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# PHARMACOGNOSTIC ACCOUNT ON CALOTROPIS PROCERA ROOT

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ABSTRACT

Arka (Calotropis procera) an important drug of Ayurveda is known in this country from the earliest time. It is mentioned by the earliest Hindu writers and the ancient name of the plant which occurs in the vedic literature was Arka alluding to the form of leaves, which was used in the sacrifical rites. There are two common species of Calotropis, viz. Calotropis gigantean (Linn.) R.Br. and Calotropis procera (Ait.) R.Br described by the Sanskrit writers. Both the species are used as substitutes for one another and are said to have similar effects. In Dhanvantari Nigantu three varieties of Arka are mentioned viz. Rajarkah, Suklarkah and Svetamandarah. It has been widely used in the Sudanese, Unani, Arabic and Indian traditional medicinal system for the treatment of various diseases namely leprosy, ulcers, piles and diseases of the spleen, liver and abdomen. The latex is used as an abortifacient, spasmogenic and carminative properties, antidysentric, antisyphilitic, antirheumatic, antifungal, mullusccide, diaphoretic and for the treatment of leprosy, bronchial asthma and skin affiction. Different parts of the plant have been reported to possess a number of biological activities such as proteolytic, antimicrobial, larvicidal, nematocidal, and anticancer, anti-inflammatory.Its flowers possess digestive and tonic properties. On the contrary, the powdered root bark has been reported to give relief in diarrhoea and dysentery. The root of the plant is used as a carminative in the treatment of dyspepsia. The root bark and leaves of Calotropisproceraare used by various tribes of central India as a curative agent for jaundice.

**KEYWORDS** Arka, Calotropis, antidysentric, antisyphilitic, antirheumatic, antifungal, mullusccide, proteolytic, antimicrobial, larvicidal, nematocidal, anticancer, anti-inflammatory.etc.

## INTRODUCTION

Arka (Calotropisprocera) an important drug of Ayurveda is known in this country from the earliest time. It is mentioned by the earliest Hindu writers and the ancient name of the plant which occurs in the vedic literature was Arka alluding to the form of leaves, which was used in the sacrifical rites. There are two common species of Calotropis, viz. Calotropis gigantean (Linn.) R.Br. and Calotropisprocera(Ait.) R.Br described by the Sanskrit writers [1]. Both the species are used as substitutes for one another and are said to have similar effects. In DhanvantariNigantu three varieties of Arka are mentioned viz. Rajarkah, Suklarkah and Svetamandarah. It has been widely used in the Sudanese, Unani, Arabic and Indian traditional medicinal system for the treatment of various diseases namely leprosy, ulcers, piles and diseases of the spleen, liver and abdomen [2].

The latex is used as an abortifacient, spasmogenic and carminative properties, antidysentric, antisyphilitic, antirheumatic, antifungal, mullusccide, diaphoretic and for the treatment of leprosy, bronchial asthma and skin affiction. Different parts of the plant have been reported to possess a number of biological activities such as proteolytic, antimicrobial, larvicidal, nematocidal, anticancer, anti-inflammatory [3]. Its flowers possess digestive and tonic properties. On the contrary, the powdered root bark has been reported to give relief in diarrhoea and dysentery. The root of the plant is used as a carminative in the treatment of dyspepsia. The root bark and leaves of Calotropisproceraare used by various tribes of central India as a curative agent for jaundice [4].

## LIST OF SYNONYMS

**Table No.1**

| Sr. No. | Language | Common Names |
|---|---|---|
| 1. | Sanskrit | Arka, Alaka, Ravi |
| 2. | Hindi | Aaka, Aanka, Ak |
| 3. | English | Calotropis, Roostertree, Mudar plant |
| 4. | Arabic | Oshar |
| 5. | French | Calotrope, Pomme de Sodome |
| 6. | German | WahreMudarpflanzer, Gomeiner |
| 7. | Italian | Calotropo |
| 8. | Spanish | Algodonextranjero, Cazuela |
| 9. | Turkish | Ipekag |

