

Internal application of some Ethno medicinal plants to treat bone fractures in Eastern Ghats of India, AP.

N.V. Jayanth Babu, P. Prayaga Murty and G.M. Narasimha Rao

Department of Botany, Andhra University, Visakhapatnam-530003, Andhra Pradesh, India

Corresponding Author: N.V. Jayanth Babu

Abstract: The present paper aims at the documentation of the traditional wealth of various medicinal plants and their therapeutic uses to cure the fractured bones by the tribal people of Eastern Ghats region of Andhra Pradesh. Herein, 23 plant species belonging to 21 genera and 18 families, used for healing bone fractures by the natives of Eastern Ghats of Andhra Pradesh are mentioned. Information on botanical name, vernacular name, family, plant part used, mode of drug preparation, formulations and dosage are presented in this paper in detail. Due to over exploitation of the medicinal plants in this region, certain plant species mentioned herein are becoming rare and extinct from their natural habitats or endemic conditions. So it is suggested for taking up ex-situ and in-situ conservation measures to overcome the said problem.

Key words: Bone fractures, ethno medicinal plants, Eastern Ghats of India Andhra Pradesh.

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I. Introduction

Traditional herbal therapy is an age old practice (Rawat & Chaudhury 1998) [1]. This has cured varied diseases in the past and is still a favorite way out, for the indigenous tribes. In fact, the traditional healing practices are arousing curiosity among various researches from all round the professions to go in depth into this subject (Tag *et al* 2005) [2]. Bone fractures are caused due to accidents or violent acts caused by others either willfully or negligently or due to falling or due to pathological reasons or due to osteoporosis. Fractures are accompanied by severe pain, swelling and at times injuries also. In nature, there are wonderful plants and traditional medical practices in vogue from the time immemorial for healing the fractures quite effectively. In Tribal and Folk (Jaanapada) medicine, hair line fractures, incomplete fractures, simple fractures can be healed safely and easily. Whereas, for treating multiple fractures, or compound fractures proper attention, care, Diagnosis through X Rays and expertise Medical treatment are very much essentially required to re-set the fractured bone/bones, as well as for taking up surgery if required. After X Ray, resetting the fractured bones to its original alignment/after surgery, for ensuring effective, qualitative, quick re-union of broken bones as well as for alleviating severe pain, the proven Ethno Botanical/ Tribal /Folk/Jaanapada Medicinal practices in vogue are very much required. For alleviating unbearable pain, usage of powerful Pain killers and injections for longer period, may harm the health of the individuals. More over there is no specific treatment for in Allopathy for joining the fractured bones effectively. Hence there is a need to follow traditional proven Ethno botanical /Jaanapada medicinal practices, after Allopathic treatment initially, which is safe, effective and is without side effects.

II. Study area

The Eastern Ghats are a long chain of broken hill ranges that pass mainly through three states viz., Orissa, Andhra Pradesh and Tamilnadu (Legris and Meher-Homji, 1982) [3]. They run about 1750 km with an average width of about 100 km between Mahanadi and Vaigai rivers along the Indian east coast. In Andhra Pradesh and Telangana they are situated between 120 38' – 220 N latitudes and 780 50' – 840 46' E longitudes. The altitudes range from 300 – 1000m above MSL and the vegetation varies from semi-evergreen forests to scrub jungles. Tribes like Koyas, Kondareddis, Valmiki, Chenchus, Lambadas, Jatapus, Savaras, Bagatas, Porjas, Khonds, Yanadis and Yerukalas inhabit the forests of Eastern Ghats.

III. Materials and methods

The survey was conducted in selected tribal pockets of Eastern Ghats of Andhra Pradesh, the first field trip of the study area was devoted to acquaintance with the local chiefs, priests, Vaidyas, herbal doctors, headman's and elderly people of both men and women. The methodology was adopted as described by Jain (1964, 1981, 1987, 1999) [4-7]., Chadwick and Marsh (1994) [8], Hemadri (1994) [9] and Martin (1995) [10]. It is the outcome of intensive field trips were made in the interior tribal pockets of the forest areas. The information was collected from who secured from their hereditary and ancestral line. Folklore and Tribal

medicinal practices are not easily revealed or shared by them with anyone. They avoid by saying that, if they tell the names of the Plant species their medicine will not work. Tribal people may share their knowledge with certain people under special circumstances. Whereas, the village folk native Doctors living in the villages located in the fringes of forest areas, generally will not reveal their secrets and inherited methods of treatment so easily. While carrying out the fieldwork, help was taken from the traditional healers. The gathered information was entered in the investigator filed note book. Plants specimens were collected and identified by referring to standard Flora of the Presidency of Madras, Gamble and Fischer (1936) [11], Andhra Pradesh by Pullaiah et al (1997) [12] and local floras.

