Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; 8(4): 3143-3145
Received: 28-05-2019
Accepted: 30-06-2019

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Management of chilli thrips *Scirtothrips dorsalis* Hood in Krishna district of Andhra Pradesh

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Abstract
On farm trials in ten locations were conducted to evaluate the efficacy of management strategies against chilli thrips [*Scirtothrips dorsalis*] with emphasis on cultural practices, timely observation of the pest incidence, use of granular insecticides to avoid effect on natural enemy fauna in the crop ecosystem and proper use of different groups of insecticides so that even with repeated use of insecticides having different mode of action, the pest may not develop resistance against particular group of insecticides besides achieving proper management and to create awareness among the farming community during rabi, 2014-15 to 2016-17 in the farmer's fields in Krishna District of Andhra Pradesh. In chillies, thrips cause upward leaf curling typically called 'murda disease" and cause severe losses. By adoption of IPM practices in all the three years, thrips damage was reduced on an average by 9.5 per cent compared to 16.0 per cent in farmers practice. This has resulted in reduction in the average cost of cultivation by Rs. 18225.67 per hectare and the average net income was improved by Rs. 59503 per hectare compared to the farmers practice. The average yield levels in the demonstration (140.68 qt/ha) improved by 14.92 per cent compared to farmers practice (123.04 qt/ha) giving a clear message that adoption of IPM practices with emphasis on cultural practices and use of different insecticides helped in reducing the pest levels, damage, improving yield and net income levels to the resource poor farmers.

Keywords: Chillies, thrips, IPM, yield and net income

Introduction
Chilli (*Capsicum annum* L.) is an important Solanaceous spice crop, grown extensively for both domestic and export market. It is mainly cultivated for its green fruits and for dry red chilli as the spice of commerce. It is a rich source of vitamins C, A and B. In India, it is an important cash crop. India is the largest producer of chillies in the world cultivating in 8.11 lakh ha with a production of 15.2 lakh tonnes of dry chillies and green chillies in 2.92 lakh ha with a production of 29.55 lakh tonnes in 2015-16. Andhra Pradesh is the largest producer of chilli in India. It contributes about 30% to the total area followed by Karnataka (20%), Maharashtra (15%), Orissa (9%) Tamil Nadu (8%) and cultivated in an area of 1.56 lakh ha with a production of 6.18 lakh tonnes and with 3.96 MT/ha productivity (Indian Horticulture Database, 2017). The extensive and intensive cultivation with very high use of inputs without proper crop rotation, poor crop management targeting solely on high yields has led to increase in pest and disease problems leading to severe crop losses. Problems *viz.*, insect pests including sucking pests, fungal and bacterial diseases in nursery and main field and vector transmitted viral diseases are major constraints hampering the realization of good yields in chillies.

Chilli is infested by a large number of insect and mite pests causing considerable damage to the plants. More than 39 genera and 51 species of insect and mite pests have been recorded attacking chilli leaves and fruits, but only a few of them cause serious damage to the crop. The crop is attacked regularly or sporadically by a few number of insect and mite pests of which thrips, *Scirtothrips dorsalis* Hood (Thripidae: Thysanoptera); Aphid, *Aphis gossypii* Glov.; whitefly, *Bemisia tabaci* Genn.; borers, *Spodoptera litura* Fab. and *Helicoverpa armigera* Hub.; gall midge, *Asphondylia capsici* Barnes and mite *Polyphagotarsonemus latus* (Banks) were considered as major pests of chilli (Hosmani 1993) [5]. Reddy and Puttaswamy (1984) [11] reported thirty five species of insects belonging to six orders and a species of each of mite and snail infesting chilli crop in nursery beds.

Among all, sucking pests constitute a major threat to chillies contributing severe loss from nursery till harvest of the crop. Thrips, *Scirtothrips dorsalis* Hood (Thripidae: Thysanoptera) is one of the most destructive pest of chilli and under severe infestation, the yield losses are severe. Patel and Khakri (1982) [9] observed that thrips alone is a major pest of chilli in south India.

