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COMPARATIVE TREATMENT FOR PARANYCHIA INFECTION WITH LOCALLY AVAILABLE MEDICINAL PLANTS AND SYNTHETIC DRUGS OF BACTERIAL AND FUNGAL MICROORGANISMS

Rama Rao Karri

Department of Zoology, Government Degree College, Satavahana University, Jammikunta, Karinagar, Andhra Pradesh, India

E-mail: drkarriramarao@gmail.com

ABSTRACT

Paranychia is fairly common and usually caused by injury to area around the nail folding of human thumb finger. It is caused by multiple micro organisms of both bacterial and fungal infection mostly both micro organisms were observed in severe cases. For microbial study 42 swab samples were collected from Agricultural farmers and inoculated in suitable agar media. The most commonly responsible bacteria is *Staphylococcus aureus, Streptococcus species, Pseudomonas species etc.* and *Candida albicans* fungus were observed in chronic infectious patients. A series of 10 medicinal plants such as *Allium setivum* , *Anacardium orientalie, Azadirachta indica, Citrus limon, Curcuma longa, Eukaliptus ligulata* , *Lawsonia alba, Ocimum sanctum, Terminalia chebula,* and *Tridax prokambence,* extracts and decoction were tested for antibacterial and antifungal agents. Most of the plant methanol extraction is highly inhibitory activity for *Staphylococcus* 2.5 ± 0.34 cm and *pseudomonas species* 2.4 ± 0.47 cm. Some of the plant extractions were moderate inhibitory activity of fungal species. The plant extractions were compared with market available synthetic drugs in the laboratory.

Key words : Paranychia, Multiple Infection, Swabs, Synthetic Drug

INTRODUCTION

In developing countries like India, low income group people such as farmers, people of small isolate villagers and native communities use folk medicine for the treatment of common infections. These peoples are followed to treat paranychia infection with *fire oil drop crude method and applying of *Anacardium* black juice extract. This fire oil drop burns the surrounding of infected nail folds at same time patients can tolerate the heavy pain. *Anacardium orientalie* black juice extracts acting as a water proof in a short while. Medicinal plants play an important role to treat infections. These plants are ingested as decoctions and juice preparations to treat external infections they are also made into a

poultice and applied directly on the infected wounds or burns. When people from these remote communities get an infectious disease, they are usually treated by traditional healers because of their expertise in such procedures as making diagnoses; treating wounds and making herbal medicines.Traditional healers claim that their medicine is cheaper and more effective than modern medicine. Patients of these communities have a reduced risk to get infectious diseases from resistant pathogens than people from urban areas treated with traditional antibiotics.

Acute paronychia develops over a few hours when a nail fold becomes painful, red and swollen. Sometimes yellow pus appears under the cuticle. In some cases acute paronychia is accompanied by fever and painful glands under the arms. Chronic paronychia may be due to several different micro-organisms and a form of dermatitis. (Rigopoulos, 2009) often a mixture of yeasts and bacteria are present, particularly candida specie and gram negative bacilli. Brook (1993) reported that the inflammation results in debris which builds up, encouraging more infection. Both acute and chronic infections start with a break in the epidermis. An acute infection is associated with traum to the skin such as a hangnail, ingrowing nail or nail biting. Tebson (1998) the most common bacteria responsible is *Staphylococcus aureus*. Other bacteria that are less commonly involved are *Streptococcus* species, *Pseudomonas* species and anaerobes. A chronic infection is associated with repeated irritation such as exposure to detergents and water. Most chronic infections are caused by *Candida albicans* or other fungi (Rock well, 2011 and Sripriya, 2013).