IV. Preparation of Infusions and Decoctions.

Stainless steel vessels or earthen vessels are to be used for boiling pure and soft water. Vessels of aluminum, copper, brass, zinc and other metal vessels are to be avoided.

Hot water infusion: pure water is to be boiled in stainless steel vessel. The collected flowers or pounded leaves, or powders of roots, or stem or stem bark, root powders or seeds, Rhizomes etc., as specified /indicated to be added in the boiling water and flame is to be put-off. Steep for 15 minutes and allowed to stain.

Cold water infusion: Indicated plant material is to be steeped in cold water for a night and to be used in the morning.

Decoction: The Root/ Stem/ Bark etc., powders are gently boiled in pure water for 10 minutes.

Dosage for adults: 5 grams per 1 day. 5 grams of plant material powder as indicated can be mixed in 100 ml. of water can be used /consumed twice a day in two split doses in the form of Decoction/Hot or Cold water infusions. The decoctions/infusions are to be prepared every day, afresh and should not be stored for next day.

Dosage for children: Age 2 to 5 years 1 gram of plant powder is specified. Age 6 to 10 years 2 grams of plant powder is specified. Age 11 to 14 years 3 grams of plant powder specified.

V. Results and discussion

In the present study a total number of 23 plant species belonging to 21 genera and 18 families have been identified as potential source for treating bone fractures. The scientific names of the species along with families, vernacular names, part(s) used, doses and mode of preparation are recorded in Table -1 and Special diet recommended to be taken is also recorded. Few researchers like Rama Rao and Henry, 1996[13]; Venkata Ratnam and Venkata Raju, 2008[14]; Prayaga Murty and Venkata Rami Reddy 2015[15]; had been previously reported for bone fractures but they concentrated external applications only. Now the Information being reported is on the internal applications i.e., oral administration or oral intake of the folk medicine, is not found in the literature.

Table- I : Traditional medicinal plants reported for internal use for (oral administration) curing/joining the fractured bones