## SCIENTIFIC CLASSIFICATION

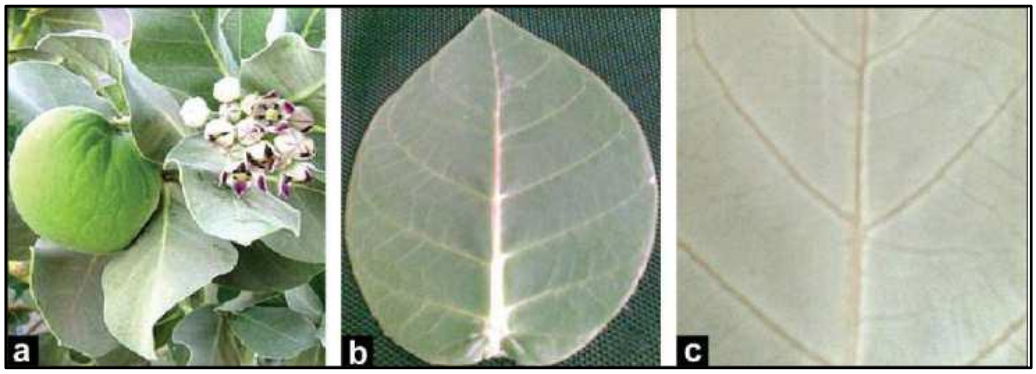
**Table No.2**

| Kingdom | Plantae – Plants |
|---|---|
| **Subkingdom** | Tracheobionta– Vascular plants |
| **Superdivision** | Spermatophyta– Seed plants |
| **Division** | Magnoliophyta– Flowering plants |
| **Class** | Magnoliopsida– Dicotyledons |
| **Subclass** | Asteridae |
| **Order** | Gentianales |
| **Family** | Asclepiadaceae– Milkweed family |
| **Genus** | CalotropisR. Br. – calotropis |
| **Species** | Calotropisprocera(Aiton) W.T. Aiton – roostertree |

## BOTANICAL DESCRIPTION

Morphology of Calotropisprocera leaf [a – A twig with oppositely arranged subsessile leaves; b - Broadly ovate or elliptical, cottony, pubescent when young and glabrous on maturity; c - Portion of the lamina showing venation pattern] Calotropisproceraoccurs as a single or many stemmed soft-wooded shrub, and occasionally a tree reaching to 6m.

All parts of the plant exude white milky latex when cut. Botanical description of Calotropisproceraincudes following parts:



## GEOGRAPHIC DISTRIBUTION

Procerais drought-resistant, salt-tolerant to a relatively high degree, and it disperses seeds through wind and animals. It quickly becomes established as a weed along degraded roadsides, lagoon edges and in overgrazed native pastures. It has a preference for and is often dominant in areas of abandoned cultivation especially sandy soils in areas of low rainfall; assumed to be an indicator of over-cultivation. C. Procerais native to India, Pakistan, Nepal, Afghanistan, Algeria, Iran, Iraq, Israel, Kenya, Kuwait, Niger, Nigeria, Oman, Saudi Arabia, United Arab Emirates, Vietnam, Yemen and Zimbabwe 9.

## PROPAGATION AND MANAGEMENT PROPAGATION METHODS

The tree seeds freely, and natural regeneration is common. Vegetative propagation through half stumps assumes a special importance as compared with the entire stumps because they help in faster multiplication of the parent genotype with plus characters, as each plant gives rise to 2 half stumps. Stumps also help in propagating only one plant. Vegetative propagation through stem and root cuttings is very useful in large-scale multiplication of the superior genotypes 22.

## TREE MANAGEMENT

procerahas been cultivated in South America and on the Caribbean Islands for the production of fibres at a spacing of 1-1.5 m. When cultivated, annual yields of up to 500 kg/ha are expected. A single harvest per season is preferable to a double (or triple) harvest; a single harvest would result in a net saving of energy input both on the farm and in the processing plant. Well suited for intensive energy farming in arid or semi-arid regions where frost is not a limiting factor 23.

## MACROSCOPICAL CHARACTERISTICS

Macroscopical characteristics of various parts of Calotropisprocera are as follows:

**Root**

The root occurs in the entire condition. The bark is separated from the wood 0.5-2.0 cm. in diameter bearing rootlets with diameter varying from 0.2 to 0.5 cm. externally whitish grey in colour, wrinkled in the fresh condition, plenty of whitish latex exudes from cuts or wounds in the bark. Fracture is incomplete.

