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Study on effect of management methods on tomato yellow leaf curl disease (TYLCV)

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ABSTRACT : Field experiment was carried out during *Rabi* 2011-12 at the Horticultural Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G), to know the effect of different insecticides, biopesticides and its combination on incidence of tomato yellow leaf curl virus (TYLCV) disease and population of whitefly on tomato cv. Pusa Ruby. The disease incidence of TYLCV was recorded periodically from 15 to 90 days after transplanting (DAT) with an interval of 15 days by visual observation. Among the all treatments T_9 *i.e.* thiacloprid treated plots showed lowest average whitefly population and proved to be effective treatment with lowest mean disease incidence 30.24 per cent and highest marketable fruit yield 18.38 q/ha^{-1} while the more average whitefly population was observed in T_6 *i.e.* (Cowdung + cow urine @ 20ml/l.) treated plots and control plots showed highest disease incidence and more number of whiteflies per plant.

Key Words : Management methods , TYLCV, Whitefly, Disease incidence

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Tomato is affected by large number of viral diseases (Anonymous, 1983). Over 40 viruses belonging to Alfamo, Luteo, Carla, Cucumo, Gemini, Poty, Illar, Nepo, Tombus, Tobamo and Tospovirus groups attack this crop (Allen and Gibs, 1990). Among them, tomato leaf curl and tospoviruses are very important, tospoviruses are though very common in vegetable crops are increasing year after year and more so in tomato (Reddy *et al.*, 1997).

Leaf curl is one of the most important diseases of tomato causing heavy losses in yield and quality of fruits. Leaf curl caused by tomato yellow leaf curl virus (TYLCV) is one of the devastating diseases of the crop and depending on the severity and stage of the infection causing heavy losses in yield (Kalloo, 1988). The incidence of TYLCV in tomato growing areas of Karnataka ranged from 17-100 per cent in different seasons and 50 to 70 per cent yield loss was observed in tomato cv. Pusa Ruby grown in February – May (Saikia and Muniyappa, 1989). Yield loss exceeds 90 per cent, when infection occurred within four weeks after transplanting in the field (Sastry and Singh, 1973) Saikia and Muniyappa, 1989).

The whitefly,*bemisia tabaci* gennadius is one of the most economically important pests throughout the world causing extensive damage in more than 500 species of crops (Greathead,1986).in tomato besides causing direct damage as a suking pest,it transmits tomato leaf curl virus (TYLCV), a Gemini virus, which causes heavy losses round the year in tropical and sub tropical tomato growing regions of the world (Green and Kalloo,1994). In india,this diseases is wide spread during summer in south india (Saikia and Muniyappa,1989) and autumn in north india (Banerjee and Kalloo,1987).Whiteflies and the viruses they transmit result in extensive losses necessitating for a worldwide search for the cost effective management strategies. Cultural practices play a significant role in integrated pest management system targeting whiteflies and consequent reduction in TYLCV incident. The cultural practices have received little attention from the researchers, possibly due to difficulty of testing by conventional method.

RESEARCH PROCEDURE

To study the effect of different management practices and their combination on disease progress, whiteflies population dynamics, disease incidence and yield of tomato, a field experiment was conducted. The experiment was laid out in Randomized Block Design, having ten treatments with four replications. The transplanting was done on 15th October, 2011 in *Rabi* season using the variety Pusa Ruby. The plot size was used 3 x 3.15 m^2. The spacing followed was 60 x 45 cm. and

around the tomato plots two rows of maize crop was sown at a distance of 50 cm which acted as whitefly vector barrier.

In this experiment total 10 treatments including control were included. Four sprays of each T_1 acephate @ 1.5 g/l. + neem oil @ 2.0 ml/l., T_2 fipronil @ 1.5 g/l. + neem oil @ 2.0 ml/l., T_3 imidacloprid @ 2 g/l. + neem oil @ 2.0 ml/l., T_4 by (I^{st} of T_1, II^{nd} of T_2, III^{rd} spray of T_3). T_5 neem oil 2ml/l., T_6 Cow-dung+cow urine 20ml/l. T_7 vermiwash 20ml/l. T_8 *Panchgavya* 20ml/l., T_9 thiacloprid 2ml/l.

For seed treatment dose of imidacloprid used was 1.5 g *a.i.*/kg seed. The weighted quantity of seeds was taken in a plastic bag and weighted quantity of seed dresser was spread over it. Sufficient quantity of water was added. Then the plastic bag was perfectly closed and shaken vigorously until uniform coating of the insecticide was formed over the seeds. For spraying, insecticides used were applied at 10 days interval starting from 19 days after sowing. Four sprayings were given at 20, 30, 40 and 50 days after sowing. Measured quantity of insecticide was added in known quantity of water. Knapsack sprayer was used for spraying and it was done in afternoon hours.

RESEARCH ANALYSIS AND REASONING

Effect of insecticides and bio pesticides was studied in tomato cv. Pusa Ruby against *B. tabaci* and consequent TYLCV incidence and results are presented in Table 1. The data on disease incidence of TYLCV was recorded periodically from 15 to 90 days after transplanting (DAT) with an interval of 15 days by visual observation. It has been found that in all treatments percentage of disease incidence increased with the age of the plants (Table 2). At 15 DAT, the lowest disease incidence was recorded in T_4 (2.2%), T_7 (2.87%), T_2 (2.99%) T_5 (3.65%), while T_8 (5.65%) and highest T_6 (7.33%) disease incidence.

At 30 DAT, the lowest disease incidence was recorded in T_4 followed by T_3 and per cent disease incidence was 11.16% and 11.89%, respectively. Beside these T_1 and control showed higher disease incidence and their percentage were 22.52% and 22.36%, respectively.

