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EVALUATION OF THE GALACTAGOGUIC ACTIVITY OF *ASPARAGUS FALCATUS*

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SUMMARY. Aqueous, methanol, methylene chloride and protein extracts of roots of *Asparagus falcatus* were administered orally to lactating Sprague Dawley rats for one week from the fifth day after the delivery. The weight gain of the litter was compared with control groups in order to evaluate the galactagoguic activity of the extracts. A significant increase in the percentage weight gain of the litter was not observed in the treatment groups following administration of any of these extracts. This is suggestive of an absence of galactagoguic activity in the extracts of *A. falcatus* investigated, at the doses administered.

INTRODUCTION

Herbal medicinal plants are used by practitioners of the traditional systems of medicine for increasing milk secretion in lactating women. One such plant, recommended by Ayurvedic practitioners in Sri Lanka, is Hathawariya, of which 2 species are found, viz. *Asparagus falcatus Linn* (Liliaceae) confined to the moist and intermediate regions up to an altitude of about 4,000 feet and *Asparagus racemosus Willd* (Liliaceae) common in the low country, mostly in the dry regions[2]. In India roots of *A. racemosus* are administered by farmers to cows and buffaloes to correct low and irregular milk yields.[4]

Galactagoguic effect of *A. racemosus* has been previously demonstrated in post-partum and oestrogen primed rats by administering the crude alcoholic extract of *A. racemosus* intramuscularly.[5] Weight gain of the mammary glands and histological changes in the mammary glands were used as the parameters to assess galactagoguic activity. Patel and Kanitkar[4] have reported an increase in the milk production when roots of *A, racemosus* were administered to buffaloes in the diet but the significance level reported by them is only 0.1. The present study was designed to investigate the possible galactagoguic effect of *A. falcatus* using lactating Sprague Dawley rat as the experimental animal.

MATERIALS AND METHODS

Virgin female Sprague Dawley rats housed under standard conditions and liberally fed with rat pellets and water were used for this study. Female rats aged 14 weeks and weighing 150—175 g were paired wih proven fertile males. When they littered, the number of litter mates were reduced to 7 per mother, and the mothers with their litter were randomly allocated into treatment and control groups. The day of the delivery was designated as Day 1. Extracts of roots of *A. falcatus* were administered orally, for one

week commencing from Day 5, to the mothers in the treatment groups under light ether anaesthesia. The oral route was used because "hathawariya" is prescribed as a herbal conjee or a decoction by Ayurvedic practitioners. The control groups received distilled water (experiments 1, 2, 4) or a solution of 0.3% Tween 80 in 0.9% saline (experiment 3) which were used as the vehicles to administer the extracts of *A. falcatus*, under identical conditions. The weight of the litter was recorded daily. The percentage weight gain per littermate was used as the index of galactagoguic activity and these were compared between treatment and respective control groups using students 't' test.

Experiment 1

An aqueous extract of roots of *A. falcatus* was prepared by liquidising fresh roots of *A. falcatus* in a known amount of water, The juice was extracted by squeezing and filtering through a muslin cloth, freeze dried and reconstituted with sterile distilled water. One kg of fresh roots yielded approximately 500 g of aqueous extract, which was administered at a daily dose of 1 g/100 g body weight to the treatment group (n=10) while the control group (n=10) received an equivalent amount of distilled water.

Experiment 2

The residue of roots of *A. falcatus* after obtaining the aqueous extract was air-dried and extracted twice with methanol. Methanol extract was concentrated *in vacuo* till all methanol evaporated. The residue was reconstituted with sterile distilled water, freeze dried and reconstituted again with sterile distilled water to yield a concentration of 50 mg/ml. This methanol extract was administered at a daily does of 50mg/100g body weight to the treatment group (n=6) while the control group (n=6) received distilled water.

Experiment 3

The residue of roots of *A. falcatus* left after extracting with methanol was extracted with methylene chloride. This extract was concentrated *in vacuo* and a white amorphous substance was obtained by crystallizing with chloroform and methanol. The white amorphous material was suspended in 0.9% saline containing 0.3% Tween 80 to yield a concentration of 2 mg / ml. This methylene chloride extract was administered at a daily dose of 2 mg / 100g body weight to the treatment group (n=7) while the control group (n=7) received an equivalent amount of 0.3% Tween 80 in 0.9% saline.

Experiment 4

An aqueous extract was prepared as in experiment 1 and the proteins in this extract were precipitated by saturating with ammonium sulphate. The precipitated proteins were separated by centrifuging (3000 rpm, 30 min), dissolved in 0.9% saline and dialysed for 48 h against sterile distilled water at 4°C, freeze dried and reconsitituted with sterile distilled water to yield a solution containing 25 mg of protein concentrate per ml. The actual protein content of this concentrate was 2.2 mg / ml which was three times higher than the protein content in the aqueous solution when estimted by the method of Lowry.[3] Protein concentrate was administered at a daily does of 2.2 mg protein/100 g body weight to the treatment group (n=6) while the control group received distilled water (n=6).