Fungal paranychiais commonly caused by a group of fungi called dermatophytes. Fungal paranychia is common among patients with onychomycosis and those who are frequently getting thir hands wet for long periods of time (eg. swimmers). Biting the nails, hangnailsor pushing back the cuticles also increases the risk of an infection. Patients respond well to treatment with antifungal. However, it may take several months for the infection to be completely cured. The nails may be yellow, greenbrown or black in colourand they may emita foul odor. In some case, infected nails may separate from the nail bed, causing a condition called oncholysis. For treating of paranychia we chose ten species used as folk medicine to determine their antimicrobial and antifungal activity: Methanolic and acetone extracts of 10 selected medicinal plants in the treatment of Paronychia infection were screened for antibacterial and. antifungal activity. Among these plants tested with *Allium setivum, Anacardium orientalie, Azadirachta indica, Citrus limon, Curcuma longa, Eukaliptus ligulata,, Lawsonia alba, Ocimum sanctum, Terminalia chebula,* and *Tridax prokambence.* (Table- 1) results show the ethnobotanical use of best antibacterial and antifungal activity.

MATERIAL AND METHODS

Plant extracts were prepared with different parts like leaves, Fruit pericarp, seed and stem. The plant extracts were prepared using the modified method of Alade & Irobi (2009). Briefly, three 100 g portions of the dried powdered plant were soaked separately in 500 ml of distilled water, Methanol (98 %), Acetone, Infusion and Decoction by Manikanda et al (2006) and Yogesh kumar et al (2007). Then each mixture was refluxed followed by agitation at 200 rpm for 30 minits. The filtrate obtained concentrated under vacuum at 40ºC to obtain the dry extracts (Table-2). For determination of antimicrobial activity Bauer-Kirby (1966) to test organisms (*Staphylococcus aureus, Streptococcus species, Pseudomonas species, E.coli* and *Candida albicans*) were obtained from the paranychia samples from agriculture frmers. The sterile swabs were kept in aseptic condition for collection microbes in our microbiology laboratory, Govt. Degree College at Jammikunta of the Satavahana University.

The sterile medium used for the activation of the microorganism was soybean casein broth (SBCB). The following selective agar media were used for the identification of microbial genera by Bergeys manual (*Staphylococcus aureus*), Cetrimide *(Psudomonous sps., Streptococcus species)* Mc Connkey (*Eschrichia coli*) and Saborud-Dextrose (*Candida albicans).* All the culture media were prepared and treated according to the manufacturer guidelines (Becton Dickinson). The microorganisms were inoculated into SBCB and incubated at 35 ± 2ºC for 4 hours.

Agar diffusion assay :

The modified agar well diffusion method of Perez *et al.*, (1990) was employed. Each selective medium was inoculated with the microorganism suspended in SBCB. Once the agar was solidified, it was punched with a six

millimeters diameter wells Bauer AW(1966) and filled with 25 µL of the plants extracts and blanks (Methanol, distilled water, and acetone). The concentration of the plant extracts employed was 25 µg/ml. Simltaniously Amoxycillin, Ciprofloxin Gentamycin sulfate, and Neomycin (*Staphylococcus aureus*, *Psudomonous*, and *Escherichia coli*), and Nystatin, Thymol (*Candida albicans*) were used as positive controls at a concentration of 1.0 µg/ml respectively. The dilution medium for the positive controls was sterile distilled water. The test was carried out by triplicate. The plaques were incubated at 35 ± 2°C for 24 h, except for *Candida albicans* which was incubated at 29 ± 2°C. The antimicrobial activity was measured in centimeters (cm).