Thrips with its lacerating mouthparts cause necrosis of tissues by extracting contents from the epidermal cells of plant. Both nymphs and adults suck the sap from tender plant parts, resulting in shrivelling of leaves, retarded shoot development and finally the leaves fall-off. In addition, in leaves, eruption of internal areas, puckering and upward curling is also noticed (Reddy and Puttaswamy, 1983) [10]. Thrips can be found along the mid vein or along the borders of damaged tissues. Infested leaves show crinkling, elongated petioles, development of brown or silvery areas between veins of both young and older leaves, feeding scars, distortion of leaf shape, reduction of leaf size and linear thickening of leaf lamina. Heavy infestation causes "chilli leaf curl" also called "Murda disease". Young buds become discoloured, distorted and brittle leading to early fall. Early infestation of thrips causes stunted growth of the plant, reduced flowering and fruit set. Infested fruits show development of corky and scarred tissue around the apex. Interveinal wrinkling and puckering of apical leaves coupled with chlorotic speckling, reduction of leaf size, drying of growing tips, followed by plant stunting were the common symptoms (Borah, 1987) [4]. Yield loss of green chilli due to thrips had been estimated to be 60.50 to 74.30 per cent. The yield loss caused by thrips and mites is estimated to be over 50 per cent in the event of serious infestation (Ahmed *et al*., 1987) [1]. Bhede *et al*. (2008) [3] reported 30-50 per cent crop loss by severe infestation of thrips and considered as the most destructive pest. It is reported to be a major pest of chilli in south India (Patel and Khatri, 1982) [9] causing 50% (Nelson and Natarajan, 1994) [8] and 60-74% yield loss (Narvaria, 2003) [7]. There is a need to manage this dreaded pest effectively and economically in chilli to realise potential yields.

Farmers continually apply insecticides to control this pest repeatedly but the effectiveness is less due to the fact that with complete reliance on the chemical pesticides right from the transplanting of the crop, the natural enemy fauna is completely eliminated from the crop ecosystem. The pest develops resistance and population rebound due to resurgence with the resultant severe crop loss coupled with high cost of cultivation. However, there is potential to check this pest and to increase production of chilli by adopting improved production practices and recommended plant protection measures at right time. Adoption of integrated crop management practices with emphasis on cultural practices has beneficial effect on improving the natural enemy population, which in turn keep the pest population in check.

Thus, an attempt was made to evaluate and popularise on the use of integrated management practices with emphasis on cultural practices for the management of chilli thrips in the farmers' fields.

Materials and methods

The present investigation was carried out in the farmers' fields of adopted villages of KVK, Ghantasala in Mopidevi mandal of Krishna district for three consecutive years from 2014-15 to 2016-17, where farmers cultivate chillies in large area during *rabi* season. On farm trials were conducted in 10 selected farmers' fields with an objective to evaluate the performance of integrated pest management practices with emphasis on cultural practices for management of chilli thrips so that the same package may be popularized among the farming community with less dependence on pesticides.

T1: IPM with emphasis on cultural practices

a. Seed treatment with imidacloprid @ 8 ml/kg seed
b. Application of fipronil 0.3% granules @ 80 gm/cent nursery
c. Use of blue sticky traps @ 20/acre
d. Planting of border crop around the field with jowar or maize in 4-6 row
e. Proper application of micronutrient (Zinc &Boron)
f. Soil application of fipronil 0.3 % granules @ 8 kg/acre twice at 15 DAT & 45 DAT
g. Spraying of neem oil @ 5 ml/lt or NSKE 5%
h. Spray fipronil 2 ml/lt or spinosad 0.3 ml/lt or diafenthiuron 1.5 gm/lt

T2: Farmers practices (Non IPM)

a. Use of only insecticides for management of chilli thrips (acephate 1.5 gm/lt, imidacloprid, acetamiprid / bio-products)

Each treatment was imposed in 0.4 ha with chillies VNR-145 and other hybrids. Recommended package of practices were followed for raising the crop. For monitoring and mass trapping of thrips adults blue sticky traps @ 20 were employed (supplied by Pheromone Chemicals, Hyderabad) placed at equal distance in the field. In the nursery, fipronil granules @ 80 gm/cent were applies for management of thrips. Other cultural practices were employed from nursery to harvesting of the crop. Around the field jowar was planted in 4-5 rows to avoid the spread of the adult sucking pests from the neighbouring fields. Fipronil 0.3% granules were applied @ 8 kg/acre at 15 DAT and 45 DAT. Micronutrients *viz*., zinc sulphate @ 20 kg/acre and boron @ 6kg/acre were applied basally to avoid incidence of micronutrient deficiencies. Insecticides *viz.,* acetamiprid, fipronil, diafenthiuron and spinosad were sprayed at recommended doses for management of thrips infestation and damage.

