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Maize (*Zea mays*) barrier as a cultural method for management of thrips in onion (*Allium cepa*)

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Abstract

A study was conducted during Rabi 2010-11 and 2011- 12 using maize (*Zea mays* L.) plants as barrier for blocking migrating adult thrips in onion (*Allium cepa* L.) under All India Network Research Project on Onion and Garlic, Tirhut College of Agriculture, Dholi, Muzaffarpur, (Dr. RPCAU, Pusa) to evaluate the IPM modules for the management of onion thrips (*Thrips tabaci* L.). Three modules were designed as M1-IPM module, M2-farmer practices and M3- control plot and laid out in RBD. IPM module plot comprised of outer row of maize + inner row of wheat on all four sides in an area of 250 m2 (40 beds of 3.0 × 2.0 m.). The results obtained over two years indicated that both M_1 and M_2 not only significantly reduced the thrips population (22.36 and 20.12 thrips plant^{-1}) but also increased total marketable yield (26.30and 26.91 tha^{-1}), respectively over the control, M_3 (43.85 thrips plant^{-1} and 15.41 tha^{-1}) . Higher BC Ratieo was recorded in M_1 (3.27) than M_2 (2.78). It may be concluded that adoption of IPM module approach consisting of planting of border crop of two rows maize and wheat, 20 days prior to planting, seedling dip treatment with Carbosulfan and need based insecticides spray, when thrips population exceed ETL (30 thrips plant^{-1}) not only reduces the thrips infestation but also increases the bulb yield with quality bulbs in onion.

Keywords: Maize, Onion and Garlic, management

Introduction

Onion is the world famous spice commodities, used for flavouring the dishes. Besides culinary purposes, these are considered as valuable medicinal items. Dehydrated powder & flakes, and paste prepared out of onion provide rich agro-industrial base for these commodities. India ranks second in area (9.59 lakh ha) and production (163.09 lakh tons) of onion next to China (FAO STAT, 2015). Besides meeting domestic requirements, India exports 13.0 to 15.0 lakh tons of onion worth Rs. 3000 crores (APEDA Website, 2014). Over last 25 years the production of onion has increased from 25.04 to 163.09 lakh tons. The horizontal growth in area has contributed to total production rather than vertical growth per unit area. The productivity of onion (17.01 t/ha) is far low as compared to Netherlands, USA and China (FAO STAT, 2015). For commercial cultivation of onion, thrips play the key role in reducing the bulb yield and quality of produce. Among the various insects, thrips (*Thrips tabaci* L.) are the most devastating and prevalent in many parts of India (Gupta *et al*., 2011) [2], including in Bihar. This is more important due to change in climatic conditions during the growing season. Onion Thrips (*Thrips tabaci* Linderman) is the key biotic factor for reducing yield loses in both bulb as well as seed cops in onion. Besides direct damage to both foliage and bulbs, thrips can indirectly aggravate purple blotch and vector for viral diseases, Iris yellow spot as well. Though host plant resistance is a crucial component of IPM, in absence of high levels of host plant resistance to *Thrips tabaci* and development of resistance towards number of pesticide of late. There is an urgent need to look at other IPM options for effective management.

Materials and Methods

The experiment was carried out under the All India Network Research Project on Onion and Garlic, Tirhut College of Agriculture (Dr. RPCAU, Pusa), Dholi, Muzaffarpur, during the rabi 2010-11 and 2011-12 in RBD with three modules such as M1 :IPM module, M2 :Farmers' practices and M3: Control, with 8 replications per module. The details of modules are as follows:

01. Ml: IPM module

- Planting barrier crops -outer row of maize + inner row of wheat on all 4 sides of the plot at least 15-20 days before onion planting. Wheat planted closely and maize at 25 cm interval. Avoid tall maize variety. No gaps between maize plants.

- Seedling root dip: Dip the seedlings (bottom 1/3rd) in carbosulfan (2ml/l) solution for 2 hours before transplanting.
- Monitor thrips population.
- Whenever thrips cross ETL, spray - methomyl @ 240 g ai/ha or neem oil (3ml/l) + profenofos (0.5ml/l), or fipronil (I ml/l), or neem (3ml/l) + carbosulfan (1 ml/l).

02. M2: Farmers' practice
- Insecticides spray at 15 day interval: Rogor, monocrotophos, cypermethrin, chlorpyriphos, L-cyhalothrin.
- Start spraying as soon as thrips appear

03. M3: Control
- Without spraying of pesticides.

Variety Agrifound Light Red seedlings of about 55 days old were transplanted in plots of 250 m^{-2} for each module (40 beds of 3m x 2m) with a spacing of 15 cm x 10 cm on second week and third week of October in 2010 and 2011 respectively. All the recommended package of practices were adapted uniformly except the insecticidal treatments. Insecticidal treatments were given as soon as infestation started. The observations on population were recorded at 30,45,60,90 days after planting (DAP).