S.No	Name of Species Family Local name	Plant Parts Used and Doses	Other ingredients used and Doses	Mode of Preparation and Usage
1	<i>Pavonia zeylanica</i> Malvaceae Kaarubenda	Root 5 Grams of fine powder of root. Whole plant powder is a pain killer	Pepper seed 3 Nos. Powder Garlic clefts 1 or 2 paste Goat's milk 30 ml.	Root powder is mixed with goat's milk along with other ingredients specified (for better results) and taken orally daily in the morning for 15 days.
2	<i>Pavonia odorata</i> Malvaceae hirubenda	Root 5 Grams of fine powder of root. Whole plant powder is a pain killer.	Pepper seed 3 Nos. Powder Garlic clefts 1 or 2 paste Goat's milk 30 ml.	Root powder is mixed with goat's milk along with other ingredients specified (for better results) and taken orally daily in the morning for 15 days.
3	<i>Hibiscus micranthus</i> Malvaceae Nitya Malli	Root 5 Grams of fine root powder	Pepper seed 3 Nos. Powder Garlic clefts 1 or 2 paste Goat's milk 30 ml.	Root powder is mixed with goat's milk along with other ingredients specified (for better results) and taken orally daily in the morning for 15 days.
4	<i>Sida cordata</i> Malvaceae Nela benda or Tirunaalla benda	Whole plant. Fine Powder of whole plant 5 Grams.	Pepper seed 3 Nos. Powder Garlic clefts 1 or 2 paste Goat's milk 30 ml.	Root powder is mixed with goat's milk along with other ingredients specified (for better results) and taken orally daily in the morning for 15 days.
5	<i>Solanum nigrum</i> Solanaceae Kamanchi	Leaves Juice 10 to 15 ml.	Pepper seed 3 Nos. Powder Garlic clefts 1 or 2 paste Goat's milk 30 ml.	Juice obtained from leaves is to be mixed with Goats milk along with other ingredients and taken daily in the morning orally for 15 days
6	<i>Eclipta alba</i> Asteraceae Guntha galagara	Leaves Juice 10 to 15 ml	Pepper seed 3 Nos. Powder Garlic clefts 1 or 2 paste Goat's milk 30 ml.	Juice obtained from leaves is to be mixed with Goats milk along with other ingredients and taken daily in the morning orally for 15 days
7	<i>Peristrophe paniculata</i> Acanthaceae elama sandhi	Leaves Powder 5 Grams	Pepper seed 3 Nos. Powder Garlic clefts 1 or 2 paste Goat's milk 30 ml.	Fine powder obtained from leaves is to be mixed with Goats milk along with other ingredients and taken daily in the morning orally for 15 days
8	<i>Terminalia arjuna</i> Combretaceae Tella Maddi	Stem bark Fine powder 5 Grams.	Pepper seed 3 Nos. Powder Garlic clefts 1 or 2 paste.	Hot water infusion is to be prepared along with the specified ingredients and to be taken orally every day for 15 days.
9	<i>Syzygium cumini</i> Myrtaceae Neredu	Bark powder fine bark powder 5 grms	Pepper seed 3 Nos. Powder Garlic clefts 1 or 2 paste.	Hot water infusion is to be prepared along with the specified ingredients and to be taken orally every day for 15 days.
10	<i>Bambusa arundinacea</i> Poaceae veduru	Tender stem and leaves .fine powder 5 grms	Pepper seed 3 Nos. Powder Garlic clefts 1 or 2 paste. Goat's milk 30 ml	Plant powder is to be mixed with other ingredients and taken orally for 15 days. please note that this treatment with bamboo should not be used for epilepsy patients.
11	<i>Annona squamosa</i> Annonaceae Seethaphalam	Fine bark powder 5 grams	Pepper seed 3 Nos. Powder Garlic clefts 1 or 2 paste. Goat's milk 30 ml	Plant powder is to be mixed with other ingredients and taken orally for 15 days
12	<i>Annona reticulate</i> Annonaceae Ramaphalam	Stem bark powder 5 grams	Pepper seed 3 Nos. Powder Garlic clefts 1 or 2 paste. Goat's milk 30 ml	Plant powder is to be mixed with other ingredients and taken orally for 15 days.
13	<i>Cissus quadrangularis</i> Vitaceae Nalleru	Stem juice - 5 ml per day	Pepper seed 3 Nos. Powder Garlic clefts 1 or 2 paste Goat's milk 30 ml.	Stem juice is to be mixed with goat's milk 30ml + Turmeric powder 3 grams + Pepper powder 3 nos. - mixed thoroughly and taken orally in the morning
14	<i>Nyctanthus arbortristis</i> Nyctanthaceae Parijatham; Coral plant	Fine powder of stem bark 5 grams	Pepper seed 3 Nos. Powder Garlic clefts 1 or 2 paste Goat's milk 30 ml.	Hot water infusion of bark powder 5 grams + Turmeric powder 2 grams + Black Pepper powder 3 nos. to be taken orally daily in the morning
15	<i>Litsia glutinosa</i> Linaceae Nara maamidi/Narra alagi	Fine powder of stem bark 5 grams	Pepper seed 3 Nos. Powder Garlic clefts 1 or 2 paste Goat's milk 30 ml	Stem bark powder is to be mixed with goat's milk 30ml + Turmeric powder 3 grams + Pepper powder 3 nos - mixed thoroughly and taken orally in the morning
16	<i>Euphorbia nivula</i> Euphorbiaceae Akujemudu	Fine powder of bark excluding dead portion 5 to 10 grams	Pepper seed 3 Nos. Powder Garlic clefts 1 or 2 paste Goat's milk 30 ml.	Stem bark powder is to be mixed with goat's milk 30ml + Turmeric powder 3 grams + Pepper powder 3 nos - mixed thoroughly and taken orally in the morning

