EVALUATION OF CHRYSANTHEMUM AND MARIGOLD AS TRAP CROPS AGAINST LEAF MINER (*Liriomyza trifolii* BURGESS) IN TOMATO

VARIYA, M. V. AND PATEL, J. J.*

COLLEGE OF AGRICULTURE
NAVSARI AGRICULTURAL UNIVERSITY, BHARUCH- 392 012
GUJARAT, INDIA

***E-mail: jjpatel27664@yahoo.co.in**

ABSTRACT

A field experiment was conducted at Main Vegetable Research Station, Anand Agricultural University, Anand, Gujarat during *rabi* season of the year 2011-12 to evaluate chrysanthemum and marigold as trap crops against leaf miner (*Liriomyza trifolii* Burgess) in tomato. Of the two trap crops, the infestation of *L. trifolii* based on number of mines per leaf, larvae per leaf and per cent damaged leaves was significantly higher on chrysanthemum (11.80, 2.40 and 15.33 %, respectively) as compared to marigold (8.30, 1.99 and 12.22 %, respectively). On tomato, the crop surrounded by chrysanthemum recorded significantly lower infestation of 2.10 mines per leaf, 0.92 larvae per leaf and 12.60 per cent damaged leaves as compared to crop surrounded by marigold (3.27, 1.45 and 14.60 %, respectively). The tomato crop surrounded by chrysanthemum yielded significantly more quantity (288.39 q/ha) of fruits as compared to tomato crop surrounded by marigold (258.97 q/ha). Thus, for trapping *L. trifolii*, chrysanthemum crop was more effective than marigold.

KEY WORDS: Chrysanthemum, *Liriomyza trifolii*, marigold, tomato, trap crop

INTRODUCTION

In the world, tomato is an important vegetable crop ranks second after potato in many countries. India is fourth largest producer after China, U.S.A and Turkey (Anonymous, 2008), possessed an area of about 6.33 lakh ha with a production of 124.25 lakh tonnes of fruits. In Gujarat, it was grown in an area of 0.34 lakh ha with the production of 8.41 lakh tonnes and a productivity of 24.89 tonnes per hectare. Among the various factors responsible for reducing the crop yield, insect pests is one of the important factors cause considerable losses in tomato production. Of different insect peasts attacking tomato, leaf miner, *Liriomyza trifolii* Burgess (Agromyzidae: Diptera) was causing serious damage to the crop. In India, it was first time reported in the proceeding of the annual castor research workers' group meeting held at Hyderabad in 1991 (Anonymous, 1991). The estimated losses due to infestation of *L. trifolii* was 46-70% loss to tomato seedlings (Pohronezny *et al.*, 1986), 90% loss to tomato foliage (Johnson *et al.*, 1983) and 70% loss of tomato yield (Zoebisch *et al.*, 1984).

The major form of the damage of this peast is mining of leaves by larvae, which results in destruction of the leaf mesophyll. Extensive mining also causes premature leaf drop, which can result in lack of shading and sun scalding of fruits. Punctures on the foliage by female also allow entry of bacterial and fungal pathogens. Limited work has been done on the different aspects in relation to *L. trifolii* in tomato particularly under Middle Gujarat condition. Hence, the present investigation was carried out to evaluate chrysanthemum and marigold as trap crops against *L. trifolii* in tomato.

MATERIALS AND METHODS

To study the evaluation of trap crops on incidence of *L. trifolii* in tomato, a field experiment was conducted at Main Vegetable Research Station, Anand Agricultural University, Anand during the *rabi* season of 2010-11. Tomato seedlings were raised successfully by adopting recommended suitable agronomical practices. Two rows of marigold and chrysanthemum were planted on border around tomato plots on the same day. The observations on main crop (tomato) as well as on trap crop (marigold and chrysanthemum) were recorded one week after transplanting till to the harvest of the crop at weekly interval. For recording observations on main crop (tomato), five plants were selected randomly in each sector. The observations on number of mines and larvae were recorded from the three compound leaves from the middle portion of same selected plants. For observations on damaged leaves, total and damaged leaves from three compound leaves of the same 5 plants were counted. For recording observations on trap crops (marigold and chrysanthemum), ten plants were selected randomly and numbers of mines as well as larvae were counted from the three compound leaves of same selected plants. For damaged leaves, total and damaged compound leaves were counted from middle 10 cm twig length. The fruit yield was recorded picking wise from each net plot. The whole experimental plot was kept free from any insecticides.

