# COMPARATIVE EFFECTIVENESS OF *SANTALUM ALBUM* AND *TERMINALIA CHEBULA* AS NATURAL HERBAL MEDICINES :

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## ABSTRACT:

The recent need of the world is to investigate herbal medicine from *Terminalia chebula* and Santalum *album.* The plants were dried and extracted with different solvents. The obtained extracts were tested for their Antimicrobial activity against *S.typhii* MTCC-733, *S. aureus* MTCC-96, *E. coli* MTCC-739, *P.aeruginosa* MTCC-741, *B. subtilis* MTCC-619, *P. vulgaris* MTCC-1771 and *K. pneumonia* MTCC-109 using agar cup diffusion method. This study confirms the antimicrobial activity of *Santalum album* & *Terminalia chebula* against *Bacillus subtilis*, *Salmonella typhi*, and *Staphylococcus aureus* which can work as safe and effective natural medicinal value of the phytochemicals. This study confirms the antimicrobial activity of *Santalum album* & *Terminalia chebula* against *Proteus vulgaris*, *Escherichia coli*, *Pseudomonas aeruginosa* and *Klebsiella pneumonia* which can work as safe and effective natural medicinal value of the phytochemicals.

**KEY WORDS:** Terminalia chebula Antimicrobial activity, Santalum album,Herbal medicine.

## NTRODUCTION:

Several medicinal plants occupy a very significant place as raw material for important drugs and plants used in traditional system of medicine in Pharmaceuticals. Plants are considered to be medicinal if they possess pharmacological activities of possible therapeutic use. Many medicinal plants are used as modern medicine where they occupy a very significant place as raw material for important drugs and plants used in traditional system of medicine in Pharmaceuticals (Mackleen MM et al., 2000 ). Atleast 25% of the modern pharmacopoeias contain the drugs which are derived from plants.

In recent years antimicrobial properties of medicinal plants are increasingly reported ( Eloff JN et al., 1998 ). In the present study, two plants of medicinal properties, namely *Santalum album* and *Terminalia*

*chebula* are to be screened against seven different microorganisms, namely *Bacillus subtilis*, *Salmonella typhi*, and *Staphylococcus aureus*.

***Terminalia chebula*** is commonly known as 'Harde'. *Terminalia chebula* (Family: Combretaceae) is a moderate or large deciduous tree 25-30 m in height. Leaves are 7-20cm,opposite, oblong, round with acute apex. Flowers are bisexual, white or yellow with offensive smell. Fruits are drupe, pendulous 2-4cm long, ovoid from broad base.

***Santalum album*** **is commonly known as 'Chandan'.** *Santalum album* (Family: Santalaceae ) is a small evergreen tree found in Southern parts of India, Sri Lanka, Hawaii and number of South Pacific Islands. It is about 20-30 feet high with many opposite slender branches and smooth grey-brown bark. ( Ebadi et al., 2007 ).Wood is heavy, hard with light yellow color.

***Terminalia chebula*** as this plant contains constituent with wide antibacterial and antifungal activities, it inhibits growth of E. coli, which is most common for Urinary tract infections. It also prevents ageing and imparts longevity, immunity and body resistance against several diseases. This plant is used in the preparation of many Ayurvedic forms for infectious diseases like chronic ulcers, fungal infections, Leucorrhoea and also constipation.( Dev S et al., 1997 ).

***Santalum album*** leaves are ovate and smooth in shape. Flowers are small, numerous with short stalks found at the top of the plant. Fruits are spherical, concealed and like the size of the pea. They are smooth, fleshy and nearly black with single seed. The application of Chandan is through oil, powder and paste derived from wood. It possesses various soothing qualities that work against skin allergies and ailment. It is also used for aromatherapy, perfume and wood working. Chandan gives the skin a soothing effect and make it soft and supple. It is also used healing purposes. Sandalwood oil is also used for the treatment of Gonorrhoea.

