Antifeedant and repellent properties of Chaste tree, *Vitex negundo* and Goat weed, *Ageratum conyzoides* against Tea mosquito bug, *Helopeltis theivora* Waterhouse

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ABSTRACT

Both the plant extracts with chloroform gave the highest antifeedant property and repellency. The spots produced by two nymphs (179.50) within 24 hours were reduced to (20.25-28.50 & 27.50-37.50) with chloroform extracts of *V. negundo* and *A. conyzoides* at 5.0-1.0% concentrations, respectively. The other two solvent extracts gave significant results. Likewise, the repellency was observed and found that *V. negundo* with chloroform resulted the highest repellency (100%) followed by petroleum ether and methanol extracts of the same order. The other plant extracts too showed significant repellent effect compared to control.

Key words: *Ageratum conyzoides*, *Helopeltis theivora*, Plant extracts, *Vitex negundo*.

The tea mosquito bug, *Helopeltis theivora* Waterhouse (Hemiptera: Miridae) is a very serious pest of tea in North east India which can cause more than 50% damage to pluckable shoots (Deka *et al.*, 2013). Both Nymphs and adults of this pest are harmful and remain active from April to November. Its control with conventional pesticides is costly. Besides, the toxic residues of chemicals remaining on the tea shoots cannot be completely eliminated. Preliminary observations indicated repelling and antifeedant effects of the extracts of few indigenous plants on the behaviour of few tea insect pests (Deka *et al.*, 1998). So, the investigation aims at studying the antifeedant and repellent effect of two indigenous plants against tea mosquito bug.

Materials and Methods

Leaves and tender shoots of *Vitex negundo* and *Ageratum conyzoides* were collected locally around Jorhat. The plants materials were cut into small pieces and were dried in oven at 60°C, then powdered to 60 mesh. The dried powder (750 g) was then soxhletted for 72 hrs. with petroleum ether and the aliquot obtained was dried in partial vacuum. The same was mixed with water to get required concentration. 5.0, 4.0, 2.0, 1.5 and 1.0 g aliquots were mixed separately in 100 ml of water to form 5.0, 4.0, 2.0, 1.5 and 1.0% concentrations of petroleum ether extract. Triton x was used as emulsifier by mixing 0.5 ml/100 ml water as the extracts were partially soluble in water. The methanol and chloroform extracts were obtained as per the procedure used as above.

The shoots of TVI were sprayed with the extracts and shoots kept as control were sprayed with water containing 1% Triton X, air dried for 5 min. then kept inside lantern chimney, one end of which was covered by a piece of muslin cloth and secured by a rubber band. Two 1st instar nymphs of *H. theivora* starved for 6 hrs were released inside these chimneys in the laboratory (28±4°C & 80-95 % RH), replicated 6 times. The nymphs were

allowed to feed on the leaves for 3 days and the number of spots developed by the nymphs in each replication was counted after 24, 48 and 72 hrs. To explore the repellent effect, shoots treated with concentration of extracts were randomly placed in a circle on a glass plate at equal distance. Fifty nymphs starved for 6 hrs. were released in the centre and the plate covered with a beljar. The nymphs were allowed to feed on the shoots for 4 hrs. The data on the number of nymphs reaching each treated shoots and the spots produced were recorded thereafter.

Results and Discussion

It is evident that both *V. negundo* and *A. conyzoides* have good antifeedant and repellent properties. Table 1 shows that 5.0% concentration of chloroform extract of *V. negundo* after 24 hrs of treatment gave excellent results in terms of number of spots and showed better results than petroleum ether and methanol plant extracts. Chloroform extracts of both the plants were found to be the best of all the solvents extracts. Singh *et al.* (2011) reported 100% mortality was recorded in hexane, chloroform, ethylacetate and acetone extracts of *Acorus calamus.* The spots produced in chloroform extracts at 5.0% of *V. negundo* were 20.25 which were high significantly less than those at lower concentrations and the control treatments after 24 hrs. The number of spots increased after 48 and 72 hrs exposure (Chandel *et al.,* 2009). The number of spots after 24, 48 and 72 hrs. of petroleum ether and methanol extracts of *V. negundo* at 5% were 22.25, 35.50 and 50.00 and 25.50, 39.32 and 55.57, respectively., whereas the number of spots in untreated control were 170.55, 389.50 and 613.50 and 164.35, 375.28 and 607.54 ,respectively. It revealed that *A. conyzoides* possessed good antifeedant property in all the solvents (Table 1). At lowest dose minimum

Table 1. Antifeedant activity of solvent extracts of *Vitex negundo* and *Ageratum conyzoides* on *Helopeltis theivora.*