RESULTS AND DISCUSSION

The data on infestation of *L. trifolii* on trap crops are presented in Table 1 are discussed hereunder. The data pooled over periods are depicted in Figure 1. The periodical data on infestation of *L. trifolii* on trap crops based on number of mines per leaf indicated that number of mines per leaf was significantly higher on chrysanthemum during all the weeks as compared to marigold. The larval population of *L. trifolii* was also significantly higher on chrysanthemum as compared to marigold at III, IV, VII, VIII, XI, XII, XIII, XIV, XV and XVII weeks after transplanting. Similarly, the per cent damaged leaves was significantly more on chrysanthemum as compared to marigold during all the weeks except at VII, XI and XVI weeks after transplanting. The data pooled over periods revealed that number of mines per leaf was significantly higher on chrysanthemum (11.80) as compared to marigold (8.30). Almost similar trend was observed for the number of larvae per leaf and per cent damaged leaves. The number of larvae per leaf was significantly higher on chrysanthemum (2.40) than on marigold (1.99). The per cent damaged leaves were also significantly higher on chrysanthemum (15.33%) than on marigold (12.22%). Thus, for trapping *L. trifolii*, chrysanthemum crop was found significantly superior than marigold.

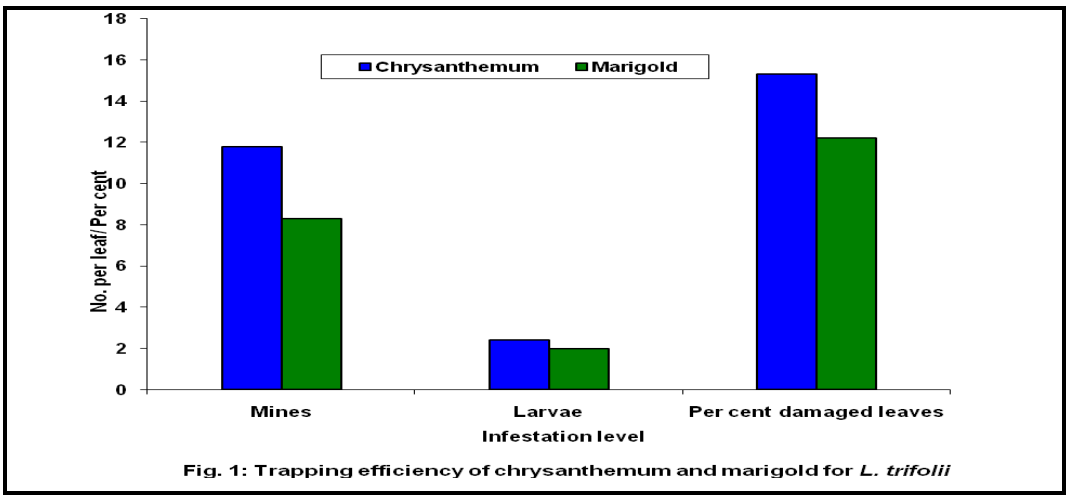

Fig. 1: Trapping efficiency of chrysanthemum and marigold for *L. trifolii*

The data on infestation of *L. trifolii* on main crop tomato are presented in Table 2 and discussed hereunder. The data pooled over periods are depicted in Figure 2. The periodical data on infestation of *L. trifolii* on tomato crop based on number of mines per leaf and larvae per leaf indicated that tomato crop surrounded by chrysanthemum plant recorded significantly lower mines as well as larvae during all the weeks as compared to tomato crop surrounded by marigold. The per cent damaged leaves were also significantly lower on tomato crop surrounded by chrysanthemum as compared to tomato crop surrounded by marigold during all the weeks, except at VII weeks after transplanting. The data pooled over periods indicated that the number of mines /leaf was significantly lower on tomato crop surrounded by chrysanthemum plant (2.10) as compared to the tomato crop surrounded by marigold (3.27). Almost similar trend was observed for number of larvae /leaf and per cent damaged leaves. The number of larvae /leaf was significantly lower on tomato crop surrounded by chrysanthemum (0.92) than on tomato crop surrounded by marigold (1.45). The per cent damaged leaves were significantly lower on tomato crop surrounded by chrysanthemum (12.60%) than on tomato crop surrounded by marigold (14.60%). Thus, tomato crop surrounded by chrysanthemum had significantly lower infestation of *L. trifolii* as compared to tomato crop surrounded by marigold.

