

Pharmaceutical Studies and Therapeutic Uses of *Plumbago Zeylanica* L. Roots (Chitraka, Chitramulamu)

K. Madhava Chetty, K. Sivaji, G. Sudarsanam*, P. Hindu Sekar

Department of Botany, Sri Venkateswara University, Tirupati, A.P., India

* Corresponding author

Email : sudarsanamg@gmail.com

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Abstract

The pharmaceutical studies and therapeutic uses of *Plumbago zeylanica*, in fresh root and as well as dry drug (root), were studied. The fresh root drug preparation includes Chitraka swarasam (freshly expressed juice), Chitraka kalkam (paste) and their therapeutic uses. Dry drug reveals preparation of Chitraka churnam (powder), Chitrakadi vati (tablets), Chitrakadi dutika (pills), Chitraka ghritam (ghee preparation), Chitraka quatham (decoction), Chitraka himam (cold infusion), Chitraka Phantam (hot infusion) and their therapeutic use for the treatment of various ailments was recorded.

Key words : Pharmaceutical studies, Therapeutic uses, *Plumbago zeylanica*, Chitraka, Chitramulamu.

INTRODUCTION

India is the seventh largest country in the world. Its civilization is very ancient; and, the country as a whole has long been known for its rich resources of medicinal plants. Today, Ayurvedic, Hoemoeo, and Unani physicians utilize numerous species of medicinal plants that found their way a long time ago into the Hindu Materia Medica (Narayana Rao and Thamanna, 1987). The medicinal importance of a plant depends upon their active principles. The crude drugs which are obtained from the plants are being used in several parts of India in various ailments. The drugs are effective upto a certain level to give a good results but nobody knows which chemical drug is the active principle present in that particular drug (Kirtikar & Basu, 1933).

The plant species *Plumbago zeylanica* (known vernacularly as Chitraka, *Chitramulamu*, *Tellachitramulamu*, *Agnichela*, *Agnimaala* or by its trade or popular names of "Lead wort-white flowered" and "Ceylon Lead wort") of the Plumbaginaceae, is distributed as a weed in throughout the tropical and subtropical countries of the world. The family Plumbaginaceae consists of 10 genera and 280 species. The genus *Plumbago* includes 3 species, namely *Plumbago indica* L. (*P. rosea* L.) *P. capensis* L., and *P. zeylanica* L., which are distributed in several parts of India. Among these species *Plumbago zeylanica* grows all districts of plains in Andhra Pradesh, common, wild or in cultivation

due to its more therapeutic uses. The natural climatic conditions in Chittoor district of Andhra Pradesh not only famous for world popular pilgrim center as a holyshire of the Lord Sri Venkateswara or Balaji is situated in Tirumala – Tirupati but also famous for treasure house of rich medicinal plants and providing more favourable conditions for an extensive growth of *P. zeylanica* (Madhava Chetty, 1998).

Chittoor district, the southernmost region of Andhra Pradesh (Madhava Chetty, *et.al.* 1998) has a total population of 3.22 million of which 2.62 million are living in rural areas (Amulya Rathnanda, 1991). The most important communities of the district (Kamma, Kapu, Balija, Konda Reddy, Harijana, Jangama, Padmasali, Vaddi, Kamsali, Kummari, Tsakali, Gandla, Mangali, Irola, Yanadi, Sugali, Tanda, Yerukala, Nakkala etc.) are well experienced with the numerous therapeutic uses of the chitraka (Sudhakar & Madhava Chetty, 1998).

The present study is therefore undertaken to lay special emphasis on pharmaceutical studies and therapeutic uses of the root of *Plumbago zeylanica* used by different communities in this district.

EXPERIMENTAL

The data on the pharmaceutical studies and therapeutic uses of *Plumbago zeylanica* were gathered from Sri Srinivasa Ayurvedic Pharmacy, 10 Km from Tirupati, local healers, local and tribal medicine men, age old persons, farmers, mid-wivers and other dwellers having high degree of knowledge in herbal medicine. The method of drug preparation, qualitative, quantitative ingredients used, quality of the drug, colours used in medicine, basic media used for preparation, preparation of the drug, activators or precaution to be taken during drug preparation, mode of preparation of final form, temperature variation in the preparation of the drug, shelf life and stability of the drug after preparation, method of preservation, mode of administration, therapeutic uses of the drug, age wise dosage levels, duration of treatment, toxic levels of the drug, effective dosage, side effects and precautions to be taken when using the drug are reported in detail.