RESULTS

The bacterial and fungal pathogens were tested with ten medicinal plants extract in our laboratory. The pathogenic bacteria inhibition zone in centimeters (cm) of mean value was calculated and shown in table 2. Methanol extraction of *Curcuma longa* showed 2.5 ± 0.34 cm inhibition zone against *Staphylococcus aureus* followed by *Tridax* 1.8 ± 0.15 and *Allium* 1.7 ± 0.02. *Curcuma* methanol extracts indicates 2.7 ± 0.37 cm highest inhibitory zone against *Streptococcus species* (Fig: 1), followed by *Ocimum* and *Allium* (1.7 ± 0.26 and 1.2 ± 0.02). *Tridax* methanol extracts showed 2.3 ± 0.23 cm inhibition zone against *Psudomonous sps* followed by *Allium* and *Terminalia* (2.0 ± 0.03and 1.7 ± 0.23). *Terminalia* methanol extract indicates 2.4 ± 0.47 cm inhibitory zone against *E. coli* followed by *Lawsonia* and *Curcuma* (2.1 ± 0.25 and 1.9 ± 0.12 cm).

The results have indicated that the acetone extraction of *Curcuma longa* affects 2.1 ± 0.26 cm inhibitory zone against Staphylococcus *aureus* followed by *Allium* and *Terminalia* (1.6 ± 0.3 and 1.5 ± 0.04 cm). *Curcuma longa* acetone extracts indicated 2.7 ± 0.40 cm inhibitory zones against *Streptococcus species* followed by *Ocimum* and *Allium* (1.7 ± 0.24 and 1.4 ± 0. 02 cm). *Allium* acetone extraction affects 1.8 ± 0.02 cm inhibitory zone against *Psudomonous sps.*, followed by *Terminalia* and *Tridax* (1.6 ± 0.26 and 1.4 ± 0.14 cm). *Lawsonia* acetone extraction affects 1.9 ± 0.14 cm inhibitory zone against *Eschrichia coli* followed by *Tridax, Allium,* and *Terminalia* (1.7 ± 0.03, 1.5 ± 0.02 and 1.5 ± 0.23 cm). Table: 2, Fig:2.

Infusion of *Allium* affects 1.6 ± 0.02 cm inhibitory zone against *Staphylococcus aureus* followed by *Terminalia* and Citrus (1.5 ± 0.03 and 1.2 ± 0.05 cm). *Ocimum sanctum* infusion affects 1.8 ± 0.17 cm inhibitory zone against *Streptococcus species* followed by *Tridax* and *Allium* (1.7 ± 0.12 and 1.2 ± 0.02). *Allium* and *Tridax* both indicated 1.2 ± 0.08cm inhibitory zone against *Psudomonous sps* followed by *Citrus* 0.8 ± 0.05 cm. *Terminalia* infusion affects 2.1 ± 0.42 cm inhibitory zone against *Eschrichia coli* followed by *Tridax* and *Allium* (1.7 ± 0.04 and 1.5 ± 0.02 cm). Table: 2, Fig:3.

Decoction extract of *Tridax* showed 1.3 ± 0.07 cm inhibitory zone against *Staphylococcus aureus* followed by *Allium* and *Curcuma* (1.2 ± 0.01 and 0.9 ± 0.02). *Tridax* decoction affects 1.2 ± 0.08 cm inhibitory zone for *Streptococcus,* 1.2 ± 0.06 for *Psudomonous sps,* 1.6 ± 0.12 for *Eschrichia coli.* In these results only *Tridax* infusion gaves good result comparatively other plant species. Table: 2, Fig:4.

The growth of pathogenic fungal species was (*Candida albicans)* tested with ten medicinal plants of four extractions showed moderate growth results. The methanol and acetone extraction of *Allium, Lawsonia* and *Terminalia* plants species showed negative growth result. In the similar way *Curcuma* and *Tridax* infusion also showed negative growth to *Candida albicans*. The decoction of *citrus* and *Tridax* affect negative growth. *Candida albicans* tested with *Anacardium* infusion and decoction, did not show fungal growth and indicate to positive growth of *Candida albicans*. Table: 3.

The combination of four selected plant species namely *Allium, Azadirachta, Curcuma* and *Tridax* extractions affect good inhibitory zone in all bacterial species. There is no growth of

Candida albicans with methanol, acetone and infusion of these four plant species. Table: 4 bacterial species tested with four synthetic drugs mainly Amoxicillin, Ciprofloxin, Gentamycin

Table: 1. Ethanobotanical information of medicinal plants used for antimicrobial activity.

