

Effect of Different Botanical Pesticides Against *Thrips tabaci* on Garlic Crop

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Abstract

An experiment was conducted to evaluate the efficacy of certain biopesticides against Thrips tabaci on garlic during 2009/10 to 2010/11. Among the biopesticides, kalmegh (Andrographis paniculata) decoction was more effective against thrips (3.73–5.01 thrips per leaf) and the efficacy was similar to 0.03% dimethoate followed by lantana (Lantana camara), neem (Azadirachta indica), sickle senna (Cassia tora), sadaphuli (Catharanthus roseus), karanj (Pongamia pinnata), and arka (Calotropis gigantea). All the treatments significantly increased the yield of garlic over control but the highest yields were obtained in dimethoate (98.07 q ha⁻¹) treatment and kalmegh decoction spray (98.04 q ha⁻¹). The yield in control plot was 89.99 q ha⁻¹. Botanical pesticides enhanced the shelf life by three weeks in comparison to control and dimethoate (0.03%) treated plots.

Garlic (*Allium sativum*) is an important spice crop mainly cultivated in Hadoti region of Rajasthan as it is a more profitable rabi (postrainy season) crop. The pest *Thrips tabaci* is responsible for curling of leaves, low yield, and poor quality of bulbs. Leaf curling reduces the activity of photosynthesis and thus reduces the crop yield. Foliar application of some insecticides has been recommended against this pest on garlic (Bharadwaj *et al.*, 1990; Mittal and Butani, 1994; Butani and Kapadia, 1999).

India is the third largest consumer of pesticides in the world and highest among the South Asian countries. Insecticides account for 60% of total pesticides consumed in India, out of which natural pesticides (including botanicals) consumption is a

meager 2% (Agnihotri, 2000). Botanicals are now emerging as a viable component of integrated pest management (IPM) strategies for all crops due to their efficacy to managing pest, environmental and public health safety, ecofriendly nature, and cost-effectiveness. Botanical pest control is a distinct possibility in subtropical countries, which are endowed with the biodiversity of such plants. The repeated application of synthetic insecticides has resulted in development of insecticide resistance in pest populations (Natarajan and Chidambaram, 1986; Mahrotra and Phokela, 1992). Some plant products have pesticide properties against sucking pests (Parmar, 1995; Schmutterer and Singh, 1995; Haris, 2001; Sharma, 2007). In view of this, an attempt

was made to determine the comparative toxicity of extracts of seven locally available plants against garlic thrips.

Materials and methods

The study was conducted during 2009/10 and 2010/11 using plant origin insecticides in the form of decoction. The plants tested were *kalmegh* (*Andrographis paniculata*), *arka* (*Calotropis gigantea*), *sadaphuli* (*Catharanthus roseus*), lantana (*Lantana camara*), sickle senna (*Cassia tora*), neem (*Azadirachta indica*), and *karanj* (*Pongamia pinnata*). Decoction of each plant species was prepared by mixing 1 kg fresh leaves with 5 L of cow urine in an earthen pot. The pot was then buried in the soil for 3 weeks. It was then taken out and the cow urine and leaves of different plants were mixed thoroughly and poured in a copper pot. The mixture was cooked in the copper pot till the volume reduced to one-fourth (1.25 L). It was then filtered and the decoction was stored in a colored glass bottle in dark. The decoction was diluted (1 ml decoction per liter water) for spraying on garlic plants one month after sowing. Besides the seven biopesticides, 0.03% dimethoate was sprayed for comparison and water was used as control. The experiment

was carried out in randomized block design with three replications per treatment. The spray solution was prepared initially by mixing required quantity of the biopesticide or pesticide thoroughly in little quantity of water and then mixed with the total quantity of water required for spraying. The quantity of water required for preparing the spray material was worked out by spraying on garlic plants in the control plot. Plants were sprayed with biopesticides in the evening using knapsack sprayer with hollow cone nozzle. The sprayer was washed thoroughly with clean water before and after each spray. Polythene cover was used to avoid possible drifting of spray material. Number of thrips was counted on three leaves (top, middle, and bottom) of each of five randomly selected plants from each plot before 24 hours, and after 48 and 96 hours of spraying. All the cultural operations were carried out as per schedule of crops. After harvesting the bulbs were stored in a ventilated room to determine shelf life of garlic bulb.