**Leaf**

Simple, opposite, sub-sessile, slightly thick, fleshy, coriacious,10-15 cm. long and 4.5 to 6.5cm. broad, broadly cuneate, obovate or obovate oblong, slightly cordate and auricled at base with tuff of short simple hairs on the upper side near place of the attachment to the petiole. The tender leaves are covered with ashy gray pubescence. Mature leaves are nearly smooth or even glabrous and pale green.

**Flowers**

Regular,bisexual, liliac or pale rose, purple or light greenish yellow and have a faint odour. They are arranged in simple or rarely compound cymose corymbs at the ends of laterally placed or interpetiolar peduncles arising from alternate sides of the nodes. Each cluster is surrounded by an involucre of several small oblong pointed scaly caducous bracts. Flower buds ovoid.

**Calyx**

Five lobes broadly ovate with small fleshy teeth like glands within the base.

**Corolla**

Regular, gamopetalous, pale rose purple or liliac, subcordate to broadly sub-campanulate with a short tube and five broad ovate, lanceolate, valvate, spreading lobes.

**Stamens**

Five, inserted at the base of the corolla. Filaments united to form a large staminal column provided with five conspicuous radiating coronal appendages that are completely adnate to, but slightly shorter than the column. The appendages are fleshy, pale purplish or yellowish white and laterally compressed with a circinnatelyrecurved hollow corsal spur at base and two short obtuse obliquely divergent cuticles towards the top just below the apex. Anthers short, broad, somewhat horny with broadly triangular membranous anther tips that are inflexed over the sides of the stigmatic hood.

**Root bark**

The tap roots are found to be having prominent tops with rounded head and rest of the portion spirally curved. These hard roots are greyish white in colour and exhibit sap exudations at the places where bark has been cut. The bark of the older roots is cracked at places. The bark is yellowish grey outside and yellowish white inside. The upper cork portion is spongy and rough while the inner portion of bark is smooth and mucilaginous. The dried bark is bitter to taste 14.

## MICROSCOPICAL CHARACTERISTICS

Microscopical characteristics of various parts of Calotropisproceraare as follows:

**(A) Stem**

**(I) Epidermis:** This is an outermost layer of uniseriate cells with thick cuticle. Uni- and multicellular hairs clothe epidermis almost completely. Cells are barrel to rectangular and are compactly arranged.

**(II) Cortex:** These form a few layers below the epidermis which are collenchymatous (thickened corners). A few chloroplasts may also occur in these cells. Rest of the cortex isparenchymatous. Intercellular spaces are numerous.

**(III) Endodermis:** This layer of uniseriate cells forms a wavy ring around the vascular tissue (separates cortex from underlying tissues.) The cells are barrel- rectangular shaped and are compactly arranged. Characteristic casparian thickening is lacking. It, however, contains starch grains (termed as starch sheath).

**(IV) Pericycle:** It is in the form of small patches of sclerenchymatousfibres. A few parenchymatous cells of the original pericycle are present between these groups.

**(V) Vascular tissue system:** Secondary growth is prominent. It shows groups of primary phloem, secondary phloem, cambium, secondary xylem, primary xylem and intraxylary phloem. Primary phloem is completely obliterated. Patches of secondary phloem occur above and close to the cambium. Cambium is unistratose (but its derivatives on either side which are alike, give an appearance of a broad zone of cambium) . Secondary xylem forms a broad and extensive region. It comprises vessels and tracheids. The annual rings are feeble. Primary xylem occurs near the pith and is endarch. A few groups of phloem are situated just below the primary xylem in the region of pith and are the groups of intraxylary or internal phloem 15.

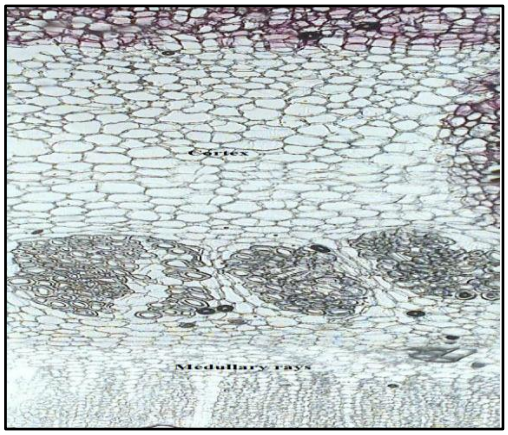
**(VI) Pith:** Centre is occupied by thin walled parenchyma and also many latex vessels.

