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Studies on Reducing Thrips Populations in Onion by Optimizing Nitrogen and Potash Levels

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A B S T R A C T

A field trial was conducted at Regional Research station, NHRDF, Nashik in three consecutive years during *Rabi* 2014-15, 2015-16 and 2016-17 on onion variety Agrifound Light Red for the management of onion thrips by applying different doses of nitrogen as basal application. The result showed that, lowest mean thrips population (22.56 nymphs/plant) were recorded in without N (0 % Nitrogen), however, highest gross yield (306.89q/ha) was recorded in higher application of N (100% of the recommended dose as basal application through calcium nitrate).

Introduction

Onion (*Allium cepa* L.) is grown all over world and is a favourite vegetable in India. It is relished mostly as salad and Indian cuisine is incomplete without onion. India is the second largest onion producing country in the world (FAO, 2014). Thrips (*Thrips tabaci* Lindeman) is a regular and potential pest of onion and cause considerable losses as high as 90% in quality and yield (Gupta *et al.*, 1984, Dharmasena, 1998., Sudharma and Nair, 1999). Thrips attack onion at all the stages of crop growth but their count increases from bulb initiation and remain high up to bulb development and maturity. Both nymphs and adult cause damage directly through feeding and indirectly through the transmission of lethal plant viruses. It is difficult to control this pest with insecticides because of its small size and cryptic habits (Lewis, 1997). Failure to control this pest by timely and effective means causes considerable damage and result in immense economic loss by remarkably reduced yield (Anonymous. 2000, Jaun, 2002). Fertilizers i.e. nitrogen (N), phosphorous (P_2O_5) and potassium (k) play an important role that promote growth and productivity of onion crop. Phosphorous is required for root growth and development of plant (Uchida, 2000). They are not only improving crop yield, but also influence crop suitability for insect development, depending on the type of fertilizer and pest species (Van

Emden, 1966: Kogan, 1994). Magdoff and Van. (2000) suggested farming practices that cause nutrition imbalance can also lower pest resistance.

The recommendation is to apply 100-120 Kg of nitrogen per hectare, but there is a wide range in the amount of nitrogen added to the crop. Some growers apply nitrogen at planting and supplement with foliar applications during the season. However, recent work has shown that foliar-applied nitrogen will not improve bulb size or yield (Warncke 2008). Westerveld *et al.,* (2002) reported that onion yield did not differ between a conventional nitrogen treatment and one that received twice the amount of nitrogen. The Vegetative growth of onion plants and minerals uptake increased with increasing nutrients like P_2O5 and N that affect the infestation of *Thrips tabacai* (Malik *et. al*.; 2009; Bandi and Sivasubramanian, 2012).Therefore, the present study were aimed to study different doses of nitrogen and potash on the infection of *Thrips tabaci.*

Materials and Methods

The field experiment was conducted at NHRDF, Regional Research Station, Chitegaon, Nashik, Maharashtra during Rabi 2014-15, 2015-16 and 2016-17 seasons. The seedlings of onion variety Agrifound Light Red were transplanted in a bed size of 3.0 x 1.20 m at 15 cm x 10 cm spacing. Randomized Block Design with 4 replications was followed. The treatments evaluated were T1 (0 % Nitrogen), T2 (50% nitrogen of the recommended rate as basal application through calcium nitrate), T3 (75% Nitrogen of the recommended rate as basal application through calcium nitrate). T4 (100% nitrogen of the recommended rate as basal application through calcium nitrate).T5 (50% nitrogen of the recommended rate as basal application through Urea & potash through sulphate of potash as basal application),T6(75% nitrogen of the recommended rate as basal application through Urea & Potash through sulphate of potash as basal application), T7(100%nitrogen of the recommended rate as basal application through Urea & Potash through sulphate of potash as basal application) and control (Recommended dose). The crop was harvested after attaining the maturity. The data on thrips (Nymphs/plant) population were counted at the inner most leaves in 10 plant marked randomly in each treatment.

All other agronomical practices were performed uniformly as per need in all the treatments.

