

Antifertility effects of two Malaysian plants

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Key words: Antifertility plants; Malaysian.

RINGKASAN

Kesan pada dua tumbuhan tempatan terhadap kesuburan tikus telah dikaji. Lepidagathis longifolia yang juga dikenali sebagai Penluruh, Serga dan Penggugur, didapati mengurangkan saiz seperinduk anak tikus jika ekstrak air (500 dan 550 mg/kg berat badan) daripada akarnya diberikan melalui mulut selama 10 hari selepas koitum. Pendapat ini adalah selaras dengan penggunaannya sebagai agen pengguguran. Sebaliknya, pemberian ekstrak air dan etanol (250 mg/kg berat badan; 30 hari) daripada bunga Hibiscus rosa sinensis (Bunga raya) melalui mulut tiada kesan terhadap berat dan histologi organ-organ seks pada tikus jantan.

SUMMARY

The effects of two indigenous plants on the fertility of rats have been studied. Lepidagathis longifolia, also known as Penluruh, Serga dan Penggugur, has been found to reduce the litter size of rats if an aqueous extract (500 and 550 mg/kg body weight) of its roots is administered orally for 10 days post-coitum. This finding is consistent with its alleged used as an abortifacient. In contrast, the oral administration of aqueous and ethanol extracts (250 mg/kg body weight; 30 days) of Hibiscus rosa sinensis flowers (Bunga raya) has no effect on the weight and histology of the sex organs of male rats.

INTRODUCTION

Many of our indigenous plants have long been reputed to possess medicinal properties, although such claims have not been verified experimentally. It was only recently that some attempts have been made to confirm or refute these claims. Thus, as part of a long-term evaluation of potential antifertility plants, we have conducted some studies on the effects of *Lepidagathis longifolia* Wight and *Hibiscus rosa sinensis* Linn. on the fertility of rats. The former is a fairly common lowland shrub of the Acanthaceae family, and is also known vernacularly as Penluruh, Serga or Penggugur. A water decoction of its roots has been known to be used for terminating early pregnancy (Burkhill, 1966), and our survey revealed that it is still being used for that purpose by the Orang Asli. Similarly, aqueous extracts of the *Hibiscus* flowers are believed to exert antifertility effects in females. This has not been substantiated here, although it has been reported elsewhere that alcoholic and benzene extracts of the flowers are anti-oestro-

genic (Kholkute and Udupa, 1976a), and disrupt implantation (Kholkute and Udupa, 1976b). Effects of the flower extracts on male reproduction are, however, unknown. Thus, in this study, we have examined this aspect in male rats, besides studying the effect of root extracts of *L. longifolia* on the fertility of the females.

MATERIALS AND METHODS

L. longifolia was collected from Forest Reserves at Air Hitam, Gombak, Ulu Langat and Pasoh. The roots were air dried in the shade, powdered, and a water extract was prepared by soxhlation. The extract was evaporated to dryness, and administered orally to rats as an aqueous suspension. Aqueous and ethanol extracts of *Hibiscus* were similarly prepared and administered.

For the studies on *L. longifolia*, female Sprague-Dawley rats (6 weeks old; 260 ± 20 g) showing at least two regular oestrus cycles, as determined by daily examination of vaginal

smears, were used. Females at pro-oestrus were housed overnight with adult males, and mating was ascertained the following morning by the presence of sperm in the vaginal smears. This was designated day 1 of pregnancy, and the plant extract was administered to groups of 7 pregnant rats, over periods of 5 and 10 days. Throughout these studies, the body weights of the rats were recorded to monitor possible toxicity. The effectiveness of the treatment was assessed in this preliminary study by the size of litters produced, compared with controls similarly treated with distilled water (Price, 1965)

In the case of studies with *H. r. sinensis*, 7-week-old male Sprague-Dawley rats weighing 284 ± 10 g body weight, and of proven fertility were fed aqueous and ethanol extracts (250 mg/kg body weight) for 30 consecutive days. This dose induces regressive histological changes in the reproductive organs of female rats (Kholkute *et al.*, 1976). Controls were similarly fed distilled water. The animals were killed after the last treatment, and the testes, epididymes, ventral prostate and seminal vesicles were excised, blotted and weighed. For histological studies, the testes and epididymes were fixed in Bouin's fluid for 24h, embedded in paraffin wax, sectioned at 6 μ m and stained in Harris hematoxylin-eosin.

Differences between means were tested by analysis of variance and least significant difference, and Student's *t* test.

