Proceedings:
International Symposium on
Prospects of Horticultural Industry in Pakistan
28th to 30th March, 2007
Institute of Horticultural Sciences, University of Agriculture, Faisalabad

MANAGEMENT OF CITRUS LEAF MINER, *Phyllocnistis citrella* Stnt. USING IGRs AND SYNTHETIC INSECTICIDES

Mansoor-ul-Hasan*, Muhammad Sagheer and Muhammad Asif Javaid
Department of Agricultural Entomology, University of Agriculture, Faisalabad
*Email: mansoorsahi2000@yahoo.com

Abstract

The present investigations were carried out to find out the efficacy of nine commonly used insecticides viz., match, fastac, pirate, cascade, aflix, hostathion, methyl-parathion, azodrin and systoate against *Phyllocnistis citrella*. The efficacy trials were laid out at the orchard of University of Agriculture, Faisalabad following RCBD. Insecticides were applied at dose rates 100 ml, 50 ml, 70 ml, 100 ml, 200 ml, 150 ml, 150 ml, 100 ml, 100 ml per 100 liters of water each, respectively. The treatments were evaluated for the assessment of percentage reduction in leaf infestation caused by citrus leaf miner and the percentage of larval mortality then corrected by using Abbot's formula. Percentage leaf infestation was taken on two intervals viz., 7 days and 10 days, while the larval mortality was calculated after 3 days, 7 days and 10 days after each application of insecticides. Statistical analysis was applied and the means were compared by DMR test. The effectiveness of the pest control materials was estimated on the basis of their effect on the population/infestation of target insects. The results achieved revealed that the application of all the test materials gave significant reduction in population/infestation. These test materials proved to more effective in reducing the damage and increasing citrus yield. In the present research all the insecticides used on citrus for the control of citrus leaf miner significantly controlled the pest.

INTRODUCTION

The citrus leaf miner, *Phyllocnistis citrella* Stainton (Lepidoptera: Gracillariidae) is a pest native to southern Asia that has now spread to all major citrus-growing areas of the world (Hoy and Nguyen, 1997). Heavy infestations of *P. citrella* can seriously affect plants from nurseries and those recently planted, although the damage is less significant in mature trees (Sohi & Sandhu 1968). *P. citrella* is also known to increase the rate of spread of citrus canker by opening the leaf cuticle to infection and increasing the number and severity of lesions, thereby augmenting inoculum (Sinha et al., 1972; Gottwald et al., 1997).

Ujiye (2000) mentioned that it is so important to protect new shoots of young or top-grafted trees from the damage caused by summer and autumn generations of CLM. All citrus orchards in Pakistan suffer from the attack of citrus leaf miner to a greater or lesser extent. The damage is caused by the larvae which live in the leaves and feed on the chlorophyll below the epidermal layer. They form zigzag galleries where by the leaves wrinkled and are devoid of chlorophyll content and give whitish yellow or silvery appearance. The infested leaves curl down,

photosynthetic function of the leaves adversely affected and thereby the yield potential is greatly reduced.

The present studies were carried out to test the efficacy of different insecticides viz., Match, fastac, pirate, cascade, aflix, hostathion, methyl-parathion, azodrin and systoate against *P. citrella* larvae on citrus nursery.

MATERIALS AND METHOD

In this project an attempt was made to investigate the efficacy of match 5EC, fastac 5EC, pirate 36 SC, cascade 10WDC, aflix 36 EC, hostathion 40EC, methyl-parathion 50EC, azodrin WSC, Systoate 40EC against citrus leaf miner.

The trials were conducted in the orchard of University of Agriculture, Faisalabad to study the efficacy of different insecticides against the citrus leaf miner. The trials were laid out in Randomized Complete Block Design (RCBD) with three replications and 10 treatments. The plot size was 6.1 × 3.66 m.

The test insecticides viz., Match 5EC, Pirate 36 SC, cascade 10WDC, aflix 36 EC, hostathion 40EC, methyl-parathion 50EC, azodrin WSC, systoate 40EC were applied at dose rates 100 ml, 50 ml, 70 ml, 100 ml, 150 ml and 200 ml per 100 liters of water, respectively. Three sprays of each treatment were applied with an interval of 15 days.

