



# Documentation of ethnomedicinal information and antimicrobial validation of *Thespesia populnea* used by Yanadi tribe of Ganugapenta village, Chittoor district, Andhra Pradesh, India

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## ABSTRACT

**Aim:** This study aimed to document the traditional knowledge of medicinal plants and antimicrobial validation of *Thespesia populnea* used by Yanadi tribe of Chittoor district, Andhra Pradesh, India.

**Materials and Methods:** The study was mainly focused on documentation of medicinal plants used by Yanadi tribe to treat different diseases with a standard questionnaire. These plants were cross-checked in Dr. Dukes Database and available literature to know the significance of this tribe on medicinal knowledge. Among the documented plants, *T. populnea* was selected for antimicrobial activity with disc diffusion assay.

**Results:** Among the documented medicinal plants, herbs were the most utilized plants, followed by leaf part of the plants; paste form of medicinal preparation was the dominant one among the mode of preparations and oral administration was generally followed by this tribe. When checked these plants in Dr. Duke's Phytochemical and Ethnobotanical Database most of the medicinal plants were matched at least one medicinal use and most of them were correlated with existing literature. In antimicrobial activity, the microbial pathogens *Klebsiella pneumoniae* among bacteria and *Rhizopus arrhizus* among fungi were most susceptible to methanol extract of *T. populnea*. **Conclusion:** From this study, we conclude that the preparation and dosage of the medicines by Yanadi tribe of this area is unique and the correlation of medicinal data with Duke's Database and existing literature reveals high medicinal significance of claimed data of this tribe and potential inhibitory activity of *T. populnea* could be studied further to isolate effective antimicrobial agents.

**KEY WORDS:** Antimicrobial activity, ethnomedicinal studies, Ganugapenta, medicinal plants, Yanadi tribe

## INTRODUCTION

Since antiquated times people utilized plants for their daily needs, they practice the plant-based medicine to cure different

ailments. These concerns are now asserted by modern civilization as "Ethnobotany" [1] defines the study of interaction between plants and people. The ancient people like tribes utilized plants for food, fodder, dyes, fibers and medicinal purposes collected

from forests without any destructive way, they gave up holy respect to the plants and conserved in the form sacred groves. The documentation of the above-mentioned actions except medicinal knowledge, practiced by various ethnic groups which apply the methods of ethnobotany and medical anthropology are known as ethnomedicine [2]. The earliest ethnomedicinal documentation was started in 1500's by knowing the medicinal value of Indian fever bark (*Cinchona officinalis*) by European people and in India this modern ethnomedicinal investigation was started during 1935 by Kirtikar and Basu [3]. This research was continued by different modern ethnologists in different places with different tribal communities of India still today [4-9]. The World Health Organization proclaims that 80% of the world population still relies on medicinal plants to cure different types of diseases either by the traditional way of treatment or isolation of novel active compounds from medicinal plants [10]. Among the world, India has rich and diverse cultural traditions associated with the use of medicinal plants in different traditional systems of medicine including Ayurveda, Homeopathy, Siddha, and Unani [11]. Therefore, India is a botanical garden of the world and a goldmine of well recorded and traditionally well-practiced knowledge of herbal medicine [12]. The ethnic people residing in different places of India still dependent on medicinal plants to treat various ailments. The people who have a treasure house of knowledge on medicinal plants keep subtly and passed that knowledge only for their generations. The ethnomedicinal investigation helps to ecologists and wildlife managers to ensure and establish the local knowledge, which ultimately helps to pharmacists and pharmacognosists to prepare novel pharmaceuticals [13].

The ethnic group "Yanadi" is native to Chittoor district of Andhra Pradesh, India. Some of the researchers documented traditional knowledge of Yanadi tribe inhabited in surrounding villages of Chittoor district [14-20]. There is no proper report on medicinal knowledge of Ganugapenta village so far. Hence, the present investigation is mainly focused on medicinal knowledge of the Yanadi tribe of Ganugapenta village is situated in Chittoor district of Andhra Pradesh, India. This knowledge is transferred orally from generation to generation and dwindling rapidly due to the lack of interest among the younger generations. Therefore, this study is led to document the indigenous knowledge of this ethnic group. Based on the documented information the medicinal plant, *Thespesia populnea* is being used for many ailments by the Yanadi tribe of Ganugapenta village and was chosen to assess growth inhibitory efficacy against different bacterial and fungal pathogens.

## MATERIALS AND METHODS

### Study Area

The selected village Ganugapenta is situated in Chittoor district of Andhra Pradesh, India with the geographical coordinations such as 13°30'16" N latitude and 79°8'49" E longitudes with an elevation of 1425 feet above the mean sea level [Figure 1]. The village gets the highest precipitation from monsoon months with an annual average rainfall of 729 mm. The studied forest area comes under dry deciduous forests of Eastern Ghats covered with timber yielding trees, thorny shrubs and herbaceous flora

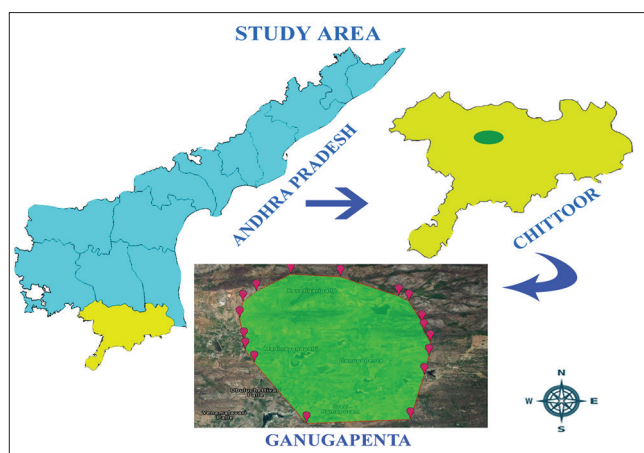


Figure 1: Mapping representation of study area

occupied with an area of 1125.38 hectares and possesses richest knowledge on usage of plants to treat various ailments by simple or in combination with other ingredients.