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17	<i>Oroxylum indicum</i> Bignoniaceae Dundilamu / Panpini	Fine powder of root bark 5 grams	Pepper seed 3 Nos. Powder Garlic clefts 1 or 2 paste Goat's milk 30 ml.	Hot water infusion of root bark powder 5 grams + Turmeric powder 2 grams + Black Pepper powder 3 no.s to be taken orally daily in the morning
18	<i>Bassia latifolia</i> Sapotaceae Ippa / Mahua	Fine Bark powder without dead tissues 5 grams	Pepper seed 3 Nos. Powder Garlic clefts 1 or 2 paste Goat's milk 30 ml.	Hot water infusion of bark powder 5 grams + Turmeric powder 2 grams + Black Pepper powder 3 no.s to be taken orally daily in the morning
19	<i>Butea monosperma</i> Fabaceae Moduga	Stem bark / Root bark fine powder 5 grams	Pepper seed 3 Nos. Powder Garlic clefts 1 or 2 paste Goat's milk 30 ml.	Hot water infusion of bark / root powder 5 grams + Turmeric powder 2 grams + Black Pepper powder 3 no.s to be taken orally daily in the morning
20	<i>Moringa oleifera</i> Moringaceae Munaga / drumstick	Green Leaves	Pepper seed 3 Nos. Powder Garlic clefts 1 or 2 paste Goat's milk 30 ml.	Green leaves are cooked with daal and taken daily for curing hairline fractures
21	<i>Albizia amara</i> Mimosaceae Chigara, Cheekireni	Leaves paste 25 grams	Pepper seed 3 Nos. Powder Garlic clefts 1 or 2 paste Goat's milk 30 ml.	Fine leaves powder/ paste is to be mixed with the specified ingredients and applied on the skin around the fractured bone and bandaged for alleviating the pain as well as for joining the bones effectively
22	<i>Tinospora cordifolia</i> Menispermaceae Tippa Teega	Stem paste 25 grams	Pepper seed 3 Nos. Powder Garlic clefts 1 or 2 paste Goat's milk 30 ml.	Fine stem paste is to be mixed with the specified ingredients and applied on the skin around the fractured bone and bandaged for alleviating pain and for joining fractured bones.
23	<i>Sterculia urens</i> Sterculiaceae Tapasi, Yerrapoliki	Stem bark or Root bark paste 5grams	Powder/paste 5 grams and 5 grams of its gum pepper seed 3 nos. powder garlic clefts 1 or 2 paste to be mixed in goats 30 ml or cow's milk 60 ml	Fine stem /root bark paste or powder is to be mixed with the specified ingredients and to be administered orally in two split doses one in the morning and one in the evening

Plants used for quick healing of bleeding injuries, like cuts, abrasions, etc., occurred on the skin at the time of bone fractures and for pain relief.

1. *Tridax procumbens*. Family: Asteraceae. Local name. Gaddi chamanthi/ Gaayapaku. Juice obtained from leaves is applied externally on the wound/cut/abrasion and the crushed leaves are to be placed over it and bandaged.
2. *Hyptis suaveolens*. Family: Lamiaceae. Local name. Bhu Tulasi/ Mahavira. Leaves are crushed and to be placed over the cut or wound and bandaged.
3. *Ipomoea cornea*. Family: Convolvulaceae. Local name. Gayapaku/ Rubber Aku. Leaves are crushed and to be placed on the wound and bandaged.
4. *Argyrea nervosa*. Family: Convolvulaceae. Local name. Samudra pala. Leaves are pounded finely and placed on the wounds and bandaged for quick healing.
5. *Heliotropium indicum*. Family: Boraginaceae. Telu mani/ Naga danthi Leaves are crushed into paste, applied externally on wounds/cuts and bandaged.
6. *Ageratum conyzoides*. Family: Asteraceae. Local name. Pumpullu, Goat Weed. Leaves are made into paste and applied externally on wounds.
7. *Dodonea viscosa*. Family: Sapindaceae. Local name. Bandedu, Banderu. Leaves are pounded and applied externally on wounds, cuts etc., for quick healing as well as for bone fractures.
8. *Achyranthus aspera*. Family: Amaranthaceae. Local name. Uttareni Leaves are made into paste and applied externally on wounds, cuts, and abrasions.
9. *Withania somnifera*. Family: Solanaceae. Local name. Aswagandha, Penneru. Leaves are crushed into paste and applied externally on wounds and cuts associated with swellings, pain for early recovery as well as for healing bone fractures.
10. *Helianthus annuus*. Family: Asteraceae. Local name. Surya kantham, Sun flower. Leaves are crushed into paste and applied externally on wounds for healing.
11. *Lannea coramandelica*. Family: Anacardiaceae. Local name. Gumpena. Leaves paste/Stem bark powder is applied on wounds for quick healing.
12. *Oroxylum indicum*. Family: Bignonaceae. Local name. Dundilam, Pampini. Root bark powder is applied externally for healing cuts/ wounds and bone fractures.
13. *Curcuma longa*. Family: Zingiberaceae. Local name. Pasupu. Rhizomes powder is applied on the wounds/cuts for quick healing.