The marketable bulb yield was recorded including only A, B & C grade bulbs. The bolters, doubles, small size bulbs and rotten bulbs were excluded. The data generated were subjected to statistical analysis and the efficacy of different module was assessed (Sukhatme and Amble, 1995) [6].

Results and Discussion

The thrips populations per plant show significant effect at all stages i.e. 45 DAP to 90 DAP except at 30 DAP. The population of thrips were increased from 60 DAP onwards and crossed ETL in M2 and M3 module at 60 DAP (43.18 and 54.00 thrips population per plant, respectively). The non-significant effect on population during initial 30 DAP stage might be due to initiation of infestation. The population of thrips was significantly low in M1 (16.21and 27.52 thrips plant^{-1}) as compared to M2 (15.86 and 43.18 thrips plant^{-1}) up to 60 DAP. Subsequently, the thrips plant^{-1} was significantly lower in M2 (21.33 and 17.14 thrips plant^{-1}) than M1 (33.87 and 30.11 thrips plant^{-1}), respectively. Similar findings were also reported by Singh *et.al* (2013) [3] and Tripathy *et al* (2014) [8].

Similarly, the better efficacies up to 60 DAP in M1 module might be due to border crop effect of both maize and wheat. Thrips are weak fliers and carried by wind. Therefore, planting live barriers like maize and wheat could effectively block or reduce adult thrips reaching onion plants. Similar report of efficacy of border crop - maize and wheat to block thrips in onion was reported by Srinivas and Lawande (2006) [4] and Tripathy et.al (2013) [7]. On the other hand, significant reduction in population after 75 and 90 OAP in farmers' practice over IPM might be due to senescence of border crop effect, both maize and wheat. On the contrary, due to repeated spraying of insecticides, the thrips population was well under control in M2, the farmer's practice. The population counts pooled over all the stages from 30-90 DAP, indicated significant reduction in population in both IPM and farmers' practice over control. Significantly lowest thrips plant^{-1} was recorded in farmers' practice (20.12) over control (43.85). The modules were equally effective in reducing population. The pooled results over 2010-11 and 2011-12 on marketable bulb yield revealed significant variations ranging from 15.41 tha^{-1} in control to 26.91 tha^{-1} in farmers' practice with a mean value of 22.87 tha^{-1} (Table 2). Significantly highest marketable bulb yield was recorded in farmers' practice (26.91 tha^{-1}). However, both farmers' practice and IPM (26.91 and 26.30 tha^{-1}) was non-significant statistically indicating the better efficacy of IPM modules.

The economics of marketable bulb yield over two years revealed that adoption of IPM modules was best with highest BC ration of 3.27 than farmers' practices (2.78). The higher BC ratio in IPM plot is primarily due to less insecticidal application (Krishna Kumar *et al.*, 2011) [1] and additional income of border crop -maize and wheat as compared to fanners' practice. Srinivas and Lawande (2008) [5] and Tripathy et.al (2014) [8] also reported highest BC ratio when thrips control was undertaken between 45-75DAP in onion.

Thus the adoption of IPM module consisting of planting of border crop of two rows wheat and maize, 15-20 days prior to planting, seedling dip treatment with carbosulfan and need based insecticides I spray, when thrips population exceed ETL (30 thrips plant^{-1}) not only reduces the infestation but also increases the bulb yield.

Efficacy of IPM module against onion thrips

Treatment	Thrips population plant^{-1}						Market able yield (t/ha)	BC ratio
	30DAP	45 DAP	60DAP	75DAP	90DAP	Pooled		
M1(IPM Modules)	4.31 (2.19)	16.21 (4.07)	27.52 (5.29)	33.87 (5.85)	30.11 (5.53)	22.36 (4.78)	26.30	3.27
M2 (Farmers Practice)	3.09 (1.89)	15.86 (4.03)	43.18 (6 .60)	21.33 (4.67)	17.14 (4.20)	20.12 (4.54)	26.91	2.78
M3 (Control)	4.92 (2.32)	26.51 (5.19)	54.00 (7.38)	62.65 (7.94)	71.18 (8.46)	43.85 (6.65)	15.41	
Grand Mean	4.01 (2.12)	19.52 (4.47)	41.56 (6.48)	39.28 (6.30)	39.47 (6.32)	28.77 (5.41)	22.87	
Sem±	0.02	0.05	0.08	0.04	0.05	0.03	0.28	
CD 5%	NS	0.17	0.27	0.15	0.16	0.10	1.89	

* Figure in the parentheses indicated the corresponding of square root of the (x + 0.5) values.


Control, Farmer Practice and IPM Module

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