The evaluation of the treatments was made on two bases.

1. Assessment of percentage reduction in leaf infestation caused by citrus leaf miner.
2. The percentage of larval mortality.

Percentage leaf infestation was taken on two intervals viz., 7 and 10 days, while the larval mortality was calculated after 3, 7 and 10 days after each application of insecticides. The larval mortality was corrected using Abbott's (1925) formula. The data were subjected to analysis of variance technique and treatments were compared by Duncan's Multiple Range (DMR) test.

RESULTS

1. Citrus leaf infestation by *Phyllocnistis citrella* at various intervals after spray under different treatments

The data regarding the percent reduction in leaf infestation of citrus leaf miner after 7 days of first application are given in Table 1a (II) which shows that treatments have highly significant difference among each other. Individual comparison of means showed that treatment T_5, T_1 and T_3 have no significant difference among each other, having the percentage reduction in damage 65.18%, 59.80% and 59.16% respectively. While, these treatments are at par with T_8 (55.49%), T_2 (53.92%), T_4 (52.18%), T_9 (52.05%) and T_7 (47.00%). Results given in Table 1-A (III) showed the percent reduction in leaf infestation of citrus leaf miner after 10 days of first application. Individual comparison of means showed that T_9 (54.56%), T_1 (54.17%), T_3 (53.90%), T_5 (52.52%), T_2 (49.33%), T_8 (49.26%), T_4 (46.75%), T_6 (45.77%) and T_7 (41.18%) are statistically similar. Untreated check (T_{10}) gave the lowest percent reduction in leaf infestation of 11.42% and have a significant difference to all test treatments.

Table 1b (II) shows the data regarding percent reduction in leaf infestation of citrus leaf miner after 7days of second application. These results revealed that Azodrin (T_8) different significantly from all the other treatments in effectiveness and gave a maximum reduction in leaf infestation of 81.32%.

The data pertaining to the percent reduction in leaf infestation of citrus leaf miner after 10 days of second application is given in Table 1b (III). The data shows that Systoate (T_9) gave the maximum reduction in leaf infestation of 78.70%. The data in Table 1c (II) shows the percent reduction in leaf infestation of CLM after 7 days of third application. All test insecticides are showing statistically similar results.

After 10 days of third application T_4 gave the maximum reduction in leaf infestation of 81. 89% while at par with T_1 (76.17%), T_6 (75.74%), Ts (75.68%), T_2 (74.74%), T_9 (68.79%) and T_8 (65.69%). However, these treatments, T_1, T_6, T_3, T_2, T_9, T_8, T_5, and T_7 are statistically similar. T_5 (63.38%) and T_7 (60.62%) are significantly differ to T_4, while at par with all other treatments except T_{10} with minimum reduction in leaf infestation of 22.58%. T_{l0} also have a significant difference to all the test treatments.

Results given in Table 1d (II) showed the overall mean percent reduction leaf infestation of citrus leaf miner after 7 days of spraying (Average of 3 sprays). The results revealed that T_8 (69.33%), T_5 (67.38%), T_4 (64.43%), T_6 (61.88%), T_1 (60.94%), T_9 (60.87%), T_7 (60.69%), T_2 (60.61%) and T_3 (60.30%) are statistically similar. Untreated check (T_{l0}) gave the minimum reduction in leaf infestation of 10.91%. The data regarding the overall mean percent reduction in leaf infestation of citrus leaf miner after 10 days of spraying (Average of 3 sprays) are gives in Table 1d (III). Individual comparison of means showed that treatments T_3 and T_9 not significantly different among each other, having the percentage reduction in damage 67.41% and 67.35% respectively. While, these treatments are at par with T_6 (63.50%), T_1 (63.28%), T_4 (63.27%), T_8 (62.66%), T_2 (62.48%) and T_5 (61.36%).