The plant material was identified with the help of South Indian and local floras (Gamble & Fishcher, 1957; Mathew, 1983; Thamanna, *et. al.* 1994). The nomenclature was updated by consulting the recent literature (Henry, *et.al.*1989). The voucher herbarium specimen was deposited in the Herbarium of Botany Department, S.V.University, Tirupati. Its accession number is 1156.

RESULTS

Our results are given under the following headings:

PLANT DESCRIPTION

Plumbago zeylanica, a rambling subscandent perennial herb or under shrub with green branches, stems somewhat woody, spreading, terate, striate, glabrous. Leaves alternate, ovate or oblong, petiole narrow, amplexicaul at the base and often dialted into stipule like auricles. Flowers white, in axillary and terminal elongated spikes, bisexual. Calyx densely covered with stalked, sticky glands. Corolla white, very slender, tubular. Stameus 5, free. Ovary superior, 5-gonous, one celled, ovule one, basal. Roots are light yellow coloured when fresh, reddish brown when dry, found in the

form of tough pieces, straight unbranched or slightly branched with or without secondary roots, with uniform and smooth texture, strong and characteristic odour with acrid and bitter taste.

PHARMACEUTICAL STUDIES AND THERAPEUTIC USES

PREPARATION OF MEDICINES AND ITS THERAPEUTIC USES

The root of *Plumbago zeylanica* (Chitraka, Chitramulamu) collected at the stage of flowering can be pharmaceutically moulded into two main categories of dosage forms by using (A) Fresh root and (B) Dry drug (root).

A) FRESH ROOT

The freshly collected root can be converted in the following forms for therapeutic use.

1. Chitraka swarasam (Freshly expressed juice)

The fresh juice expressed by macerating the fresh root of chitraka is called as chitaka swarasam.

Therapeutic uses : The fresh juice (5-10 ml) is taken with cow's urine (15-30 ml) twice a day for 2-3 weeks relieves internal piles.

2. Chitraka kalkam (Paste)

The fresh root of chitraka is ground into a fine paste by using sufficient water is known as a chitraka kalkam.

Therapeutic uses:

- a.** External application of the paste to the filarial leg is useful.
- b.** The paste made out of the root of chitraka and stem barks of *Erythroxylon monogymum* Roxb. And *Moringa oleifera* Lam. in equal proportions ground with cow's urine is useful as an external application to relieve oedema of the legs.
- c.** External application of the paste made out of the root of chitraka, *Nerium oleander* L. and stem bark of *Semicarpus anacardium* L. f., *Holoptelia integrifolia* (Roxb.) Planch. and excretory matter of pigeon in equal proportions induces early maturation, rupture and healing of abscess.
- d.** The root of *Plumbago* is to be pasted within a jar on to the inner walls and bottom of the jar. Curd or butter milk prepared in that jar is taken in a dosage of 30-60 ml, twice a day for a period of 7-10 days relieve piles.
- e.** External application of fine paste made out of fresh roots of chitraka, soaked in cow's urine for a period of 24 hours alleviates the signs and symptoms of scabies.
- f.** Local administration of fine root paste (3-5 g) of chitraka into the vaginal track for a period of 3-5 days found to having abortifacient action.

B) DRY DRUG

The dry drug can be prepared in the following forms.

1. Preparation of chitramula churnam (Root powder)

The freshly collected roots of the plant are thoroughly cleaned by soaking in fresh water repeatedly to separate mud particles sticking on to the roots. Then the root is excavated and cut into small bits of about 2-3 cm in size. The pieces are thoroughly shade dried and subjected to grinding to convert into fine powder. Whenever necessary the fine power is again sieved to obtain microfine powder by using mesh No.80 (Sifter sieving machine used in pharmaceutical industries). The so prepared powder is to be preserved in antigut container for usage as a single drug or it can be mixed proportionally with other plant drugs to prepare drugs such as chitrakadi vati (pills) and chitraka gutika (tablets), chitraka ghritam (ghee preparation), chitraka quatham (decoction), chitraka himam (cold infusion) and chitraka phantam (hot infusion). The churnam (powder) should be used in dosage of about 2-3 g in divided doses (twice or thrice in a day) preparably after meal with luke warm water or with the prescribed vehicle.