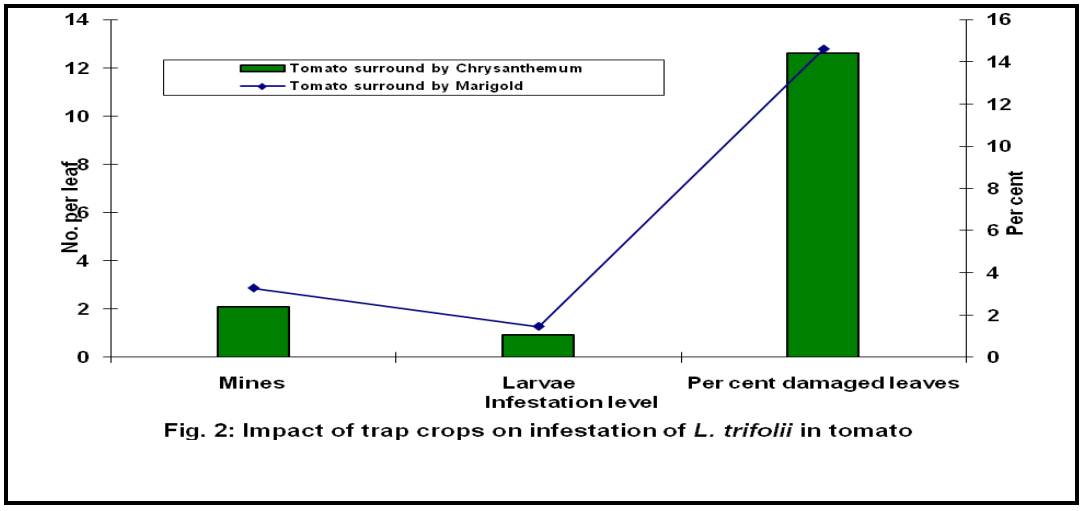

Fig. 2: Impact of trap crops on infestation of *L. trifolii* in tomato

The data on fruit yield of tomato are presented in Table 3 and depicted in Figure 3 revealed that tomato crop surrounded by chrysanthemum yielded significantly more quantity (288.39 q/ha) of fruits as compared to tomato crop surrounded by marigold (258.97 q/ha).

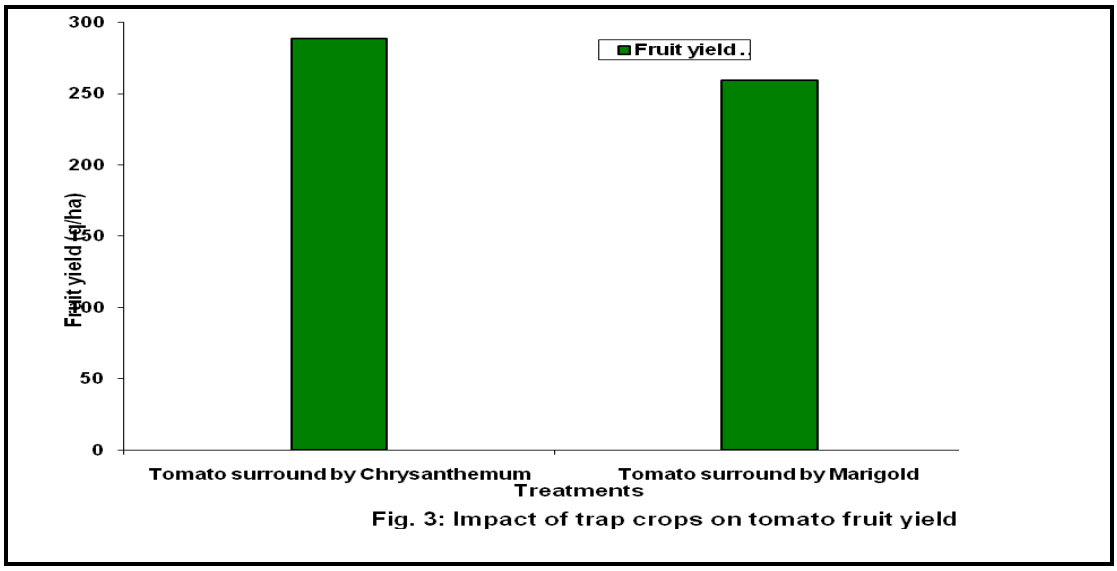

Fig. 3: Impact of trap crops on tomato fruit yield

Overall, from the present study, it can be concluded that chrysanthemum crop is found to be more effective as trap crop in comparison to marigold for preventing the infestation of *L. trifolii* in tomato. The impact of trap crop was also reflected on tomato fruit yield.

