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Introduction to the Taxonomy and Pharmacology of *Tinospora cardifolia*, *Commiphora mukul*, *Ficus religiosa* and *Saraca asoca*.

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ABSTRACT: The morphological and floral description of *Tinospora cardifolia*, *Commiphora mukul*, *Ficus religiosa* and *Saraca asoca* are studied and Taxonomic identifications have been done following Bentham and Hookers Classification system. Pharmacology is the study of biochemical products of plants applied in treating human diseases in Ayurveda, Homeopathy, Unani, and Siddha therapeutic systems, and ethno botany as a home remedy. The pharmacological characteristics of these four plants were discussed.


KEY WORDS : Taxonomy Pharmacology, *Tinospora cardifolia*, *Commiphora mukul*, *Ficus religiosa* and *Saraca asoca*.

INTRODUCTION ; Plants identification and nomenclature is significant Taxonomy deals with these both, needed for study of the plant specially in the application of plants in medical biology. The term 'Taxo' refers to classification and 'Nomos' is Nomenclature. Thus taxonomy is a biological Science of full identification.[1] It's circumference is floral morphology, genomics, proteomics, and evolution. An application of taxonomy is cosmopolitan or everywhere, especially in Biomedical Sciences identification of a species is significant for required result and to avoid adverse effect or no effect.[2] There are basically two type of Taxonomy, First is Evolution based, Called phylogenetic classification or Biosystematics, E.g. Hutchinson's Classification.[3] But in Practical study, Bentham and Hookers Classification of plant is followed in all over India and globe [4]. There are also Mathematical application of evolutionary trend of classification, which is base of similarity and dissimilarity in evolution, to which, Lucien Cuenot (1958), Termed Cladogenesis and Cane and Harrison (1960) Termed Cladistics. Although in modern informatics of Taxonomy "Quick Response code" is applied to identify the trees. [5] Father of Taxonomy is **Carolus Linnaeus**, who gave Binomial system of Nomenclature to solve the confusion of plant naming on local languages. He also gave first Scientific Classification of the plant based on floral sex organ, i.e. number of stamen and carpel and their organization like cohesion and adhesion. [6] *Tinospora cardifolia* is Climbing Bell called 'Giloy' in Hindi, and it is frequently administered, for treatment of Diarrhea and decenter by Ayurvedic doctors Called Vaidya. [7] *Commiphora cumunis*, is called 'Guuggul' in Hindi and it is administered in Arthritis therapy.[8] *Ficus religiosa* is Sanctum tree due to having high Bioelectronics properties [9,10] But it is used in the treatment of infection in Elementary canal and male impotency.[11] and *Saraca asoca* is an Ayurvedic tree for women related problems. The Ashokarist tonic or syrup for gynecological treatment and women health, regarding irregular MC periods [12]. These all four plants are found in sub tropical area in all over Asia continent. The objective of the paper is to study of Identification and pharmacology of these plants.

MATERIAL AND METHOD : Figure 1a represents to *Tinospora cardifolia* bell on the wall at Sivadhari colony Ambikapur, it Coordinates 23.139323N, and 83.193523E. figure 1b and 1c represents to *Tinospora cardifolia* Bell on Neem tree (*Azardirecta melia*) Figure 2a represents to *Commiphora cumunis*, Leafy form located in deep forest of Chendra Ranghagh Surguja It coordinates 23.095899N, 83.292463E. Figure 2b represents it's fruiting stage. Figure 2c represents Regin Gum obtained from the Tree of *Commiphora mukul*. Fgure 3a. represents to *Ficus religiosa* took photograph from Shivadhari Dam Ambikapur. It coordinates 23.139680N, 83.192781E, and Figure 3b represents Hypanthodium inflorescence found in Moraceae family. Figure 4a represents Medicinal Ashoca at Devi temple Chukan, Kotma, Anuppur, MP. It coordinates with 23.117615N, 82.046224E. Figure 4b represents to Non medicinal ornamental asoka (*Poliantha longifolia*) which is not of medicinal application The Bark, leaves and floral twigs are collected and taxonomical floral description, identification and pharmacological study has been done. Figures 6a, 6b, 6c and 6d are the screen shots of the setallite maps showing location of *Tinospora cardifolia*, *Commiphora mukul*, *Ficus religiosa* and *Saraca asoca* respectively.

