhizome
	24.1	*Coscinium fenestratum* (Goetgh.)Colebr.	Menispermaceae	Maramanjal	Climber	Rhizome
25	**_Hydnocarpus wightianus_ Blume**		Achariaceae	Maravatta	Tree	Seed oil
	25.1	*Gynocardia odorata* R.Br.	Achariaceae	Marotti	Tree	Seed oil
	25.2	*Avicennia officinalis* L.	Acanthaceae	Uppatti	Tree	Seed oil
	25.3	*Hydnocarpus kurzii* (King)Warb.	Achariaceae	Niradimuttu	Tree	Seed oil
26	**_Clitoria ternatea_ L.**		Leguminosae	Shankupushpam	Climber	Whole plant
	26.1	*Canscora alata* (Roth)Wall.	Gentianaceae	Kanjenkora	Herb	Whole plant
	26.2	*Convolvulus prostratus* Forssk.	Convolvulaceae	Shankupushpi	Herb	Whole plant
27	**_Alhagi maurorum_ Medik.**		Leguminosae	Kappathumba	Herb	Whole plant
	27.1	*Fagonia arabica* L.	Zygophyllaceae	Dhanvayaasam	Shrub	Whole plant

	27.2	*Tragia involucrata* L.	Euphorbiaceae	Kodithoova	Climber	Whole plant
28	**_Sida cordifolia_ L.**		Malvaceae	Vally kurunthotty	Herb	Root
	28.1	*Sida rhombifolia subsp. alnifolia* (L.)Ugbor.	Malvaceae	Vankurunthotty	Herb	Root
29	**_Sida rhombifolia_ L.**		Malvaceae	Kurunthotty	Herb	Root
	29.1	*Sida spinosa* L.	Malvaceae	Kattuventiyam	Herb	Root
30	**_Cedrus deodara_ (Roxb.ex D.Don) G.Don**		Pinaceae	Devatharu	Tree	Bark, heartwood, resin
	30.1	*Picea abies* (L.) H.Karst	Pinaceae	Charalam	Tree	Bark, heartwood, resin
	30.2	*Pinus palustris* Mill	Pinaceae	Chirpine	Tree	Bark, heartwood, resin
31	**_Aconitum chasmanthum_ Stapf ex Holmes**		Ranunculaceae		Herb	Root
	31.1	*Aconitum napellus* L.	Ranunculaceae		Herb	Root
	31.2	*Aconitum ferox* Wall.ex Ser.	Ranunculaceae		Herb	Root
	31.3	*Aconitum lethale* Griff.	Ranunculaceae		Herb	Root
32	**_Baliospermum solanifolium_ (Burm.) Suresh**		Euphorbiaceae	Nagadanti	Shrub	Root
	32.1	*Croton tiglium* L.	Euphorbiaceae	Neervalam	Shrub	Root
	32.2	*Ricinus communis* L.	Euphorbiaceae	Aavanakku	Shrub	Root
	32.3	*Jatropha glandulifera* Roxb.	Euphorbiaceae	Katalavanakku	Shrub	Root
33	**_Croton tiglium_ L.**		Euphorbiaceae	Neervalam	Shrub	Leaf,root,seed
	33.1	*Jatropha pelargoniifolia* Courbai	Euphorbiaceae		Shrub	Leaf,root,seed
	33.2	*Croton polyandrous* Spreng.	Euphorbiaceae		Shrub	Leaf,root,seed
	33.3	*Jatropha curcas* L.	Euphorbiaceae	Kally	Shrub	Leaf,root,seed
34	**_Abies spectabilis_ (D.Don)Mirb.**		Pinaceae	Talisapatram	Tree	Leaves
	34.1	*Taxus baccata* L.	Taxaceae		Tree	Leaves
	34.2	*Rhododendron lepidanthum* Balf.f. & W.W.Sm.	Ericacaceae		Tree	Leaves
35	**_Desmodium gangeticum_ (L.)DC.**		Leguminosae	Oorila	Shrub	Whole plant
	35.1	*Pseudarthria viscida* (L.)Wight & Arn.	Leguminosae	Moovila	Shrub	Whole plant
	35.2	*Desmodium heterocarpon* (L.)DC.	Leguminosae	Nilathevara	Herb	Whole plant
	35.3	*Uraria lagopodoides* (L.) DC.	Leguminosae	Cheriyaoorila	Herb	Whole plant
	35.4	*Uraria rufescens* (DC.) Schindl.	Leguminosae	Moovila	Herb	Whole plant
	35.5	*Flemingia paniculata* Benth.	Leguminosae		Herb	Whole plant
36	**_Rubia cordifolia_ L.**		Rubiaceae	Manjatty	Climber	Root
	36.1	*Houstonia purpurea* L.	Rubiaceae		Herb	Root
37	**_Uraria picta_ (Jacq.) DC.**		Leguminosae		Herb	Root
	37.1	*Desmodium gangeticum* (L.) DC.	Leguminosae	Oorila	Shrub	Root
38	**_Citrullus colocynthis_ (L.) Schrad.**		Cucurbitaceae	Kattuvellari	Climber	Root, Fruit
	38.1	*Cucumis sativus* L.	Cucurbitaceae	Andanga	Climber	Root, Fruit
	38.2	*Ceratosanthes palmata* (L.) Urb.	Cucurbitaceae	Kakkattonti	Climber	Root, Fruit
39	**_Tribulus terrestris_ L.**		Zygophyllaceae	Nerinnil	Climber	Whole plant
	39.1	*Martynia annua* L.	Martyniaceae	Kakkachundu	Herb	Whole plant
	39.2	*Acanthospermum hispidum* DC.	Compositae	Pulinagham	Herb	Whole plant
	39.3	*Pedalium murex* L.	Pedaliaceae	Ananerinnil	Herb	Whole plant
40	**_Cyclea peltata_ (Lam.) Hook.f. & Thomson**		Menispermaceae	Padathali	Climber	Whole plant
	40.1	*Cissampelos pareira* L.	Menispermaceae	Karanakodi	Climber	Whole plant
	40.2	*Rivea ornata* Choisy	Convolvulaceae	Musta	Climber	Whole plant
	40.3	*Rivea hypocrateriformis* Choisy	Convolvulaceae		Climber	Whole plant
41	**_Hemidesmus indicus_ (L.)R.Br.ex Schult.**		Apocynaceae	Nannari	Herb	Tuber
	41.1	*Ichnocarpus frutescens* (L.)W.T.Aiton	Apocynaceae	Palvalli	Climber	Tuber
	41.2	*Cryptolepis dubia* (Burm.f.) M.R.Almeida	Apocynaceae	Kattupalvalli	Climber	Tuber

	41.2	*Decalepis hamiltonii* Wight & Arn.	Apocynaceae	Mahalikizhangu	Climber	Tuber

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