Results and Discussion

The data presented in (Table 1) revealed that thrips population at different stages of growth of crop and gross yield were influenced significantly due to different treatments. A mixed trend of increasing and decreasing the thrips population was observed. The lowest mean thrips population (22.56 nymphs/plat) were recorded in T1 (0 % Nitrogen).The highest gross yield (306.89 q/ha) and marketable yield (279.73q/ha) were recorded in T4 (100% nitrogen of the recommended rate as basal application through calcium nitrate) and were found at par with T3 (75% Nitrogen of the recommended rate as basal application through calcium nitrate).The lowest gross yield (249.05q/ha) was recorded in T1. The highest C: B ratio 1:1.45 was recorded inT3.

A positive correlation between onion thrips and nitrogen fertilizer has been observed. Cultural practices, e.g., crop fertilization can affect susceptibility of plants to insect pest by altering plant tissue nutrient levels (Altieri and Nicholls, 2003). However; they reported that excessive use of chemical fertilizers can cause nutrient imbalances and lower pest resistance. Recommended rate of N, P, and K, three times

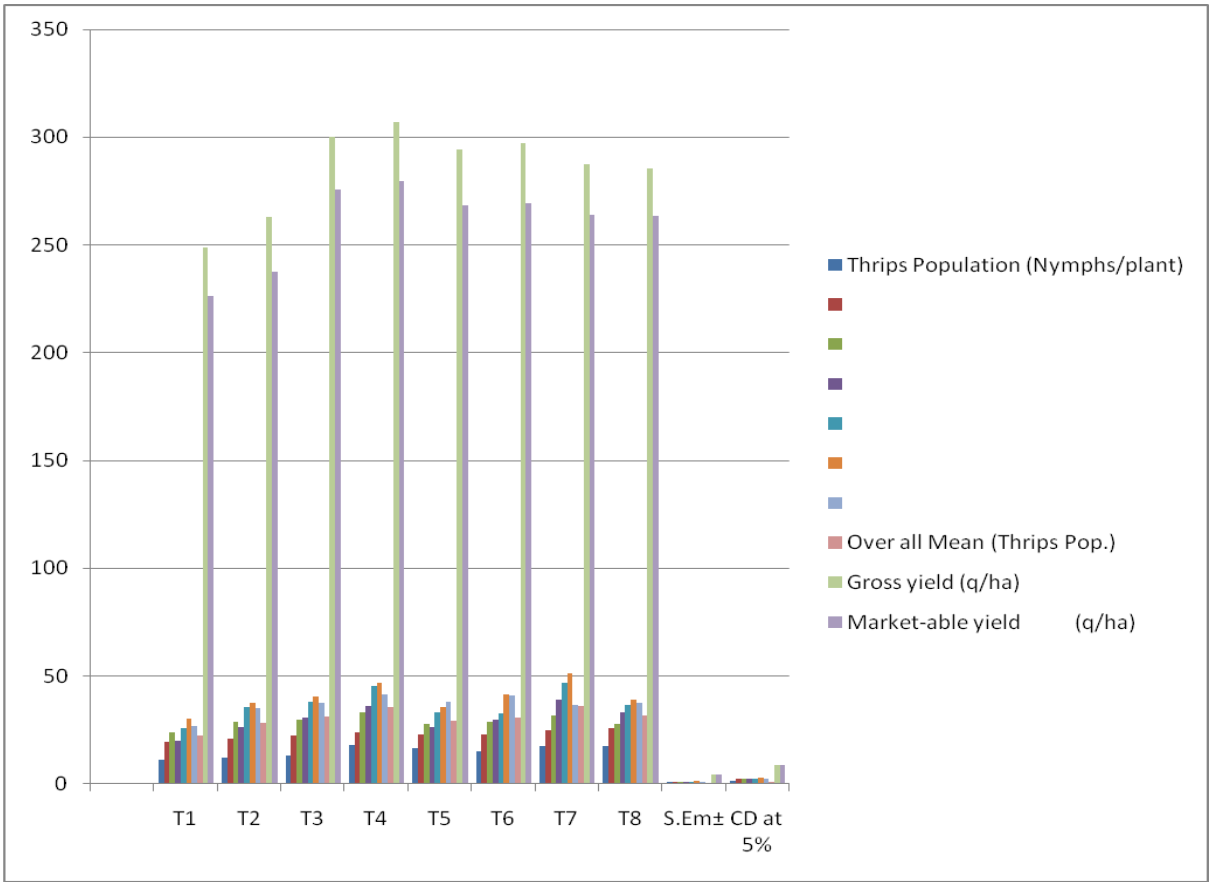
of the recommended rate of organic fertilizer, and control without fertilizer application were similar in relation to density of thrips (Goncalves and Sousa, 2004). Furthermore, six rates of N, low (50 kg N/ha) and optimum (150 kg N/ha) were applied to soil, but they did not affect on the abundance of *T.tabaci* on onions, although the density of thrips (7.6 thrips/plant) was decreased in 150kg N/ha (Malik *et al.,* 2009). They also reported that a total of 13 thrips/plant were observed with application of higher rate of N (200 and 250 kg/ha), which increased the population of thrips up to73.90%.However, it is confirmed by Martin and Workman (2006) that agronomic and N-fertilizer factor affected the susceptibility of onion bulbs to onion thrips. Combination of NPK + FYM + bio-fertilizers + neem cake recorded the lowest incidence of *T.tabaci* on compared to the treatments receiving inorganic NPK alone (Bandi and Sivasubramanian, 2012).Patel and Patel (2012) found that 100kg N/ha recorded significantly lowest thrips (9.23 thrips/plant) density compared to 50 kg N /ha (10.13 thrips /plant), but the infestation was minimum when the crop served with 50kg N/ha on compared to 150 kg N/ha. Onion yield was also increased as a result of P_2O_5 compared to N and K fertilizer (Goncalves *et al.,* 2009).