No body has evaluated the impact of trap crop on incidence of *L. trifolii* in tomato, as indicative from review of available literature. Hence, the result has not been compared. However, *L. trifolii* is introduced probably along with cut chrysanthemum flowers during early 1970s to California, USA (Parella *et al*., 1981). Herbert *et al.* (1984) reported that inter planting of field bean (*Vicia faba*) as a trap crop with chrysanthemum showed potential for reducing damage of *L. trifolii*. Lee (2000) noticed the high population of *L. trifolii* adult in spring crops of chrysanthemum. Castor was reported as a preferred host over marigold at Anand in Gujarat (Jyani, 1999). Thus, these reports for potentiality of chrysanthemum support the present findings.

CONCLUSION

Of the two trap crops, the infestation of *L. trifolii* was more on chrysanthemum as compared to marigold. Tomato crop surrounded by chrysanthemum had significantly lower infestation as compared to tomato crop surrounded by marigold. The tomato crop surrounded by chrysanthemum yielded significantly higher yield as compared to tomato crop surrounded by marigold.

REFERENCES

Anonymous (1991). Directorate of Oilseed Research. Annual progress report castor, Hyderabad, India, pp. 121-133.

Anonymous (2008). Worldwide production. (www.wikipedia.com)

Johnson, M. W., Welter, S. C., Toscano, N. C., Ting, I. P. and Trumble, J. T. (1983). Reduction of tomato leaflet photosynthesis rates by mining activity of *Liriomyza sativae* (Diptera: Agromyzidae). *J. Econ. Entomol.,* **76**: 1061-1063.

Herbert, H. J., Smith, R. F. and MCRae, K. B. (1984). Evaluation of non-insecticidal methods to reduce damage to chrysanthemum by leaf miner, *L. trifolii* (Diptera: Agromyzidae). *Canadian Entomol.,* **116**(9): 1259-1266.

Jyani, D. B. (1999). Bioecology of serpentine leafminer, *Liriomyza trifolii* and management of leafminer and fruit borer on tomato, *Lycopersicon esculentum* Mill. Ph.D thesis submitted to GAU, S. K. Nagar (Unpublished).

Lee, P. (2000). Population dynamics and injuries by *Liriomyza trifolii* (Burgess) in chrysanthemum field. *Korean J. Appl. Entomol.,* **39**(3): 141-147.

Parella, M. P., Allen, W. W. and Morishita, P. (1981). Leaf miner species causes California mum grower new problems. *California Agric.,* **35**(9): 28-30.

Pohronezny, L., Waddill, V. H., Schuster, D. J. and Sonoda, R. M. (1986). Integrated pest management for Florida tomatoes. *Pl. Dis.,* **70**: 96-102.

Zoebisch, T. C., Schuster, D. J. and Gilreath, J. P. (1984). *Liriomyza trifolii:* Oviposition and development in foliage of tomato and common weed hosts. *Florida Ento.,* **67**(2): 250-254.

