

Estimation of Loss Due to Two Spotted Spider Mite, *Tetranychus urticae* Koch (Acari: Tetranychidae) Infesting Brinjal

Abhishek Shukla*, G.G. Radadia and G.D. Hadiya

Department of Entomology, N. M. College of Agriculture, Navsari Agricultural University,
Navsari- 396 450, Gujarat, India

*Corresponding author

ABSTRACT

Keywords

Two spotted spider mite, *Tetranychus urticae*, Estimation, Loss, Brinjal.

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An experiment was carried out during the year 2014-15 to 2016-17 in the polyhouse of AINP on Agricultural Acarology to estimate the losses due to two spotted spider mite, *Tetranychus urticae* Koch (Tetranychidae: Acari). The estimated loss in brinjal due to two spotted spider mite, *T. urticae* on different plant growth characters like plant height, number of branches per plant, number of fruits per plant and fruit weight ranging between 8.24 to 33.65, 7.84 to 13.35, 26.94 to 64.93 and 15.29 to 81.10 per cent, respectively.

Introduction

Brinjal (*Solanum melongena* L.) is an agronomical important, highly cosmopolitan and popular vegetable grown as poor man is crop in India. The area under brinjal cultivation is estimated at 0.51 million ha with productivity of 16.08 t/ha. Among the various limiting factors of successful brinjal production, the insect pests and mites are very important. Among the insect pests the shoot and fruit borer, *Leucinodes orbonalis* Guenne is very serious, insect while among the non-insect pests of attacking brinjal in agricultural crops, mites are probably the most notorious ones and gaining tremendous important in the recent years due to their devastating nature. On vegetables alone, spider mites damage accounts for 10-15 per cent yield loss

(Anonymous, 1991). Out of the 37 mite species known to feed on vegetable crops, six species are serious pests of the vegetable crops including brinjal in major part of the country (Gupta, 1991). Basu and Pramanik (1968) ranked red spider mite as a major threat next to fruit and shoot borer.

Although 23 species of mite pests have been reported on brinjal from different parts of the world (Dhooria and Bindral, 1977). These mites inflict heavy damage to brinjal plant by sucking sap from underside of leaves resulting in white specklets which coalesce producing large patches. As the population increases mites web profusely covering the entire foliage on all sides resulting in poor

growth of the crop. The losses caused by spider mite are between related to the population level and stages of infestation. The yield reduction of 13.64 and 31.09 per cent at Bangalore and Varanasi, respectively was estimated due to the red spider mite (Anonymous. 1998) In South Gujarat, the infestation of two spotted spider mite, *T. urticae* appears in moderate to severe form on brinjal. Therefore, a study was conducted in the polyhouse to estimates the yield loss due to *T. urticae* infestation in brinjal.

Materials and Methods

An experiment was conducted in the polyhouse of AINP on Agricultural Acarology, Department of Entomology, N. M. College of Agriculture, Navsari Agricultural University, Navsari during Summer season of 2014-15 to 2016-17. Brinjal seedlings of CV Pant Bahar (Locally Known jamli) were raised in earthen pots. The experiment was laid out in completely randomised design with crop growth stage as three main treatments and release of mites as six sub treatments repeated three times in one plant in each repetition.

The three crop growth stages were 30, 60 and 90 days after transplanting, while the six release of mites were made at the rate of 25, 50, 100, 150 and 200 per plant in comparison with no release of mite (*i.e.* control). Each pot was covered individually using nylon mesh after artificial release of mites. Observations on plant height (cm), number of branches, number of fruits and yield (g) per plant were recorded and thus the data obtained were analysed statistically.

Results and Discussion

The year wise data on the losses due to various levels of spider mite were presented here with:

Year 2014

Data presented in table 1 indicated that the average height of the plant in control (T₆) was 74.46 cm which was significantly superior over other treatments except T₁ (66.67 cm). Among the plant stages at 90 DAR recorded significantly higher plant height of 75.00 cm followed by 60 DAR (74.80 cm) and 30 DAR (73.60 cm). The effect of different levels of mite release showed that 90 DAR the plant height was ranged between 67.00 to 75.00 cm. The number of branches per plant decreased with increase in number of mite release (Table 1). However, the number of branches are more in control (T₆) *i.e.* 12.30, while least in the treatment T₅ (200 mites/plant) *i.e.* after 30 DAR 5.80. Among the plant stage of 90 DAR recorded more number of branches (12.90) followed by 60 DAR (12.60) and 30 DAR (12.30). The data resented in table 1 pertaining to number of fruits revealed that irrespective of plant stages, significantly higher number of fruits was recorded in control (T₆) (12.00 at 90 DAR). In general number of fruits reduced with increase in the level of mites. Significantly higher fruit yield was recorded in control (T₆) (1246.0 gm) followed by T₁ (988.0 gm) after 90 DAR. The weight of fruits also reduced with the increase in the level of mites.