S.No	Plant Name	Family	Common Name	Part used	Therapeutic Use
1	*Allium setivum*	Lilliaceae	Garlic	Leaf	Anti cholesterol, Antibacterial, Antiviral, Anti HIV, Antifungal activity, Cough, Parasites, Cold, Tuberculosis, Dysentery, Digestive elements and Fungus.
2	*Anacardium orientalie*	Anacardiaceae	Landry marking	Seed	The nut oil is used topically as an antifungal and for healing cracked heels.
3	*Azadirachta indica*	Maliaceae	Neem	Leaf	Immunomodulatory, Anti-inflammatory, Antihyperglycamic, Antiulcer, Antimlaria, Antifungal, Antibacterial, Antiviral, Antioxidant, Antimutagenic and Anticarcinogenic.
4	*Citrus limon*	Rutaceae	Lemon	Fruit	Anti cancer, Antiviral, Anti-inflammatory activity, Diseases of the musculoskeletal system, Blood diseases and Blood-forming organs
5	*Curcuma longa*	Zingibaraceae	Termric	Stem	Antioxidant, Anti-inflammatory, Antiviral, Antibacterial and Antifungal.
6	*Eukaliptus ligulata*	Myrtaceae	Eukaliptus	leaf	Antiseptic, Slightly anaesthetic and Anti-bacterial.
7	*Lawsonia alba*	Lythraceae	Henna	Leaf	Aflok remedy against amoebiosis, Headache, Jaundice, Ranging from beriberi to burns and bruises, Leprosy. Henna extracts show antibacterial, antifungal and Ultraviolet light screening activity.
8	*Ocimum sanctum*	Lamiaceae	Tulasi	Leaf	Antioxidant, Ringworm and Other skin diseases.
9	*Terminalia chebula*	Combretaceae	Karakkaya	Fruit pericarp	Astringent, Purgative, Stomachic and Laxative. It is used in treating Asthma, Cough, Pile, Eye disorders including inflammation and Conjunctivitis and as a purgative that helps removing toxins.
10	*Tridax procumbens*	Asteraceae	Coat buttons	Leaf	Anti-viral, Anti-oxidant, Antibiotic efficacies, Wound healing activity and Anti-inflammatory activity.

After treated with fire oil drop, the samples were tested with above four selected plant extracts, but no organism was founded. Paranychia sulfate, and Neomycin (Table-5), these drugs showed big zone formation (cm) to the four types of bacterial species, Ciprofloxin has more

Table: 2. Pathogenic bacteria inhibition zones in cms, tested with Methanol, Acetone, Infusion and Decoction extractions.

