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Full length research article

ANTI-INFECTIVE AND WOUND HEALING PROPERTIES OF *FLABELLARIA PANICULATA*

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The methanol leaf extract of Flabellaria paniculala was studied for its potency on normal wounds and infected wounds in rats. Wounds were inflicted on Wistar rats using excision model. Local infection was introduced into rat abdominal wounds using a 10^8 bacteria/ml inoculum. Two groups of infection were used: Staphylococcus aureus Pseudomonas aeruginosa . Rate of wound healing was assessed by contraction and p of epithelisation. Crude extract of F. paniculala demonstrated sic wound contraction and decrease in epithelisation period ($p < 0.05$). On day 14, extract achieved 100% wound contraction in non-infected and Staphylococcus aureus while 100% wound contraction was recorded in Pseudomonas aeruginosa group on day 18. This drug is anti-infective as well as wound healing agent thus justifying the local uses of the plant for the treatment of skin diseases and sores.

Key Words: *Flabellaria paniculala*, infected wounds, wound contraction, wound healing.

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INTRODUCTION

In a previous paper (Abo and Olugbuyiro, 2004), we reported on the phytochemical and antibacterial studies of *Flabellaria paniculala*. To further investigate the biological activities of the species, we report its effect on normal wounds and infected wounds in rats.

MATERIALS AND METHODS

Drug:
Fresh leaves of *F. paniculata* were collected as described previously (Abo and Olugbuyiro, 2004). Hundred grams of dried (45°C) *F paniculata* were powdered and macerated with 70% methanol. The filtrate was dried, concentrated *in vacuo* and kept in refrigerator for wound healing test.

Animals:
Adult male Wistar rats (250-300g) were used. They were obtained from the animal house in the Department of Physiology, University of Ibadan, Ibadan. They were housed individually in cages, fed with standard rat pellets and water was allowed *ad libitum*.

Wound model
(a) Normal Wounds: A circular wound of 2cm x 2cm was made on the pre shaved, sterile, left dorsolateral flank of the rat. The wound was traced on a transparent plastic on the day of wounding and subsequently on alternate days until healing was complete.

Twelve animals were used and they were randomly divided into three sub-groups of four each. Crude methanol extract of *F.*

paniculata (100mg/ml) was applied topically at 2 daily intervals until complete epithelization had taken place. Gentamicin (8mg/ml) and normal saline were similarly applied as positive and negative controls respectively. The methods are modifications of technique described by Palanichamy *et al* (1991) and Padmaja *et al* (1994).

(b) Infected wounds: Local infection was introduced into rat abdominal wounds using 0.5ml of a 10^8 bacteria/ml inoculum (Bucknall, 1980). Two groups of infection were used: *S. aureus and Ps. aeruginosa*. Swabs were taken on day 5 to confirm the presence of the expected organisms in the pus. Grouping of the animals and topical treatment of the wounds were as described above.

Statistical analysis:. Unpaired "t" test was applied for data analysis. Values of $p<0.05$ were taken to imply statistical significance.

RESULTS

The crude leaf extract of *Flabellaria paniculata* demonstrated significant anti-infective and wound healing properties ($p < 0.05$). The area of wound in non-infected group was reduced to 187.0± 1.0mm of their original size (400mm on day 7, 27.5± 0.5mm on day 12, 0mm (complete closure) on day 14. The corresponding figures for the control were 276.5 ± 2.3mm (day 7), 110 ± 8 (day 12) and 87.5± 7.5mm (day 14). The figures for the reference drug were 152.0 ± 0mm (day 7), 36.5± 0.5mm (day 12) and 2.0 ± 2.0 mm (day 14).

The epithelization period was shortest in crude extract compared to both controls and this is equally reflected by the percentage of wound contraction in both normal and *S aureus* inoculated wounds (Tables 1 & 2). In the *P. aeruginosa* group, the crude extract demonstrated significant healing potency ($p < 0.05$) compared to control. However, the reference drug exhibited higher potency against the crude extract (Table 3). The crude extract achieved 100% wound contraction on day 18 while reference drug achieved same on day 16.