Year 2015

The data presented in the table 2 indicated that the average height of the plant was maximum in control (T₆) (74.26 cm) and was significantly higher to rest of treatments. The higher plant height was recorded at 90 DAR (75.60 cm) followed by 60 DAR (74.00 cm) and 30 DAR (73.20 DAR). The average number of branches were highest in T₆ (12.96) which was at superior to T₁ (10.93), and also significantly superior over rest of the levels of mite release.

Table.1 Effect of different levels of spider mite *T. urticae* release on brinjal (1st year)

Treat.	Plant height (cm)				Branches (Nos.)				No. of fruits				Weight of fruits (gm)			
	30DAR	60DAR	90DAR	Mean	30DAR	60DAR	90DAR	Mean	30DAR	60DAR	90DAR	Mean	30DAR	60DAR	90DAR	Mean
T ₁	61.20	68.00	70.80	66.67	10.00	11.20	12.00	11.06	3.60	5.80	12.00	7.13	924.0	984.0	988.0	965.3
T ₂	56.60	59.00	69.60	61.73	9.80	10.20	10.40	10.13	1.60	2.60	10.60	4.93	208.0	330.0	394.0	310.6
T ₃	52.60	55.00	72.40	60.00	9.20	9.80	10.20	9.73	1.40	2.20	10.20	6.90	160.0	276.0	279.0	238.3
T ₄	48.80	52.40	72.60	57.93	7.40	8.00	11.40	8.93	1.20	1.80	11.40	4.80	134.0	212.0	234.0	193.3
T ₅	41.60	44.60	67.00	51.06	5.80	6.40	10.00	7.40	1.00	1.40	10.20	4.20	100.0	150.0	592.0	280.6
T ₆	73.60	74.80	75.00	74.46	12.30	12.60	12.90	12.60	6.20	8.60	12.00	8.93	1288.0	1246.0	1246.0	126.0
SEM	1.893	2.162	1.986	2.013	0.486	0.519	0.310	0.438	0.400	0.516	0.424	0.446	4.501	0.267	4.585	3.11
CD	5.528	8.312	3.498	5.112	1.420	1.516	0.907	1.281	0.168	1.507	1.238	0.343	131.40	121.4	385.0	606.0
CV	7.60	8.20	3.76	6.52	11.87	11.94	6.95	10.25	10.78	10.93	14.04	11.91	11.46	3.65	10.96	8.96

Table.2 Effect of different levels of spider mite *T. urticae* release on brinjal (2nd year)

Treat.	Plant height (cm)				Branches (Nos.)				No. of fruits				Weight of fruits (gm)			
	30DAR	60DAR	90DAR	Mean	30DAR	60DAR	90DAR	Mean	30DAR	60DAR	90DAR	Mean	30DAR	60DAR	90DAR	Mean
T ₁	65.40	71.20	71.20	69.26	10.00	10.20	12.60	10.93	3.80	5.80	12.00	7.20	890.0	984.0	1060.0	978.0
T ₂	56.60	58.00	69.60	61.4	10.00	10.20	10.0	10.06	1.40	2.80	10.60	4.93	168.0	326.0	370.0	288.0
T ₃	52.80	53.20	72.80	59.6	9.00	9.20	9.80	9.33	1.40	2.00	10.20	4.53	170.0	268.0	300.0	246.0
T ₄	48.80	50.40	72.80	57.33	7.20	7.20	11.60	8.66	1.20	2.00	11.80	5.00	130.0	250.0	262.0	214.0
T ₅	44.00	45.20	65.00	51.4	5.80	6.00	9.80	7.20	1.00	1.60	10.80	4.46	100.0	178.0	252.0	176.6
T ₆	73.20	74.00	75.60	74.26	12.80	13.00	13.10	12.96	5.60	8.60	12.80	9.00	750.0	1072.0	1508.0	111.0
SEM	1.98	1.687	1.059	1.575	0.412	0.400	0.443	0.418	0.331	0.447	0.391	0.389	4.495	0.306	7.161	3.987
CD	5.806	4.9424	3.093	4.613	1.20	1.167	1.294	1.153	0.968	1.305	1.142	1.138	131.21	14.74	29.02	58.30
CV	7.3	6.43	3.33	5.68	10.09	9.62	8.96	9.55	9.90	6.32	7.70	7.97	7.31	5.60	5.84	6.25

