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# Androgenic activity of the total alkaloid fraction of *Alangium salviifolium* (Linn.F)

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**Abstract**

Objective: To perform the androgenic and anti-androgenic activity of the total alkaloid fraction of *Alangium salviifolium* (Family: Alangiaceae). Materials and methods: The total alkaloid fraction of the methanolic extract of stem bark of *Alangium salviifolium* was used for the experiment. Immature male albino rats received orally a dose of 10 mg and 20 mg/kg body weight of the fraction for 7 days. The weight of the reproductive organs of the treated rats was measured on the eighth day of the treatment and histometric measurements were carried out. Results: A significant increase in the weight of testis, seminal vesicles, ventral prostate and epididymis was observed in the treated rats. Conclusion: The results suggest the androgenic behaviour of the total alkaloid fraction .

**Key words:** *Alangium salviifolium*, total alkaloid fraction, androgenic activity.

## 1. Introduction

*Alangium salviifolium* (Alangiaceae) is a deciduous, rambling shrub or tree, upto 10 mts in height, widely distributed over plains and foothills throughout the greater parts of India, China, Malaysia and Phillippines [1].

Its roots are acrid, astringent, anthelmintic, diuretic and purgative. They are used externally in rheumatic pain, leprosy and inflammation. Root bark is an antidote in several poisons. Fruits are used in burning sensation and haemorrhage [2]. Stem bark possesses biphasic action on blood pressure in low doses [3]. Physicians in Tirupattur, Vellore district in Tamil Nadu use this plant as abortifacient. Villagers here are using the stem bark of this plant to suppress the libido of the male dog (personal communication). Earlier studies in our laboratories have shown significant antifertility effect of the stem bark in female rats [4]. Its anti-inflammatory and antibacterial activities have also been reported [5]. In the present study based on the folklore claim, its androgenic or anti - androgenic activity has been carried out in the immature male albino rats.

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## 2. Materials and methods

### *2.1.Plant Material*

Fresh stem bark of *Alangium salviifolium* (Linn.F) Wang used for the present studies was collected in the month of April 2000 from Thirupattur, Vellore district of Tamilnadu. The fresh plant was identified, confirmed and authenticated by comparing with voucher specimen available at Botanical Survey of India, Coimbatore. The stem bark was dried in an hot air oven at 42°C and then pulverized into coarse powder, passed through a 40 mesh sieve and stored in a closed vessel until further use.

### *2.2. Isolation of the total alkaloid and preparation of suspension*

The powdered stem bark was extracted with methanol in a Soxhlet apparatus for 18-20 h. The methanolic extract was concentrated to dryness under vacuum. The extract was separated into alkaloid and non-alkaloid fractions using a conventional procedure [6].The yields of the total alkaloid was 8.35 %w/w. The total alkaloid was suspended in distilled water using sodium CMC (0.3%) and administered orally to the animals with the help of an intragastric catheter.

### *2.3. Androgenic and antiandrogenic activity*

Wistar strain colony-bred immature male albino rats weighing about 30 g and 23-25 days old were used for evaluation of androgenic or anti androgenic activity [7,8]. The experimental procedure was approved by the committee for the purpose of control and supervision of experiments on animals (CPCSEA), Chennai. (proposal No: 22/29, dated 16.12.2000). The rats are divided into six groups containing six animals in each group.

The first group served as control and received the vehicle only (sodium CMC 0.3%). The second group served as positive control and received testosterone propionate 1mg/kg body weight subcutaneously. The third and fourth groups received, a test dose of the total alkaloid fraction at 10 mg and 20 mg/kg body weight, respectively. The fifth and sixth groups received in addition to testosterone 1 mg/kg body weight subcutaneously, a test dose of the total alkaloid fraction at 10 mg and 20 mg/kg body weight, respectively.

All the above treatments were given for 7 days. On the eighth day of the experiment, these animals were sacrificed by decapitation. The testis, epididymis, vas deferens, ventral prostate and seminal vesicles were dissected out, freed from surrounding tissues and weighed quickly on a sensitive balance.