The crude extract has the shortest period of wound closure compared to both controls. Complete wound contraction took place in crude extract 2 days after that of the reference drug.

Table 1: Effect of crude MeOH extract of *F. paniculata* on non-infected rat wounds

Treatment	Wound area (mm^2) on day				Epithelization period (days)
	7	**12**	**14**	**18**	
Crude extract	187.0 ± 1.0 (32.4)	27.5 ± 0.5 (75.0)	0.0 (100)	-	15.0 ± 0.0
Gentamicin	152.0 ± 0.0 (45.0)	36.5 ± 0.5 (66.8)	2.0 ± 0.0 (97.7)	-	15.3 ± 0.7
Control	276.5 ± 2.3	110.0 ± 8.0	87.5 ± 7.5	38.5 ± 0.5	24.5 ± 0.5

Values are mean + SEM. In parenthesis, the percentage of wound contraction compared with control

Table 2: Effect of crude MeOH extract of *F. paniculata* on S. aureus inoculated rat wounds.

Treatment	Wound area (mm^2) on day				Epithelization period (days)
	7	**12**	**14**	**18**	
Crude extract	201.5 ± 1.5 (18.3)	22.0 **± 2.0** **(85.9)**	0.0 (100)	-	15.3 ± 0.7
Gentamicin	142.0 ± 3.5 (42.4)	38.0 **±** 2.0 (75.5)	0.0 (100)	-	16.0 **± 0.0**
Control	246.5 ± 4.0	156.5 **± 1.5**	102.0 **± 3.0**	33.0 **± 7.0**	26.5 **± 0.5**

Values are mean + SEM. In parenthesis, the percentage of wound contraction compared with control

Table 3: Effect of crude MeOH extract of *F. paniculata* on *P. aeruginosa* inoculated rat wounds.

Treatment	Wound area (mm^2) on day				Epithelization period (days)
	7	**12**	**14**	**18**	
Crude extract	271.5 ± 5.0 (10.9)	115.0 ± 3.0 (22.8)	60.0 ± 4.0 (54.2)	0 (100)	15.3 ± 0.7
Gentamicin	185.5 ± 5.5 (39.0)	90.5 ± 2.5 (39.3)	9.0 ± 3.0 (93.1)	0 (100)*	16.0 ± 0.0
Control	304.0 ± 4.0	149.0 ± 3.5	131.0 ± 5.0	45.0 ± 1.0	26.5 ± 0.5

Values are mean + SEM. In parenthesis, the percentage of wound contraction compared with control
**Effective day = 16*

DISCUSSION

Flabellaria paniculta shows pronounced anti-infective and pro-healing actions. Better wound, healing potential exhibited by the crude extract in non-infected group and *S. aureus* group compared to controls may be due to presence of tannins and other astringents in this plant. The multi-drug resistant *S. aureus* causing boils, infections or uncommonly carbuncles and facultative Ps. aerugnosa have been implicated to be susceptible to the antibacterial agents containing aminoglycosides such as gentamician, streptomycin & neomycin (Tyrrel *et al*, 1979). In this present study, gentamicin was used as reference drug. Aminoglycosides act on the ribosome by interfering with mRNA attachment and thus inhibiting protein synthesis (Tyrrel et al, 1979; Moellenng, 1979). Therefore it could be that there are components containing amino- glycosides in the crude extract thus responsible for its anti-infective action on the infected wounds.

Also, an agent known to stimulate collagen could be expected to promote wound healing since collagen is the principal component of any repaired tissue (Macsween & Whaley, 1992). There are reports (Padmaja et al, 1994) that crude betel nut (*Areca calechu*) extract as well as, betel nut polyphenols stimulate collagen synthesis by buccal mucous fibroblasts.

Therefore, it may be concluded that the leaf extract of *F. paniculata* possesses stimulating effect in collagen synthesis thus justifying its traditional uses. Further studies are in progress to ascertain the possible effects of the leaf extract on selected growth factors and various parameters of wound healing.

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