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Effect of nitrogen sources on thrips, *Scirtothrips dorsalis* Hood in chilli

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Abstract
Investigations on "Effect of nitrogen sources on thrips, *Scirtothrips dorsalis* Hood in chilli." were conducted at Horticulture farm, S.K.N. College of Agriculture, Jobner during *Zaid*, 2014 and 2015. Among the different sources of nitrogen the treatments T_4 (100% N through NC), T_3 (75% N through NC + 25% through urea), T_8 (100% N through VC) and T_7 (75% N through VC + 25% through urea) resulted in the population of thrips (3.69 to 3.96 thrips/ three leaves) were found most effective whereas, the treatment of T_9 (25% N through FYM + 75% through urea) with 6.53 thrips per three leaves and T_{10} (50% N through FYM + 50% through urea) with 6.11 thrips per three leaves proved least effective and both were at par. The maximum fruit yield of chilli was also obtained in these treatments which exhibited 86.52, 84.79, 83.85 and 82.54 q ha^{-1}, respectively while, the minimum was found in the treatments T_9 (25% N through FYM + 75% through urea) and T_{10} (50% N through FYM + 50% through urea) was found least effective resulted in 62.57 and 63.61 q ha^{-1}, respectively.

Keywords: Chilli (*Capsicum annum* L.), thrips, nitrogen combinations

Introduction
Chilli (*Capsicum annuum* L.) belongs to the family Solanaceae is an important spice cum vegetable crop commonly used in Indian dietary. It is grown throughout the year as a cash crop and used in green and red ripe dried stage for their pungency, colour and other ingredients in all culinary preparations of rich and poor alike to impart taste, flavour and colour. Nutritionally, it is a rich source of vitamin A, B and C. Capsaicin an alkaloid responsible for pungency in chillies has medicinal properties and it prevents heart attack by dilating the blood vessels (Gill, 1989) [7]. India is the largest consumer and exporter of chilli in the world with a production of 1492 million tones from an area of 775 thousand hectares during 2014 (Anonymous, 2014) [3]. In India, it is intensively cultivated in Andhra Pradesh, Maharashtra, Karnataka, Tamil Nadu, Rajasthan and in hilly areas of Uttar Pradesh (Ratnakumari *et al*., 2001) [16]. In Rajasthan, it is cultivated in an area of 12.21 thousand hectares with an annual production of 17.71 million tones (Anonymous, 2013) [2]. The major chilli growing districts of Rajasthan include Jodhpur, Swai Madhopur, Pali, Jalore, Bhilwara, Jaipur, Ajmer, Tonk, Udaipur and Bharatpur.
The chilli crop is attacked by a number of insect-pests right from germination to harvest of the crop, out of them thrips is major sucking insect pests, responsible for low productivity, reduce up to 50 per cent yield (Ahmed *et al*., 1987) [1]. In the last few decades, awareness of health consciousness lead to organically produced food stuffs. The tremendous demand for organically produced food has lead to the creation of new export avenues for developing countries. Organic farming is a holistic production management system which involves the use of organic manures, botanical pesticides and biological pest control strategies which can act as an alternative to the costlier, non-eco-friendly and energy intensive chemical inputs. Keeping these points in view in the present field experiment was conducted to evaluate the effect of nitrogen sources on the population of thrips in chilli crops.

Material and methods
The experiment was laid out in a Randomized Block Design (RBD) with fourteen treatments including standard check and untreated control, each replicated thrice. The plot size was 2.25 x 1.50 m^2 keeping row to row and plant to plant distance of 45 and 30 cm, respectively. The chilli variety 'RCH-1' (recommended for this region) was used for the experiment. The recommended package of practices was followed to raise the crop. The observations on population of thrips were recorded on three leaves of chilli at top, middle and bottom canopy from five randomly selected and tagged plants in each plot. The population was counted visually or by using magnifying lens in early morning hours (Bhede *et al*., 2008) [4].

The observations initiating from 30 days after transplanting at two weeks interval. The yield of green chilli per plot was recorded and converted into q/ha. The mean data of pest population and fruit yield were statistically analysed. The data of population of thrips were transfer in to $\sqrt{x+0.5}$ values for analysis.