### Data Collection

Frequent field visits were conducted during 2014-2016 for collection of ethnomedicinal information from Yanadi tribe inhabited in the forest areas of Ganugapenta and their surrounding villages. The 80% of data were collected from Ganugapenta village and remaining from surrounding villages like Kavetigaripalle and Yallankivaripalle situated on the north side, Madinayanapalli from west side, Sreeramapuram from the south side, finally east side of Ganugapenta having an enormous range of deciduous forest with high hill tops. Most of the medicinal plants are available on the east side of Ganugapenta which is the major source for collection of medicinal plants. The ethnic group cultivates and earns money from rice and black-eyed pea, cowpea, groundnut, black gram, green gram, red gram and also gets their wages from farm works in the surrounding villages. The tribal villages inhabited by 945 families with 4300 people; among them, 1912 of males, 1952 of females and 436 children are residing in thatched houses, thatched huts and in concrete roofed houses. Most of the ethnomedicinal data were collected from 22 traditional medicine practitioners such as Chengaiah (60Y), Chinnabba (50Y), Jayaramaiah (52Y), Nagaiah (70Y), Sankaraiah (61Y), Narasimhulu (55Y), Siddaiah (70Y), Ramaiah (70Y), Krishnaiah (56Y), Bosanna (52Y), Srinivasulu (58Y), Yerraiah (61Y), Ramakrishnaiah (52Y), Gopal (60Y), Veeraswami (60Y), Venkataswamy (54Y), Venkatesu (53Y), Muniah (64Y), Chinakka (60Y), Nagaratnamma (56Y), Kamalamma (65Y), and Parvatamma (54Y). Among the 22 practitioners 18 members are from men's, 04 members are from women's and their age range from 50 to 70 years. The younger generations are not interested to participate and if as they participate, we personally observed that they do not have sufficient knowledge about on medicinal plants. During the field visits, the plants were collected based on the information provided by the tribe in their own language with the help of standard questionnaire [Figure 2]. The collected medicinal plants were locally identified to know the vernacular name

**PROFORMA FOR COLLECTING FIELD DATA ON MEDICINAL PLANTS**

**I. Tribe:** Name of the TMP  
 Gender: Male/Female Age: below 15/15-40/ 40 above  
 Experience: below 5/15-10/10 above Locality: Altitude:  
 Knowledge gained from: Knowledge transferred to:  
 Occupation:

**II. Name of the Diseases:**

**III. Number of diseases cured:**

**IV. Data on the plant:**  
 a) Scientific Name: b) Vernacular Name (s) (Specify the dialect):  
 c) Family: d) Habitat: H/S/C/T  
 e) In case of Tree Species: Height and Girth and Bark nature f) flower color:  
 g) Fruit characteristics: h) Small: i) Latex Present: Yes/No  
 j) Collection and identified: k) Photograph: l) availability:

**V. Description of the drug:**  
 a) Time of the collection: Morning/Afternoon/Evening/Night  
 b) Method of preparation of the drug: (1) Natural form (2) Crushed (3) Juice  
 (4) Decoction (5) Poultice (6) Soft paste (7) Solid preparation (8) Powder  
 i) Internal application (Chewing, Ingestion, Inhalation, Ticking)  
 ii) External application (Lotion, Bath Ointment, Poultice)  
 c) Ingredients used: single/mixed  
 d) Mode of administration:  
 e) Preservation of the drug: Y/N (Duration-----)  
 f) Plant part used as Medicine: (i) Root (ii) Stem (iii) Leaf  
 (iv) Flower (v) Fruit (vi) Seed (vii) Root bark (viii) Stem bark  
 (ix) Latex (x) Gum.  
 Percentage of the plant parts used for the preparation of drugs for 100 gr

**V. Therapeutic indications:**  
 a) Dosage b) Person

Content	Duration			Child	Adult	Old
	day	Month	Year			

c) Diet restrictions: Y/N  
 d) Patient Treatment With in the Tribal /other than Tribal  
 e) Side effects: Y/N/Unknown

**VI. Reason of the plant for considering as medicine**  
 a). Magico – religious belief b) traditional c) personal experience of healers  
 d) Strong belief on herbal drug e) Tales f) proverbs  
 g) Satisfaction level on particular drug: satisfied/ partially satisfied/ not satisfied  
 h) No. of persons treated:  
 i) No. of persons cured:  
 j) Other information:

Figure 2: Questionnaire for collecting information on medicinal plants

from medicinal practitioner and bring back to the laboratory to prepare herbarium specimens. These herbariums were cross-checked with the help of herbaria already deposited in Department of Botany, Sri Venkateswara University, local flora of Chittoor district [21] and Gamble volumes [22]. The documented ethnomedicinal data were cross-checked with Dr. Dukes Phytochemical and Ethnobotanical Database [23] and with the existing literature. Voucher specimens were prepared for the collected medicinal plants and were deposited in the Herbarium wing, Department of Botany, Sri Venkateswara University, Tirupati.

### Antimicrobial Validation

Based on the ethnomedicinal information received from the Yanadi tribe, the medicinal plant *T. populnea* is enormously using in the preparations of herbal medicines to treat various diseases. Hence, the plant was selected for antimicrobial validation against different microorganisms. The leaves of *T. populnea* were collected from the Ganugapenta village forest area, cleaned with distilled water and shade dried and grounded with a kitchen blender. The dried 100 g of plant leaf powder was soaked in 500 ml of methanol and moderately shaken for 24 h on a shaker (Tanco HRD3 Shaker, India). The contents were filtered with Whatman No. 1 filter paper and again re-extracted with the same quantity of fresh solvent. The obtained filtrates were combined and dissipated with a rotary evaporator (Royal Scientific 137 B, India) at 38°C to separate the solvent from mixture. The remaining residue was dried to yield a granulate form of nearly 1.45% of powder (dry weight/material dry weight × 100) on lyophilization (Terroni lyophilizer, Brazil). The obtained powder was stored in airtight containers at 4°C for further studies. For antimicrobial activity, five bacterial species (*Bacillus subtilis*, *Escherichia coli*, *Klebsiella pneumonia*, *Proteus vulgaris*, and *Pseudomonas aeruginosa*) and five fungal pathogens (*Aspergillus flavus*, *Aspergillus niger*, *Curvularia lunata*, *Fusarium oxysporum*, and *Rhizopus arrhizus*) were procured from the Department of Microbiology, Sri Venkateswara University, Tirupati. The disc diffusion assay was followed for the checking antimicrobial activity [24]. The Whatman No. 1 filter paper (6 mm) was loaded with 20 µl of various concentrations like 25, 50, 100 µg/ml of leaf extract and kept for 10-15 min for drying under sterile conditions. Nutrient agar medium for bacteria and potato dextrose agar medium for fungi were prepared and solidified under sterile conditions.