Table 1: Infestation of *L. trifolii* on trap crops

Week After Transplanting	Number of Mines per Leaf			Number of Larvae per Leaf			Per Cent Damaged Leaves		
	Chrysan-themum	Marigold	Calculated 't'	Chrysan-themum	Marigold	Calculated 't'	Chrysan-themum	Marigold	Calculated 't'
III	08.00	06.71	03.11*	2.44	1.16	8.26**	05.76	04.00	2.77*
IV	09.60	06.68	06.46**	2.43	1.53	3.76**	08.95	06.58	2.59*
V	09.45	06.45	04.84**	1.89	1.75	0.85	07.64	05.78	4.89**
VI	09.28	06.22	05.77**	1.78	1.74	0.33	11.49	06.67	3.74**
VII	09.55	05.75	07.93**	2.10	1.39	5.14**	08.66	07.77	1.11
VIII	09.35	07.72	03.60**	2.12	1.68	3.13*	11.19	07.71	2.89*
IX	09.75	07.87	03.26*	2.16	2.10	0.39	13.36	11.00	4.06**
X	11.80	07.68	04.05**	2.38	2.08	1.27	18.80	12.15	5.17**
XI	14.00	08.38	20.75**	2.75	2.25	2.37*	18.18	16.42	1.34
XII	13.80	09.45	18.98**	2.57	2.08	2.44*	16.68	12.91	3.08*
XIII	13.80	09.45	18.98**	2.38	2.15	3.08*	17.27	13.69	2.88*
XIV	14.15	11.30	03.60**	2.42	1.88	4.00**	18.30	13.18	2.99*
XV	13.15	09.38	06.14**	2.80	2.42	4.25**	19.92	15.87	2.66*
XVI	13.65	10.10	09.80**	2.80	2.53	1.96	22.99	20.49	1.91
XVII	14.10	09.99	11.14**	2.95	2.66	2.48*	22.83	20.66	2.66*
XVIII	15.45	09.70	41.03**	2.48	2.37	0.72	23.33	20.66	4.73**
Pooled over periods	11.80	8.30	21.42**	2.40	1.99	8.91**	15.33	12.22	10.72**

, ** significant at 5 per cent and 1 per cent levels of significance, respectively.

Table 2: Infestation of *L. trifolii* on tomato

Week After Transplanting	Number of Mines per Leaf			Number of Larvae per Leaf			Per Cent Damaged Leaves		
	Tomato Surrounded by Chrysan-themum	Tomato Surrounded by Marigold	Calculated 't'	Tomato Surrounded by Chrysan-themum	Tomato Surrounded by Marigold	Calculated 't'	Tomato Surrounded by Chrysan-themum	Tomato Surrounded by Marigold	Calculated 't'
III	1.43	2.00	03.53**	0.50	0.78	02.58*	06.32	08.26	30.93**
IV	1.70	2.80	05.60**	0.70	1.04	06.34**	09.86	10.12	03.68**
V	1.42	2.72	09.54**	0.55	1.26	04.66**	08.29	10.87	02.55*
VI	1.30	2.63	08.23**	0.73	1.16	16.63**	11.29	11.84	04.15**
VII	1.61	2.78	06.92**	0.73	1.29	06.21**	08.62	09.37	01.21
VIII	1.45	2.68	06.77**	0.70	1.41	08.34**	09.51	11.07	03.53**
IX	1.63	2.88	07.64**	0.80	1.44	05.15**	09.86	11.36	03.00**
X	2.40	3.65	07.64**	0.93	1.39	10.04**	14.84	16.80	08.73**
XI	2.75	4.00	07.64**	1.00	1.50	26.46**	14.43	17.14	02.65*
XII	2.52	3.77	09.35**	1.13	1.69	15.00**	12.86	14.81	10.56**
XIII	2.42	3.83	22.10**	1.05	1.58	16.75**	13.05	15.38	10.05**
XIV	2.80	4.08	08.59**	1.18	1.61	04.73**	14.66	15.86	02.68*
XV	2.40	3.58	08.04**	1.08	1.61	29.37**	15.65	17.66	19.25**
XVI	2.45	3.83	11.00**	1.18	1.76	19.91**	18.86	20.99	12.08**
XVII	2.08	2.49	07.11**	1.23	1.84	27.03**	18.82	21.20	08.12**
XVIII	3.29	4.54	08.02**	1.28	1.91	19.68**	19.11	20.86	13.08**
Pooled over periods	**2.10**	**3.27**	**27.41****	**0.92**	**1.45**	**26.51****	**12.60**	**14.60**	**15.31****

, ** significant at 5 per cent and 1 per cent levels of significance, respectively.

Table 3: Fruit yield of tomato as affected by trap crops

Treatments	Fruit Yield (q/ha)
Tomato surrounded by chrysanthemum	288.39
Tomato surrounded by marigold	258.97
Calculated 't'	3.41*
Table 't' (7 df):	At 5% 2.36, At 1% 3.50

[MS received: October 09, 2012] *[MS accepted: November 11, 2012]*