Result and discussion

In the present study fourteen combinations of nitrogen sources including standard check and untreated control, were evaluated against thrips in chilli crop. Among the different combinations of nitrogen sources tested against the thrips of chilli, all the combinations were found significantly superior over untreated control in reducing the population of thrips, however they were inferior to standard check *i.e.* alternate sprays of dimethoate 30EC/ Oxydemeton-methyl 25EC + recommended FYM and NPK in POP (0.50 / three leaves). The minimum population of thrips was recorded in the treatment of T_4 comprising 100% N through NC (3.69/ three leaves) followed by T_3 comprising 75% N through NC + 25% through urea (3.77/ three leaves), T_8 comprising 100% N through VC (3.87/ three leaves) and T_7 comprising 75% N through VC + 25% through urea (3.96/ three leaves). The treatments *viz*., T_{12} comprising 100% N through FYM (4.65/ three leaves), T_2 comprising 50% N through NC + 50% through urea (5.24/ three leaves), T_6 comprising 50% N through VC + 50% through urea (5.32/ three leaves), T_{11} comprising 75% N through FYM + 25% through urea (5.40/ three leaves), T_1 comprising 25% N through NC + 75% through urea (5.47/ three leaves) and T_5 comprising 25% N through VC + 75% through urea (5.54/ three leaves) were found moderately effective, while T_9 comprising 25% N through FYM + 75% through urea (6.53/ three leaves) and T_{10} comprising 50% N through FYM + 50% through urea (6.11/ three leaves) were found least effective in reducing the population of thrips.

Recorded least thrips incidence in the plots applied with half dose of NPK + half dose of FYM + full dose of vermicompost, corroborate the present finding. Reported that application of neem cake @ 500 kg ha^{-1} to soil reduced the thrips population support the finding. Sashidhra (1999) [17] also reported that organic sources like FYM and vermicompost reduced the sucking pest population in chilli corroborate the present result. Giraddi *et al.* (2003) [10] found combined applications of neem cake (500 kg ha^{-1}) with 50 per cent RDF significantly lowered thrips population support the present finding. Giraddi and Verghese (2007) [9] also reported that crop amended at planting with neem cake (1000 kg ha^{-1}) and vermicompost (2500 kg ha^{-1}) were effective in keeping the thrips density in check, being comparable to recommended insecticides fully support the present result. The present findings are in agreements with those of Ukey *et al*. (2001) [18], Linappa *et al*. (2002) [13], Mallapur *et al*. (2003) [14], Varghese (2003) [20], Giraddi and Smitha (2004) [8], Varghese and Giraddi (2005) [19], George and Giraddi (2007) [6] and Gundannavar *et al*. (2007) [12].

The maximum fruit yield of chilli was obtained in the treatment of T_4 (86.52 q ha-^{1}) followed by T_3 (84.79 q ha-^{1}), T_8 (83.85 q ha-^{1}) and T_7 (82.54 q ha-^{1}), respectively. However, these treatments were significantly inferior to the standard check. The next effective treatments were T_{12}, T_2, T_6, T_{11}, T_1 and T_5 which gave fruit yield ranged from 75.68 to 70.77 q ha-^{1} and these were at par with each other. The minimum yield was obtained in the treatments of T_9 (62.57 q ha-^{1}) and T_{10} (63.61 q ha-^{1}) and both were at par to each other. The present results are in fully agreement with those of Lingappa *et al.* (2002) [13], Giraddi *et al.* (2003) [10] and Varghese (2003) [20] who reported that maximum fruit yield of chilli was obtained in the treatment of neem cake with the combination of 50 per cent NPK. Varghese and Giraddi (2005) [19] recorded highest fruit yield of chilli in the treatment of neem cake + 50 per cent RDF also support the present findings. Giraddi and Smitha (2004) [8] also reported that neem cake with 50 per cent NPK and vermicompost with 50 per cent NPK were gave higher fruit yield support the present results. George and Giraddi (2007) [6] found higher yield of chilli in the plots receiving either vermicompost or neem cake also confimity with the present result. Giraddi and verghese (2007) [9] recorded highest chilli yield in the crop receiving neem cake, followed by vermicompost fully support the present findings. Brahmchari *et al*. (2008) [8] reported that application of 100 per cent RDF exhibited the lowest yield of chilli support the present result. Gundannavar and Giraddi (2013) [11] reported highest chilli yield in the plots in which neem cake and vermicompost were applied at the time of transplanting also support the present findings.