14. *Leptadenia reticulata* /Jeevanthika, Family : Asclepiadaceae leaf juice applied on cuts
15. *Flacourtia indica* /Puliregu,pulivelaga, Family : Flacourtiaceae leaf juice applied on cuts or wounds

Special diet being prescribed for effective and quick healing the bone fractures.

For Healing bone fractures effectively and faster, in addition to the External applications of specified plants, to support the body to form strong bonding /cementing in between fractured bones, certain special diets are recommended by the local Bone setters.

- *Setaria italica*/ Fox millets. Family. Poacea, Local name: Korralu and
- *Triticum dicoccum*/ wheat. Family. Poaceae , Local name : Godhumalu, , seeds of Godhumalu and korralu are made in to Rawa(broken in to small pieces) , cooked and eaten daily in place of Rice/pulka.
- *Eleusine coracana*/ Finger millet. Family: Poaceae, Local name: Ragi. Ragi seeds powder is cooked with water to make Jawa/ soup, to be consumed with curds/jaggery made from ie., *Saccharum officinarum* /sugar cane juice and to be taken orally daily.

➤ *Sorghum bicolor*/Great millet, Family: Poaceae. Local name: Jonna. Jonna seeds powder is used to prepare Rotis and eaten along with palak/Bhendi curry daily.

➤ *Vigna mungo*/Black gram, Family: Fabaceae. Local name: Minumulu. Seeds are soaked in water, grinded into paste roasted in gingely oil- olive oil and vadas are prepared and consumed daily.or, seeds are to fried in ghee, powdered, mixed with cow ghee and jaggery powder made into round balls called Sunni vundalu (each weighing about 20 grams) and eaten daily.

➤ *Sesamum indicum*/Gingelly seed, Family: Pedaliaceae, Local name: Nuvvulu. Nuvvulu seeds are to be powdered and to be mixed with pure jaggery and eaten daily.

Egg white yolk 2 nos. are to be consumed / swallowed in raw along with jaggery daily followed by intake of one glass of cow milk mixed with two grams of Gomuthra Shilajith .

➤ *Abelmoschus esculanthus* /Ladies finger. Family: Malvaceae, Local name : Bhendi is to be consumed daily.

➤ Piper betle/Betel leaves, Family: Piperaceae. Local name: Tamala paku to be chewed along optimum quantity of shell lime powder daily and to be gulped.

➤ *Annona squamosa*/Custard apple, Family: Anonaceae. Local name: Seethaphal. Fruits are to be taken before meal

➤ *Annona reticulata*/ Family: Anonaceae. Local name: Ramaphal. Fruits are to be taken before meal

➤ *Psidium guajava*/ Guava, Family : Myrtaceae. Fruits are to be taken before meal

➤ *Musa paradisiaca*/Banana, Family : Musaceae. Fruits are to be taken before meal

➤ *Phonix dactylifera*/Date palm, Family:Arecaceae, Local name; khajoor fruits are eaten daily.

➤ *Citrus sinensis* /Batevia, Family: Rutaceae, Local name: Bathhai, Fruit juice is to be consumed.

➤ *Citrus lanatus*/Indian squash melon. Family: Cucurbitaceae,Puchhakaya, Juice of fruit pulp along with seeds is to be consumed daily.

❖ *Lycopersicon esculentum*/Tometo, Family: solanaceae. local name : Tometo

❖ *Spinacia oleracea*/spinach, Family: Chenopodiaceae. Leaves are made into curry and taken .

❖ *Daucus carota*/carrot, Family: Apiaceae

❖ *Beeta vulgaris* /Beet root, Family : Chenopodiaceae

❖ The above four items each weighing 100 grms are to be made into juice by adding adequate water and to be taken orally every day

➤ *Moringa olefera* / drumstick leaves , Family : Moringaceae

➤ *Cajanus cajan* / Red gram seed , Family :Fabaceae

The Above two are to be cooked and consumed along with Jowar roties .

Intake of Rice and other curries are to be avoided completely. Optimum quantities of the above mentioned qualitative food is to be taken.

➤ *Cocus nucifera* / coconut, Family: Arecaceae .Coconut water is to be consumed profusely every day.

➤ *Amaranthus viridis*/ *Thotakura* / Family : Amaranthaceae is to be made it to curry and to be consumed with jowar roties

VI. Conclusion

Phyto pharamaco therapy for bone fractures healing is expected to be safe when compared to synthetic drugs in terms of side effects, therefore, use of medicinal plants must be promoted for this problem and researches must be promoted for isolation of active molecules from the effective therapeutic herbs for bone fractures healing.

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