Summary
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At the beginning of the eighteenth century, there were no synthetic drug preparations used in any sphere of human activity. Today, in contrast, we enjoy the benefits of synthetic drugs, but we also suffer from their side-effects. There is a general growing trend among consumers for more natural rather than synthetic products in a whole range of industries, including food and drink, cosmetic, agricultural and pharmaceuticals (Bauer et al., 1997; Svoboda and Deans, 1998; Glaser, 1999; Traffic International, 1999; Walton and Brown, 1999). Volatile oils may have an important role to play in the preservation of foodstuffs against fungi, in fungicidal application against plant diseases and in the fight against various human fungal infections. Recent literature has shown the biological activities of essential oils and their individual pure components, and has documented the inhibitory activity of these substances against the growth of various fungi and bacteria (Marotti et al., 1994; Pattnaik et al., 1996; Ezer and Abbasoglu, 1996; Thoppil et al., 1998; Baratta et al., 1998).

Fungi cause annoying and sometime dangerous infections in animal and human (Bennett and Walzer, 1998). Most of these fungal infections are on the skin, the scalp, the groin and the inside of the outer ear are other common sides of fungal infection. Some fungi penetrate more deeply into the body. The fungus known as *Monilia* (Moniliaceae, Deuteromycotina) often infect the mouth and the vagina, *Histoplasma capsulatum* penetrate the lungs, causing fungal
*Histoplasma capsulatum* penetrate the lungs, causing fungal infections of the lungs are sometime mistaken for tuberculosis.

Many essential oils have been found to have antifungal activity. Because of their notable antimycotic properties coupled with pleasing flavors, essential oils can be used to treat skin diseases caused by fungi. Essential oils also have advantages over chemical antimycotics due to their low mammalian toxicity, their environment friendly status, target specificity, ability to overcome pest resistance, low cost, and easy accessibility. The commercial used of volatile oils for controlling various fungal diseases seems to be a neglected field, though a large number of oils are known to possess antimicrobial activity. Very little is known on the mechanism of antimicrobial activity of essential oils. More studies should be conducted to understand the mechanism of antifungal activity of essential oils. The possible relationship between fungitoxicity of essential oils and the chemical nature of the most abundant principles present in the oils as well as the active principles at ready identified should be examined. However, this kind of study has been undertaken for few species.

The present study deals with evaluation of selected essential oils against a diverse range of organisms comprising bacteria and fungi. The main goal of this investigation was to find out new plant-derived antibacterial and antifungal agents.
The fabaceous plants of Amravati and suburbs were selected for antimicrobial activity. These include *Abrus precatorius* (Linn.), *Acacia nilotica* (Linn), *Albizia lebbek* (L.), *Alhagi camelorum* (Fischer), *Cassia alata* (L.), *C. tora* (L.), *C. fistula* (L.), *Cicer arietinum* (Linn.), *Butea monosperma* (Lam.), *Dalbergia sissoo* (Roxb.), *Delonix regia* (Boj. Ex Hook.), *Lablab purpureus* (Linn.), *Mucuna pruriens* (L.), *Parkinsonia aculeate* (L.), *Peltophorum pterocarpus* (DC.), *Pithecolobium dulce* (Roxb.), *Pisum sativum* (Linn.), *Pongamia pinnata* (L.), *Saraca indica* (Linn.), *Tamarindus indica* (Linn.) and *Trigonella foenum-graecum* (Linn.).

In the present study *Pongamia pinnata* and *Trigonella foenum-graecum* oil exhibited significant activity against the test pathogens. Similarly, Subramanian and Nagarajan (1988) reported that oil of *Pongamia pinnata* was effective against *A. niger*. Similarly, Mustata and Christensen (1996) found that fenugreek oil was more effective against various fungi. Saxena and Vyas (1986) reported antifungal activity of leguminous plants including: *Pongamia pinnata* and *Trigonella foenum-graecum* against *A. flavus, A. niger, Candida albicans, Fusarium moniliforme* and *Microsporum cookie*. Oil of *Mucuna pruriens* was also much effective which support the findings of earlier investigators (Lindley, 1985; Ramnath, 1992; Warrier, 1995; Shalini, 1997; Upadhayay, 2000).

The activity shown by *P. pinnata* was more or less similar to activity of clotrimazole. It was also observed that the activity
shown by *Cassia tora*, *C. fistula* and *Abrus precatorius* was equal to the sensitivity against *A. niger* and *A. fumigatus*. In the present investigation, oil of *P. pinnata* was more active to *A. niger* (26 mm) than that of *A. fumigatus* (24 mm). Oil of *T. foenum-graecum* was more fungitoxic *A. niger* to than *A. fumigatus*. Hence, it is concluded that oils of *P. pinnata* and *T. foenum-graecum* were more active against *A. niger* than *A. fumigatus*.

The present investigation also showed significant activity of oil of *Cassia tora*, *C. fistula*, *Abrus precatorius*, *Acacia nilotica* and *Mucuna pruriens* against *S. aureus* and *P. aeruginosa*.