Triplicates of treated discs were placed on solidified media and were incubated at 37 ± 2°C for 24 h and the results were tabulated.

### RESULTS

The study revealed that the Yanadi tribe of Ganugapenta forest area using 54 medicinal plants belonging to 35 families to treat 40 ailments. The scientific name, vernacular name, voucher specimen number, family, part used, life form, mode of preparation, administration, and actual use of medicinal

plants were listed in Table 1, and the important photographs of them were given in Figure 3. Among the documented medicinal plants, the Yanadi tribe used more plants from herbs, followed by shrubs, trees, and the stragglers for their preparation of medicine [Figure 4]. Majority of the medicines prepared from leaf part of the plant followed by root, stem bark, whole plant, stem, seed, flower, fruit, rhizome, and root tuber [Figure 5]. Among the different mode of medicinal preparations, paste form of medicine preparation is widely used method for the documented plants followed by juice, powder, decoction, crushed form, fresh form, capsule, fumes, and tonic form [Figure 6]. Oral administration of medicine is a predominant method used by this tribe followed by topical application and inhalation through nostrils [Figure 7]. In this study, we observed that the Yanadi tribe admixtures camphor for the preparation of medicines with *Glossocardia boswellia*, gingly oil in the case of *Haldina cordifolia* and *Martynia annua*, jaggery in the case of *M. annua* and *Pterolobium hexapetalum*, lime in the case of *Cardiospermum halicacabum*, milk in the case of *Ocimum gratissimum* and *Sarcostemma acidum*, pepper and salt in the case of *Pavetta indica*, turmeric powder in the case of *Anisochilus carnosus*, *Capparis sepriaria*, *C. halicacabum*, *Cassia tora*, *Cleome viscosa*, *Dactyloctenium aegyptium*, *Jasminum angustifolium*, and *Sansevieria roxburghiana* and hot water in the case of *Curculigo orchoides*, *Maba neilgherrensis*, *Rhus mysorensis*, and *Sida spinosa*. Utilization of these admixtures may help to elevate the actual use of medicine. The camphor enhances the relief from rheumatic pains, the utilization of gingly oil, milk, hot water may helpful to easy intake of medicines and may act as lubricants, utilization of turmeric powder and lime may enhance the actual life of medicine and their activity. Pepper and salt may give a taste to the medicine prepared from bitter parts of the plant.

The medicinal uses of the documented plants were cross-checked with Dr. Dukes Phytochemical and Ethnobotanical Database. Among the 54 medicinal plants documented from the Yanadi tribe, 20 medicinal plants were matched with this database for at least one use and the remaining most of the plants were correlated with recent scientific literature. Among the documented 54 medicinal plants, the plant *T. populnea* was utilized mostly by Yanadi tribe of Ganugapenta forest area to cure various ailments such as cuts, skin diseases, inflammations, stomachache, dysentery, lesions on the face and wounds. Notwithstanding these, the Yanadi tribe inhabited in different parts of Andhra Pradesh like, Tirumala hills of Chittoor district prepared paste from stem with the help of goat milk to treat dandruff [25], leaf paste to treat arthritis [26], inhabitants of Kailasagirikona prepared eye drops from flowers to soothe watering of eyes [27], the leaf paste was utilized as analgesic and antiseptic medicine by Sriharikota Island inhabitants [28]. Rather than this Yanadi tribe, the other tribes like Kanni tribes of Tamil Nadu state prepared juice from fruit to treat skin diseases, fistula, inflamed joints and insect bites [29], decoction from stem bark and leaves were used to treat leprosy [30]. Irula tribe of the same state to a prepare paste from leaves to treat skin diseases [31], juice from stem bark to treat snake bite [32], crushed form of fruit to treat insect bites [33]. The Hill