In recent years antimicrobial properties of medicinal plants are increasingly reported ( Eloff JN et al., 1998 ). Medicinal plants produced variety of compounds of known therapeutics. The substances that can either inhibit the growth of pathogens or kill them or have no or least toxicity to host cells are considered criteria's for developing new antimicrobial drugs. In the present study, two plants of medicinal properties, namely *Santalum album* and *Terminalia chebula* are to be screened against several microorganisms, namely *Proteus vulgaris*, *Escherichia coli*, *Pseudomonas aeruginosa* and *Klebsiella pneumonia.*

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***Terminalia chebula*** Retz is commonly known as '**Harde'**. *Terminalia chebula* (Family: Combretaceae) is used in the preparation of many Ayurvedic forms for infectious diseases like chronic ulcers, fungal infections, Leucorrhoea and also constipation.( Dev S et al., 1997 ). As this plant contains constituent with wide antibacterial and antifungal activities, it inhibits growth of E. coli, which is most common for Urinary tract infections. It also prevents ageing and imparts longevity, immunity and body resistance against several diseases.

**MATERIALS & METHODS:**

Plant material was the powder of *Santalum album* and *Terminalia chebula* were collected from the local stores. The test cultures for the antimicrobial activity were procured from Indore namely *Bacillus subtilis, Staphylococcus aureus,* and *Salmonella typhi.* This project was carried out as a part of preliminary screening of effective phytochemicals against few microorganisms. The work shows the antimicrobial activity for the given samples was checked by the agar cup diffusion method against various microorganisms.( Shrivastava et al., 2007 ).

The antimicrobial assay is done by Agar cup method. 1ml of diluted inoculum of test organism was spread on the agar plates. Wells of 8mm were punched into the agar medium and filled with 100 microlitres of the plant extract to which the test bacteria is sensitive.( Harborne JB et al., 1984 ). The plates were incubated for 28-36 hours at normal room temperature. Then the antimicrobial activity was evaluated by measuring the zones of inhibition against the test organisms.

The test cultures for the antimicrobial activity namely *Escherichia coli, Pseudomonas aeruginosa, Klebsiella pneumonia & Proteus vulgaris***.** The antimicrobial assay is done by Agar cup method. 1ml of diluted inoculum of test organism was spread on the agar plates. Wells of 8mm were punched into the agar medium and filled with 100 microlitres of the plant extract to which the test bacteria is sensitive.( Harborne JB et al., 1984 ).

**RESULTS:**

Assessment of antimicrobial activity was carried out for the aqueous extract of *T. chebula* and also aqueous, methanol and acetone extracts of *S. album*. The results showed the antimicrobial activity for

aqueous extract of S. album against *B. subtilis and S. typhii* while in methanolic extract it was observed against *B. subtilis* and *Staphylococcus aureus,* while for the acetonic extract the antimicrobial activity was observed against all the three test organisms. In the case of aqueous extract of *T. chebula*, antimicrobial activity was observed against *B. subtilis* and *S. typhii* .

The results were noted as diameter of inhibition in millimeters as shown in the table: Assessment of antimicrobial activity was carried out for the aqueous extract of *T. chebula* and also aqueous, methanol and acetone extracts of *S. album*. The results showed that there is some antimicrobial activity for aqueous extract of S. album against the three tested culture organisms, i.e. *E. coli, K. pneumoniae, P. aeruginosa* except *Proteus vulgaris.* The methanolic and acetonic extract showed higher antimicrobial activity than the aqueous extract of S. album against the tested organisms.In the case of aqueous extract of *T. chebula*, antimicrobial activity was observed against *E. coli, K. pneumoniae, Ps. aeruginosa*. The results were noted as diameter of inhibition in millimeters as shown in the table:No 1