**(VII) Points of ecological interest:** A well differentiated cortex, presence of conjoint, bicollateral, opens and endarch vascular bundles indicate that the material is a dicotyledonous stem. Intraxylary phloem which is primary phloem of the bicollateral vascular bundle is characteristic.

**B) Leaf**

Transverse sections through the midrib showed an upper and lower, single- layered epidermis that was externally covered with a thick, striated cuticle, a few epidermal cells on both lower and upper surfaces, parenchymatous cells that were thin-walled and isodiametric to circular. Intracellular spaces were present in ground tissue and the stele was crescent-shaped and composed of bicollateral and open vascular bundles. The xylem consisted mostly of vessels and tracheids, and a strip of cambium was present between the xylem and phloem tissues. The lamina which was

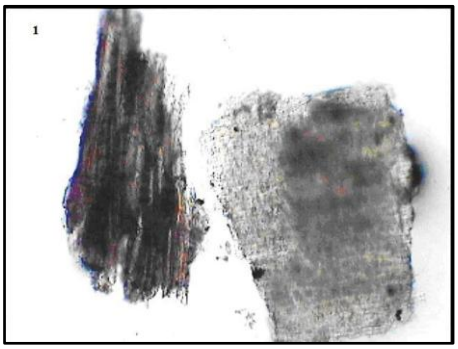
dorsiventral with the mesophyll, was seen to be differentiated into a palisade and spongy tissue. The upper and lower epidermise were covered externally with a thick, striated cuticle. Below the upper epidermis were three rows of elongated, closely arranged, palisade parenchyma. Spongy parenchyma tissues were almost radially elongated with intracellular spaces. Central cells were irregular in shape; laticifers and vascular bundles were also present scattered in this region. 16, 36



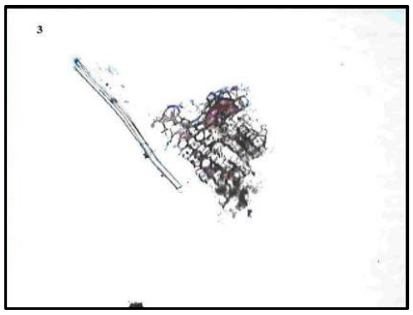

**T.S. of Calotropisprocera Root**

## POWDER CHARACTERISTICS

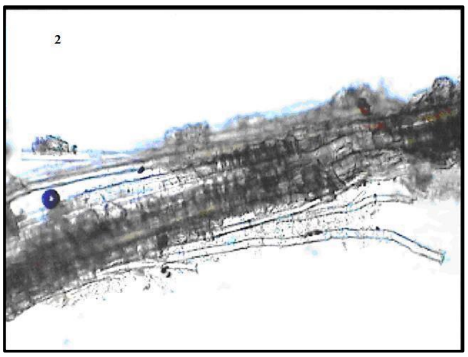
a) Fragments of cork occur with thin walled cells and appear reddish brown in colour.
b) Lignified stone cells occur in groups with rectangular to elongated shape.
c) Phloem fibres appear in groups, individual fibre is thick and can appear either entire or in fragments.
d) Starch grains are simple, round and rarely compound.



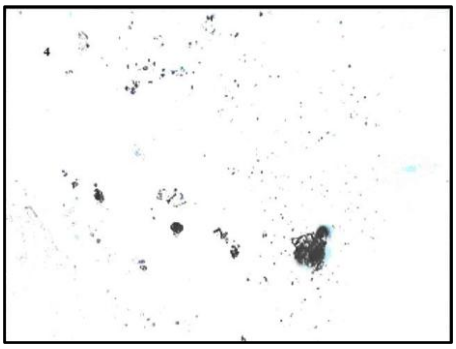

**1. Cork**




**2. Parenchymatous cells**




**3. Phloem fibres**



**4. Starch grains**

## CHEMICAL CONSTITUENTS

Phytochemical studies on Calotropisprocerahave afforded several types of compounds such as Cardenolide, triterpinoids, alkaloids, resins, anthocyanins and proteolytic enzymes in latex, flavonoids, tannins, sterol, saponins, cardiac glycosides. Flowers contain - terpenes, multiflorenol, and cyclisadol 17.

**Leaves**

The leaves contain mainly the amyrin, amyrin acetate, ß-sitosterol, urosolic acid, cardenolides, calotropin, calotropagenin.

