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Exploratory behaviour of male rats treated with a crude extract of *Ficus tsiela* leaves

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Introduction: In Sri Lanka, herbal treatment is still widely used to suppress aggressive behaviour in elephants (*Elephas maximus maximus*). According to the mahouts at Pinnawala Elephant Orphanage and the National Zoological Gardens at Dehiwala, Sri Lanka, three types of plants are commonly used for this purpose: rhizomes of *Bambusa vulgaris*, aerial parts of *Tetracera sarmentosa* and leaves of *Ficus tsiela* Roxb (Family: Moraceae).

We initiated a programme of research to evaluate the sedative potential of these materials (using crude extracts). Among other effects, sedation is one possible mechanism for the suppression of aggressive behaviour in musth. Previous results with two of these plants, *Tetracera sarmentosa* and *Bambusa vulgaris*, have been reported [1, 2].

The aim of this study was to evaluate the sedative potential of leaves *Ficus tsiela*, the third variety that is claimed to suppress aggressive behaviour in musth.

Materials and methods: Fresh mature leaves of *Ficus tsiela* were plucked from a tree growing at the National Zoological Gardens, Dehiwala. They were cut into small pieces and 6.0 kg immersed in a methanol-dichloromethane (Petroleum Corporation, Colombo, Sri Lanka) (1:1, 5.0 L) solvent system and stored for 14 days at 30 ± 1°C to obtain a gummy and blackish crude extract (yield 2.1 g kg^{-1}). Traces of any organic solvents were removed by storing the crude extract *in vacuo* overnight at 30 ± 1°C.

The crude extract (10.0 g) and polyvinyl pyrrolidone (PVP) (Sigma Chemical Co., St. Louis, MO, USA) (15.0 g) were separately dissolved in methanol-dichloromethane (1:1, 100 mL each). The two resulting solutions were then mixed and concentrated under negative pressure at 30 ± 1°C to obtain a brownish PVP co-precipitate. Traces of any residual organic solvents were removed by storing the co-precipitate in *vaccuo* overnight at 30 ± 1°C. The co-precipitate was dissolved in distilled water for oral intubation to the experimental animals.

The experimental animals were Sprague Dawley male rats from our own colony (weight: 250 ± 20 g, age: 120–140 days). They were housed in groups, under standardised animal house conditions, with free access to pelleted food (Oils and Fats Co. Ltd., Siduwa, Sri Lanka) and tap water.

The sedative potential of the extract was evaluated using the rat hole-board technique described in detail by File and Wardrill [3]. Two doses were tested, using single acute gastric intubation: 1,000 mg kg^{-1} (n = 8) and 2,000 mg kg^{-1} (n = 8). Vehicle control used was 1,500 mg kg^{-1} PVP (n = 8). The extract and vehicle treated rats were placed singly in the centre of the hole-board (8.00–9.00 h), 30 min after its administration. Each rat was given a 7.5 min trial period, and the number of head dips, rears, and locomotory activity made during this period was assessed. The time spent for each dip then calculated.

The results are represented as means ± SEM. The data were sin-arc transformed and statistical comparisons between control and treated rats were made using Student's t-test. p values less than 0.05 were considered significant.

Table 1: Effects of Ficus tsiela *crude extract in rats, in a 7.5 min trial in the hole-board (means ± SEM).*

Treatment	Number of head dips	Time/dip (s)	Number of rears	Locomotory activity
Vehicle control (Polyvinyl pyrrolidone) 1,500 mg kg^{-1})	9.5 ± 3.3	1.5 ± 0.31	19.1 ± 4.3	14.6 ± 3.4
Crude extract 1,000 mg kg^{-1}	8.2 ± 3.9	0.9 ± 0.3	22.5 ± 7.9	14.3 ± 4.3
2,000 mg kg^{-1}	4.8 ± 0.6	2.0 ± 0.4	9.5 ± 2.4	8.3 ± 2.4

Results: The results are summarised in Table 1. Lower dose of the extract (1,000 mg kg^{-1}) did not cause marked changes in any of the exploratory parameters examined. The higher dose, on the other hand, induced marked reductions in 3 of the 4 parameters: number of head dips (by 49.2%); number of rears (by 50.3%) and locomotor activity (by 43.0%). However, these impairments did not reach statistical significance even after the data was sin-arc transformed.

Discussion: As in our previous studies [1, 2], we used the rat hole-board technique to evaluate the sedative potential of the leaf extract of *Ficus tsiela*. This technique has been used to investigate the sedative activity of both synthetic [4] and natural products [5, 6]. It is claimed to be a remarkably sensitive and selective method for this purpose [4, 7].

According to the results of this study, the leaf extract of *Ficus tsiela* has only mild sedative activity; since none of the parameters of exploratory behaviour was significantly reduced, although these were impaired by 43–50%. Moreover, even these impairments were evident only at a high concentration (2,000 mg kg^{-1}). On the other hand, the sedative activity of *Bambusa vulgaris* rhizomes was extremely potent [2] and *Tetracera sarmentosa* had virtually no activity [1].

If the present result is applicable to elephants, then it appears that *Ficus tsiela* is unlikely to impair aggression at musth via a sedative mechanism. However, it is always possible that *Ficus tsiela* can inhibit aggression via some other mechanism, perhaps by inhibiting and/or activating some nerve centre: frequent prodding of nerve centres with a cold or a hot ankus is a method used to control aggression at musth [8]. Alternatively, it is possible that *Ficus tsiela* reduces the testosterone level in blood: a sharp rise in blood testosterone level has been reported in elephants at musth [7, 8]. Obviously, further experiments are needed to confirm or refute these possibilities.

In conclusion, our results show that *Ficus tsiela* has only a mild sedative action when evaluated by the rat hole-board technique. Further, this study plus our previous findings [1, 2] indicate that *Bambusa vulgaris* possesses the most potent sedative activity amongst the three most popular plants given to elephants in Sri Lanka to regulate aggression at musth.