Table.3 Effect of different levels of spider mite *T. urticae* release on brinjal (3rd year)

Treat.	Plant height (cm)				Branches (Nos.)				No. of fruits				Weight of fruits (gms)			
	30DAR	60DAR	90DAR	Mean	30DAR	60DAR	90DAR	Mean	30DAR	60DAR	90DAR	Mean	30DAR	60DAR	90DAR	Mean
T ₁	62.20	65.60	78.60	68.80	9.80	11.00	11.40	10.73	3.00	5.45	9.40	5.95	868.0	976.0	990.0	944.6
T ₂	62.00	63.40	67.20	64.20	9.80	10.20	10.40	10.13	1.20	2.00	7.20	3.46	140.0	324.0	374.0	279.3
T ₃	52.40	53.40	56.20	54.00	8.80	9.00	9.20	9.00	1.40	1.60	7.00	3.33	176.0	200.0	246.0	207.3
T ₄	45.80	47.40	51.00	48.06	7.20	7.40	8.00	7.53	1.20	1.40	7.60	3.40	128.0	148.0	182.0	152.6
T ₅	45.60	45.40	48.60	45.53	6.40	6.60	6.60	6.54	1.00	1.20	8.20	3.46	100.0	486.0	584.0	390.0
T ₆	71.60	74.20	77.40	74.40	13.60	14.20	14.40	14.06	7.80	9.40	12.20	9.80	752.0	1130.0	1270.0	1050.6
SEM	1.288	1.368	1.503	1.386	0.336	0.316	0.310	0.320	0.251	0.310	0.424	0.328	4.640	0.968	3.873	3.160
CD	3.760	3.995	4.388	4.047	0.982	0.923	0.907	0.937	0.734	0.907	1.238	0.959	135.43	61.10	13.385	91.79
CV	5.14	5.26	5.32	5.24	8.12	7.26	6.95	7.443	8.64	9.86	8.04	8.84	8.77	5.76	9.29	7.94

Table.4 Effect of different levels of spider mite *T. urticae* release on brinjal (Pooled)

Treat.	Plant height (cm)					Branches (Nos.)					No. of fruits					Weight of fruits (gm)					
	30DAR	60DAR	90DAR	Mean	% loss	30DAR	60DAR	90DAR	Mean	% loss	30DAR	60DAR	90DAR	Mean	% loss	30DAR	60DAR	90DAR	Mean	% loss	
T ₁	62.93	68.26	73.53	68.24	8.24	9.93	10.80	12.00	10.91	18.27	3.46	5.66	11.13	6.75	26.94	894.0	981.4	992.6	956.0	15.29	
T ₂	58.40	60.13	68.80	62.44	16.04	9.86	10.20	10.53	10.20	23.59	1.40	2.46	7.80	3.89	57.90	172.0	326.6	346.0	281.5	75.05	
T ₃	52.60	53.86	61.13	57.86	22.19	9.00	9.33	9.73	9.35	29.96	1.40	1.93	7.40	3.57	61.36	168.6	248.0	274.60	230.4	79.56	
T ₄	42.80	50.06	65.46	52.77	29.04	7.26	7.53	10.33	8.37	37.30	1.20	1.73	8.26	3.73	64.71	130.6	203.3	206.0	179.9	84.05	
T ₅	42.74	45.06	60.20	49.34	33.65	6.00	6.33	8.80	7.84	41.27	1.00	1.40	7.40	3.26	64.93	10.00	269.3	270.6	213.3	81.10	
T ₆	72.80	74.33	76.00	74.37	--	13.06	13.33	13.67	13.35	--	6.53	8.86	12.33	9.24	--	93.00	1149.3	1306.6	1128.6	--	
SEM	T	1.023	1.050	4.019	2.030	--	0.231	0.243	0.755	0.409	--	--	0.243	1.355	--	--	71.26	0.160	5.111	4.132	--
	YT	1.751	1.769	1.267	1.595	--	0.416	0.421	0.377	0.404	--	--	0.443	0.415	--	--	4.546	5.810	5.394	3.507	--
CD	2.884	2.960	3.577	3.140	--	0.654	0.685	1.064	0.801	--	--	--	1.171	--	--	--	1.36	15.746	--	--	
CV	6.97	6.75	4.14	5.95	--	10.13	9.80	7.90	9.27	--	--	--	8.25	--	--	--	7.67	8.94	--	--	