2. Percent mortality of *Phyllocnistis citrella* at various intervals after spray under different treatments

The data regarding the percent mortality of citrus leaf miner at various intervals after spray under different treatments is given in Table 2 which shows that after 72 hours of first application, all the treatments were highly significant from each other. Systoate (T_5) gave the best control with maximum mortality of 86.97%. After 7 days of first application again T_5 gave maximum mortality of 91.62% and it is at par with T_4 (87.27%), T_3 (86.52%), T_6 (86.41), T_2 (84.72%) and T_8 (83.42%). After 10 days of first application, T_2 gave the maximum mortality (88.42%) and is at par with T_5 (86.28%), T_4 (83.94%), T_6 (83.83%) and T_3 (82.82%). Untreated check (T_{10}) gave no mortality.

The data regarding the percent mortality of CLM after 72 hours of 2nd application are given in Table 2b (II) which shows that T_6 gave the maximum mortality (86.67%).After 7days of 2^{nd} application maximum mortality was showed by T_4 (04.44%) and after 10 days of the 2^{nd} application T_9 showed maximum mortality (83.33%).

The data regarding the overall average percent mortality of citrus leaf miner after 72 hours of spraying (average of 3 sprays) are given in Table 2d (II).The results revealed that T_9 gave the maximum mortality of 91.02% while T_9 is at par with T_8, T_6, and T_4 with 85.84%, 83.87% and 83.53% mortality respectively. T_1 (81.20%), T_2 (80.40%), T_7 (80.00%), T_3 (79.33%) and T_5 (77.41%) are statistically similar, while at par with T_8, T_6 and T_4. Untreated check (T_{10}) gave minimum mortality of 3.96%.

Table 2d (III) Showing the overall percent mortality of citrus leaf miner after 7 days of spraying (average of 3 sprays) which shows that all the treatments have highly significant differences among each other. T_4 gave the maximum mortality of the pest with 91.13%. While, T_4 is at par with T_9 (89.83%), T_1 (87.68%), T_3 (87.17%), T_8 (86.96%), T_6 (85.47%), T_7 (83.89%) and T_2 (82.87%) mortality. However, these treatments, i.e. T_9, T_1, T_3, T_8, T_6, T_7 and T_2 are statistically similar. T_5 gave 79.06% mortality and is at par with T_9, T_1, T_3, T_8, T_6, T_7 and T_2 and these treatments are statistically similar. T_{10} gave the minimum mortality of 6.41% and is significantly different to all other test treatments.

The data regarding the overall average percent mortality of citrus leaf miner after 10 days of spraying (average of 3 Sprays) are given in Table 2d (IV). The results showed that T_4 gave 89.09% mortality of the pest. While, mortality percentage of T_4 is at par with that of T_1 (84.82%), T_3 (84.35%), T_2 (82.80%), T_6 (80.80%) and T_9 (80.40%). However, these treatments, i.e. T_1, T_3, T_2, T_6, and T_9 have no differences statistically. T_7 (79.54%), T_8 (77.70%) and T_5 (77.65%) are statistically similar and is at par with T_1, T_3, T_2, T_6 and T_9. However, these treatments, i.e., T_1, T_3, T_2, T_6 and T_9 are statistically similar. Untreated check (T_{10}) gave the minimum mortality of 6.11%.

DISCUSSION

The results of these investigations showed that Azodrin (69.33%), Aflix (67.38%), Cascade (64.43%), Hosthathion (61.88%), Match (60.94%), Systoate (60.87%), Methyl-parathion (60.69%), Fastac (60.61%) and Pirate (60.30%) gave significant reduction in leaf infestation of citrus leaf miner after 7 days of application as compared to untreated check. These findings are in agreement with Zeng and Huan (1995) who reported that fenvalerate, methomyl, cartap, cascade and azadirechtin gave good control of *Phyllocnistis citrella*. Valand et al. (1992) also reported effective control of citrus leaf miner with the application of fenpropathrin, fluvalinate, triazophos, monocrotophos, endosulfan, qunialphos, methyl-o-demeton, dimethoate, after 7 days of treatment.