RESULTS

Percentage weight gain per litter mate in response to aqueous, methanol, methylene chloride and protein extracts of A. *falcatus* and in the respective control groups are shown in Table 1.

TABLE 1. — Mean ± s.e.m of the percentage weight gain per littermate

Type of extract administered	Control group	Treatment group
Aqueous extract	68.7± 6.73	78.6± 6.60
Methanol extract	59.5± 2.44	54.0± 3.60
Methylene chloride extract	71.92± 5.28	72.6± 6.34
Protein extract	59.5± 2.44	54.0± 4.09

Although the weight gain after administration of the aqueous extract was higher in the treatment group than in the control group, the difference was not statistically significant. A common control group was used for the treatment groups receiving methanol and protein extracts as these two treatment groups were studied simultaneously. The percentage weight gain per litter mate was lower in both treatment groups when compared to the control group, but this difference was also not significant. The weight gain after administration of the methylene chloride extract was also not significantly different from that of the control group. Thus all four extracts of roots of *A. falcatus* failed to exert any significant effect on the weight gain of the litter.

DISCUSSION

Intra-muscular administration of the crude alcoholic extract of *A. racemosus* by Sabnis *et al.*[5] led to a significant increase ($p<0.05$) in the weight of the mammary glands both in the oestrogen primed virgin rats and in post-partum rats. In post-partum rats involution of the lobulo-alveolar tissue was inhibited and a slight milk secretion maintained by *A. racemosus*, while in oestrogen primed virgin rats both lobulo-alveolar tissue and milk secretion were well developed. The species of Asparagus used, the route of administration and the parameters used to assess galactagoguic activity are different in the present study from what has been used by Sabnis and co-workers.[5] Although these workers observed an increased weight and histological changes compatible with milk secretion in the mammary glands, such changes may not necessarily increase the milk available for the litter. The weight gain of the litter will depend on the quantity of milk ingested and this in turn will depend on the time and duration of suckling. On the other hand possible inactivation of galactagoguic compounds, if any, following oral administration of extracts cannot be excluded in the present study.

Patel and Kanitkar[4] evaluated the galactagoguic activity of *A. racemosus* by adminis tering chopped fresh roots in the concentrate at a daily does of 0.5 kg to buffaloes. *A. racemosus* was administered from 21st day after calving to 50th day and the milk yield was compared with matched controls. Although they concluded that the milk yield in the treated animals was significantly high, the significance level as estimated by analysis of variance is only 0.1 and therefore does not warrant the conclusions reached. Re-analysis of the raw data published in their paper showed an average daily milk yield (mean ± sem of 9.7 ± 0.7 kg in the treatment group and 8.9 ± 0.7 kg in the control group and the comparison of these using paired 't' test again gave a significance level of $p < 0.1$ The inability of *A. racemosus* ingestion to increase the milk yield in buffaloes significantly is in agreement with the observations in the present study. However, the objections to oral administration still hold.

In the pesent study the 4 different extracts were evaluated for galactagoguic activity in lactating rats using the percentage weight gain per litter mate as the index of galactagoguic activity. Although the weight gain of the litter will depend on many other factors (i.e. health of the litter and its suckling ability) apart from the available amount of milk, this was used to evaluate galactagoguic activity in the present study, as there is no other non-invasive method for the measurement of galactagoguic activity in small animals. Chaudhury and Tennekoon[1] have previously suggested the use of the difference in litter weight before and after suckling as an index of galactagoguic activity. Although this was attempted in a pilot study, it did not prove very practical, as negative weight gains were sometimes obtained in spite of obvious suckling, perhaps due to loss of urine or faeces from the litter during the suckling period. The present study suggests that aqueous, methanol, methylene cloride and protein extracts of roots of *A. falcatus* do not possess galactagoguic activity when administered orally to lactating rats. The doses of various extracts used were adequate in concentrating active principles if there were any. Thus the absence of galactagoguic activity observed in the present study is unlikely to be due to inadequate dosage. One possibility is that *A. falcatus* may not contain galactagoguic compounds unlike *A. racemosus*. Another possibility already mentioned is that the galactagoguic compounds, if any, are inactivated in the digestive tract. If this be the reason, the plant is unlikely to be effective as a galactagogue in the form in which it is prescribed by Ayurvedic practitioners. A third possiblity, a seasonal variation of galactagoguic activity, if any, cannot be excluded in the present study as the plant material was collected only during the first six months of the year.

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