Therapeutic uses

- a. The paste made out of the root churnam (1-2 g) is taken with butter milk (30-60 ml), 2-3 times a day gives quick relief in diarrhoea.
- b. The decoction prepared out of the root bark churnam is taken orally (30-60 ml) twice in day for about 1-2 weeks gives relief from dysentery, abdominal disorders, peptic ulcers, piles and improves appetite. In children the dosage should be limited to 5-10 ml in divided doses.
- c. The fine powder of the root is taken orally (2-5 g) with honey twice a day for a period of 3 months, it gradually reduces hypercholostremia.
- d. The fine powders of chitraka and *Abutilon indicum* (L.) Sweet. root in equal proportion is given in dosages of 1-3 g with milk ones in a day for 3 months gradually reduces the condition of anemia and improves blood formation.
- e. The fine powder of chitraka (1 part), dry zinger, *Piper longum* L. and *Piper nigrum* L. (1 part each) are taken orally 2-3 g with ghee or honey, twice a day for period of 3 months gives results in leucoderma and psoriasis.

Side Effects

If the powder (churnam) is taken in excessive doses it produces severe irritation in the stomach, vomiting, diarrhoea, painful micturition (burning urination) and abortion etc. It also produces ulceration in the stomach.

2. Preparation of chitrakadi vati (tablets) and gutika (pills)

Medicines prepared in the form of tablets or pills is known as vati and gutika. These are made of one or more drugs of plant, animal or mineral origin.

Table 1. Ingredients used in the preparation of chitrakadi vati and gutika .

1.	Chitraka (<i>Plumbago zeylanica</i> , root)	-	1 part
2.	<i>Piper longum</i> L. (root)	-	1 part

3.	Yava ksara (Impure potassium carbonate)	-	1 part
4.	Sarji ksara (Impure sodium carbonate)	-	1 part
5.	Sauvarcala lavana (Sodium sulphate mixed with sodium chloride)	-	1 part
6.	Saindhva lavana (Rock salt)	-	1 part
7.	Vida lavana (A mixture of sodium chloride + sodium sulphate + aluminium sulphate + magnesium sulphate + ferric oxide + ferric sulphate)	-	1 part
8.	Samudra lavana (Common salt)	-	1 part
9.	Subhid lavana (75% sodium sulphate + 10-15% sodium carbonate + 5-10% magnesium sulphate)	-	1 part
10.	Zinger (Dry rhizome)	-	1 part
11.	Marica (<i>Piper nigrum</i> L., fruit)	-	1 part
12.	Pippali (<i>Piper longum</i> L., fruit)	-	1 part
13.	Hingu (<i>Ferula asafoetida</i> L., resin)	-	1 part
14.	Ajamoda (<i>Carcum copticum</i> L., fruit)	-	1 part
15.	Cavya (<i>Piper cubeba</i> L.f., root)	-	1 part
16.	Mutulunga rasa (<i>Citrus medica</i> L., or <i>C. limon</i> Burnm.f., fruit juice)	-	1 part
	or		
	Dadima rasa (<i>Punica granatum</i> L., fruit juice)	-	For mardana (maceration)

The above dried drugs should be powdered, sieved and mixed in the proportions stated above and mixed all together. The compound is thoroughly macerated by using fresh juice of *Citrus medica* or *C. limon* or *Punica granatum* repeatedly till fine paste is obtained. The criteria to determine the final stage of the formulation before making tablets or pills is that it should not stick to the fingers when rolled. The so obtained paste is to be dried under shade and to be converted into pills or tablets of desired size (dosage form) of about 500 mg. The pills or tablets should be preserved in airtight plastic containers or plastic bags and can be used upto 1-2 years.

Therapeutic uses

a. The above prepared tablets or pills (2 tablets or pills) are taken orally thrice in a day after meal preparably with luke warm water or butter milk for period of two weeks relieves dyspepsia (loss of appetite), indigestion, peptic ulcers, dysentery and diarrhoea.

b. The pills prepared by using chitraka and haritaki (*Terminalia chebula* Retz., fruit) in equal proportions in the dosage of 1-2 pills of about 500 mg each, in divided doses (twice or thrice a day) in luke warm water for about 1-2 weeks relieves coryza (running nose).

c. The plain (single drug) made of chitraka root if taken orally in dosage of 2-3 pills twice a day for about 3 months with luke warm water or butter milk, results in reducing excessive liquid levels in blood i.e. reduces obesity.

3. Chitraka ghritam (Ghee preparation)

It is a preparation in which ghee is boiled with the prescribed decoction of the plant drug to the formula. This process ensures absorption of the active therapeutic principles of ingredients used.