RESULTS

Table 1 shows the effect of aqueous root extract of *L. longifolia* on the fertility of female rats. It is evident that when the extract was administered to pregnant rats for five days, no significant ($P > 0.05$) effect on litter size was observed, irrespective of the dosage. However, over a longer period of 10 days, a significant ($P < 0.05$) reduction in litter size was noted at high doses (500 and 550 mg/kg body weight). At the highest dose studied, 40% of the females did not deliver offspring. Additionally, a negative correlation ($r = -0.99$; $P < 0.05$) existed between dosage and litter size. No apparent toxicity was noted in both the adults and young.

In contrast, flower extracts of *Hibiscus* have no effect on the sex organ weights of male rats (Table 2). Histological studies also revealed that the testicular and epididymal tissues were unaffected by the extracts. In the testes, normal spermatogenesis occurred in all rats, irrespective of treatment: the height of the seminiferous

Table 1
Effect of aqueous root extract of *L. longifolia*
on litter size of rats.

Expt.	Dose (mg/kg body weight)	Duration (days)	Litter ⁺ size
I	0	5	8.6 ± 0.5
	100		8.8 ± 1.2
	150		7.0 ± 1.8
	250		7.0 ± 1.4
	500		7.7 ± 1.2
II	0	10	9.1 ± 0.6
	100		8.3 ± 0.1
	150		8.0 ± 0.6
	250		7.7 ± 0.5
	500		$6.3 \pm 1.3^*$
	500		$5.7 \pm 2.3^*$

⁺ each value represents mean \pm S.E.M. ($n = 7$);

* $P < 0.05$, compared to controls.

epithelium, and the diameter of the tubules were comparable with that of the controls. Similarly, the epididymis of the extract-treated animals exhibited normal histologic features.

DISCUSSION

The present screening of two indigenous plants for potential antifertility agents has yielded different results: while *L. longifolia* causes a reduction in the fertility of female rats, it is unlikely that *Hibiscus rosa sinensis* has an antifertility effect in the males, as adjudged by the insensitivity of the testis and accessory sex organs to the flower extracts. In the case of *L. longifolia*, a significant reduction in litter size was effected by administration of aqueous root extracts for 10 days post-coitum. However, the mechanism of this effect remains uncertain. In rats, four major reproductive processes could be disrupted by antifertility agents: ovulation, fertilization, tubal transport of fertilized ova, and implantation of the blastocyst. Of these processes, the first two occur shortly after oestrus, while tubal passage occurs during days 1 to 3 of pregnancy (McLaren, 1972), and implantation on late day 5 (Harper and Walpole, 1967). Since administration of the extract for five days was without effect on the fertility of the rats, it seemed unlikely that pre-implantation processes have been disrupted. The

ANTIFERTILITY EFFECTS OF TWO MALAYSIAN PLANTS

Table 2
Effect of administration of flower extracts of *H.r. sinensis* on body weight (BW)
and sex organs weight of male rats.

Treatment 250 mg/kg BW)	Final body Weight (BW; g)	Sex Organs Weight (g/100 g final BW)*			
		Testis	Epididymis	Ventral prostate	Seminal vesicle
1. Control	328.51 ± 8.22	0.99 ± 0.03	0.33 ± 0.02	0.19 ± 0.03	0.15 ± 0.03
2. Ethanol extract	344.42 ± 4.88	0.96 ± 0.02	0.32 ± 0.01	0.20 ± 0.02	0.11 ± 0.01
3. Aqueous extract	324.90 ± 8.62	1.03 ± 0.03	0.34 ± 0.02	0.18 ± 0.01	0.11 ± 0.02

*Each value represents mean ± S.E.M. (n = 5).

results suggest a post-implantation mechanism: administration of the extract for a period of 10 days, i.e., up to and after the occurrence of implantation (day 5), was necessary to secure a positive effect. Thus the aqueous extract acts as an abortifacient, and this is consistent with its use in humans. Further studies are needed to confirm this view.

The lack of effect of an aqueous (and alcoholic) extract of *Hibiscus* flowers on the reproductive organs of male rats indicates the unlikelihood of it containing antifertility agents affecting male reproduction. In female rats, extracts of the flowers, administered at the same dosage, reduced the weight of the ovary, uterus and pituitary, besides causing regressive histological changes (Kholkute *et al.*, 1976). Although it is possible that the active principle(s) might be extractable in organic solvents like benzene, such extracts are not consistent with local usage of the flowers. Studies with these extracts would, however, be useful.

ACKNOWLEDGEMENTS

This study was supported by a research grant (1705/3/061) from Universiti Pertanian Malaysia. The assistance of Encik Mohd. Nordin bin Kassim and Puan Soliah bte Hussin is gratefully acknowledged.

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(Received 14 October 1982)