1. Flower description and Taxonomic identification: *Tinospora cardifolia*:

- i. **Habit and habitat:** Climber bell.
- ii. **Stem:** The stems of *T. cordifolia* are rather succulent with long filiform fleshy aerial roots from the branches.
- iii. **Leaf:** Exstipulated, Petiolated, membranous and cordate.
- iv. **Inflorescence:** In axillary and terminal racemes or racemose panicles, the male flowers are clustered and female flowers are usually solitary.
- v. **Flower:** Actinomorphic, Unisexual, small and yellow or greenish yellow
- vi. **Calyx:** Number of sepals 3, Polysepalous,
- vii. **Corolla:** Number of petals 3 Polypetalous,

- viii. **Androecium:** Number of Stamen 6 Free, anther bilobed, basifixed. Longitudinal dehiscence.
 ix. **Gynoecium:** Number of carpel 3 apocarpous, Superior, Perital Placentation.
 x. **Fruits:** The drupes are ovoid, glossy, succulent, red and pea sized.. Fruits are fleshy and single seeded.
 xi. The seeds are curved.
- xii. **Floral Formula:** Male flower: Br.  $K_3 C_3 A_3 G_0$

Female Flower: Br.  $K_3 C_3 A_0 \underline{G_{(1)}}$

Identification: Bentham and Hooker's Taxonomy :

Group - **Dicotyledonae** ; - Climber habit and Reticulate leaf venation.

Class – **Polypetalae** ; - Petals free.

Series -**Thalmiflorae** ; - Thalamus cup shaped, Sepals free and Hypogynous flower.

Order -**Ranales** ; - much number of flowers, floral parts attached spiral, stamen indefinite and free. gynoecium apocarpous,

Family- **Menispermaceae:** Calyx 3 sepels , Corolla 3 petals, stamens 3+3 in two whorls Capel 3 apocarpous.

Tinospora cardifilia: Climber bell, The bark is creamy white to gray, deeply left spirally the space in between being spotted with large rosette-like lenticels. Stem varying thicknesses, ranging from 0.6 to 5 cm in diameter. Cardiac leaves in spiral Phyllotaxy

2 Flower description and Taxonomic identification: *Commiphora mukul*

- Habit and habitat:** *Commiphora mukul* grows as a shrub or small tree, reaching a maximum height of 4 meter with thin papery bark. The branches are thorny. it is deciduous.
- Stem:** Erect woody cylindrical branched, Resin canal present in phloem
- Leaf:** Exstipulate, Petiolated, Alternate, mucilaginous gland dotted, simple, ovate, 1–5 cm (0.39–1.97 in) long, 0.5–2.5 cm (0.20–0.98 in) broad,
- Inflorescence:** Peniculate Racemes on flowering twigs.
- Flower:** Short pedicilate, Hypogenous, Unisexual or bisexual. It is gynodioecious, with some plants bearing bisexual and male flowers, and others with female flowers. The individual flowers are red or pink.
- Calyx:** Number of sepals four small sepals, .imbricate aestivation.
- Corolla:** Number of petals four small petals. imbricate aestivation.
- Androecium:** Number of Stamen 8 obdiplostaminous, Anthers bilobed and introse.
- Gynoecium:** Number of carpel (4) Syncarpous superior, Axile placentation, Anatropous ovule. One ovule in each locule. Nectar disc present below ovary.
- Fruits:** Berry , small, round, red when ripe.
- The **seeds** are non endospermic and curved embryo.

Floral Formula: Female Flower: Ebr  $K_4 C_4 A_0 \underline{G_{(4)}}$

Bisexual Flower: Ebr  $K_4 C_4 A_8 \underline{G_{(4)}}$

Identification: Bentham and Hooker's Taxonomy :

Group - **Dicotyledonae** ; - Tree habit and Reticulate leaf venation.

Class – **Polypetalae** ; - Petals free.

Series –**Disciflorae** ; - Nectar disc present below ovary. Sepals free, Hypogynous.

Order-**Geraniales** ; -Stamen double to petals, Obdiplosteminous. Axile Placentation.

Family-**Burseraceae** ; -Regin canals in Phloem, Simple leaves Alternate, Short single style.

Commiphora mukul : is a flowering plant in the family Burseraceae, which produces a fragrant resin called gugal, guggul or guggul, that is used in incense and vedic medicine , Resin canals present in the Phloem.