**Table 1: Documentation of ethnomedicinal information from Yanadi tribe of Ganugapenta forest area**

Scientific, vernacular name and voucher specimen No.	Family	Part used and life from	Mode of preparation, administration and medicinal use
<i>Acacia chundra</i> Rottler. (Sundra) NP 206	Mimosaceae	Stem bark (T)	Oral administration of stem bark decoction twice a day up to 3 days for the treatment of worm infection
<i>Allmania nodiflora</i> L. (Errabadiaku) NP 234	Amaranthaceae	Leaf (H)	Paste form of plant leaves with a pinch of jaggery given orally for the treatment of worm infection
<i>Andrographis serpyllifolia</i> Rottl. (Pamu nelavemu) NP 207	Acanthaceae	Root (H)	A spoon of root decoction administered orally twice a day for the treatment of snakebite
<i>Anisochilus carnosus</i> (L.f.) (Sarugudu) NP 209	Lamiaceae	Leaf (H)	External application of leaf paste prepared with turmeric powder for the treatment of sores and ring worms
<i>Aristolochia bracteata</i> Retz. (Tella eswari) NP 230	Aristolochiaceae	Leaf (CI)	External application of leaf paste for 3-4 weeks for the treatment of leprosy
<i>Aristolochia indica</i> L. (Nalla eswari) NP 235	Aristolochiaceae	Root (CI)	A spoon of root decoction administered orally twice a day for 3 days for the treatment of snakebites
<i>Canthium dicocum</i> (Gaertn.) (Nalla balasa) NP 233	Rubiaceae	Stem bark (T)	Oral administration of stem bark decoction twice a day for the treatment of fever
<i>Capparis sepiaria</i> L. (Nelaupili) NP 236	Capparidaceae	Leaf (St)	External application of leaf paste with the admixture of turmeric powder for the treatment of skin diseases
<i>Caralluma lasiantha</i> (Wt.) (Godugu jamudu) NP 239	Asclepiadaceae	Stem (H)	2-3 inches fresh form of stem pieces administered orally increases the desire of appetite in the case of lean children
<i>Caralluma umbellata</i> Haw. (Kundena kummulu) NP 257	Asclepiadaceae	Stem (H)	2-3 inches of fresh form of stem pieces administered orally once a day for 3 days for the treatment of stomachache and gastric ulcers
<i>Cardiospermum halicacabum</i> L. (Budda teega) NP 265	Sapindaceae	Leaf (H)	Crushed form of plant leaves along with lime and turmeric powder applied externally for 7-10 days for the treatment of rheumatic pains
<i>Cassia montana</i> Heyne ex. Roth. (Konda thangedu) NP 289	Caesalpinaceae	Leaf (T)	Crushed form of leaf poultice externally to treat bone fracture
<i>Cassia tora</i> L. (Thatipumokka) NP 250	Caesalpinaceae	Leaf (H)	External application of leaf paste prepared along with turmeric powder once a day for 3 days for the treatment of skin itches and inflammations
<i>Cereus pterogonus</i> Lam. (Bonthajemudu) NP 219	Begoniaceae	Stem (Sh)	Oral administration of tonic prepared by mixing the stem along with jaggery given once a day for 7 days for the treatment of cardiac diseases
<i>Cleome felina</i> L.f. (Erra vomintaku) NP 211	Cleomaceae	Whole plant (H)	Oral administration of 2-3 ml of whole plant decoction thrice a day for 3 days for the treatment of worm infection
<i>Cleome viscosa</i> L. (Kukka vaminta) NP 231	Cleomaceae	Seed (H)	External application of seed paste prepared with the admixture of turmeric powder was used for the treatment of rheumatic pains
<i>Curculigo orchioides</i> Gaertn. (Nelathati) NP 218	Hypoxidaceae	Root tuber (H)	Powder form of root tuber given orally with a glass of hot water for the treatment of diabetes and piles
<i>Dactyloctenium aegyptium</i> (L.) Willd. (Nela ragi) NP 222	Poaceae	Whole plant (H)	Crushed form of whole plant along with a pinch of turmeric powder is applied externally for the treatment of wounds
<i>Diospyros melanoxylon</i> Roxb. (Beediaku) NP 269	Sapotaceae	Stem bark (T)	Poultice of crushed form of stem bark applied externally for the treatment of wounds
<i>Ehretia laevis</i> Roxb. (Pogadi chettu) NP 275	Cordiaceae	Stem bark (T)	A spoon of stem bark decoction administered orally twice a day for the treatment of snakebites
<i>Flacourtia indica</i> (Burm.f) Merr. (Pulleraka) NP 294	Flacourtiaceae	Stem bark (Sh)	A spoon of decoction prepared from stem bark administered orally for 3 days for the treatment of digestive problems
<i>Glosocardia boswellia</i> (L.f.) DC. (Para palanamu) NP 248	Compositae	Leaf (H)	External application of leaf juice prepared along with camphor for the treatment of rheumatic pains
<i>Grewia carpinifolia</i> Juss. (Jana) NP 225	Tiliaceae	Root (T)	External application of root juice for the treatment of boils and burns
<i>Habenaria plantaginea</i> Lindl. (Chukka dumpa) NP 228	Orchidaceae	Root tuber (H)	A spoon of root tuber powder administered orally twice a day for 3 days for the treatment of fever
<i>Haldina cordifolia</i> (Roxb.) Ridsd. (Rudraganapa) NP 229	Rubiaceae	Stem bark (T)	Oral administration of capsules prepared from stem bark powder with gingelly oil given for 3-7 days for the treatment of jaundice
<i>Heliotropium bracteatum</i> R. Br. (Gutta kondi) NP 215	Boraginaceae	Leaf (H)	Oral administration of capsule form of leaves twice a day for 2 days and poultice for scorpion sting
<i>Jasminum angustifolium</i> L. (Garuda malli) NP 224	Oleaceae	Root (Sh)	Poultice of fresh form of root with a pinch of turmeric powder applied externally for the treatment of ring worm infection
<i>Jatropha gossypifolia</i> L. (Yerranepalamu) NP 278	Euphorbiaceae	Root (Sh)	External application of root paste for 7-10 days for the treatment of leprosy
<i>Lepidagathis cristata</i> Willd. (Nakka pintuka) NP 290	Acanthaceae	Root (H)	External application of paste form of whole plant once a day for 3-4 days for the treatment of skin diseases

(Contd...)

Table 1: (Continued)