The testis was fixed in Bouin's fluid, embedded in paraffin, sectioned at 6 μ and stained with haematoxylin and eosin for histological observations. Histometric measurements such as diameter of the testis and seminiferous tubule were made by random selection of 30 circular sections by using ocular and stage micrometer.

### *2.4 Statistical Analysis*

The statistical analysis was carried out using the Student's *t* - test and the results were judged significant if $p<0.05$.

## 3. Results and discussion

The administration of the total alkaloid fraction of the *Alangium salviifolium* to immature male rats at 10 mg and 20 mg/kg body weight for 7 days has significantly increased the weights of testis ($P<0.001$), seminal vesicles ($P<0.01$), ventral prostate ($P<0.01$), and epididymis ($P<0.05$) when compared to control rats.

Table 1.
Effect of the Total alkaloid of *Alangium salviifolium* on weights of male reproductive organs when fed orally to immature rats

| Treatment (Dose) | Weight of male reproductive organs (mg/10gm body weight ± S.E.) | | | | |
|---|---|---|---|---|---|
| | **Testis** | **Seminal vesicle** | **Ventral prostate** | **Vas deferens** | **Epididymis** |
| Control | 319 ± 17.24 | 37 ± 1.34 | 21 ± 0.62 | 26.83 ± 2.63 | 78.9 ± 5.14 |
| Testosterone (1mg/kg) | 238 ± 10.39[c] | 53 ± 3.01[c] | 35 ± 1.69[c] | 40.00 ± 4.19[c] | 93.84 ± 7.79[b] |
| Total alkaloid fraction (10mg/kg) | 463 ± 23.44[c] | 41 ± 1.71[b] | 24.22 ± 0.9[b] | 27.87 ± 1.53 | 81.2 ± 2.29 |
| Total alkaloid fraction (20mg/kg) | 468.9 ± 19.26[c] | 44 ± 2.14[b] | 26.00 ± 1.4[b] | 27.47 ± 1.78 | 84.8 ± 1.65[a] |
| Testosterone (1mg/kg) + Total alkaloid fraction (10mg/kg) | 225 ± 13.00[c,e] | 60 ± 2.91[c,d] | 42.5 ± 3.83[c,d] | 41.42 ± 3.59[c] | 95.1 ± 8.05[b] |
| Testosterone (1mg/kg) + Total alkaloid fraction (20mg/kg) | 205 ± 12.78[c,f] | 62.15 ± 3.45[c,d] | 43.5 ± 3.37[c,d] | 42.97 ± 3.42[c] | 94.8 ± 8.78[b] |

[a]p<0.05, [b]p<0.01, [c]p<0.001 when compared to control; [d]p<0.05, [e]p<0.01, [f]0.001 when compared with standard testosterone.

The weight of the testis, seminal vesicles and ventral prostate was increased from 319 ±17.24, 37±1.34 and 21.00±0.62 mg/100 gm body weight of control rats to 463±23.44, 41±1.71 and 24.22±0.9 mg/100 g body weight in total alkaloid 10 mg/kg treated rats and 468.9±19.26, 44±2.14 and 26.00±1.4 in total alkaloid 20 mg/kg body weight treated animals, respectively.

The percentage increase in the weight of these organs during this treatment ranged between 45 - 48 % in testis, 10 -19 % in seminal vesicles and 15 - 24 % in ventral prostate. The diameter of the testis and seminiferous tubule also increased significantly in the total alkaloid treated rats when compared to control (P<0.01 & 0.001).

The percentage increase in the diameter of the testis and seminiferous tubules ranged between 13 - 20% and 47 -52%, respectively. All these changes suggest androgenic behavior of the total alkaloid.

A significant reduction in the weight of testis (versus control, P<0.001) was observed when testosterone was administered alone. It also caused a significant increase in the weights of seminal vesicles (P<0.001), ventral prostate (P<0.001), epididymis (P<0.01) and vas-deferens (P<0.001) when compared to control rats.

The simultaneous administration of the total alkaloid fraction along with testosterone, induced a significant reduction in weights of testis (P<0.001) and a significant increase in weights of other reproductive organs (P<0.01 & 0.001) when compared with control. The increase in the weights when compared with testosterone treated group of seminal vesicles was13 - 17 % and ventral prostate was 21 - 23 % and was significant (P<0.05). This confirms the androgenic activity of the extract.