3. Flower description and Taxonomic identification: *Ficus religiosa*;

- Habit and habitat:** High tree Deciduous.
- Stem:** Erect woody cylindrical branched **Latexy**
- Leaf:**, Stipulated, Petiolated, Simple Cardiac, Alternate, 3-5 basal veins make reticulate venation Acute napex, smooth margin.
- Inflorescence:** Hypanthodium in which Receptacle makes a flask , and on the axis of flask, there are infinite flowers all over . but the female flowers at the bottom side and male flowers on tip side where the mouth of the flask shaped receptacle opens for insect pollination. It is depicted in figure 3b.
- Flower:** Ebractiate, Actinomorphic, Incomplete, Unisexual, and minute
- Parianth:** Number of Tepals 2+2 in two whorls, free but less connet at base. Persistent.
- Androecium:** Number of Stamen 2, Anther bilobed, versatile, longitudinal dehiscence.
- Gynoecium:** Number of carpe 2 but one abortive. Unilocular , single pendulous ovule. Filliform style.
- Fruits:** Synchronas.
- The **seeds** are minute with curved embryo.

xii **Floral Formula:** Male flower: Ebr  P₂₊₂ A₂ G₀

Female Flower: Ebr  P₂₊₂ A₀ G₍₂₎

Identification: Bentham and Hooker's Taxonomy :

Group - **Dicotyledonae** ; - Tree habit and Reticulate leaf venation.

Class – **Monochlamydae or Incompletae.** ; - Petals Absent, Tapals (Parianth) present .

Series –(No Series are made in this Class)

Order-**Unisexuales** ; -Plant monocious but flowers Unisexual..

Family- **Moraceae** ; -Hypanthodium inflorescence Matures to Cinchonas Fruit.

Ficus religiosa: Smooth Shiny Yellowish brown stem, long acute apex cardiac leaves on Versatile long petiole . The size of **Cinchonus** fruits are 1-1.5 centimeters in diameter. Long living high sanctum tree good fodder of Elephants.

3. Flower description and Taxonomic identification of *Saraca asoca*;

- i. **Habit and habitat:**. Medium tree with semispherical herbage cover.
- ii. **Stem:** Erect woody cylindrical branched
- iii. **Leaf:** Exstipulate, Short petiolate, Simple, elongated, wavy margin Unicosted reticulate venation. Acute apex
- iv. **Inflorescence:**Raceme.
- v. **Flower:**Bractiate, Pedicillate,Zygomorphic , Bisexual,hypogynous, complete,Red pink Colored.
- vi. **Calyx:** Number of Sepals (5), one anterior is odd sepal gamosepalous, imbricate aestivation.
- vii. **Corolla:** Number of petals 5, Polypetalous, ascending imbricate aestivation.
- viii. **Androecium:** Number of Stamen10, unequal, free, 2 stamens are steminodes.
- ix. **Gynoecium:** Monocarpellary, unilocular, Marginal Placentation. Style long Stigma simple.
- x. **Fruits:** Pod legume , Dehiscence by both by both sutures.
- xi. The seeds are less endospermic with large embryo.

xii. **Floral Formula:** Br.   K₍₅₎ C₅ A₁₀ G₍₁₎

Identification: Bentham and Hooker's Taxonomy :

Group - **Dicotyledonae** ; - Tree habit and Reticulate leaf venation.

Class – **Polypetalae** ; - Petals free.

Series –**Calyciflorae;** ; - Sepals 5 Fused, hypogynous.

Order-**Rosales** ; -Stamens 10 unequal some steminodes. Marginal Placentation.

Family **Leguminosae**:- Tree habitat, Monocarpillary Superior ovary Fruits Legume-pod.

Sub Family; **Saesapinioidae:** Tree habit, Large leaves, Zygomorphic Pentamerous Flowers.

Saraca asoca; Medium size ever green tree. having scattered branching Leaves longer up to 30 – 60 centimeter long. Bark is Dark greenish brown, Fragrant pink yellow flowers matures to 4-8 seeded pod. Seeds flat. It's Flowering to fruiting occur between July to October.