The oil of *P. pinnata* showed more antibacterial activity against *S. aureus* than *P. aeruginosa*. *T. foenum-graecum* seeds oil showed more activity against *S. aureus* than *P. aeruginosa*. The oil of *Pongamia pinnata* showed remarkable activity against *S. aureus* and *P. aeruginosa*. The activity was similar to the ampicillin against both the bacteria, viz., *S. aureus* and *P. aeruginosa*.

Different concentrations of *P. pinnata* and *T. foenum-graecum* has been evaluated for their antifungal efficacy against human pathogen *A. niger* and *A. fumigatus* and antibacterial efficacy against a human pathogen *S. aureus* and *P. aeruginosa*.
The pure oil of *P. pinnata* and *T. foenum-graecum* completely checked the vegetative growth of the *A. niger* followed by *A. fumigatus* and *S. aureus* followed by *P. aeruginosa*.

All essential oils tested were similar in efficacy to clotrimazole and ampicillin at all concentrations. Fifty per cent concentration of *P. pinnata* and *T. foenum-graecum* fully inhibited the growth of test fungi and bacteria while at the same concentration, similar inhibition was shown by the clotrimazole and ampicillin.

At 25% and 12.5% concentration, oil of *P. pinnata* and *T. foenum-graecum* showed the minimum inhibition for fungus and for bacteria.

It is concluded that the essential oil of *P. pinnata* and *T. foenum-graecum* can be used as natural antimycotics and antibacterial. Even at the low concentration, essential oils of these plants showed very significant antimycotic and antibacterial activity against *Aspergillus niger*, *A. fumigatus* and *S. aureus*, *P. aeruginosa*.

The maximum efficacy was shown by oil of *P. pinnata* against *A. niger* followed by *A. fumigatus*, and *S. aureus* followed by *P. aeruginosa*. *T. foenum-graecum* oil showed more efficacy at 25 μ/ml against *A. niger*, 50 μ/ml at *A. fumigatus*, 6.25 μ/ml against *S. aureus* and 25 μ/ml against *P. aeruginosa*. The essential oils tested were equally efficacious to clotrimazole and ampicillin.
Evaluation of antimicrobial activity in oils of *P. pinnata* and *T. foenum-graecum* singly and in combination of available drugs was also carried out. The synthetic drugs, viz., clotrimazole and ampicillin were selected for making combination with those of fabaceous essential oils. Result of disc diffusion test were remarkable when combination of oil of *P. pinnata* and *T. foenum-graecum* was used. This combination of oils, completely checked the vegetative growth of the *A. niger* followed by *A. fumigatus, S. aureus* and *P. aeruginosa*.

Combinations of oils of *T. foenum-graecum* and *P. pinnata* tested were similar in activity to the drugs (clotrimazole for fungus and ampicillin for bacteria) with *T. foenum-graecum* and *P. pinnata*. The combination of *P. pinnata* and *T. foenum-graecum* at 100% concentration fully inhibited the growth of the fungi and bacteria, at the same concentration. Similar inhibition was shown by combination of *T. foenum-graecum, P. pinnata* and clotrimazole and *T. foenum-graecum, P. pinnata* and ampicillin.

The combination of *P. pinnata* and *T. foenum-graecum* at 50% concentration inhibited the growth of the fungi and bacteria. Whereas at this concentration similar inhibition was shown by combination of *T. foenum-graecum, P. pinnata* and clotrimazole and *T. foenum-graecum, P. pinnata* and ampicillin. At 25% and 12.5% concentrations, oil of *P. pinnata* and *T. foenum-graecum* showed the minimum
inhibition of fungus and bacteria. The combination of drugs and oils showed more efficacy than tested singly.

It is concluded that the essential oil of combination of P. pinnata and T. foenum-graecum can be used as natural antimycotics and antibacterial agents. Even at the low concentration, combination of essential oils of these plants showed very significant antimycotic and antibacterial activity against A. niger, A. fumigatus, S. aureus and P. aeruginosa.

The oils of P. pinnata and T. foenum-graecum showed the maximum efficacy at 3.12 µ/ml against A. niger, 12.5 µ/ml, A. fumigatus, 0.78 µ/ml, S. aureus and 3.12 µ/ml P. aeruginosa. Oil of T. foenum-graecum exhibited more efficacy at 0.78 µ/ml against A. niger, 1.56 µ/ml at A. fumigatus, 0.39 µ/ml S. aureus and 1.56 µ/ml against P. aeruginosa.

In chromatogram of oil of Pongamia pinnata, the largest peak, which eluted after 49 min, was identified as 9-octadecenoic acid and other minor compound identified i.e Benzensulfonic acid, Hexadecanoic acid. In chromatogram of oil of Trigonella foenum-graecum the largest peak, which eluted after 50 min, was identified as 9,12-octadecadienoic acids and another compound is Hexadecanoic acid and other minor compound is Benzenesulfonic acid. Chemical analysis revealed that there are significant qualitative and quantitative differences among the oils tested. The active principles octadecadienoic acid was found in the
cromatogram, viz., *P. pinnata* and *T. foenum-graecum*. The activity of the oils must be due to octadecadienoic acid.

Combination of volatile substances of *P. pinnata* and *T. foenum-graecum* could be used as effective antimicrobial agents. But, before using this combination, a thorough study should be carried out.