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## Synthetic pyrethroids and Amitraz resistance in *Hyalomma anatolicum* ticks of Sirsa district, Haryana

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### Abstract

Acaricides resistance in *Hyalomma anatolicum* ticks collected from a Gaushala in Sirsa district, Haryana was investigated. FAO recommended adult immersion test (AID) was carried out using different concentrations of commercially available cypermethrin, deltamethrin, Amitraz and fipronil following 10 minutes' immersion time and 14 days' observation protocol. Probit analysis of the data revealed LC<sub>50</sub> and LC<sub>95</sub> to be 53.70ppm and 501.18 ppm for deltamethrin; 303.39 ppm and 3467.37 ppm for cypermethrin and 1602.83 ppm and 5574.42 ppm for Amitraz, respectively. There was complete inhibition of egg laying in ticks exposed to varied doses of fipronil, the lowest dose being 15ppm. The results indicated the emergence of acaricides resistance against cypermethrin, deltamethrin and Amitraz while fipronil was found to be highly effective in control of *H. anatolicum* ticks.

**Keywords:** Acaricide resistance, synthetic pyrethroids, Amitraz, fipronil, Haryana, *Hyalomma anatolicum*,

### Introduction

Tick and tick borne diseases such as theileriosis, babesiosis and Anaplasmosis pose a constant threat to the cattle health. There are more than 106 species of ticks reported from India [6, 12]. *Rhipicephalus (Boophilus) microplus* and *Hyalomma anatolicum* are the most commonly found cattle tick species in Haryana [1]. *Rhipicephalus (Boophilus) microplus* is widely studied by tick researchers due to its high prevalence, extensive disease transmission potential, wider distribution and carpeting nature on animal body. In comparison, *Hyalomma* ticks in India are mainly prevalent in dry regions with extremes of temperatures [5]. In India, 8 species of *Hyalomma* viz. *H. anatolicum*, *H. detritum*, *H. dromedarii*, *H. brevipunctata*, *H. issaci*, *H. hussaini*, *H. kumari* and *H. turanicum* were reported to be distributed in 24 states of India [7]. The *Hyalomma* ticks are of high economic importance in a state like Haryana because of high transmission potential of bovine tropical theileriosis in cattle [11]. Acaricide control of ticks forms the mainstay for preventing theileriosis outbreaks in cattle. An alarming situation on Acaricide resistance is already emerging globally and well reported from Haryana [14,4]. The present study aims at determination of Acaricide resistance status in *H. anatolicum* ticks collected from Sirsa district of Haryana.