Results and discussion

All biopesticides had similar effect of control of thrips as dimethoate (0.03%) during 2009/10 and 2010/11. Among the biopesticides, *kalmegh* decoction was most effective against thrips. The lowest population of thrips was recorded 48 and 96 hours after spraying *kalmegh* decoction

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(5.01 and 3.73 thrips per leaf) followed by lantana (5.25 and 4.02 thrips per leaf), neem (5.42 and 4.15 thrips per leaf), sickle senna (5.48 and 4.24 thrips per leaf), *sadaphuli* (5.56 and 4.36 thrips per leaf), *karanj* (5.64 and 4.67 thrips per leaf), and *arka* (5.74 and 4.83 thrips per leaf) (Table 1). However, the lowest thrips population (5 and 3.72 thrips per leaf) was recorded in dimethoate (0.03%) spray plot. Our findings are in conformity with those of Vekaria and Patel (2000) and Chandel *et al.* (2006) who reported significant results with certain plant products for the control of bugs, beetles, and aphids.

Among the biopesticides, highest yield was obtained in *kalmegh* decoction treated plot (98.04 q ha⁻¹). All the treatments significantly increased the yield over control but the highest yield was obtained in dimethoate (0.03%) treatment (98.07 q

ha⁻¹) which was similar to that with *kalmegh* decoction spray. The yield in control plot was 89.99 q ha⁻¹. The data also revealed that there was 1.92% to 8.94% increase in yield over control due to the use of biopesticides. Mandal *et al.* (2008) reported 16.91% to 27.07% increase in yield of cotton over control due to the use of biopesticides. The leaves of thrips-infected garlic plants were curled, which reduced the photosynthetic activities of the plants resulting in low yield. The shelf life and weight of garlic bulb increased with the use of all biopesticides (Table 2). Botanical pesticides enhanced the shelf life by three weeks in comparison to control and dimethoate (0.03%) treated plot.

Among the biopesticides, highest yield was obtained in kalmegh decoction treated plot (98.04 q ha⁻¹).

Table1. Effect of spraying biopesticides on thrips population on garlic crop.

Treatment	No. of thrips per leaf								
	Before spray			After 48 hours			After 96 hours		
	2009/10	2010/11	Average	2009/10	2010/11	Average	2009/10	2010/11	Average
Neem	18.75	27.32	23.03	4.87	5.97	5.42	3.87	4.43	4.15
Lantana	20.21	26.42	23.31	4.69	5.82	5.25	3.71	4.33	4.02
<i>Sadaphuli</i>	19.34	26.41	22.87	4.98	6.15	5.56	4.04	4.69	4.36
<i>Kalmegh</i>	17.55	25.75	21.65	4.32	5.71	5.01	3.21	4.26	3.73
Sickle senna	19.31	26.53	22.92	4.95	6.01	5.48	3.92	4.57	4.24
<i>Arka</i>	19.42	27.11	23.26	5.15	6.34	5.74	4.55	5.11	4.83
<i>Karanj</i>	19.33	27.01	23.12	5.02	6.27	5.64	4.46	4.89	4.67
Dimethoate	19.59	26.98	23.28	4.31	5.69	5.00	3.18	4.26	3.72
Control	18.99	28.37	23.68	20.01	30.21	25.11	22.35	31.89	27.12
CD at 5%	0.081	0.034	0.071	0.049	0.054	0.047	0.068	0.654	0.068
CV (%)	2.121	2.150	2.462	2.431	2.348	2.168	4.048	4.351	4.235

Table 2. Effect of biopesticides on growth and yield of garlic.