In the present studies Pirate and Systoate not differ significantly among each other having the percentage reduction in damage 67.41% and 67.35% respectively hosthathion (63.5%), Match (63.28%), Cascade (63.27%), Azodrin (62.66%), Fastac (62.48%), Aflix (61.36%) and Methyl-parathion (57.70%) gave significant reduction in leaf infestation of citrus leaf miner after 10 days of application as compared to untreated check. These findings are supported by Karimullah and Ahmad (1988) who studied the efficacy of triflumuron, phosphamidon, dimethoate and methamidophos and reported that these insecticides gave good control of *Phyllocnistis citrella*. Present finding are quite in conformity with those of Batre and Sandhu (1986) who also reported that cypermethrin at 0.01% and deltamethrin at 0.005% gave best control. Our findings further tally with the results of Maheshwari and Sharma (1986) who use phosphamidon, dimethoate, formothion, lindone, malathion, endosulfan and carbaryl for the effective control of this pest on citrus.

The results of present investigations revealed that systoate (91.02%), azodrin (85.84%), hosthathion (83.40%), methyl parathion (80.00%), Pirate (79.33%) and Aflix (77.41%) mortality of citrus leaf miner was observed after 72 hours of application as compared to untreated check. These results are in conformity with those of Singh and Azam (1986) who reported that Neem cake extract at a rate of 1 kg $10l^{-1}$ gave 95.26%, dimethoate 0.05% gave 94.25% and Metasystox 0.05%, (demeton-somethyl) causing 89.90% mortality of Phyllocnistis citrella after 72 hours of treatment. Radke and Thakare (1989) reported effective control of larval populations of *Phyllocnistis citrella* on newly flushed citrus trees after 72 hours of treatment with 0.01% permethrin, 0.01% Fenvalerate and Cypermethrin, Endosulfan, Malathion and Monocrotophos.

Radke and kandaekan (1990) successfully controlled the larval population of *P. citrella* by treating with fenvalerate, cypermethrin and permethrin at 0.01% concentration. These results are also supported by Rade and Kandalkar (1988) who tested fenvalerate, cypermetnrin and permethrin which resulted in 68.04, 64.46 and 69.43% mortality respectively, 24 hours after spray.

The results of these investigations showed that cascade (89.09%), match (84.82%), pirate (84.35%), fastac (82.80%), hosthathion (80.80%), systoate (80.40%), methyl-parathion (79.54%), azodrin (77.70%) and aflix (77.65%) mortality of citrus leaf miner was observed after 10 days of application. These results are supported by Sing (1984) who observed the efficacy of 0.05% parathion, 0.1% metasystox (demeton-s-methyl) and phosphamidon gave 89.2-98.6% mortality of the pest. These results are also confirmed by Reddy et al. (1988) who tested the efficacy of 0.03% and 0.05% monocrotophos causing 100% larval mortality *of P. citrella* after 12 days of application. Lin et al. (1985) reported 25% isofenphos gave 96.1-98.1% control and 20% fenvalerat gave 94.7-100% mortality. Many workers like Bhatia and Joshi (1991), Wilson (1991), Katole et al. (1993), Pena and Duncan (1994) and Alrubeai et al. (1997) carried out investigations on different insecticides against the citrus leaf miner and gave satisfactory results.

REFERENCES

Alrubeai, H., I. Aljboory, A. Hafied, B. Hassan and N. Jabbo, 1997. Efficacy of some plant extracts and chemical insecticides on *Phyllocnistis citrella*. *Arab Near East Pl. Pr. News Lett.,* No. 24, 1997.

Batra, R.C. and G.S. Sandhu. 1986. Chemical control of citrus leaf miner in nursery . *Punjab Hortic. J.* 26 (1/4) 31-33.

Bhatia, K.N. and R.K. Joshi. 1991. Efficacy of insecticidal treatments in the control of citrus leaf miner on Kinnow seedlings in the nursery. *Madras. Agric. J.* 78(1- 4):106-108.

Gottwald, T. R., J.H. Graham, and T.S. Schubert. 1997. An epidemiological analysis of the spread of citrus canker in urban Miami, Florida, and synergistic interaction with the Asian citrus leaf miner. *Fruits,* 52:371-378.