S.No.	Plant Name	Extract	A	B	C	D
1	*Allium setivum*	Methanol	1.7 ± 0.02	1.2 ± 0.02	2.0 ± 0.03	1.8 ± 0.08
		Acetone	1.6 ± 0.03	1.4 ± 0.02	1.8 ± 0.02	1.5 ± 0.02
		Infusion	1.6 ± 0.02	1.2 ± 0.02	1.2 ± 0.02	1.5 ± 0.02
		Decoction	1.2 ± 0.01	-	0.8 ± 0.01	0.1 ± 0.01
2	*Anacardium orientalie*	Methanol	-	-	0.5 ± 0.02	-
		Acetone	-	-	0.2 ± 0.01	-
		Infusion	-	-	-	-
		Decoction	-	-	-	-
3	*Azadirachta indica*	Methanol	0.2 ± 0.01	-	0.4 ± 0.02	0.8 ± 0.03
		Acetone	0.1 ± 0.01	-	0.2 ± 0.01	0.5 ± 0.02
		Infusion	-	-	0.4 ± 0.02	-
		Decoction	-	0.1 ± 0.01	0.4 ± 0.02	-
4	*Citrus limon*	Methanol	0.9 ± 0.01	0.2 ± 0.01	0.5 ± 0.01	-
		Acetone	0.7 ± 0.01	0.2 ± 0.01	0.2 ± 0.01	-
		Infusion	1.2 ± 0.05	0.8 ± 0.07	0.8 ± 0.05	1.4 ± 0.05
		Decoction	-	-	-	-
5	*Curcuma longa*	Methanol	2.5 ± 0.34		0.5 ± 0.01	1.9 ± 0.12
		Acetone	2.1 ± 0.26	2.7 ± 0.37	0.2 ± 0.01	0.8 ± 0.02
		Infusion	-	2.7 ± 0.40	-	-
		Decoction	0.9 ± 0.02		-	0.2 ± 0.01
6	*Eukaliptus ligulata*	Methanol	-	-	0.6 ± 0.02	1.4 ± 0.12
		Acetone	-	-	-	0.5 ± 0.01
		Infusion	-	-	0.5 ± 0.01	0.9 ± 0.02
		Decoction	-	-	-	0.1 ± 0.01
7	*Lawsonia alba*	Methanol	-	-	0.2 ± 0.01	2.1 ± 0.25
		Acetone	-	-	0.2 ± 0.01	1.9 ± 0.14
		Infusion	-	-	-	0.9 ± 0.02
		Decoction	-	-	-	0.1 ± 0.01
8	*Ocimum sanctum*	Methanol	0.5 ± 0.01	1.7 ± 0.26	-	1.8 ± 0.26
		Acetone	0.5 ± 0.02	1.7 v 0.24	0.8 ± 0.03	1.2 ± 0.14
		Infusion	0.2 ± 0.01	1.8 ± 0.17	-	0.8 ± 0.02
		Decoction	-	-	-	-
9	*Terminalia chebula*	Methanol	1.5 ± 0.04	0.7 ± 0.02	1.7 ± 0.23	2.4 ± 0.47
		Acetone	1.5 ± 0.04	1.2 ± 0.14	1.6 ± 0.26	1.5 ± 0.23
		Infusion	1.5 ± 0.03	-	-	2.1 ± 0.42
		Decoction	-	-	-	-
10	*Tridax procumbens*	Methanol	1.8 ± 0.15	-	2.3 ± 0.23	0.5 ± 0.01
		Acetone	1.2 ± 0.07	0.8 ± 0.07	1.4 ± 0.14	1.7 ± 0.03
		Infusion	1.2 ± 0.05	1.7 ± 0.12	1.2 ± 0.08	1.7 ± 0.04
		Decoction	1.3 ± 0.07	1.2 ± 0.08	1.2 ± 0.06	1.6 ± 0.12

A: *Staphylococcus aureus*, **B:** *Streptococcus species*, **C:** *Pseudomonas sps.*, **D:** *Escherichia coli* and **E:** *Candida albicans*. ("-" indicates did not show inhibitory activity)

Table: 3. Pathogenic fungus (C. *albicans*) **growth with Methanol, Acetone, Infusion and Decoction extractions.**

S.No.	Plant Name	Methanol	Acetone	Infusion	Decoction
1	*Allium setivum*	Negative growth	Negative growth	Moderate growth	Moderate growth
2	*Anacardium orientalie*	Moderate growth	Moderate growth	Positive Growth	Positive Growth
3	*Azadirachta indica*	Moderate growth	Moderate growth	Moderate growth	Moderate growth
4	*Citrus limon*	Moderate growth	Negative growth	Moderate growth	Negative growth
5	*Curcuma longa*	Moderate growth	Moderate growth	Negative growth	Moderate growth
6	*Eukaliptus ligulata*	Moderate growth	-	-	-
7	*Lawsonia alba*	Negative growth	Negative growth	Moderate growth	Moderate growth
8	*Ocimum sanctum*	Moderate growth	Moderate growth	-	-
9	*Terminalia chebula*	Negative growth	Negative growth	Moderate growth	Moderate growth
10	*Tridax procumbens*	Moderate growth	Moderate growth	Negative growth	Negative growth

Table: 4. Growth formation of four selected plant species combination extraction.

