

*Short communication*

EFFICACY OF HERBAL ECTOPARASITICIDES IN CAPTIVE  
RAT SNAKES (*PTYAS MUCOSUS*) REARED IN INDIA

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**Summary**

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The efficacy of herbal extracts from the plants *Vitex negundo* and *Acorus calamus* against tick infestation in rat snakes (*Ptyas mucosus*) maintained under captivity was studied and compared to that of Ivermectin. A total of 6 rat snakes affected with heavy tick infestation were taken for the study. Investigation of ectoparasites in snakes under captivity showed abundance of *Aponomma sp.* ticks. The anti-parasitic treatments were conducted with ivermectin at the dose rate of 200 µg/kg body weight, applied subcutaneously (n=2) and with herbal preparation from *Vitex negundo* (n=2) and *Acorus calamus* (n=2) at the dose of 0.05% aqueous solution applied on the body. Number of ticks was counted on day 0, day 3, day 5 and day 7, respectively for comparison of drug efficacy in a 10×5 cm<sup>2</sup> area in four quadrants of the snake body (the fore quarter, the right and left abdomen and the tail part). It was concluded that in tick-infested rat snakes, herbal preparations from *Vitex negundo* (56.7%) and *Acorus calamus* (68.3%) showed no side effects but their efficacy did not reach that of Ivermectin (94.5%).

**Key words:** *Acorus calamus*, ectoparasites, Ivermectin, rat snake, *Vitex negundo*

Snakes (suborder Ophidia) harbour a variety of ecto- and endoparasites. It is well known that stress under captivity affects host-parasite relationship and then, certain parasites which are normally behaving as commensals can indeed become pathogens affecting the survival of the host species. Under captivity, confinement of reptiles to small areas contributes to increased parasite load especially of parasites with direct life cycle (Momin *et al.*, 1990). Rat snakes in the wild harbour

most of these parasites (Wallach & Bover, 1983; Mader, 1996). Tick infestations are common in captive reptiles (Marcus, 1981; Fowler, 1986) and may pose problems for the snakes in ecdysis. The potential ectoparasitic infection of reptiles can be heavy and quite varied.

Reports on ectoparasitic drug trials in snakes under captivity are few. A wide variety of anthelmintics have been employed, but their efficacy has been assessed only rarely as their clinical use in

reptilian patients may have many toxic side effects. The present study investigates for the first time the comparative efficacy of ectoparasitic drugs, Ivermectin and herbal preparation of *Vitex negundo* and *Acorus calamus* (n=6) and without any untoward effects. The purpose of the study was to compare the efficacy of these ectoparasitic drugs and their side effects against tick infestation in rat snakes.

The study was carried out in Arignar Anna Zoological Park, Chennai-06, India. The study was conducted during the winter season from November 2006 to January 2007 under captive condition for a period of 3 months. Injectable form of Ivermectin by subcutaneous route was used at dose rate of 200 µg/kg body weight in 2 rat snakes. Herbal preparations from *Acorus calamus* and *Vitex negundo* were used as ectoparasitic agents in another 4 rat snakes. Leaves of *Vitex negundo* and rhizomes of *Acorus calamus* were shade dried and grounded to coarse powder in a grinder and subsequently subjected for purification, using petroleum ether in soxhlet apparatus. The extract collected at bottom of flask was dried in hot air oven at 55° C and 0.05% aqueous solution was prepared and used in this study.

The rat snakes used for this study were taken after thorough investigation of reptiles reared under captivity in the zoo. The investigation showed higher prevalence of *Aponomma* sp. tick infestation (Fig 1). The application of extracts was done by dipping the snakes in the solution for about 5–10 min. The drug effect was studied by counting the number of ticks in a 10×5 cm<sup>2</sup> area in four quadrants of the snake body (the fore quarter, the right and left abdomen and the tail part). The efficacies were compared and analysed.



**Fig. 1.** Tick infestation in a rat snake.

Applied herbal extracts showed lower efficacy compared to the commercial ectoparasiticide (Table 1). The subcutaneous injection of ivermectin resulted in efficacy of 94.5%, followed by external application of *Acorus calamus* (68.3%) and *Vitex negundo* (56.7%) extracts.