Scientific, vernacular name and voucher specimen No.	Family	Part used and life from	Mode of preparation, administration and medicinal use
<i>Maba neilgherrensis</i> Wt. (Pisinki) NP 292	<i>Ebanaceae</i>	Stem bark (T)	A spoon of stem bark powder administered orally with glass of hot water for the treatment of fever
<i>Martynia annua</i> L. (Telikondikaya) NP 293	<i>Pedaliaceae</i>	Leaf (H) Fruit	Oral licking of leaf paste with mixing of jaggery and gingelly oil for the treatment of throat infection A spoon of fruit powder administered orally once a day for 3 days for the treatment of scorpion sting
<i>Ocimum gratissimum</i> L. (Ramathulasi) NP 285	<i>Lamiaceae</i>	Leaf (Sh) Whole plant	Whole plant powder given orally with glass of milk for the treatment of cough and fever Spoonful of whole plant decoction given orally once a day for 3-4 days for the treatment of worm infestations
<i>Opilia amentacea</i> Roxb. (Pacha papiti) NP 264	<i>Opiliaceae</i>	Root (St)	Spoon of root juice given orally once a day for the treatment of snake bites
<i>Pavetta indica</i> Wt. (Papidi chettu) NP 258	<i>Rubiaceae</i>	Leaf (T)	Oral licking of leaf paste prepared with mixing of pepper and salt given once a day for 3 days for the treatment of hepatitis
<i>Phyla nodiflora</i> (L.) Greene (Bokkenaku) NP 241	<i>Verbenaceae</i>	Leaf (H)	2 to 5 ml of leaf juice given orally for 6-7 days for the treatment of stomach ulcers; it also acts as diuretic
<i>Phyllanthus reticulatus</i> Poir. (Purugudu) NP 227	<i>Euphorbiaceae</i>	Stem bark (Sh) Leaf	A spoon of stem bark powder given orally twice a day for 3 days for the treatment of dysentery A spoon of leaf juice administered orally twice a day up to 2 days for the treatment of snake bite
<i>Phyllanthus virgatus</i> Forst. (Gadhasiri) NP 226	<i>Euphorbiaceae</i>	Whole plant (H)	A spoon of whole plant powder administered orally twice a day for 7 days for the treatment of jaundice and continued for diabetes for long time
<i>Polycarpaea corymbosa</i> (L.) (Rajuma) NP 262	<i>Caryophyllaceae</i>	Leaf (H)	Oral administration of leaf juice for the treatment of jaundice and inflammations in the foot
<i>Polygala chinensis</i> L. (Nelajanumu) NP 267	<i>Polygalaceae</i>	Root (H)	Spoonful of root juice given orally for 3 days for the treatment of fever
<i>Premna latifolia</i> Roxb. (Pedda nelli) NP 270	<i>Verbenaceae</i>	Stem bark (T)	Oral administration of stem bark powder twice a day for 3-4 days for the treatment of diarrhea
<i>Pterolobium hexapetalum</i> Roth. (Erracheeki) NP 281	<i>Caesalpinaceae</i>	Leaf (Sh) Seed	Oral licking of leaf paste prepared with mixing of jaggery, given orally once a day for 3 days for the treatment of constipation Spoonful of seed powder given orally once a day for 3-4 days for the treatment of piles
<i>Randia dumetorum</i> Lam. (Manga) NP 261	<i>Rubiaceae</i>	Fruit (SH)	External application of paste form of fruit for the treatment of dandruff
<i>Rhus mysorensis</i> G. Don. (Sunnarapu chettu) NP 263	<i>Anacardiaceae</i>	Leaf (T)	A spoon of leaf powder administered orally along with a glass of hot water for the treatment of hepatitis and diabetes
<i>Sansevieria roxburghiana</i> Schult. (Nela kithalu) NP 242	<i>Agavaceae</i>	Rhizome (H) Leaf	External application of rhizome paste with the mixing of turmeric powder for the treatment of skin diseases Pour 2-3 drops of leaf juice in to ear for 3 days for the treatment of earache
<i>Sarcostemma acidum</i> (Roxb.) Viogt (Pullakada) NP 246	<i>Asclepiadaceae</i>	Whole plant (St)	Oral administration of spoonful of whole plant powder along with a glass of milk for the treatment of edema
<i>Secamone emetica</i> (Retz.) (Vanthula teega) NP 249	<i>Asclepiadaceae</i>	Root (Sh) Leaf	A spoon of root juice administered orally once a day up to 3 days at the time of menstrual cycle for the treatment of leukorrhea Leaf paste applied externally once a day for the treatment of headache
<i>Sida spinosa</i> L. (Nagabala) NP 256	<i>Malvaceae</i>	Root (Sh)	A spoon of root powder administered orally along with a glass of water for the treatment of diabetes Spoonful of root decoction given orally twice a day for 3 days for the treatment of fever
<i>Striga angustifolia</i> (D. Don.) (Ratibadanika) NP 259	<i>Scrophulariaceae</i>	Whole plant (H)	Spoon of whole plant juice administered orally once a day for 3 days for the treatment of snake bite
<i>Thespesia populnea</i> L. (Gangaravi) NP 287	<i>Malvaceae</i>	Leaf (T)  Flower  Fruit  Stem bark	External application of leaf paste for the treatment of skin diseases until cure and poultice for the treatment of inflammations  A spoon of leaf juice administered orally once a day for 3 days for the treatment of stomachache and dysentery  External application of flower bud paste up to long periods for the treatment of lesions on the face  External application of fruit paste with the mixing of water for the treatment of cuts  External application of stem bark paste up to heal for the treatment of scars appeared due to wounds on the skin

(Contd...)

Table 1: (Continued)

Scientific, vernacular name and voucher specimen No.	Family	Part used and life from	Mode of preparation, administration and medicinal use
<i>Toddalia asiatica</i> L. (Mirapa gandra) NP 282	Rutaceae	Leaf (Sh)	Pour 2-3 drops of leaf juice through nostrils once a day until cure for asthma Oral administration of leaf decoction twice a day for 2-3 days for the treatment of fever
<i>Tribulus terrestris</i> L. (Palleru) NP 284	Zygophyllaceae	Fruit (H)	Oral administration of spoonful of fruit powder once a day for long time for diabetes and anemia
<i>Triumfetta rhomboidea</i> Jacq. (Dhekki) NP 295	Tiliaceae	Flower (H)	Inhalation of flower fumes twice a day for 2 days for the treatment of migraine headache
<i>Tylophora indica</i> Burm. f. (Meka meyaniaku) NP 291	Asclepiadaceae	Root (Cl)	Spoon of root decoction given orally twice a day for 3 days for the treatment of cough
<i>Ziziphus oenoplia</i> (L.) Mill. (Pariki chettu) NP 260	Rhamnaceae	Fruit (T)	Spoon of fruit paste administered orally once a day for 3 days for the treatment of stomachache and acidity

Cl: Climber, H: Herb, Sh: Shrub, St: Straggler, T: Tree, E: External, I: Inhalation, O: Oral