The data on the thrips incidence and damage was recorded from five randomly selected plants from each field leaving border rows. The percentage of damage to leaves was calculated by using the following formula. The fruit yield, cost of cultivation, net benefit and cost benefit ratios were calculated.

$$\text{Per cent infestation} = \frac{\text{Number of upward curled leaves}}{\text{Number of total leaves}} \times 100$$

Results and discussion

The results indicate (Table No. 1) that adoption of IPM practices with emphasis on cultural practices helped in reduction of pest population buildup and thereby reducing the leaf curl damage. Farmers prefer high yielding private hybrids for getting higher net returns, which are fast growing, fertilizer responsive and less tolerant to pest's infestation. In the IPM plots insecticides *viz.,* fipronil, spinosad and diafenthiuron were used for management of thrips as and when necessary and are found to be effective in reducing the damage by thrips. In 2014-15 in the IPM plot, the per cent leaf curl damage was 9.0 per cent while, in the farmers practice it was 16.5 per cent wherein only chemical insecticides were sprayed indiscriminately. In IPM plot, the yield was 150.75 q/ha with 8.16 per cent increase over farmers practices (139.38 q/ha). In 2015-16 in the IPM plot, the per cent leaf curl damage was 12 per cent while, in the farmers practice it was 18 per cent. In the IPM plot, the yield was 165.79 q/ha with a 17.4 percent increase over farmers practices (141.23 q/ha). In 2016-17 in the IPM plot, the per cent leaf curl damage was 7.5 per cent while, in the farmers

practice it was 13.5 per cent. In the IPM plot, the yield was 105.5 q/ha with a 19.2 per cent increase over farmers practices (88.5 q/ha). The results were in agreement with Vanisree *et al.* (2013) [12], who observed that spinosad 0.015 per cent was most effective in reducing the population of *S. dorsalis* as well as in increasing yields. It attains highest cost benefit ratio followed by diafenthiuron 0.045%, and fipronil 0.01%. Almeida (2013) [2] also found that spinosad 0.015 per cent was most effective in reducing the population of *S. dorsalis* as well as in increasing yields.

The cost of cultivation, average gross returns, average net returns and benefit cost ratios calculated in each year were presented in table no. 2 indicates that adoption of IPM practices with emphasis on cultural practices resulted in reduction of leaf curl damage, number of sprays of insecticides, thus reducing the cost of cultivation and improving the net income levels. In 2014-15, through adoption of IPM practice, the cost of cultivation was reduced by Rs. 10687.00 with an increase of Rs. 52507.00 in net returns compared to the farmers practice, the benefit cost ratio was 1.48 compared to 1.17 in farmers practice. In 2015-16, the cost of cultivation was reduced by Rs. 2740.00 with an increase of Rs. 59965.00 in net returns in IPM plots compared to farmers practice. The benefit cost ration was 2.14 compared to 1.8 in farmers practice. In 2016-17, the cost of cultivation was reduced by Rs. 41250.00 and an increase of Rs. 66037.00 in net returns in IPM plots compared to farmers practice. The benefit cost ration was 1.72 compared to 1.31 in farmers practice.

The data indicates that by adoption of IPM practices with emphasis on cultural practices has reduced the cost of cultivation and improved the net returns in the demonstration plots compared to famer's practice of using only chemicals.

Results

Table 1: Details of the chilli crop yields obtained and thrips damage

Year	Variety	No. of Farmers	Yield (q/ha)		Increase in yield (%)	Per cent upward leaf curl damage	
			Demo	Check		Demo	Check
2014-15	VNR 145	10	150.75	139.38	8.16	9.0 %	16.5%
2015-16	VNR 145	10	165.79	141.23	17.4	12 %	18%
2016-17	VNR 145	10	105.5	88.5	19.2	7.5%	13.5%

Table 2: Details of cost of cultivation, average gross and net income levels

Year	Average Cost of cultivation (Rs./ha)		Average Gross Return (Rs./ha)		Average Net Return (Profit) (Rs./ha)		BC ratio	
	Demo	Local Check	Demo	Local Check	Demo	Local Check	Demo	Local Check
2014-15	174938	185625	259530	217710	84592	32085	1.48	1.17
2015-16	180230	182970	386291	329066	206061	146096	2.14	1.80
2016-17	191250	232500	328635	303848	137385	71348	1.72	1.31

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