Bennett (1986) quoted that ivermectin acts by paralysis of parasites, in addition to the suppression of the reproductive processes and in case of ticks, egg production and molting. The usage of ivermectin as an ectoparasiticide in snakes was recommended by Lawrence (1984) who opined on the successful usage of this chemically modified avermectin derivative in snakes, mainly effective in killing the feeding stages of the ticks and mites. It was particularly recommended that if dichlorvos-resistant ectoparasites were present, this could be considered as the treatment of choice. Though ivermectin was used in two rat snakes in this study, there was no untoward reaction subsequent to its usage. It is noteworthy to mention that usage of ivermectin was recommended in various species of reptiles (Campbell & Benz, 1984) but more

**Table 1.** Efficacy of Ivermectin, *Vitex negundo* and *Acorus calamus* herbal extracts against ticks in captive rat snakes at a zoological park.

		<i>Vitex Negundo</i> extract									
		Number of ticks, rat snake I				Number of ticks, rat snake II					
Body region		Day				Efficacy	Day				Efficacy
		0	3	5	7		0	3	5	7	
Abdomen	Right	10	9	6	5	50.0%	16	12	9	7	56.3%
	Left	16	11	9	7	56.3%	22	16	11	9	59.1%
Fore Quarter		6	5	3	2	66.7%	12	9	7	5	58.3%
Tail		4	4	2	2	50.0%	7	4	3	3	57.1%
Total		36	29	20	16	55.7%	57	41	30	24	57.7%
Mean efficacy		56.7%									
		<i>Acorus calamus</i> extract									
		Number of ticks, rat snake III				Number of ticks, rat snake IV					
Body region		Day				Efficacy	Day				Efficacy
		0	3	5	7		0	3	5	7	
Abdomen	Right	11	9	5	4	63.7%	14	10	7	4	71.4%
	Left	7	6	4	2	71.4%	16	11	8	5	68.8%
Fore Quarter		10	8	5	3	70.0%	11	9	5	4	63.6%
Tail		4	4	3	1	75.0%	8	7	4	3	62.5%
Total		32	27	17	10	70.0%	49	37	24	16	66.6%
Mean efficacy		68.3%									
		Ivermectin									
		Number of ticks, rat snake V				Number of ticks, rat snake VI					
Body region		Day				Efficacy	Day				Efficacy
		0	3	5	7		0	3	5	7	
Abdomen	Right	16	10	4	1	93.8%	17	11	7	2	88.2%
	Left	18	9	5	2	88.9%	18	10	4	1	94.4%
Fore Quarter		7	3	1	–	100.0%	10	6	3	1	90.0%
Tail		4	1	–	–	100.0%	7	5	2	–	100.0%
Total		45	23	10	3	95.7%	52	32	16	4	93.2%
Mean efficacy		94.5%									

caution is required in other reptilian members like chelonians (Lawrence, 1984).

The use of herbal medicines however, is on the increase because of the belief

that herbal remedies are safe due to their natural origin (Jacobsson *et al.*, 2009). No adverse side effects to the herbal mixture were observed in the snakes. Similar observations were also reported by other

authors (Wanzala *et al.*, 2012). The herbal extracts of the rhizomes of *Acorus calamus* and *Vitex negundo*, showed higher efficacy after application of *Acorus calamus*. However, it needs further study with increased sample size. Usage of plant preparation of *Acorus* sp. as carried out in this study was in agreement with the report of Lee *et al.* (2002) who stated that plants like *Acorus* sp. might be a potential alternative to currently used parasitic-control agents, because of their rich source of bioactive chemicals and insecticidal activities of asarones identified in rhizomes of *Acorus* sp. The utility of *Acorus calamus* rhizomes revealed in this study with snakes was recommended by Chopra *et al.* (1996) not only against ticks, but also lice, bugs etc. The insecticidal effects of *Acorus calamus* rhizomes was also quoted by Vaidyaratnam (1996). The aromatic oil prepared from these rhizomes has even germicidal properties (Sharma, 2001) and the tick infestation can be controlled through its repellent action (Karthickeyan & Gajendran, 2005). Fresh green leaves of plant preparations were used against ectoparasites in other animal species as the case with kuppaimeni (*Acalypha indica*) (Singh *et al.*, 2004).

The usage of *Vitex negundo* against infection with *Psoroptes* sp. mites was reported by Raman *et al.* (2004) who stated that mites disappeared completely in 120 hours after the application of *Vitex negundo* in petroleum ether. It was found to possess considerable larvicide properties against *Culex* sp. and *Anopheles* sp. (Pushpalatha & Muthukrishnan, 1995).