### Material and method

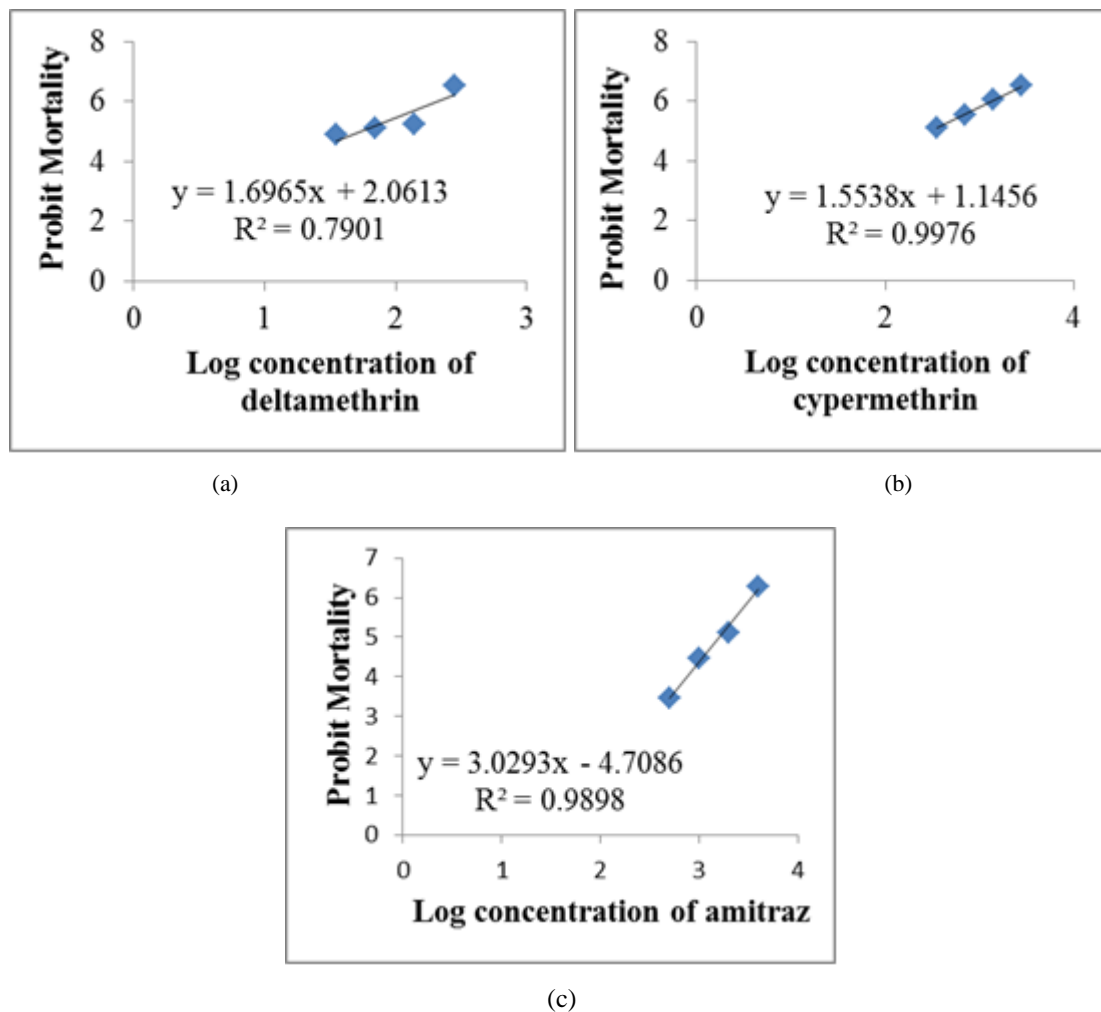
Live adult female engorged *Hyalomma anatolicum* ticks were collected from a Gaushala located at Sirsa in Haryana. The commercially available preparation of deltamethrin (Butox 1.25% EC, Intervet) was used at the concentration of 35, 70, 140 and 280 ppm in distilled water. Other Acaricide used were cypermethrin (Ektomin 100 EC, Novartis), Amitraz (Taktic 12.5% EC, Intervet) and fipronil (Protektor 0.25%, Cipla) at concentration of 350, 700, 1400 and 2800ppm; 500, 1000, 2000 and 4000ppm; and 5, 10, 20 and 40ppm, respectively, prepared in distilled water. Laboratory standardized adult immersion test (AIT) was employed at different concentrations of deltamethrin (FAO 2004) following 10 minute protocol and 14 days as observation period [8]. Ticks were placed in BOD incubator at 28 ± 2°C and 85 ± 5% relative humidity over a period of 14 days. Dose response data was analysed by probit method [3] using Microsoft excel software. Line regression curve of adult mortality is plotted against various values of drug concentration to determine LC<sub>50</sub> and LC<sub>95</sub> values of respective acaricides.

### Result & Discussion

Probit analysis of the data revealed LC<sub>50</sub> and LC<sub>95</sub> to be 53.70 ppm and 501.18 ppm against

deltamethrin; 303.39 ppm and 3467.37 ppm against cypermethrin and 1602.83 ppm and 5574.42 ppm against amitraz, respectively (Figure 1). There is complete inhibition of egg laying and thereby mortality in ticks exposed to varied doses of fipronil. Slope value is very high in Amitraz indicating greater mortality in ticks per unit change in concentration. The goodness of fit estimations were ranging from 0.79 to 0.99, indicating heterogeneity in field ticks. The manufacturer recommended dosage for deltamethrin, cypermethrin, Amitraz and fipronil are 25ppm, 200ppm, 250ppm and 5ppm, respectively. Country specific discriminating dose (DC) is not available for *H. anatolicum* using adult immersion test (AIT) for India. However, DC for *Rhipicephalus (Boophilus) microplus* is 59.2 ppm, 698.2 ppm, 975.4 ppm and 12.40 ppm for deltamethrin, cypermethrin,

Amitraz and fipronil [13, 10, 9]. The DC calculated for *H. anatolicum* using larval packet test (LPT) was 71.0 ppm and 701.4 ppm for technical grade deltamethrin and cypermethrin drugs [15]. Earlier, Shyma *et al.* [14] reported susceptibility of Hisar isolates and Acaricide resistance in Fatehabad isolates of *H. anatolicum* against synthetic pyrethroids commonly used in Haryana using larval packet test. In a recent study, synthetic pyrethroid and Amitraz resistance was also reported in *H. anatolicum* collected from Banaskantha district of Gujarat [16]. Comparison of LC95 of results with the recommended dosage and DC indicates towards resistance against synthetic pyrethroids and amitraz. Fipronil was found to be most effective drug for control of ticks in the present study.



**Fig 1:** Dose response curve of *Hyalomma anatolicum* collected from Sirsa against (a) deltamethrin, (b) cypermethrin and (c) Amitraz using Adult Immersion Test (AIT)

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