S,No.	Combination	Extract	A	B	C	D	C. albicus
1	*Allium setivum, Azadirachta indica, Curcuma longa, Tridax procumbens*	Methanol	3.3 ± 0.26	3.5 ± 0.45	2.2 ± 0.25	3.4 ± 0.37	Negative growth
		Acetone	3.2 ± 0.22	3.2 ± 0.39	1.8 ± 0.12	3.6 ± 0.41	Negative growth
		Infusion	2.9 ± 0.18	2.2 ± 0.25	2.2 ± 0.22	3.1 ± 0.29	Negative growth
		Decoction	2.9 ± 0.16	2.1 ± 0.24	1.8 ± 0.07	3.2 ± 0.31	Moderate growth
2	Fire oil drop	Crude sample	Nil	Nil	Nil	Nil	No growth

A: *Staphylococcus aureus*, **B:** *Streptococcus species*, **C:** *Pseudomonas sps.*, **D:** *Escherichia coli* and **E:** *Candida albicans*.

Table:5. Pathogenic bacteria inhibition zones in cms, tested with four Synthetic drugs.

S. No.	Synthetic Drug	*S. areus*	*Streptococcus*	*Pseudomonas*	*E. coli*
1	Amoxicillin	3.0 ± 0.05	1.5 ± 0.04	0.4 ± 0.01	2.2 ± 0.32
2	Ciprofloxin	3.0 ± 0.04	4.1 ± 0.14	3.1 ± 0.42	3.0 ± 0.54
3	Gentamycin sulfate	1.4 ± 0.02	2.0 ± 0.08	1.7 ± 0.06	1.9 ± 0.25
4	Neomycin	2.0 ± 0.08	1.8 ± 0.06	1.5 ± 0.03	2.1 ± 0.21

Table: 6. Pathogenic fungus tested with two Synthetic drugs.

S. No.	Synthetic drugs	Candida albicus
1	Thymol	No growth
2	Fluconazole	No growth

Figure-1. Comparison of zone formation (± cm) with methanol extraction.