**Latex**

The latex contains caoutchouc, calotropin, calotoxin 0.15%, calactin 0.15%, uscharin 0.45%, trypsin, voruscharin, uzarigenin, syriogenin and proceroside 18.

**Flower**

The flower contains the flavonoids, queretin- 3- ratinoside, sterol, calactin, calotoxin, calotropagenin, calotropin, polysaccharides with D-arabinose, glucose, glucosamine and L-rhamnose. Flowers also contain enzymes 3-proteinase and calotropain (protease). Other chemical constituents of C. proceraflowers are lupeol, uscharin, proceroside, proceragenin (cardenolide), syriogenin, taraxast-20(30)-en-3-(4-methyl-3- pentenoate), 3-thiazoline cardenolide, gigantin, giganteol, isogiganteol, uscharidin, uzarigeninvoruscharin a-calotropeol, 3-epimoretenol, alactuceryl acetate and a-lactucerylisovalerate 19.

**Bark**

Root bark of Calotropisproceracontains triterpenes, A new norditerpenyl ester, named Calotropterpenyl ester, and two unknown pentacyclictriterpinoids, namely calotropursenyl acetate and calotropfriedelenyl acetate, akundarolisovalerate, mundarolisovalerate and quercetin -3-rutinoside 20, 21

## PHYSICOCHEMICAL ANALYSIS

The powdered sample was subjected to various physicochemical properties, which includes Foreign organic matter, Ash value, Extractive value, Loss on drying, Crude fiber content, Swelling index, Volatile oil content. The results obtained for these were as follows. Foreign organic matter (2.10%), Ash value (6.28%), Acid insoluble ash (2.58%), Water soluble ash (2.84%), The Successive Extractive values (%w/w): Petroleum ether (60-800c) -2.09, Chloroform-6.92 Acetone-9.21, Alcohol-6.30, Water-9.41, Loss on drying-1.3%, Crude fiber content-28%, Swelling index-8.67, Volatile oil-0.0.[values are an average of triplicate.]

The behavior of stem bark powder upon treatment with different chemical reagents was also observed and reported in Table 1.

**Table 1.Behavior of powdered stem bark of C. procerawith different chemical reagents.**

| S. No. | Particulars | Under Visible light | U.V. light | |
|---|---|---|---|---|
| | | | Short wavelength | Long wavelength |
| 1. | Powder as such | Slightly brown | ----- | ----- |
| 2. | Powdered drug + Conc. HCl | Brown | ----- | Brown |
| 3. | Powdered drug + Conc. H2SO4 | Brown | ----- | Brown |
| 4. | Powdered drug+Conc. HNO3 | Dark brown | Brown | ----- |
| 5. | Powdered drug+ Glacial Acetic acid | Dull brown | ----- | ----- |
| 6. | Powdered drug+ Aqueous NaOH | Slightly brown | ------- | ----- |
| 7. | Powdered drug +alcoholic NaOH | Slightly brown | -------- | ------- |
| 8. | Powdered drug + 10%Hcl | Slightly brown | Slightly brown | Slightly brown |
| 9. | Powdered drug + 10% H2SO4 | Slightly brown | -------- | --------- |
| 10. | Powdered drug + 10% HNO3 | Brown | Slightly brown | Slightly brown |
| 11 | Powdered drug + 10% Glacial Acetic acid | Slightly brown | ------- | -------- |
| 12. | Powdered drug + Water | Slightly brown | --------- | --- ----- |

**Table 2. Preliminary phytochemical screening of C. procerastem bark**.

| Sr. No. | Tests | Powder + Water | Chloroform extract | Hydroalcohol extract |
|---|---|---|---|---|
| 1. | Alkaloids: | | | |
| | Dragendroff's test | - ve | - ve | - ve |
| | Mayer's test | - ve | - ve | - ve |
| | Hager's test | - ve | - ve | - ve |
| | Wagner's test | - ve | - ve | - ve |
| 2. | Carbohydrates: | | | |
| | Fehling's test | + ve | + ve | + ve |
| | Molish test | + ve | + ve | + ve |
| 3. | Gums/Mucilage: | | | |
| | Water | + ve | + ve | - ve |
| | Alcohol | + ve | + ve | - ve |
| 4. | Tannins: | | | |
| | Aq. FeCl3 Test | + ve | - ve | + ve |
| | Alc. FeCl3 Test | + ve | - ve | + ve |
| 5. | Flavonoids: | | | |

| | | | | |
|---|---|---|---|---|
| | Lead acetate test<br>Shinoda test<br>Alkaline tes | + ve<br>+ ve<br>+ ve | - ve<br>- ve<br>- ve | + ve<br>+ ve<br>+ ve |
| | Salfowaski test<br>LibermanBurchad test | + ve<br>+ ve | + ve<br>+ ve | - ve<br>- ve |
| 7. | Saponins: | | | |
| | Foam test<br>Lead acetate test | + ve<br>+ ve | + ve<br>+ ve | - ve<br>- ve |