**Table 1 : Record of antimicrobial activity**

| **Plant name** | **Extract** | ***B. subtilis*** **Unit** | ***E. coli*** | ***P. vulgaris*** | ***Staph. Aureus*** **Unit** | ***Ps. aeruginosa*** | ***K. pneumoniae*** | ***S. typhii*** **Unit** |
|---|---|---|---|---|---|---|---|---|
| *S.album* | Aqueous | 10 | 11 | ND | ND | 10 | 10 | 12 |
| | Methanol | 11 | 10 | 11 | 13 | 11 | 10 | ND |
| | Acetone | 14 | 11 | 10 | 11 | 10 | 13 | 10 |
| *T. chebula* | Aqueous | 14 | 16 | ND | ND | 19 | 14 | 18 |

ND= Not detected

**DISCUSSION:**

Nowadays there is an increasing trend for self medication for preventive health and for the management of common ailments, people prefer to look at the natural products having faith in their

safety and efficacy. Several anti-microbial products derived from traditional medicinal plants are available for treating various ailments caused by micro-organisms. They should inhibit the germs and exhibit greater selective toxicity towards the infecting germ than the host cells.

. A large number of anti-microbial agents derived from traditional medicinal plants are available for treating various diseases caused by micro-organisms. They should inhibit the germs and exhibit greater selective toxicity towards the infecting germ than the host cells. The mode of action for plant-derived agent should target biochemical features of the invading pathogens that are not possessed by normal host cell (Hoareau L et al., 1999 ). Thus, it was very important for biological screening of medicinal plant extracts for a safe, non-toxic and cost-effective treatment against various pathogenic diseases (Daniel M Methgot et al., 1991 ).

The mode of action for plant-derived agent should target biochemical features of the invading pathogens that are not possessed by normal host cell (Hoareau L et al., 1999 ). Thus, it was very important for biological screening of medicinal plant extracts for a safe, non-toxic and cost-effective treatment against various pathogenic diseases (Daniel M Methgot et al., 1991 ). With this intention, the Anti microbial study was carried out. When antimicrobial screening was carried out against seven standard micro-organisms, activity was observed against many bacterial strains.

When antimicrobial screening was carried out against four standard micro-organisms, activity was observed against many bacterial strains. The strains which were not susceptible to plant extracts might have become resistant or the chemical constituents present in the extract might not be affecting the mode of action of killing bacteria. Moreover, *T. chebula* showed greater antimicrobial activity compared to *S. album* which may be interpreted that this may be due to presence of high concentration of flavonoids (Khare CP et al., 2008 ).

The strains which were not susceptible to plant extracts might have become resistant or the chemical constituents present in the extract might not be affecting the mode of action of killing bacteria. Moreover, *T. chebula* showed greater antimicrobial activity compared to *S. album* which may be interpreted that this may be due to presence of high concentration of flavonoids (Khare CP et al., 2008 ). It is studied that flavonoids are extracted in acetone and the present study showed that acetone extract possessed greater antibacterial activity compared to aqueous and methanol extracts. Thus, antimicrobial activity of plant extracts against pathogenic bacterial strains may be due to the presence of flavonoids or more than one chemical constituent present in the plant.

**CONCLUSIONS :**

Antimicrobial screening of these two medicinal plants provided the therapeutic potential against several microorganisms related diseases. It leads to the conclusion that traditional plants can be the good source for the cure of several ailments. Further studies can be done on the characterization and elucidation of structure of chemical groups responsible for the antimicrobial activity. They can also be studied at molecular level for further research work.

*T. chebula* shows very high antimicrobial activity as compared to effectiveness of *S. album* which have several possibilities such as

1) It may contain large quantity of antimicrobial substances.

2) The antimicrobial substances present in it possess more diffusibility due

to low molecular weight compounds.

3) They can be extracted at at higher rates.

4) May have more stable compounds as compared to *S*. album.

5) Also the composition and content of flavonoids may be the factor.

6) *T. chebula* shows very high antimicrobial activity as compared

to effectiveness of *S. album.*

*7)* The present study showed that acetone extract possessed greater

antibacterial activity compared to aqueous and methanol extracts.

The present study showed that acetone extract possessed greater antibacterial activity compared to aqueous and methanol extracts and *T. chebula* contains large quantity of flavenoids which are best extracted in acetone and hence therefore *T. chebula* shows greater amount of anti microbial activity.

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