Hoy M.A. and R. Nguyen 1997. Classical biological control of the citrus leafminer *Phyllocnistis citrella* Stainton (Lepidoptera: Gracillariidae): *Theory, practice, art, and science. Tropical Lepidoptera,* 8(Suppl. 1):1-19.

Karimullah and S. Ahmad, 1988. Chemical control of citrus leaf miner on citrus. *Pak. J. Agric. Res.,* 9(2):271 -273.

Katole, S.R., H.S. Thakare and R.K. Mahajan. 1993. Effect of some plant products and insecticides on the infestation of citrus leaf miner on Nagpur mandarin. *J. Maharashtra Agric. Univ .,* 18(1):67-68.

Lin, Y.D., J.M. Fang, S.F. Huang and W. Chen. 1985. A study on integrated control measures for Phy/locnistis *citreila* Stainton. *Fujian Agric. Sci. Techn*. 4(1):30-31.

Maheshwari, A. C. and L. S. Sharma. 1986. Seasonal incidence control of citrus leaf miner, *Phyllocnisits citrella* stainton at Udaipur. *Pestic.,* 20(1):37-38.

Pena, J.E. and R. Duncan. 1994. Control of the citrus leaf minner in South Florida. *Proc Florida State Horti. Soc.* 106:47-51.

Rade, S.G. and H.G. Kandalkar. 1988. Chemical control of citrus leaf miner. PKV. *Res. J.,* 12 (2) :123 - 125.

Radke, S.G. and A. Y. Thakare. 1989. Chemical control of citrus leaf miner. PKV. Res. J., 13 (1) :44 -47.

Radke, S.G. and H.G. Kandaekan. 1990. Chemical control of citrus leaf miner, *Phyllocnjstis citrefia* stainton. *Indian J. Entomol.,* 52(3):397-400.

Reddy, K.R.S., P. Savitri and P.K. Rao. 1988. Chemical control of citrus leaf miner Phyllocnistis *citrella* St. *Indian J. Entomol.,* 50(4):468-475.

Saeed, A. and M.A. Ghafoor. 1962. History and development of citrus Industry. *Punjab Fruit J.* 26(7):90-99.

Shevale, B.S., D.S. AJri and D.B. Kadam. 1987. Evaluation of .various insecticides against citrus leaf miner *(Phyllocnistis citrella* Stn.). *Current Res. Rep. Mahatma Phule Agric. Univ.,* 3(2):30-32.

Shidharan, S., N. Dhandapani, N. Nagarajan and S. Thambura. 1989. Seasonal incidence and control of citrus leaf miner in mandarin orange. *Pestol*., 13(4):15-16.

Singh, B.P. 1984. Studies on the bionomics and control of citrus leaf miner *Phllocnistis citrella* Stainton. *Pestic.* 18(12):46-50.

Singh, T.V.K. and K.M. Azam, 1986. Seasonal occurrence, population dynamics and chemical control of citrus leaf miner, *Phyllocnisits citrella* St. in Andhra Pradesh. *Indian J. Entomol.* 48(1):38-42.

Sinha, M.K., R.C. Batra and D.K. Uppal. 1972. Role of citrus leaf miner (*Phyllocnistis citrella* Stainton) on the prevalence and severity of citrus canker (*Xanthomonascitri* (Hasse) Dowson). *Madras Agric. J.,* 59:240-245.

Steel, R.G.D. and J.H. Tome. 1980. Principles and Procedures of Statistics. McGraw Hill Book Co., New York.

Ujiye, T. 2000. Biology and control of the citrus leaf miner, *Phyllocnistis citrella* Stainton (Lepidoptera: Gracillariidae) in Japan. *Japan Agric. Res. Quart.* 34:167-173.

Valand, V.M., J.R. Patel and N.C. Patel. 1992. Bio-efficacy of insecticides against citrus leaf miner, on kagzi lime. *Ind. J. PI. Prot.,* 20(2):212-214.

Vekateswarlu, C. and S. Ramapandu. 1992. Compatibility of fungicides and bactericide with insecticides in the control of citrus canker and leaf miner in acid lime. *Ind. J. PI. Prot.,* 20(1):27-31.