The probable reasons of lower the population of thrips and whitefly in the crop amended with organics could be attributed by possible changes in the biochemistry of the plant, in terms of bio-chemical substances and enzyme activity. Besides reduction in application rates of NPK fertilizers they also known to reduce the succulency of the foliage, might be the other cause of low incidence of sucking insect pests Giraddi *et al*., 2003 [10] and Giraddi and Smitha, 2004 [8] which confirm the present results. Neem cake, vermicompost and farm yard manure improve physical properties of soil, provide all essential nutrients to plants besides nitrogen, neem cake also have insecticidal properties and they increase beneficial microbes in soil. The incidence of sucking insect pests in crops was comparatively less in healthy plants in the fertile soil.

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Table 1: Effect of nitrogen sources on thrips, *Scirtothrips dorsalis* Hood in chilli crop during *Zaid*, 2014, 2015 and pooled

S. No.	Treatments	Thrips population/ three leaves			Yield (q/ha)		
		2014	2015	Pooled	2014	2015	Pooled
T_1	25% N through NC + 75% through urea	5.42	5.51	5.47	71.00	71.95	71.47
		(2.43)	(2.45)	(2.44)			
T_2	50% N through NC + 50% through urea	5.20	5.27	5.24	74.12	75.33	74.72
		(2.39)	(2.40)	(2.40)			
T_3	75% N through NC + 25% through urea	3.73	3.81	3.77	84.35	85.24	84.79
		(2.06)	(2.08)	(2.07)			
T_4	100% N through NC	3.65	3.73	3.69	86.05	87.00	86.52
		(2.04)	(2.06)	(2.05)			
T_5	25% N through VC + 75% through urea	5.49	5.58	5.54	70.25	71.30	70.77
		(2.45)	(2.47)	(2.46)			
T_6	50% N through VC + 50% through urea	5.28	5.35	5.32	73.60	74.78	74.19
		(2.40)	(2.42)	(2.41)			
T_7	75% N through VC + 25% through urea	3.91	4.00	3.96	82.00	83.08	82.54
		(2.10)	(2.12)	(2.11)			
T_8	100% N through VC	3.82	3.91	3.87	83.45	84.25	83.85
		(2.08)	(2.10)	(2.09)			
T_9	25% N through FYM + 75% through urea	6.49	6.57	6.53	62.15	63.00	62.57
		(2.64)	(2.66)	(2.65)			
T_{10}	50% N through FYM + 50% through urea	5.75	6.47	6.11	63.05	64.18	63.61
		(2.50)	(2.64)	(2.57)			
T_{11}	75% N through FYM + 25% through urea	5.36	5.44	5.40	72.33	73.10	72.71
		(2.42)	(2.44)	(2.43)			
T_{12}	100% N through FYM	4.49	4.82	4.65	75.23	76.13	75.68
		(2.23)	(2.38	(2.27)			
T_{13}	Check (Alternate spray of dimethoate 30EC/ Oxydemeton-methyl 25EC + recommended FYM and NPK in POP)	0.47	0.53	0.50	98.70	99.42	99.06
		(0.99)	(1.01)	(1.00)			
T_{14}	Untreated control (Recommended FYM and NPK in POP)	10.96	11.02	10.99	57.28	58.10	57.69
		(3.38)	(3.39)	(3.39)			
	SEm ±	0.05	0.06	0.05	2.10	2.16	1.90
	CD (p= 0.05)	0.14	0.19	0.16	6.12	6.29	5.53

***** Mean of three replications

Figures in the parentheses are $\sqrt{x+0.5}$ values

POP- Package of practices, NC- Neem cake, VC- Vermicompost, FYM- Farm yard manure

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