Figure 3: Important medicinal plants documented from Ganugapenta

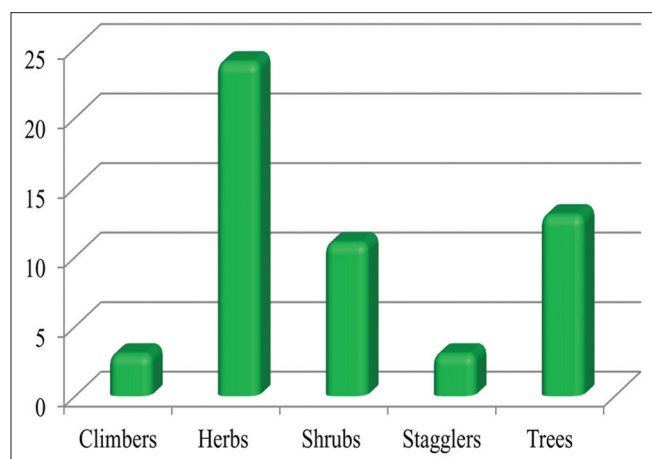
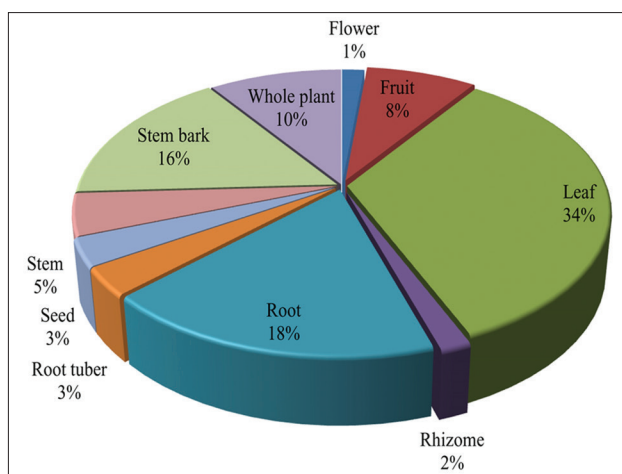
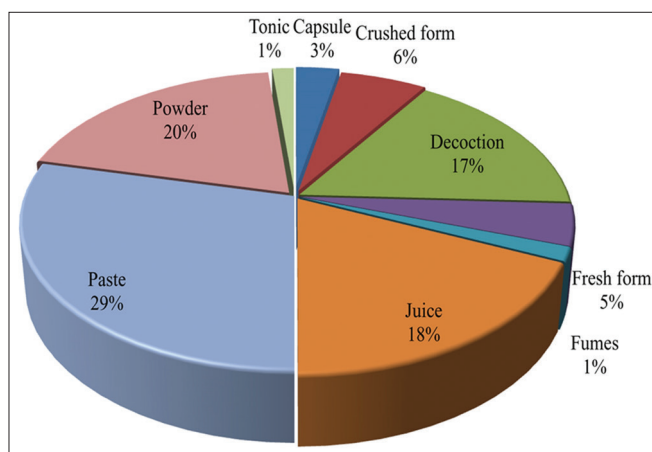


Figure 4: Life form of medicinal plants used by Yanadi tribe of Ganugapenta forest area

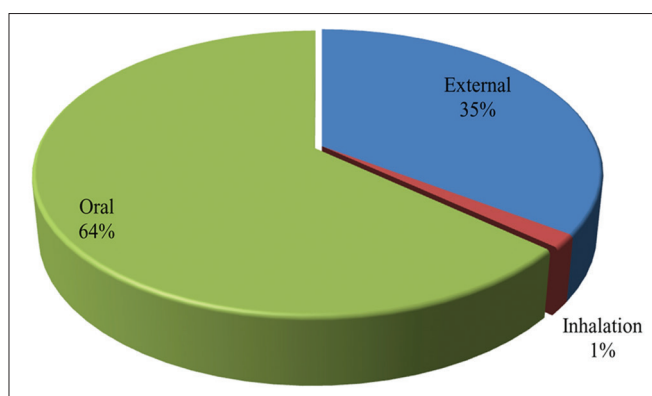
Korwa tribe from Chhattisgarh state prepared juice from the leaves to treat neuritis and mad dog bite [34]. Instead of this conventional or traditional knowledge, the work was undergone to exhibit distinctive biological activities of the plant like wound healing [35], memory enhancing [36], hepatoprotective [37], antidiarrheal [38], antioxidant [39], antidiabetic and antihyperlipidemic [40] activities of the plant. Based on the utilization rate by Yanadi tribe, scientific literature on ethnopharmacological data and the prior work on validation of antimicrobial activity of *T. populnea* are vague. Hence, the plant *T. populnea* was chosen and validated its antimicrobial efficacy followed by the method of disc diffusion assay against different microbial pathogens. The antimicrobial activity of *T. populnea* methanol extract showed highest growth inhibitory activity against *E. coli* among bacteria and *F. oxysporum* among fungi [Figure 8 and Table 2; Graph 1].



**Figure 5:** Percentage of different plant parts used by Yanadi tribe for preparation of herbal medicines



**Figure 6:** Percentage preparation of different forms of medicines by Yanadi tribe of Ganugapenta forest area



**Figure 7:** Percentage administration of herbal medicines by Yanadi tribe of Ganugapenta forest area

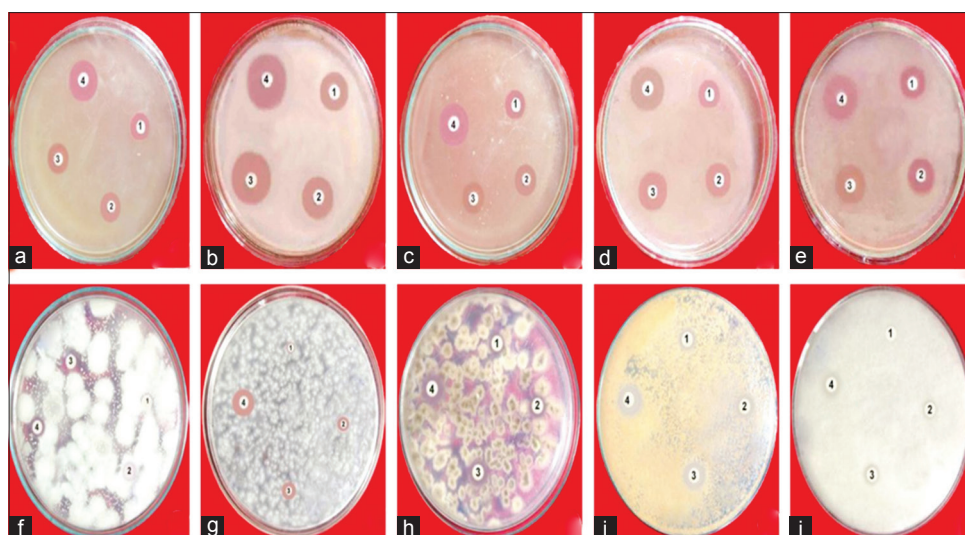
## DISCUSSION

The documented medicinal plants were categorized by diseases wise, the plants such as *Canthium dicoccum*, *Habenaria plantaginea*, *M. neilgherrensis*, *O. gratissimum*,