Similarly, Malik *et al.,* (2009) reported that yield of onion was increased with 200kg N/ha. Whereas, the highest bulb yield (19.50 t/ha) was recorded with a recommended doses of inorganic nutrients along with farm yard manure, bio-fertilizers, and neem cake (Bandi and Sivasubramanian, 2012). Patel and Patel (2012) suggested that the yield of onion bulb was significantly highest (60.74 t /ha) with 150 Kg N/ha, and it was at par with treatment of 100 kg N/ha which yielded 57.80 t /ha onion bulb as compared to 50 kg N/ha, However, Malik *et al.,* (2009) suggested that a rapid decrease in the yield was obtained with 200-250 kg/ha,

Table.1 Studies on reducing thrips populations in onion by optimizing nitrogen and potash levels (Pooled data 2014-15, 2015-16, 2016-17)

Treatments	Thrips Population (Nymphs/plant)							Over all Mean (Thrips Pop.)	Gross yield (q/ha)	Market-able yield (q/ha)	C:B Ratio
	20 DAT	30 DAT	40 DAT	50 DAT	60 DAT	70 DAT	80 DAT				
Treatments											
T1	11.27	19.61	23.95	19.81	25.68	30.33	27.07	22.56	249.05	226.21	1:0.09
T2	12.46	20.92	28.78	26.17	35.57	37.54	35.04	28.56	262.98	237.58	1:0.03
T3	13.28	22.30	29.81	30.92	38.23	40.78	37.68	31.11	300.33	275.50	1:1.45
T4	18.30	24.19	33.21	36.19	45.59	46.93	41.52	35.41	306.89	279.73	1:0.23
T5	16.86	23.00	28.03	26.58	33.05	35.50	37.93	29.11	294.03	268.48	1:1.08
T6	15.23	22.93	29.03	29.80	32.88	41.37	41.03	30.79	297.12	269.54	1:0.87
T7	17.37	25.14	31.84	39.19	46.80	51.45	36.70	35.98	287.62	263.79	1:0.08
T8	17.48	25.95	28.08	33.17	36.85	39.01	37.40	31.59	285.60	263.27	-
S.Em±	**0.77**	**1.15**	**1.22**	**1.13**	**1.10**	**1.36**	**1.11**	**0.45**	**4.44**	**4.38**	**-**
CD at 5%	**1.54**	**2.30**	**2.44**	**2.26**	**2.20**	**2.72**	**2.22**	**0.90**	**8.88**	**8.76**	**-**

Fig.1 Overall Mean Thrips Population in different treatments



The study concludes that an excessive dose of nitrogen fertilizer may produce lush green plants, which will attract pest infestation, moreover higher dose of fertilizer also affect the crop maturity and heavy attack of sucking pests.

Based on the studies made during *rabi* 2014-15, 2015-16 & 2016-17 it could be concluded that the lowest thrips population were recorded in without N application (0%nitrogen).

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