The total alkaloid fraction of *Alangium salviifolium* when administered orally to immature male rats exhibited androgenic activity

Table 2.
Effect of the total alkaloid fraction of A*langium salviifolium* on micrometric changes of testis

| Treatment (Dose) | Micrometric changes | |
|---|---|---|
| | Diameter of Testis | Diameter of Seminiferous tubules (mm) |
| Control | 13.0 ± 0.7615 | 147.2 ± 11.62 |
| Total alkaloids fraction | | |
| 10mg/kg | 14.8 ± 0.6105[a] | 216.5 ± 12.04[b] |
| 20mg/kg | 15.5 ± 1.094[b] | 264.9 ± 11.97[b] |

[a]p<0.01, [b]p<0.001 when compared with control

as seen by the significant increase in weights of reproductive organs including seminal vesicles and ventral prostate, as these organs are dependent on androgens.

The treatment also increased the weight of testis, diameter of the testis and seminiferous tubules. When the fractions were administered along with testosterone, the semininal vesicles and ventral prostate weighed significantly more when compared to the testosterone alone treated rats, further supporting the androgenic activity of the extract. Hence the androgenic effect of this plant may be responsible for its antifertility effects as claimed by the folklore use.

Several plants like *Hibiscus rosa sinenses* [8], *Solanum xanthocarpum* [9] and *Striga orabanchioides* [7] have shown potent antifertility effects in male rats. Several alkaloids like dihydropalmitine, berberine and protopine, isolated from the seeds of Argemone mexicana [12], Piperine from the fruits of *piper longum* [13], Quarsin from *Quarsia amora* [14] and Solasodine from *Solanum* species [9] exhibited anti fertility activities in the male Alangine, ankorin, tubulosine, emetin, cephaelin, alangimarine, alamarine, alamaridine and several other alkaloids [10,11] have been isolated from the plant *Alangium salviifolium*.

Hence the androgenic effect of the total alkaloid fraction from *Alangium salviifolium* may be mainly due to the presence of any of these alkaloids. Further investigation is required to prove this.

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## References

1. Anonymous. (1985) *The wealth of India,* CSIR: New Delhi; 1, 121-123.

2. Warrier PK, Nambiar VPK, Raman Kutty C. (1993) *Indian Medicinal plants a compendium of 500 species,* Orient Longman Limited: Hyderabad; 1, 67- 70.

3. Pakrashi SC, Achari B. (1970) *Experentia* 26: 933 -934.

4. Murugan V, Shareef H, Rama Sarma GVS, Ramanathan M, Suresh B. (2000) *Indian J. Pharmacol.* 32: 388-389.

5. Murugan V, Shareef H, Rama Sarma GVS, Ramanathan M, Suresh B. (2001) *Indian Drugs* 38: 46-47.

6. Trease GE, Evans WC. (1978) *Pharmacognosy* Bailliere Tindall: London; 11: 161-163.

7. Hiremath SP, Badami S, Swamy HKS, Patil SB, Londonkar RL. (1997) *J. Ethnopharmacol.* 56: 55-60.

8. Reddy CR, Krishnamurthy DR, Patil SB. (1997) *Indian J. Exp. Biol.* 35: 1170- 1174.

9. Kanwar U, Batla A, Sanyal SN, Ranga A. (1990) *J. Ethnopharmacol.* 28: 249 - 254.

10. Pakrashi SC, Mukhopadhya R, Sinha RR. Gosh Dastidar PP, Ali E. ( 1984) *Indian J. Chem.* 24: 19-28.

11. Bhattacharya A, Mukhopadhya R, Sinha RR. (1988) *Tetrahedron* 44: 3477- 3488.

12.Gupta RS, Dixit VP, Dobhal MP. (1990). *Fitoterapia* 61: 67 - 71.

13. Malini T, Manimaran RR, Aninakaran J, Arulnakaran J, Aruldhas MM, Govindarajulu P. (1990) *J. Ethnopharmacol.* 64: 219 - 225.

14. Raji Y, Bolarinwa AF. ( 1997) *Life Science* 61 : 1067 - 74.