Treatment	Bulb weight (g)			Yield (q ha ⁻¹)			Shelf life (weeks)		
	2009/10	2010/11	Average	2009/10	2010/11	Average	2009/10	2010/11	Average
Neem	34.50	34.30	34.40	96.11	95.94	96.02	26.11	26.13	26.12
Lantana	37.20	36.90	37.05	98.32	97.02	97.67	26.70	26.46	26.58
<i>Sadaphuli</i>	35.30	35.20	35.25	95.44	95.11	95.27	26.32	26.44	26.38
<i>Kalmegh</i>	38.40	38.30	38.35	98.75	97.34	98.04	26.31	26.32	26.31
Sickle senna	34.30	34.10	34.20	96.04	95.38	95.71	25.31	25.41	25.36
<i>Arka</i>	23.90	23.70	23.80	92.47	91.05	91.76	24.32	24.11	24.21
<i>Karanj</i>	30.00	29.70	29.85	94.46	94.13	94.29	25.42	25.32	25.37
Dimethoate	39.10	38.50	38.80	98.78	97.36	98.07	24.21	23.87	24.04
Control	22.10	20.16	21.13	90.13	89.86	89.99	24.12	23.10	23.61
CD at 5%	0.896	0.693	0.781	0.895	0.985	0.961	NS ¹	NS	NS
CV (%)	4.964	5.012	4.984	5.214	5.132	5.436	–	–	–

1. NS = Not significant.

References

- Agnihotri NP.** 2000. Pesticide consumption in agriculture in India – an update. *Pesticide Research Journal* 12:150–155.
- Bharadwaj BS, Gupta RP, Srivastava PK, and Srivastava JK.** 1990. Effect of different systemic and non-systemic insecticides on the control of garlic thrips. In: Annual Report. Associated Agricultural Development Foundation, Nasik, India. pp. 126–127.
- Butani PG and Kapadia MN.** 1999. Comparative efficacy of granular and EC formulated insecticides for the economic control of *Thrips tabaci* Lindeman in garlic crop. *GAU Research Journal* 25(1):68–72.
- Chandel BS, Gupta R, and Dubey R.** 2006. Comparative aphicidal activity of certain plant extracts against green peach aphid *Myzus persicae* Sulz. (Aphididae: Hemiptera) on mustard crop. *Indian Journal of Entomology* 68(3):260–264.
- Haris SM.** 2001. Comparative studies on the efficacy of certain biocides in management of insects. MPhil dissertation, AO Research Institute, AO Foundation, Davos, Switzerland.
- Mahrotra KN and Phokela A.** 1992. Pyrethroid resistance in *Heliothis armigera* Hub. V. Response of population in Punjab cotton. *Pesticide Research Journal* 4:59–61.
- Mandal S, Patel AM, and Patel CC.** 2008. Efficacy of certain commercially available biopesticides against boll worm of cotton. *Indian Journal of Applied Entomology* 22(2):128–130.
- Mittal VP and Butani PG.** 1994. Insecticidal control of garlic thrips (*Thrips tabaci* Lind.) under Gujarat conditions. In: Bioecology and Control of Insect Pests: Proceedings of the National Symposium on Growth Development and Control of Insect Pests. Uttar Pradesh Zoological Society, Muzaffarnagar, India. pp. 161–169.

Natarajan K and **Chidambaram P.** 1986. Resurgence of sucking pests and foliar diseases. Presented at the biennial workshop of the AICCIP held at Hyderabad from 21 to 24 January 1986.

Parmar BS. 1995. Results with commercial neem formulations produced in India. In: *The Neem Tree: Source of Unique National Products for Integrated Pest Management, Medicine, Industry and Other Purposes* (Schmutterer H, ed.). VCH, New York, USA. pp. 435–469.

Schmutterer H and **Singh RP.** 1995. List of insect pests susceptible to neem products. In: *The Neem Tree: Source of Unique National Products*

for Integrated Pest Management, Medicine, Industry and Other Purposes (Schmutterer H, ed.). Wiley, VCH, New York, USA. pp. 326–365.

Sharma T. 2007. Toxic effect of neem (*Azadirachta indica*) extracts against *Mylabris phalerata* Pallas (Coleoptera: Meloidae) adult under laboratory conditions. *Indian Journal of Entomology* 69(2):174–177.

Vekaria MV and **Patel GM.** 2000. Bioefficacy of botanicals and certain chemical insecticides and their combination against the mustard aphid, *Lipaphis erysimi* Kalt. *Indian Journal of Entomology* 62(2):150–158.