Looking to the number of fruits per plant at 90 DAR the shigher number of fruits was recorded in T₆ (control) (12.80 per plant) which was at par with T₁ (25 mites per plant) *i.e.* 12.00, however were significantly superior over other treatments. The higher fruit weight at 90 DAR *i.e.* 1508.0 was recorded in T₆ (control) (no release) and was significantly superior over rest of the levels of release. The fruit weight reduced as the number of mite release per plant increases.

Year 2016

The data presented in table 3 indicated that the plant height in T₁ (25 mites per plant) and T₆ (no release) was 78.60 and 77.40 cm which were significantly higher over rest of the other levels of release at 90 DAR. The number of branches were significantly higher in T₆ (control) (14.40) and it was followed by T₁ (11.40 per plant). As the number of mites increases the number of branches reduced on the plants. The maximum 12.20 fruits per plant per plant were recorded in T₆ which were significantly superior over other levels of mite release. Similarly, the fruit weight was also higher in the T₆ (no release) (1270.0 gm). As the number of mite increase it adversely affects the plant characters viz., higher number of branches, number of fruits and fruit weight.

Pooled

The pooled data of mite interaction and their effect on various plant characters viz., plant height, number of branches, number of fruit and fruit weight were presented in table 4. The pooled data indicated that 30 DAR the plant height was maximum in T₆ (no release) (72.80 cm) and was statistically superior over other levels of release, while 60 DAR the plant height was maximum in T₆ (74.33 cm) and was statistically superior to T₁ (68.26 cm) and others, however 90 DAR the maximum plant height was observed in T₆ (76.00 cm) which was at par with T₁ (25 mites per plant) (73.53 cm). The mean plant height was in case of T₆ (74.37 cm) and was superior over rest of the

treatments. The pooled data on number of branches per plant showed that 30 DAR highest number of branches were observed in T₆ (13.06) and were statistically higher than other levels of release, while 60 DAR similar trends were observed, While 90 DAR the maximum branches were recorded in T₆ (13.67) and it was significantly higher to T₁ (12.00). The minimum number of branches was recorded in T₅ (200 mites per leaf) (8.80 per plant). The mean number of branches were maximum in T₆ (13.35) and was statistically superior over rest of the treatments. The number of fruits 30 DAR maximum in T₆ (6.53 per plant) and lowest in T₅ (1.00 per plant), while 60 DAR it was highest in T₆ (8.86 fruits per plant) and was followed by T₁ (5.66 per plant) while the least fruits were recorded on T₅ (1.40 fruits per plant), further 90 DAR maximum fruits (12.33 per plant) were recorded on T₆ (12.33 per plant) and was at par with T₁ (11.13 per plant). The mean number fruits in case of T₆ was 9.24 per plant and was superior over other releases. The maximum fruit weight were recorded in T₆ (1306.6 g per plant) after 90 DAR which was significantly higher than T₁ (992.6 g per plant), the lowest fruit weight were recorded in T₅ (206.0 g per plant). The mean fruit weight was highest in T₆ (1128.6 g) and was superior over rest of the treatments.

In general, there was an increased reduction of all the plant growth and yield parameters with an increase in level of mite release and vice versa for different days after release. Thus, from the above study it can be concluded that the estimated reduction in plant height, number of branches and number of fruit and weight due to different release of spider mite *T. urticae* in brinjal were ranged between 8.24 to 33.65, 7.84 to 13.35, 26.94 to 64.93 per cent, respectively under the greenhouse conditions with 15.29 to 81.10 per cent reduction in fruit weight. Similar finding were also reported by Reddy *et al.*, (1987a and b) who noticed pronounced reduction in growth and yield component on 35 days old plant by *T. ludenias* compared to mid and late seasons. The main reason behind that, mite infestation reduces the number of fruits

formed and yield. Further, severe mite infestation may cause flower and fruit shedding and also under size small fruits due to poor nutrient uptake. Likewise, the present findings were also supported by the earlier reports of Dhooria (1985) and Palanisamy and Chellian (1987) who also reported 28.00 percent fruit yield reduction due to spider mite infestation in brinjal, which is in line with present findings.

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