## ADULTRANTS & SUBSTITENTS

## Need for Substitution

Non-availability of the drug. Eg: - Substitution for AshtavargaDravyas. Uncertain identity of the drug .Eg: - for the herb Lakshmanadifferent species such as Arliaquinquefolia, Ipomeasepiariaetc are considered Cost of the drug. Eg: - Kumkumabeing costly herb is substituted by KusumbhaGeographical distribution of the drug: Eg. As RasnaPlucialanceolata is used in Northern India while in southeren parts Alpiniagalanga is considered as the source. The adverse reaction of the drug Eg :-Vasa is a well knownRakta-Pittahara drug, but due to its Abortificiant activity its utility in pregnant women is limited, instead drugs such as Laksha , Ashokaetc are substituted.

**Criteria for Substitution** Kadaachitdravyamekamvaayogeyatranalabhyate| Tat tadgunayutamdravyamparivartenagrihyate‖ (Oushadavignana) A drug to be considered as a substitute should fulfill the following criteria – Similarity in Rasa-panchakas. Eg :-Bharangiand Kantakari. Exhibit similar therapeutic effects.Eg :-Ativishaand Musta. In a formulation the pradhanaDravya I.e. the Major ingredient should never be substituted. Eg: - while preparing BharangyaadiGudaShould not Substitute Bharangi with any other drug. Yogeyadapradhaanamsyattasyapratinidhirmataha| Yattupradhanamtasyaapisadrushamnivagrihyate‖ (Bhava prakasha.16.167)4. Substitution with Totally Different Drug here we can consider Bharangi (Clerodendronindicum) and Kantakari. Bharangi has tikta rasa and Laghu ,rukshaguna and has Kapha and vatahara property. While Kantakari (Solanumxanthocarpam) has katuvipaka and ushnavirya. It has Glycosides – Verbascoside and Solasoninie, solamargin, solasurine respectively. Both C. indicumand S. xanthocarpam have shown Anti-hisaminic activity. Both C. indicumand S. xanthocarpamare commonly employed in the diseases related to the respiratory system, which are commonly associated with release of Histamines and other Autacoids. Substitution of Different Species