At 45 DAT disease incidence was recorded lowest in T_9 (25.77%), followed by T_4 (26.55%), while T_7 (27.83%), T_8 (28.36%), T_2 (30.77%), T_{10} (39.95%) and T_3 (40.92%).

At 60 DAT the lowest disease incidence was recorded in T_9 followed by T_7 and T_8 and their percentage of disease incidence were 31.75 (T_9), 33.14 (T_7) and 35.23 (T_8). The highest (49.98%) disease incidences was in T_{10} (control) 45.98% followed by T_6 (49.98%) T_5 (44.65%), T_1 (44.18%), T_2 (42.87%), T_3 (38.14%) and T_4 (34.00%).

At 75 DAT the lowest disease incidence was recorded in T_3 treated plot followed by T_9 and their PDI were 41.94 and 45.02, respectively. The highest disease incidence was recorded in T_6 (76.05%) and T_1 (65.59%).

At 90 DAT, the lowest incidence was recorded in T_9 with PDI 62.11 whereas the highest disease incidence was observed in the T_{10} (control). Though considerable outbreak of the disease occurred between 75 to 90 DAT in T_{10}. Similarly T_8, T_6 were recorded 82.75 and 82.47 PDI, respectively.

The lowest disease incidence was in treatment T_9 followed by T_3 where PDI was 69.96 and 76.51. While the highest PDI T_5 followed by T_7 with 94.64. From the table it was also concluded that the mean PDI was lowest in T_9 (30.24%) and T_3 (34.84%).

Findings of Singh *et al.* (2004) reported that the imidacloprid 17.8 SL at 250 ml/ha was observed to provide the maximum reduction of whitefly at 1, 3, 7 and 14 days after sprays (*i.e.* 89.86, 95.58, 81.50 and 58.98%, respectively). Simlarly Rajasri *et al.*, (2009) reported profenophos @ 500 g a.i/ha and thiamethoxam @ 25 g a.i/ha effectively controlled the whitefly population and reduced the TLCV incidence and improved the yield of tomato fruits.

Table 1: Effect of insecticides and biopesticides on tomato yellow leaf curl virus (TYLCV) disease under field condition during *Rabi* 2011-12

Treatments	Disease incidence (%)*
T_1 Acephate @ 1.5g/l. +neem oil @ 2ml/l. (75%SP)	42.03
T_2 Fipronil @ 1.5g/l. +neem oil @ 2ml/l. (5%SC)	37.57
T_3 Imidacloprid @ 1.5g/l. +neem oil @ 2ml/l. (70%SC)	34.84
T_4 First spray of T_1, second spray of T_2 and third spray of T_3	33.83
T_5 Neem oil @ 2ml/l.	40.36
T_6 Cow dung + cow urine @ 20ml/l.	45.66
T_7 Vermiwash @ 20ml/l.	36.40
T_8 *Panchagavya* @ 20ml/l.	39.21
T_9 Thiacloprid @ 1.5ml/l. (21.7EC)	30.24
T_{10} Control	43.10
S.E.±	1.37
C.D. (P=0.05)	3.98

Table 2 : Incidence of tomato yellow leaf curl virus (TYLCV) disease on tomato CV. PUSA RUBY

Treatments	Disease incidence (%) ** days after transplanting (DAT)						Mean
	15	30	45	60	75	90	
T_1 Acephate @1.5g/l. + neem oil 2ml/l. (75%SP)	05.08 (2.36)	22.52 (4.79)	35.35 (36.45)	44.18 (41.61)	65.59 (54.03)	79.41(63.01)	42.03
T_2 Fipronil @1.5g/l.+ neem oil @2ml/l. (5%SC)	02.99 (1.86)	12.55 (3.61)	30.77 (33.65)	42.87 (40.86)	63.31(52.71)	73.55 (59.02)	37.57
T_3 Imidacloprid @1.5g/l. + neem oil @2ml/l. (70%SC)	03.69 (2.04)	11.89 (3.51)	40.92 (39.76)	38.14(38.12)	41.94 (40.34)	72.45(58.31)	34.84
T_4 First spray of T_1, second spray of T_2 and third spray of T_3	02.20 (1.64)	11.16 (3.41)	26.55 (30.98)	34.00 (35.65)	55.01(47.87)	73.86 (59.21)	33.83
T_5 Neem oil @ 2ml/l.	03.65 (2.03)	12.66 (3.62)	35.33 (36.45)	44.65 (41.90)	65.65(54.05)	80.16 (63.51)	40.36
T_6 Cow dung + cow urine @ 20ml/l.	07.33 (2.79)	21.20 (4.65)	39.10 (38.70)	49.98 (44.94)	76.05 (60.67)	82.47 (65.20)	45.66
T_7 Vermiwash @ 20ml/l.	02.87 (1.83)	17.40 (4.23)	27.83 (31.82)	33.14 (35.12)	57.29 (49.14)	79.73 (63.22)	36.40
T_8 *Panchagavya* 20ml/l.	05.56 (2.46)	18.10 (4.31)	28.36 (32.14)	35.23 (35.18)	65.23 (53.85)	82.75 (65.42)	39.21
T_9 Thiacloprid @ 1.5ml/l. (21.7EC)	03.78 (2.06)	12.98 (3.67)	25.77 (30.46)	31.75 (34.27)	45.02 (42.13)	62.11 (50.83)	30.24
T_{10} Control	05.14 (2.37)	22.36(4.78)	39.95 (39.17)	45.98 (42.65)	62.00 (51.94)	83.14 (65.73)	43.10
S.E.±	0.49	0.31	2.86	2.43	2.52	4.86	1.37
C.D. (P=0.05)	NS	0.90	NS	7.06	7.32	NS	3.98

NS=Non-significant

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