AYURVEDIC PREPARATIONS FOR TREATING SKIN INFECTIONS: COMPARATIVE ANTIBACTERIAL ACTIVITY OF FRESH AND REFRIGERATED DECOCTIONS OF THREE *FICUS* SPECIES, *THESPESIA POPULNEA* AND *ABUTILON INDICUM*

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Introduction

In the Ayurveda system of medicine, medicinal plants are used for external preparations such as soaks, cool wet dressings, lotions, or powders in the treatment of skin infections. The decoctions of the barks of *Ficus benghalensis* L. (Nuga), *Ficus religiosa* L. (Sacred Bo), *Ficus racemosa* L. (Attikka) and *Thespesia populnea* (L.) Soland (Gansuriya) and of the leaves of *Abutilon indicum* (L.) Sweet (Beth Anoda) is used to cure or reduce inflammatory reactions of abscesses and wounds (Jayasinghe, 1979; *Charaka Samhitha*, 1996). Normally, freshly prepared decoctions are prescribed. Most patients store the plant decoctions in the refrigerator for further use. However, there is little scientific documentation about the effectiveness of the fresh and refrigerated medicinal plant decoctions for treating skin infections. Therefore, studies on the antibacterial activity of such medicinal plant decoctions are important.

Materials and Methods

Clean, well-crushed fresh bark (60 g each) of *F. benghalensis, F. religiosa, F. racemosa* and *T. populnea* and leaves (60 g) of *A. indicum* were separately boiled in 960 mL of water (16 times the weight of plant material) and reduced to 120 mL (that is 8 to 1 reduction of volume) within 2 h to obtain the plant decoctions. Each decoction was tested against three human pathogenic bacteria, *Escherichia coli* NCTC (National Collection of Type Culture) 10418, *Staphyloccocus aureus* NCTC 6571 and *Pseudomonas aeruginosa* NCTC 10662, *S. Aureus*, using the well diffusion method. Mueller-Hinton Agar (MHA) was used for the bioassay. Equidistant wells of 12 mm in diameter and 4 mm in depth were bored into the MHA using a sterile cork borer and the wells were completely filled with the test decoctions. The plates were left on the bench for 30 min for absorption of decoctions and then incubated at 33-34 ^{0}C for 24 h. The plates were examined for areas of no growth of organism around the wells and diameters of the zones of the inhibition were measured. All the samples of decoctions were refrigerated at 2-4 ^{0}C for 24 h. The

refrigerated decoctions were placed on the bench for 30 min to bring them to room temperature and assayed for antibacterial activity using the above method. The decoctions from each plant were prepared at 9 different occasions and the 9 decoctions were tested with 42 fresh replicates and 45 refrigerated replicates for their antibacterial activity against *S. aureus*.

Results and Discussion

The decoctions of *F. benghalensis, F. religiosa, F. racemosa* and *T. populnea* showed a large inhibition area (diameter, 20-25 mm) against *S. aureus*. A small inhibition area (13-14 mm) was obtained for *E. coli*. The decoction of *A. indicum* did not show any activity against all three pathogens examined contrary to its use in clinical practice. *P. aeruginosa* was resistant to all the five decoctions. The refrigeration of decoctions increased the inhibition area produced by *F. benghalensis, F. religiosa* and *T. populnea*.

Results obtained for several replicates of fresh and refrigerated decoctions were evaluated by using MINITAB 14 statistical package using the 2 sample t (test and confidence interval) with significant level taken as 0.05 and the hypothesis as follows: Null hypothesis is antibacterial activity of the fresh decoction samples is equal to the antibacterial activity of the refrigerated decoction samples. Alternative hypothesis is antibacterial activity of the fresh decoction samples is unequal to the antibacterial activity of refrigerated samples of decoction.

Table 1 shows that the mean diameter of the inhibition zones corresponding to the refrigerated decoctions of *F. benghalensis, F. religiosa,* and *T. populnea* was greater than that of fresh decoctions. The *T. populnea* decoction had the highest diameter of the inhibition zones and there was no significant difference between the fresh and refrigerated decoctions of *T. populnea*. Therefore, the fresh or refrigerated decoctions of *T. populnea* appear to be the most effective for cleaning of wounds caused by *S. aureus*. There was no significant difference between the antibacterial activity of the fresh and refrigerated decoctions of *F. racemosa* and *T. populnea*. However, the fresh and refrigerated decoctions of *F. benghalensis* and *F. religiosa* showed significant difference in antibacterial activity. The bioassay seemed remarkably reproducible. The inter batch variation too was very slight, considering the manual method of preparation of the decoction.

The results of this study provide a scientifically valid explanation for the use of the above plants in the treatment of the patients with skin infections. Further work to define the active ingredients and activity against other organism, including recently emerged resistant strains of *S. aureus* would be helpful in maximizing the use of ancient traditional medical knowledge available in this country.

Table 1. Summary of the variability of the antibacterial activity between fresh and refrigerated decoction samples of *F. Benghalensis F. religiosa, F. racemosa, T. populnea* against *S. aureus*

Diameters of inhibition zone† mm								
Statistics of the decoction samples	*F. benghalen.*		*F. religiosa*		*F. racemes.*		*T. populnea*	
	F	R	F	R	F	R	F	R
Total replicate count	42	45	42	45	42	45	42	45
Mean diameter mm	21.55	23.96	21.93	23.89	22.7	21.76	28.69	28.96
Standard Deviation	1.37	2.95	1.84	1.17	1.09	1.32	1.96	1.98
Coefficient Variation	6.34	12.3	8.39	5.01	4.94	6.05	6.83	6.83
95 % confidence Interval	-3.38, -1.43		-2.63, -1.30		-0.20, 0.83		-1.10, 0.57	
T (test statistics) fresh versus refrigerated	-4.94		-5.88		1.22		-0.63	
Probability value (p)	0.0		0.0		0.23		0.53	

† Zones of Inhibition including diameters of wells (12 mm).
F-Fresh decoction samples
R- refrigerated decoction samples
All the samples were prepared and refrigerated as described in Materials and Methods. Calculated mean, standard deviation, 95 % CI, T ratio, p value (p), Coefficient Variation by using MINITAB 14.

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References

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