Figure 1a *Tinospora cardifilia*



Figure 1b *T. cardifilia* On wall



Figure 1c *T. cardifilia* on Neem



Figure 2a. *Commiphora mukul*



Figure 2b *C mukul* Fruiting



Figure 2c Resin from gum of *C mukul*

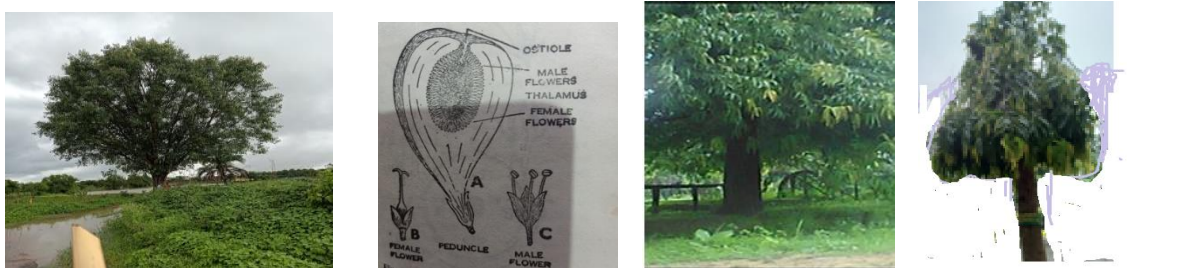


Figure 3a *Ficus religiosa* Figure 3b Hypanthodium Figure 4a *Saraca asoca*. Figure 5b *Poliantha longifolia*

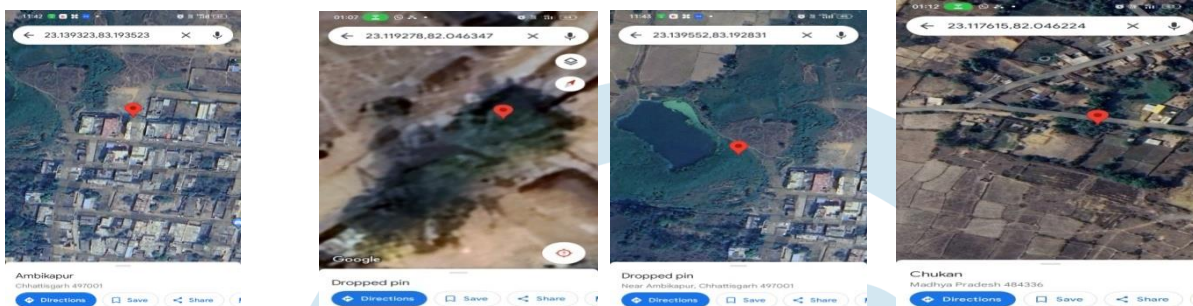


Figure 6a. Location *Tinospora* Figure 6b *Commiphora* Figure 6c Location *Boe* Figure 6d Location *Saraca asoca*



Figure 7a Mother tincture Figure 7b Capsule Figure 8 Guggullipid Figure 9 Ashocarisyrup

OBSERVATION AND RESULTS ; Table 1 represents the the Taxonomical and Chromosomal numbers of *Tinospora cardifilia*, *Commiphora cumunis*, *Ficus religiosa* and *Saraca asoka*. And Table two represents Pharmacological application of these four plants.

Table1. Taxonomy and chromosome number of of *Tinospora cardifilia*, *Commiphora cumunis*, *Ficus religiosa* and *Saraca asoka*

S r l	Hindi Name	English Name	Botanical Name	Class	Series	Order	Family	Chro mo meN ⁰
1	Goloy	<i>Tinospora</i>	<i>Tinospora cardifilia</i> ,	Polypetalae	Thalmiflorae	Rannales	Menispermaceae	N= 12
2	Guru chee	<i>Commifora</i>	<i>Commiphora cumunis</i> ;	Polypetalae	Discifloreae	Geraniales	Burseraceae	N= 12
3	Pipal	<i>Boe Tree</i>	<i>Ficus religiosa</i>	Apetalae	Monochlamydae	Unisexual es	Moraceae	N=12
4	Sita ashok	<i>Medicinal Ashoca</i>	<i>Saraca asoca</i> .	Polypetalae	Calyciflorae	Rosales	Leguminoseae (<i>Saisalpinioideae</i> Sub Family)	N= 13

Pharmacology of *Tinospora cardifilia*: Alkaloids, diterpenoid, lactones, glycosides, steroids, sesquiterpenoid, phenolics, aliphatic compounds and polysaccharides are introduced to be present in the sten extract of *T. Cardifolia*. The glycosyl component of a polysaccharide from *T. cordifolia* has been isolated, purified, methylated, hydrolyzed, reduced and acetylated. and it is to be tested on rats for treatment of Hyperlipidimia.[23] Figure 7 Represents the Mother tincture made up of *Tinospora cardifolia*. And the capsule in small bottle is depicted in figure 7b used for immunity of body.