Methods of preparation

It involves three essential components for the preparation of chitraka ghritam.

1. Liquid (water) - 16 parts
2. Fine paste of the drug (roots) - 1 part
3. Ghee - 4 parts

The fine paste of the drug and the liquid are mixed together and ghee is then added, boiled and stirred well continuously so that the paste is not allowed to adhere to vessel walls. When all the liquid contents have evaporated, the moisture content in the fine paste of the drug will also begin to evaporate. At this stage it has to be stirred more often and carefully to ensure that the fine paste of the drug does not stick to the bottom of the vessel. The fine paste is taken out with the help of ladle and tested from time to time to know the condition and stage of the pakam. When the pakam is harder when put in fire burns without any crackling noise indicates the optimal stage for oral intake. In the beginning the boiling should be on mild fire and in the end also it should be mild fire.

Characteristics : The chitraka ghritam will generally solidify when cooled. It will have the colour, odour and taste of the plant (s) drug used.

Preservation : They are preserved in glass, polythene or aluminium containers. They keep their potency upto 2 years.

Method of usage : It has to be taken after warming in the doses of 3-6 g, twice in a day for period of 15-30 days for satisfactory results in the said indications.

Therapeutic uses

- a. Sprue (dysentery)
- b. Abdominal disorders like splenomegaly, hepatomegaly and ascitis.
- c. Oedema (swelling of limbs and other parts of the body).
- d. Goats ghee processed with yavaksara, *Carcum copticum* fruits, chitraka root and *Phyllanthus emblica* L. fruits in equal proportions and mixed with honey, if taken orally in doses of 1-2 tea spoonful twice or thrice in a day for a period of 7-10 days relieves hoarseness of voice and sore throat.
- e. Cow's urine (500 ml) mixed with chitraka and trikatu (*Zingiber officinale* Rosc. + *Piper longum* + *P. nigrum* in equal proportions) of each about 100g and honey 100 g and kept in a air, smeared with ghee of about (250 g) kept for a fortnight can be used in doses of 3-5 g twice a day for period of 45 days reduces the symptoms of vitiligo.

4. Chitraka quatham (Decoction)

When fresh drug is not available, the dry drug is to be made into coarse powder and add 16 times water to the coarse powder in a container and reduced to the contents of the container to one

fourth by boiling, filter while warm and kept ready for use.

Therapeutic uses

The decoction of chitraka root in a dosage of 30-60 ml twice daily for a period of 2-3 weeks is useful in checking and preventing spermatorrhoea.

5. Chitraka himam (Cold infusion)

Add 4 times of the water to the coarse powder of chitraka root and allow it to soak for about 24 hours and in the next day early morning, filter and the cold infusion kept ready for use.

Therapeutic uses

- a. The cold infusion is taken in a dosage of 20-40 ml thrice a day for a period of 8-10 days to relieve piles.
- b. The cold infusion is also prepared by using chitraka (20 g) and turmeric (40 g) using cow's urine as the medium if taken orally in doses of 30-60 ml twice a day for period of 3-4 months relieves symptoms of leprosy and allied skin disorders.

6. Chitraka phantam (Hot infusion)

Add 8 times water to the coarse powder, soak for 24 hours and in the next day morning reduce to half volume by boiling, filter while warm and hot infusion is kept ready for use.

Therapeutic uses

The hot infusion (15-30 ml) is taken orally twice a day for a period of 7-10 days, relieves dyspepsia, peptic ulcers and indigestion.

C. COLOURS USED IN CHITRAKA DRUG PREPARATION

Classical preparations such as churnam, pills, tablets, ghritam, swarasam, kalkam, decoction, hot or cold infusions do not involve addition of any flavouring agents, colour dyes and preservatives. However patient or ethical preparations of chitraka by modern Ayurvedic pharmacies involve.

- a. Encapsulation of the powders by using gelatin capsules of capacity 250-500g.
- b. Film coating, blister packing and strip packing using aluminium foil, to attract the consumer to mask bitter taste while swallowing by the consumer which otherwise produce nausea and vomitings and for attractive presentation to improve the shelf life and to promote marketing of the product.
- c. Syrups, linctus etc., contain favouring agents, dyes and preservatives like sodium benzoate, citric acid, propyl paraben and methyl paraben are used to improve the palatability, appearance and shelf life.

D. SHELF LIFE OF THE CHITRAKA DRUG AFTER PREPARATION

It is period from the date of preparation of the dosage form till the therapeutic action of the plant drug ceases.