However, detailed studies on the application of herbal plant preparation are required in order to evaluate their exact mode of action, their effects on non-target organisms and the environment. It should be remembered that in addition to the treatment of snakes against ectoparasites,

the substrate in which the concerned serpentine species has been placed as an exhibit in zoos, zoological parks, zoological gardens or any reptilian places should also be either treated (or) preferably be changed with new substrate. Such management measures will be helpful in the prevention of recurrence of parasitic burden in serpentines or any other reptilian group.

The study concluded that Ivermectin had better efficacy when compared to herbal preparations *Vitex negundo* and *Acorus calamus* in rat snakes, which showed no side effects and are safer ethno-veterinary drugs under practice. A larger sample size could be useful for a detailed investigation. The present study was during winter season in India, hence a comparative study conducted during the summer season is highly recommended.

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#### REFERENCES

- Bennett, D. G., 1986. Clinical pharmacology of ivermectin. *Journal of American Veterinary Medical Association*, **189**, 100–104.
- Campbell, W. C. & G. W. Benz, 1984. Ivermectin: A review of efficacy and safety. *Journal of Veterinary Pharmacology and Therapeutics*, **71**, 1–16.
- Chopra, E. N., S. L. Neyer & E. C. Chopra, 1996. Glossary of Indian Medicinal Plants, 3<sup>rd</sup> Edn, New Delhi.
- Fowler, M. E., 1986. Zoo and Wild Animal Medicine, 2<sup>nd</sup> edn., W. B. Saunders Co, Philadelphia.

- Jacobsson, I., A. K. Jonsson., B. Greden & S. Hagg, 2009. Spontaneously reported adverse reactions in association with complementary and alternative medicine substances in Sweden. *Pharmacoepidemiology and Drug Safety*, **18**, 1039.
- Karthickeyan, S. M. K. & D. P. Gajendran, 2005. Indigenous technical know-how in the health care of domestic animals. *Indian Journal of Traditional Knowledge*, **4**, 462.
- Lawrence, K., 1984. Ivermectin as an ectoparasiticide in snakes. *The Veterinary Record*, **115**, 441–442.
- Lee, H. K., C. Pari & Y. J. Ahm, 2002. Insecticide activities of asarones identified in *Acorns gramineus* rhizome against *Nilaparvata lugens* (Homoptera: Delphacidae) and *Plutella xylostella* (Lepidoptera: Yponomeutidae). *Applied Entomology and Zoology*, **37**, 459–464.
- Mader, D. R., 1996. Parasitology. *Reptile Medicine and Surgery*, W. B. Saunders Co Publications, London.
- Marcus, L. C., 1981. Parasites of reptiles. In: *Veterinary Biology and Medicine of Captive Amphibians and Reptiles*, Lea and Febiger, London.
- Momin, R. R., D. K. Pethkar & R. H. Sahapura, 1990. Parasites of reptiles. *Zoos' Print*, **5**, 20–24.
- Pusphalatha, E. & I. Muthukrishnan, 1995. Larvicidal activity of few plant extracts against *Culex quinquefasciatus* and *Anopheles stephensi*. *Indian Journal of Malaria*, **32**, 14–23.
- Raman, M., D. Anandhaprakash., M. Elaiyabharathi, M. Ashok Kumar, M. Sasikala & V. Ramesh Saravanakumar, 2004. Activity of *Vitex negundo* Linn. against natural *Psoroptes cuniculi* infestation in white giant broiler rabbit. *Journal of Parasitology*, **18**, 155–158.
- Sharma, R. P., 2001. Handbook of Agriculture. ICAR Publication New Delhi.
- Singh, D. P. R., M. Raman., V. Saradha., P. Jayabharathi & V. R. S. Kumar, 2004. Acaricidal property of kuppaimeni (*Acalypha indica*) against natural *Psoroptes cuniculi* infestation in broiler rabbits. *Indian Journal of Animal Science*, **74**, 1003–1006.
- Vaidyaratnam, P. S., 1996. Indian Medicinal Plants, Madras, Orient Longman Publications.
- Wallach, J. D. & W. J. Boever, 1983. Reptiles. In: *Diseases of Exotic Animals Medical and Surgical Management*, W. B.S aunders Co, Philadelphia.
- Wanzala, W., W. Takken., W. R. Mukabana, A. O. Pala & A. Hassanali, 2012. Ethno-knowledge of Bukusu community on livestock tick prevention and control in Bungoma district, Western Kenya. *Journal of Ethnopharmacology*, **140**, 298.

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