Pharmacology of *Commiphora cumunis* : The plant grows wild in the arid, rocky tracts, also in low rainy and hot areas. The part used in medicinal preparation is resin, collected by tapping the barks. Gu gulu deserves high values in Ayurvedic medicines.

Guggulu is used in various diseases. Figure 8 represents the the medicine ‘Guggulin’ used for the treatment of Arthritis, is is made up of resin obtained from the *Commiphora mukul* tree. Due to high values and excessive demands, improper methods of collection, uncontrolled forest destruction and poor knowledge of cultivation; number of plants highly decreased. Now it categorized as threatened plant. Hence cultivation and conservation of this plant is necessary. Guggulu can be propagated by seed and vegetative method. Germination through seed is ver y poor. Vegetative propagation through stem cutting is most common and successful method. Farming care is also necessary for proper growth. Conservation can be effected by knowledge of collection methods and awareness.[18]

Table2. Pharmacology of *Tinospora cardifilia*, *Commiphora cumunis*, *Ficus religiosa* and *Saraca asoka*

Srl	Botanical Name	Habit	Used Part	Drug	Therapy	Effect	Commercial Name of medicine	Pharmaceutical company
1	<i>Tinospora cardifilia</i> ,	Climbing Bell	Stem extract	phenyl propanoid glycosides Cordifolioside A, Cordifolioside B and syringin	Hypertriglyceridemia	Cardiac protection	<i>Tinospora capsule</i>	CTRI clinic trial registry India IMC
2	<i>Commiphora cumunis</i> ;	High tree	Secreted Resin	<u>Guggulsterone</u> , Resin from stem cut	low-density lipoprotein	Antagonistic Wait loss	<i>Guggul capsule</i>	Planet Ayurveda, Mohali, Punjab, India
3	<i>Ficus religiosa</i>	High tree	Bark and leaf Extract	β -Sitosterol-D-glycoside	hypoglycemic activit	Hypoglycemic, hypolipid, antiulcer	<i>Pipalancha</i>	Hamdard Dawakhana Side effect: purgative (Julab)
4	<i>Saraca asoka</i> .	High tree	Bark and leaf Extract	glycoside, flavanoids, tannins and saponins	Gynaecology tonic	Menstrual Cycle	<i>Ashokarista</i>	Dabur Company 8/3, Asaf Ali Road, New Delhi

Pharmacology of *Ficus religiosa*:

Antidiabetic activity: Aqueous pronounced reduction in blood streptozotocin (STZ) induced known hypoglycemic drug. Aqinsulin, body weight, glycogen also reduced the serum trigly traditional use of *F. religiosa*. It’s root bark when maximum fall of the blood sugar

Anti-inflammatory activity: *F. religiosa* leaf (MFL) on proinflammatory cytokines, BV-2 microglial cells, in a mouse the proinflammatory cytokine is confirmed.[11]

Treatment of Alzheimer’s diseases : Methanolic extract of the stem bark of *F. religiosa* found to inhibit the acetyl choline sterase enzyme, thereby prolonging the half-life of acetylcholine. It was reported that most accepted strategies in Alzheimer’s diseases treatment is the use of cholinesterase inhibitors. The calculated 50% inhibitory dose (ID50) value was 73.69 μ g/ml respectively. The results confirm and justify the popular traditional use of this plant for the treatment of Alzheimer’s diseases/[20, 21]

Sreelekshmi et al. investigated the analgesic activity of the *F. religiosa* stem bark methanolic extract using the acetic acid-induced writhing (extension of hind paw) model in mice. Aspirin were used as standards drugs. It exhibited reduction in the number of writhing of 71.56 and 65.93% respectively at a dose of 250 mg/kg and 500 mg/kg. The abdominal constriction is related to the sensitization of no receptors to prostaglandins. Thus

suggest that extract showed the analgesic effect probably by inhibiting synthesis or action of prostaglandins

[22].