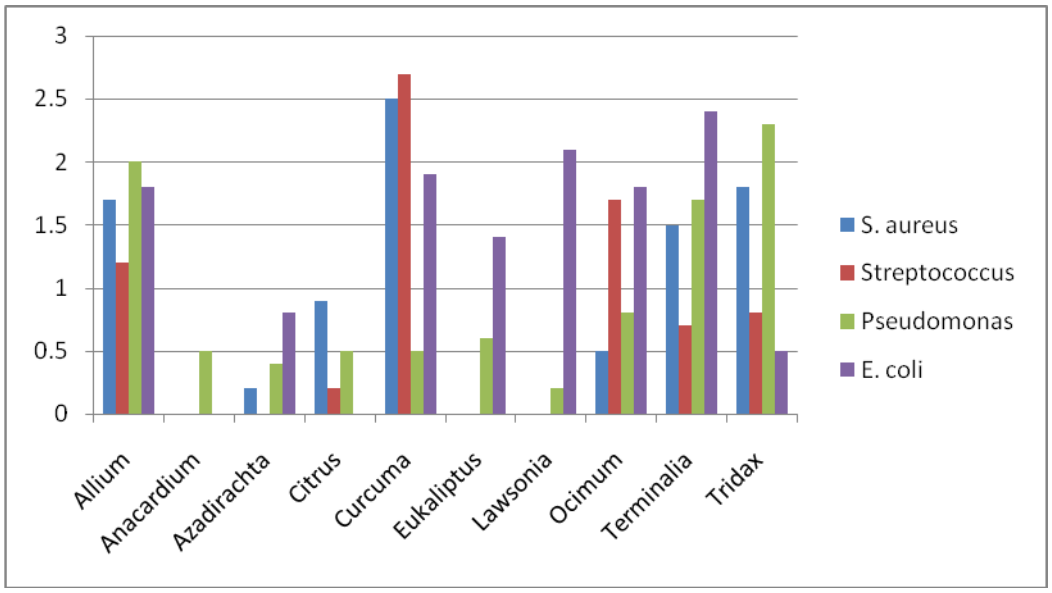
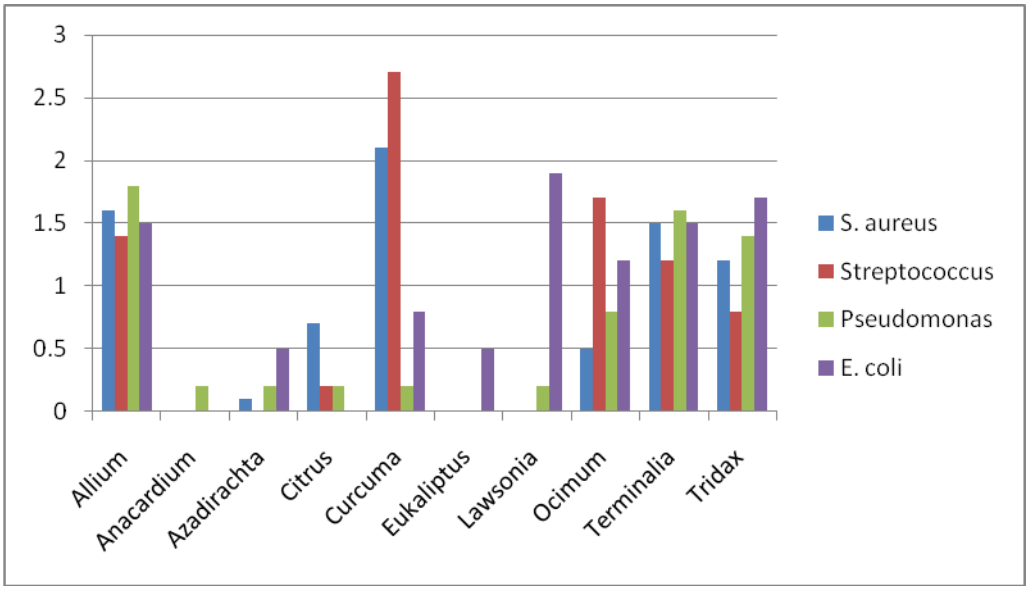


Fig: 2. Comparison of zone formation (± cm) with acetone extraction.



tested to *Candida albicans* it showed good effect there was no growth of fungal hypha in the sample plates.

DISCUSSION

The acute and chronic infection of paranychia caused by bacterial and fungal microorganisms mainly *Staphylococcus aureus*, *Streptococcus species*, *Pseudomonas sps.*, *Escherichia coli* and *Candida albicans*. Rigppoulo et al (2009) and chronic paranychia infection effected by bacterial and fungal microorganisms. In the similar study was conducted by Brook (1993) reported a mixed infection of paranychia on

Fig: 3. Comparison of zone formation (± cm) with infusion.