Here we can consider two types of Gokshura.-Tribulusterrestris(zygophylaceae) and PedaliummurEg(Pedaliaceae) T.terrestris has the chemical constituents like Chlorogenin, Diosgenin, Rutin, Rhamnose, and Alkaloid.WhileP.murexhas Sitosterol, Ursolic acid, Vanilin, Flavonoids and Alkaloids. Both the species are proved for Nephroprotective, Lothotriptic, Diuretic and Hepatoprotective activities. If we analyse the clinical conditions where Gokshura is indicated I,e,. mutrakrcra, Mutraghata, Ashmari, Pramehaetc, both T. terrestrisand P.murexappear to be appropriate. Substitution of the Species Belonging to Same Family TheDatura metal and Daturastramonium can be considered here. Chemical Constituents are Alkaloids, Scopalamine, Atropin, Hyocyamin, Lyoscine. The Alkaloids are proved as Bronchodialatory and inhibitor of secretion of mucous membrane. The alcoholic extract of D. metal showAnthelmentic Activity The Alkaloid present in Both the species are well proven Bronchodilators and also they inhibit the secretion of Mucous membrane of the Respiratory tract. Thus as far as the diseases of the Respiratory tract are concerned both D.metaland D. stramoniumare beneficial, while as KrimiharaD.metalwould be a better choice as it is a proven Anthelmentic. Context Specific Substitution The Amalaki(Embelicaofficinalis)and Bhallataka (Semicarpusanacardium) can be considered. The Amalaki has Laghuguna and lavanavargithapancharasa,Madhuravipaka,sheetavirya and tridoshaharaproperty.It has chemical constituents such as Vitamin C. phyllembin, Linolic acid, Indole Acetic acid,Ellagicacid,salts etc. While Bhallataka has Laghu,Teekshna,Snigdhaguna, Katu,Tikta,Kashayarasa,mardhuravipaka,ushnaviryaansKaphavatahara properties. Biflavonoids, Anacardic acid, Nicotinic acid, riboflavin,thiaminenad essential oils. Research profile of E.officinalisshows Anti-oxident, Hepatoprotective, Microbial, Hypoglycemic Hypolipidemic action. The research profile of Semecarpusshows Anti-tumour, Hypotensive, Anti – Cytotoxic and anticancerous properties etc. Both Amalaki and Bhallataka are Rasayana drugs. Amalaki is commonly employed as KamyaRasayana and Bhallataka as Nimittika Rasyana.in current practice the Rasayana formulations are being employed as an adjuvant therapy in Chronic as well as Malignant diseases.Amalaki can be employed as Rasayana in Chronic debilitating diseases like Bronchial Astama, Diabetisetc, while Bhallataka would be better choice in malignant conditions, both in Solid tumors and in Leukaemia. Substitution of different parts of the plant the root of Sidacordifoliaand the whole plant of Sidacordifoliacan be considered. Root has the chemical constituents such as Sitoindoside, Acylsteryglycoside. While the whole plant has Alkaloid, Hydrocarbons, Fatty acids, Ephedrine. Various extracts of the whole plant showed Anti-bacterial, Anti-oxidant, Hypoglycemic, Hepatoprotective and Cardio tonic activities. Though it is the root which is mentioned as officinal part of S.cordifoliain the classics as Balya, Brumhana,Shotaharaetc,modern researches proves that even the aerial parts are also equally effective.

## ADULTERATION

It is the substitution of the original crude drug partially or fully with other substances which is either free from or inferior in therapeutic and chemical properties.

***Types of Adulteration***

Adulteration with inferior commercial varieties Eg: Maricha(Piper nigrum) adulterated by papaya seeds. Adulteration by artificially manufactured substitutes.Eg: Artificial invert Sugar for Honey Adulteration by Exhausted drugs. Eg: Clove, Fennel. Adulteration by addition of Heavy Metals.Eg: Pieces of Limestone in Asafoetida, Lead in pieces of Opium
Adulteration by Synthetic Principles.Eg: Adding Citral to Oil of Lime.

***Uses***

All the parts, viz, root, stem, leaf and flowers of Calotropis are in common use in indigenous system of medicine 24. Compounds derived from the plant have been found to have emeto-cathartic and digitalic properties. The principal active medicinals are asclepin and mudarin 25. Other compounds have been found to have bactericidal and vermicidal properties. The latex contains a proteolytic enzyme called caloptropaine 26. An infusion of bark powder is used in the treatment and cure of leprosy and elephantiasis. It is inadvisable to use bark that has been kept for more than a year 27. The root bark is an emetic, the flower a digestive, and a tonic is used for asthma and catarrh. Bark and wood stimulate lactation in cattle 28. Roots (extremely poisonous) are applied for snakebite. The milky sap is used as a rubefacient and is also strongly purgative and caustic. The latex is used for treating ringworm, guinea worm blisters, scorpion stings, venereal sores and ophthalmic disorders; also used as a laxative 29, 30. Its use in India in the treatment of skin diseases has caused severe bullous dermatitis leading sometimes to hypertrophic scars. The local effect of the latex on the conjunctiva is congestion, epiphora and local anaesthesia 31-33. The twigs are applied for the preparation of diuretics, stomach tonic and anti-diarrhoetics and for asthma. Also used in abortion, as an anthelmintic, for colic, cough, whooping cough, dysentery, headache, lice treatment, jaundice, sore gums and mouth, toothache, sterility, swellings and ulcer 34,35.

## CONCLUSION

Empirical knowledge about medicinal plants plays a vital role in primary health care and has great potential for the discovery of new herbal drugs. The pharmacognostical studies including macroscopic and microscopic evaluation of various parts of Calotropisprocerawould be of considerable use in the identification of this drug. These findings may be useful to supplement existing information with regard to the identification and standardization of Calotropisprocerato distinguish it from substitutes and adulterants. In conclusion, the present manuscript may be useful to supplement information with regard to its identification and in carrying out further research of its use in the treatment of various diseases.

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