Pharmacology of *Saraca asoka*: Figure 9 represents the syrupe bottle of ‘Ashokarist used for problems related to gynecology. The bark of plant presence of (-) epicatechin, procyanidin2, 11'-deoxyprocyanidin B, (+) catechin, (24, £)- 24- methyl-cholesta-5-en-3p-ol (22 E, 21£)-24- ethycholesta-5,22 dien-33-ol,(24 £)-24- ethylcholesta-5-en-3-p-ol,leucopelargonidin-3-O-p-D- glucoside, leucopelargonidin and leucocyanidin.The flower part of plant contain Oleic, linoleic, palmitic and stearic acids,P-sitosterol, quercetin, kaempferol- 3-0-P-D- glucoside, quercetin- 3-0- P-D-glucoside, apigenin- 7-0-p-D-glucoside, pelargonidin- 3, 5-diglucoside, cyanidin-3, 5- diglucoside, palmitic, stearic, linolenic, linoleic, p and y sitosterols, leucocyanidin and gallic acid. Seed and Pod contains oleic, linoleic, palmitic and stearic acids, catechol, (-) epicatechol and leucocyanidin [2,10,11,12]. Five lignin glycosides, lyoniside, nudiposide, 5-methoxy-9- β - xylopyranosyl(-)-isolariciresinol, icariside E3, and schizandriside, and three flavonoids, (-) epicatechin, epiafzelechin-(4 β →8)-epicatechin and procyanidin B2, together with β -sitosterol glucoside, were

isolated from dried bark[12,]. *Saraca asoca* is reported to contain glycoside, flavanoids, tannins and saponins. It is used as spasmogenic, oxytocic, uterotonic, anti-bacterial, anti-implantation, anti-tumour, anti-progestational, anti-estrogenic activity against menorrhagia and anti-cancer. This review contains the Pharmacognostical account of various parts of plant, Phytochemical constituent and different reported pharmacological activity. [19,24]

DISCUSSION: Taxonomic Identification of medicinal plant is a significance work in Pharmacology. The same morphology having two plants could be Taxonomically and biochemically different. Therefore Identification of medicinal plant is urgent for result. And if, another plant is applied by identification mistake. No result or adverse result could be seen. *Exempli gracia: Tinospora cardifolia* is used as Bone joint but Actual Bone Joint Plant is *Cissampilos quadriangularis* of Vitaceae (grape family). Although some drugs for bone joint it also has and treatment is lately succeeds. *Tinospora cardifolia* and *Smilax.purpuria* both have bell nature and cardiac leaves in alternate. but. Difference between both, is *Tinospora cardifolia* has homologous green colored leaves but *Smilax purpuria* has Vein mosaic natural lines on ventral upper surface of leaves. Just like this There are differences between medicinal Asoka & ornamental Asoka shown in table 3.

Table 3. differences between medicinal Asoka & ornamental Asoka

Srl	Property	Medicinal Asoka	Ornamental Asoka
1	Morphology.;	Herbage cover cylindrical	Herbage cover cylindrical
2	Leaf margin	About smooth	More wavy
3	Botanical name	<i>Saraca indica</i>	<i>Polyantha longifolia.</i>
4	Taxonomic Family	Saesalpinioidea. Of LEGUMINOCEAE	Magnoliacea
5	Flowering	Fragrance Pink Saffron flower in Rainy to winter season.	Micro flowers.
6	Application	Gynecology Tonic	Ornamental Yard and Road side.

Consumption of Giloy strengthens the immunity power of the body, but sometimes due to more active immunity, the risk of autoimmune diseases increases. That is why patients suffering from auto-immune diseases such as multiple sclerosis or rheumatoid arthritis etc. are advised to avoid Giloy.[25]. Cytogenetic of the plant is an important factor for Taxonomic evidence, the Chromosome number of the plant is available in the Chromosome Count Data Base Server (CCDB). It is a community resource. If you are aware of any missing data or if any of the counts are erroneous please submit it to the forms submit new counts, or report erroneous counts.[26, 27,28]

CONCLUSION: *Tinospora cardifolia* : N= 12 (Miers), Cardiac leaves, Climbing Bell, Round rough stem,

Its extract is Used as Mother tincture, and cardiac protection. *Commiphora mukul*;; N= 12 High tree and the resin from the tree is applied in Artheritis therapy. *Ficus religiosa* Linn : N=12, Mesophyte to epiphyte and xerophytes invasion on Cemented Roof and Walls. High tree, Used for Cleaning elementary canal and to increase male impotency And, *Saraca asoca*: N=13, It is a mesophyte tree to be long leaves and semi sphere herbage cover. Its Extract is 'Ashokarist' Used for Gynecology.

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