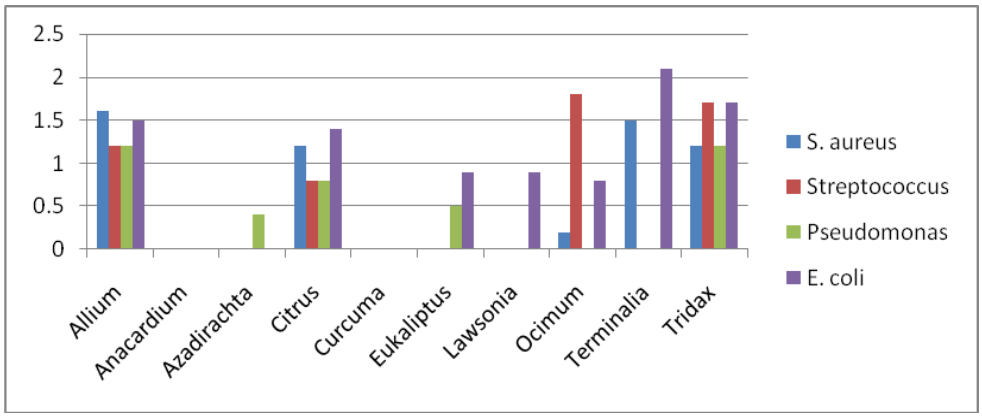
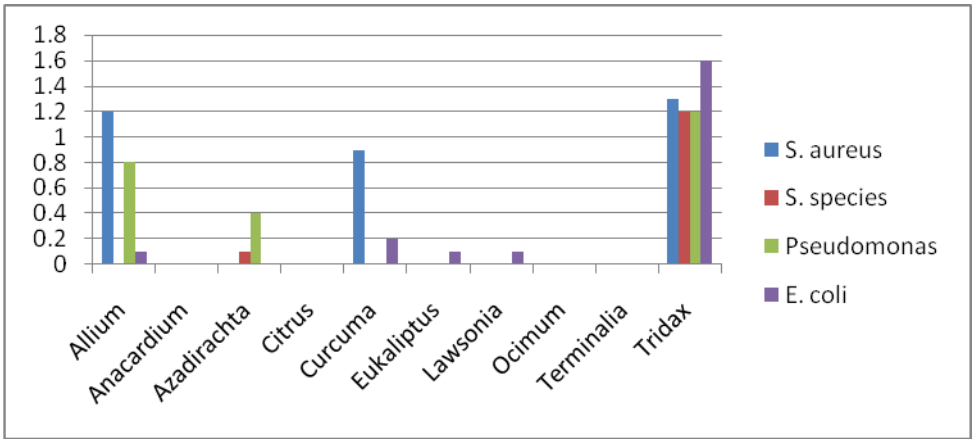


Fig:4. Comparison of zone formation (± cm) with decoction.



bacterial and fungal species. Jabson (1998) stated that infection of finger tip paranychia and felcons. The medicinal plants and traditional medicine are published in world health organization (1978). Screening of antibacterial and antifungal activity of ten medicinal plants from Ghana reported by Hoffman et al (2004) this is close relation to our study particularly on antibacterial activity. Jhon (2006), Hoffman et al (2004) and E.N. Quiroga et al (2001) demonstrated that antibacterial and antifungal properties of different medicinal plants. *Lawsonia inermis* is less microbial and moderate fungal activity reported by Lingaiah (2013) and Habbal et al (2007). The similar results were reported with *Lawsonia alba*. Dhar et al (1968) explained that the biological activity of Indian medicinal plants in the same way. Prasanth kumar et al (2006) and Rajeshwar (2013) studied on antibacterial and antifungal agents from selected Indian medicinal plants. The study of synthetic drugs such as Amoxicillin, Ciprofloxin Gentamycin sulfate, and Neomycin are higher activity against bacteria in our study. Rani and Khullr (2004) and Vinatha naini (2013) were studied medicinal plants extracts in *Salmonella typhi* shown moderate activity against multi drug resistance.

CONCLUSIONS

The present study conform that, the commonly available medicinal plants in Andhra Pradesh state were evaluated for their antimicrobial and antifungal activity. Among traditional uses these plants are also used to treat injuries, wound infection etc., and through a number of studies have been done on the plants tested. It is well known that the antimicrobial components of plants widely vary with climatic conditions and seasons. Our studies have again established that

the extracts of organic solvent extracts have higher activity than infusion and decoction.

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