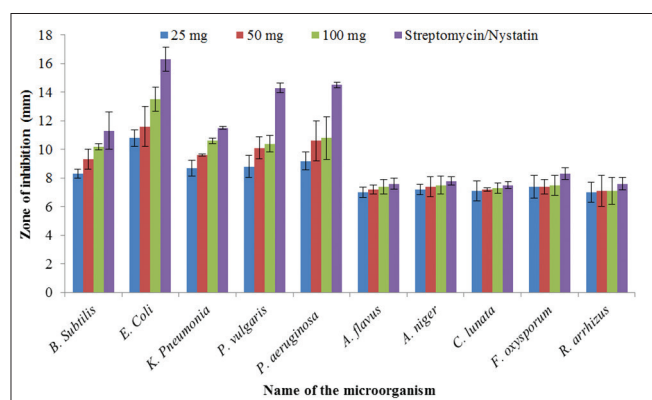
*Polygala chinensis*, *S. spinosa*, and *Toddalia asiatica* recorded as the most utilized plants for the treatment of fever followed by *Andrographis serpyllifolia*, *Aristolochia indica*, *Ehretia laevis*, *Opilia amentacea*, *Phyllanthus reticulatus*, and *Striga angustifolia* for snake bites, *C. sepiaria*, *C. tora*, *Lepidagathis cristata*, *S. roxburghiana* and *T. populnea* for skin diseases, *Allmania nodiflora*, *Cleome felina*, *J. angustifolium* and *O. gratissimum* for worm infections. The remaining plants were utilized for thrice, twice and even for single disease also. Whereas family wise, the *Asclepiadaceae* represents 5 species followed by *Caesalpinaceae*, *Euphorbiaceae* and *Rubiaceae* with 3 species, *Acanthaceae*, *Lamiaceae*, *Oleaceae*, *Tiliaceae* and *Verbenaceae* with 2 species and the rest of the families represent only 1 species each. More species from *Asclepiadaceae* was used by Yanadi tribes in the Chandragiri reserve forest area. It may be due to the wide distribution of this family and known number of medicinal uses [20]. This tribe selected most of the medicinal plant materials from herbs. Comparative results were accounted from ethnobotanical studies of Japali Hanuman Theertham, a sacred grove of Tirumala hills [41]. The reason could be that the herbs are accessible plenty in the fields and higher distribution within the grasp height. This tribe preferred leaf part of the medicinal plant for their medicine preparation, the common use of leaf in the preparation of remedies could partly due to the relative ease of finding. This observation harmonizes with the ethnomedicinal data documented from Yanadi tribe and local villagers of Veyilingalakona sacred grove [1]. This tribe preferred mostly paste form of the medicine, it may be due to easy intake and rapid action while administration of the medicine. A similar result was reported in medicines prepared by tribal groups of East Godavari district [42]. The oral administration of medicine gives better results when contrasted with topical application of medicines in the case of emergency ailments like scorpion sting and snake bite. The Yanadi tribe of Ganugapenta and the majority of ethnic groups preferred oral administration of medicines, which may be due to rapid healing from an ailment. The Yanadi tribe of Kadapa district also followed similar type of treatment [43].

The documented medicinal plants were cross-checked with Dr. Dukes Phytochemical and Ethnobotanical Database which is only the database available at present. 20 medicinal plants such as *A. indica*, *C. sepiaria*, *C. halicacabum*, *C. tora*, *C. felina*, *C. viscosa*, *C. orchioides*, *D. aegyptium*, *Flacourtia indica*, *J. angustifolium*, *Jatropha gossypifolia*, *L. cristata*, *O. gratissimum*, *Phyla nodiflora*, *Polycarpaea corymbosa*, *P. chinensis*, *S. spinosa*, *T. asiatica*, *Tribulus Terrestris*, and *Ziziphus oenoplia* were matched with this database at least by one medicinal use. Despite the fact that the following medicinal plants were appeared in the database but not correlate with Dukes Database. However, we have gone through the recently published literature for each and every plant documented from the Ganugapenta forest area. The medicinal plants like *A. carnosus* leaves have the ability to mend sores between the foot fingers [44] and the paste form of leaf applied at morning times, once in 2 days to cure ringworm [45], *Aristolochia bracteata*





**Figure 8:** (a-j) Evaluation of growth inhibitory effect of *Thespesia populnea* leaf methanolic extract on different microorganisms



**Graph 1:** Graphical representation on effect of various concentrations of *Thespesia populnea* methanolic different microorganisms

**Table 2:** Effect of various concentration of *Thespesia populnea* methanolic leaf extracts

Name of the microorganism	Zone of inhibition (mm)			Standard (streptomycin/nystatin)
	25 mg/ml	50 mg/ml	100 mg/ml	
<i>Bacillus subtilis</i>	8.3±0.31	9.3±0.70	10.2±0.21	11.3±1.30
<i>Escherichia coli</i>	10.8±0.58	11.6±1.41	13.5±0.84	16.3±0.84
<i>Klebsiella pneumonia</i>	8.7±0.56	9.6±0.07	10.6±0.21	11.5±0.10
<i>Proteus vulgaris</i>	8.8±0.77	10.1±0.77	10.4±0.56	14.3±0.35
<i>Pseudomonas aeruginosa</i>	9.2±0.63	10.6±1.41	10.8±1.48	14.5±0.17
<i>Aspergillus flavus</i>	7.0±0.35	7.2±0.31	7.4±0.49	7.6±0.39
<i>Aspergillus niger</i>	7.2±0.35	7.4±0.70	7.5±0.63	7.8±0.28
<i>Curvularia lunata</i>	7.1±0.70	7.2±0.14	7.3±0.35	7.5±0.24
<i>Fusarium oxysporum</i>	7.4±0.81	7.4±0.49	7.5±0.70	8.3±0.42
<i>Rhizopus arrhizus</i>	7.0±0.70	7.1±1.09	7.1±0.95	7.6±0.42