Treatments	Conc. (%)	Chloroform Number of spots after			Petroleum ether Number of spots after			Methanol Number of spots after		
		24 hrs	48 hrs	72 hrs	24 hrs	48 hrs	72 hrs	24 hrs	48 hrs	72 hrs
Vitex negundo	5.0	20.25	31.50	47.50	22.25	35.50	50.00	25.50	39.32	55.57
	4.0	21.95	33.25	50.00	24.00	37.75	52.50	28.00	42.00	57.32
	3.0	24.05	34.50	52.50	25.75	39.25	54.25	29.50	43.27	59.33
	2.0	25.75	37.00	55.00	27.18	42.00	56.50	31.24	45.24	62.54
	1.5	27.00	38.50	56.50	29.24	43.45	58.14	33.50	47.22	64.78
	1.0	28.50	40.25	59.00	31.25	45.50	59.75	35.15	49.15	66.51
Water + Triton X	0.0	165.50	399.50	620.50	170.55	389.50	613.50	164.35	375.28	607.54
C.D. (P=0.01)		6.75	9.33	18.50	7.50	10.54	19.33	7.55	9.86	16.70
A. conyzoides	5.0	27.50	36.25	53.25	26.22	39.25	54.55	29.67	43.25	59.12
	4.0	29.00	38.50	54.75	27.50	42.30	56.35	32.25	44.75	61.50
	3.0	31.25	41.75	56.25	29.00	45.00	58.50	34.50	46.85	63.25
	2.0	34.25	44.00	58.50	30.50	46.50	60.00	36.55	48.25	65.75
	1.5	35.75	46.25	60.25	32.15	48.25	61.50	38.25	50.15	67.25
	1.0	37.50	47.50	63.00	34.23	49.50	63.50	40.20	52.13	69.15
Water + Triton X	0.0	165.50	399.50	620.50	160.50	375.67	613.23	164.35	375.28	607.54
C.D. (P=0.01)		7.50	10.25	22.50	8.55	11.35	9.88	6.99	9.65	15.34

Table 2. Repellent activity of solvent extracts of *Vitex negundo* and *Ageratum conyzoides* on *Helopeltis theivora.*

Treatments	Conc. (%)	Chloroform			Petroleum ether			Methanol		
		No. of nymph reaching the treated surface	Mean no. of spots	No. of spots/ nymph	No. of nymph reaching the treated surface	Mean no. of spots	No. of spots/ nymph	No. of nymph reaching the treated surface	Mean no. of spots	No. of spots/ nymph
Vitex negundo	5.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.0	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.50	0.67
	3.0	0.70	0.00	0.00	1.00	0.50	0.50	1.50	1.00	0.67
	2.0	1.25	0.50	0.4	2.25	1.75	0.78	2.50	2.00	0.80
	1.5	2.00	1.50	0.75	3.20	3.00	0.94	3.75	3.25	0.87
	1.0	2.50	2.00	0.80	3.75	4.10	1.09	4.50	4.10	0.91
Water + Triton X	0.0	40.00	534.50	13.36	38.25	496.77	12.99	35.25	455.34	12.92
C.D. (P=0.01)		1.51	9.55	-	1.63	8.67	-	12.23	9.87	-
A. conyzoides	5.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4.0	0.50	0.50	1.00	0.75	0.50	0.67	1.00	0.75	0.75
	3.0	1.50	2.00	1.33	1.75	1.50	0.86	2.10	1.10	0.52
	2.0	2.50	4.00	1.60	3.00	2.75	0.92	3.00	2.50	0.83
	1.5	3.50	6.50	1.86	4.25	4.15	0.98	4.50	3.75	0.83
	1.0	5.25	10.75	2.04	6.75	7.25	1.16	7.21	6.50	0.90
Water + Triton X	0.0	34.75	520.55	14.97	32.45	475.23	14.64	30.45	435.55	14.30
C.D. (P=0.01)		2.10	17.50	-	2.33	9.87	-	11.33	12.36	-

antifeedant activity was found whereas it increased to 70.2 and 68.7% at highest dose of methanol extract of *Clerodendrum infortunatum* (Abbaszadeh *et al.,* 2011).

The repellent activity of *V. negundo* and *A. conyzoides* in all solvents was promising (Table 2). Both the plants at 5 per cent concentrations of chloroform extract showed the best results. But *V. negundo* proved to be better than *A. conyzoides*. The chloroform extracts at 5.0% of both the plants did not allow any insect to reach the treated shoots. The petroleum ether and methanol extracts of *V. negundo* also did not allow the entry of any insect to the treated surface and the number of spots produced by the nymphs was much less than the untreated control (Table 2).

The result of our experiment is in conformity with the result of Deka *et al.* (2013). They reported that many indigenous plants could be utilized for the management of tea insect pests. Panday *et al.* (2010) found that *C. inerme* extract could inhibit the feeding of *Helicoverpa armigera*. They tested the repellent and antifeedent properties of many indigenous plants and found that *C. inerme* and *P. orientale* could be effectively utilized in pest management. However, Arivudainambi and Baskaran (2004) found tree leaves of *Cleistanthus collinus* water extract had antifeedant and killing effect *in vitro* these management as both of these had antifeedant and repellent properties against crop pests. However, Patidar *et al.* (2014) reported higher mortality in ethanol extract of *Clerodendron* than water extract.

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