Table 2. Shelf Life of Chitraka.

Name of the drug	Shelf life	Preservation
Swarasam	AOS (as and when required 24 hours)	Earthen pots, stainless steel (SS) or aluminium vessels or glasses.
Kalkam	AOS	Earthen pots, stainless steel (SS) or aluminium vessels or glasses.
Churnam (powder)	6-12 months	Airtight plastic containers.
Tablets or Pills	2-3 years	Airtight plastic containers.
Ghritam	1-2 years	Aluminium jars, glass jars, polythene covers.
Quatham	1-2 years	Aluminium jars, stainless steel glass, containers, earthen posts, copper vessels.
Himam	1-2 years	Aluminium jars, stainless steel glass, containers, earthen posts, copper vessels.
Phantam	1-2 years	Aluminium jars, stainless steel glass, containers, earthen posts, copper vessels.

The dried raw material of the chitraka drug should be preserved in gummy bags allowing aeration and care should be taken to prevent damage by infestation, ants, rats, animals, insects, chemicals, etc. It should not be kept in airtight containers and the material of the container should not reach with the raw material. It should be kept away from moisture during rainy season.

E. AGEWISE DOSAGE LEVELS OF CHITRAKA DRUG

Table 3. Chitraka dosages.

Name of the drug	Dosage form			
	Infants below 1 year	Children Between 2-5 years	Children between 5-10 years	Adults above 12 years (in divided doses)
Swarasam	-	-	½ - 1 tea spoon full	2-3 tea spoon full
Kalkam	-	-	1-2 g	2-3 g
Churnam	100 mg	100-250 mg	1-2 g	2-3 g
Tablets or Pills	-	-	1-2 g	2-3 g
Capsules	-	-	-	1-2 g
Ghritam	¼ tea spoon full	½ tea spoon full	1-2 tea spoon full	2-3 tea spoon full

Quatham	-	-	10-15 ml	30-60 ml
Himam	-	-	15-30 ml	30-60 ml
Phantam	-	-	5-10 ml	15-30 ml
Syrup	2-3 ml	3-5 ml	5 ml	5-10 ml

Different dosage forms using chitraka should be processed under optimum temperature not exceeding 60⁰C, which otherwise reduces the potency of the drug used.

F. DIETARY PRECAUTIONS TAKEN WHEN USING CHITRAKA DRUG

Control of the food habits of the patient under treatment is another important aspect of Indian medical system in order to avoid crude interaction between the drug and food in the system. To achieve good results and for total effectiveness of the plant drug for absorption and bio-availability, the following precautions to be taken.

1. Potatoes, tubers and other root vegetables are avoided during the treatment to facilitate good absorption of the plant drug.
2. Oil food stuff spices and condiments to be reduced for effective absorption of the plant drug.
3. Plenty of water is to be taken in between meals and also while taking the plant drug for good absorption, bio-availability and good excretion of the plant drug.
4. Vegetable food stuffs which have allied action with the plant drug should taken during the course of treatment instead of incompatible foodstuff for synergetic action.

DISCUSSION

The root of *Plumbago zeylanica* (Chitraka or Chitramulamu) has numerous therapeutic uses. The root is known to be abortifacient and to have vesicant properties. It is used as appetizer, dysentery, diarrhoea, diuretic, expectorant, piles and peptic ulcers. The root paste is applied topically for filarial leg is useful. It is used topically for early as maturation, rupture and healing of abscess. The root powder taken orally along with honey gradually reduces hypercholestraemia and improves blood formation (anaemia). It is used to reduce obesity, vitiligo, splenomegaly, hepatomegaly and ascitis. It is also used to relieve coryza (running nose), hoarseness of voice and sore throat. It is used in the form of local applications for leucoderma, scabies, psoriasis, symptoms of leprosy and allied skin diseases. The decoction of the root is useful in checking and preventing spermatorrhoea.

The present study have clearly reveals that, it will be beneficial to establish or to start pharmaceutical industry for the production of chitraka swarasam, chitraka kalkam, chitraka churnam, chitrakadi vati, chitrakadi gutika, chitraka ghitam, chitraka quatham and chitraka phantam of purity, safety and high therapeutic values of the drugs with more commercial profits.

The present study also provides an opportunity to investigate and establish the status of *Plumbago zeylanica* will find their use for utilization in different ailments.

Finally it can be concluded that these studies are also initiate the researchers who are in this field for further pharmaceutical studies and therapeutic uses on chitraka for total drug evaluation.

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