Values are average of triplicates, ± indicates standard error

leaf was therapeutically familiar in the sake of Tvakroga for the treatment of leprosy [46], *C. dicoccum* was treated for fever by Irula tribes of Nilgiri Biosphere Reserve, India [47], *Diospyros melanoxylon* pounded bark is antiseptic having the capacity

to cure wounds and cuts [48], *E. laevis* used as an antidote for snake bites by Koya tribes resided in Warangal District of Telangana, India [49], *M. annua* leaf extract have the capacity to recuperate sore throat [50], *P. reticulatus* leaf paste given orally 2 times per day for the treatment of dysentery by Gingee hills villagers, Villupuram District of Tamil Nadu state [51] and oral administration of juice prepared from equal proportions of *P. reticulatus* leaves and roots from *Borassus flabellifer*, *Tinospora cordifolia* to treat snake bites by Chenchu, Yanadi and Yerukula tribals of Kadapa district, Andhra Pradesh [43], *Randia dumetorum* fruit paste has the ability to cure dandruff and to prevent falling of hairs [52], *S. roxburghiana* leaf paste was prepared with turmeric powder was utilized for the treatment of skin diseases by tribal groups of Nizamabad district, Andhra Pradesh [53] and for earache by Kani tribes of Agasthiyarmalai biosphere reserve, southern Western Ghats, India [54], *Secamone emetica* leaf has the capacity to cure leukorrhea [55] and headache [28], *T. rhomboidea* root is used for the treatment of headache, especially in East Africa [56].

The leaves of *A. nodiflora* given orally for the treatment of stomachache due to worm infection by Thottianaickans community resided in Tiruchirappalli district of Tamil Nadu State [57], *A. serpyllifolia* leaf paste was applied on affected part of the snake bite by local people of Kanjamalai Hills, Salem district of Tamil Nadu [58], *Caralluma umbellata* stem part given orally by the local people of Pachamalai hills of Tiruchirappalli district, Tamil Nadu for the treatment of stomachache [59] and to treat gastric ulcers by Malayali tribes native to Jawadhu hills, Thiruvannamalai district of Tamil Nadu state [60], *Cereus pterogonus* fresh young shoots were used to treat cardiac diseases [61], *G. boswellia* leaves were actually used as a green vegetable and furthermore consumes to cure rheumatic pains by tribal people of Deogarh district of Odisha state, India [62], *H. plantaginea* root tuber acts as an excellent remedy for fever [63], *H. cordifolia* stem bark have the capacity to cure jaundice honed by tribal people of Sitamata wild life sanctuary of Rajasthan, India [64],

*O. amentacea* root was smoldered with charcoal, pounded with snake teeth and applied to treat snake bite by Kenyan tribals [65], *Phyllanthus virgatus* leaf was given orally for the treatment of jaundice and diabetes by Chenchu and Nakkala tribes of Japali Hanuman Theertham, Chittoor district of Andhra Pradesh state [41], *P. hexapetalum* leaves have the capacity to cure constipation [66], *R. mysorensis* leaves were utilized for the treatment of hepatitis [67] and diabetes [68], *S. emetica* was utilized for the treatment of leukorrhea by Yanadi tribe resided in Sriharikota Island, Andhra Pradesh [28] and finally *S. angustifolia* pulverized form of whole plant was used to treat snake bite by Chenchu and Nakkala tribes of Japali Hanuman Theertham, Chittoor district of Andhra Pradesh State [41]. However the medicinal plants like, *Acacia chundra*, *Caralluma lasiantha*, *Cassia montana*, *Grewia carpinifolia*, *Heliotropium bracteatum* and *Premna latifolia* were does not reflect any appropriate ethnomedicinal values either from Dr. Dukes Phytochemical and Ethnobotanical Database or by any other recent publications. In light of this database and recently published information, we presume that the medicinal knowledge of the Yanadi tribe is highly noteworthy. Coming to the antimicrobial activity of *T. populnea*, it showed higher inhibitory activity on *E. coli* among bacteria and *F. oxysporum* among fungi. The *E. coli* is a Gram-negative bacterium was highly susceptible, whereas the *B. subtilis* is a Gram-positive bacteria showed less susceptibility toward the concentrations prepared from *T. populnea*. The fungal pathogens were less susceptible when compare to bacterial species. It might be due to the Gram-positive bacteria have thick layers of peptidoglycans when compare to Gram-negative bacteria and the fungal cell walls are made up of chitin which is more rigid than peptidoglycan [69]. This is may be the actual reason behind that the *T. populnea* showed maximum growth inhibitory activity against Gram-negative bacteria followed by Gram-positive and fungal pathogens.

As there is no primary health-care center located to nearby village and they are still dependent on traditional medicine system. Most of the medicinal information is possessed by the people of age group between 50 and 70 years. The younger generations are not intrigued to hone their ancestor's knowledge. At the same time, they are attracted and flee to urban cities toward the modern medicine system. In this way, the drastic changes are appeared in way of living will definitely loose the treasure house of medicinal knowledge to the future generations. Hence, we deliberated that this is the right time to document rapidly dwindling traditional knowledge of Yandadi tribe of Ganugapenta village.

## CONCLUSION

In the current scenario, the development of resistant pathogens against traditional antibiotics leads to innovation of novel and effective drugs from plant resources. The documented herbal formulations against diseases used by Yanadi tribe will pave the way to investigate efficient alternative antibiotics with high therapeutic potentials to combat the present pathogens. *T. populnea* shows profound

inhibitory activity against different microbial pathogens. If isolates therapeutic novel compounds from the plant can be used as a new therapeutic weapon against infectious diseases. We suggested to the research beginners and pharmaceutical companies, these documented medicinal plants will definitely have different biological activities. Because the documented medicinal data of this tribe are mostly correlated with Dr. Dukes Phytochemical and Ethnobotanical Database and the existing research documentations, the only thing is isolation of novel compounds from the plants are remanent.

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