Vivekanandan, P. and T.G. Naganathan. 1983. Efficacy of insecticides in the control of citrus leaf miner. *Pestic.*, 17(9):22-23.

Wilson, C. 1991. Citrus leaf miner. Agnote - (Darwin), (*Rev. Agric. Entomol*., 080 - 01347:1992).

Wilson, C. 1994. Citrus leaf miner. Agnote Darwin No. 593. pp.2.

Zeng, X.N. and Z.S. Huan. 1995. Investigations on timing spray insecticide against citrus leaf miner. *J. South China Agric. Univ.,* 16(1):44-49.

Table 1: Citrus leaf miner infestation before spray and percent reduction in leaf infestation at various intervals after spray under different treatments

	(a) I - Spray			(b) II - Spray			(c) III - Spray			(d) Overall average of 3 spray Applications		
Treat.	Pre-treatment population	Percent reduction in L.I. after treatment		Pre-treatment population	Percent reduction in L.I. after treatment		Pre-treatment population	Percent reduction in L.I. after treatment		Pre-treatment population	Percent reduction in L.I. after treatment	
	24 hours I	7 days II	10 days III	24 hours I	7 days II	10 days III	24 hours I	7 days II	10 days III	24 hours I	7 days II	10 days III
T_1	52.15	59.80 a	54.17 a	31.95	59.93 b	59.49 b	15.35	63.09 a	76.17 a b	33.15	60.94 a	63.28 a b
T_2	51.93	53.92 a b	49.33 a	32.23	59.51 b	63.29 b	15.19	68.40 a	74.73 a b	33.12	60.61 a	62.48 a b
T_3	52.13	59.16 a	53.90 a	28.34	64.36 b	72.55 a b	10.37	61.05 a	75.68 a b	30.28	60.30 a	67.41 a
T_4	49.04	52.18 a b	46.75 a	24.18	61.58 b	61.16 b	11.77	79.53 a	81.89 a	28.33	64.43 a	63.27 a b
T_5	52.59	65.18 a	52.52 a	29.02	67.28 b	68.17 a b	11.16	69.68 a	63.38 b	30.29	67.38 a	61.36 a b
T_6	53.14	39.17 b	45.77 a	33.37	68.66 b	73.82 a b	12.13	77.79 a	75.74 a b	29.38	61.88 a	63.50 a b
T_7	59.18	46.99 a b	41.18 a	32.26	68.18 b	71.30 a b	10.03	66.89 a	60.62 b	33.82	60.69 a	57.69 b
T_8	55.90	55.49 a b	49.26 a	32.26	81.32 a	73.04 a b	09.21	71.17 a	65.69 a b	32.46	69.33 a	62.66 a b
T_9	60.54	52.05 a b	54.56 a	33.43	69.68 b	78.69 a	11.33	60.87 a	68.79 a b	35.10	60.87 a	67.35 a
T_{10}	64.70	20.77 c	11.42 b	79.72	05.33 c	08.96 c	80.03	06.75 b	22.58 c	74.82	10.91 b	14.21 c

Table 2: Citrus leaf miner population before spray and percent mortality of citrus leaf miner at various intervals after spray under different treatments

Treats	(a) I - Spray				(b) II - Spray				(c) III - Spray				(d) Overall average of 3 spray application			
	Pre-treatment population	Percent reduction in L.I. after treatment			Pre-treatment population	Percent reduction in L.I. after treatment			Pre-treatment population	Percent reduction in L.I. after treatment			Pre-treatment population	Percent reduction in L.I. after treatment		
	24 hours I	72 hours II	7 days III	10 days IV	24 hours I	72 hours II	7 days III	10 days IV	24 hours I	72 hours II	7 days III	10 days IV	24 hours I	72 hours II	7 days III	10 days IV
T_1	66.66	71.38 be	82.51b	79.48 bed	66.66	86.11 a	86.11 a	80.55 a	66.66	86.11 a	94.44 a	94.44 a	66.66	81.20 b	87.68 ab	84.82 ab
T_2	66.66	68.98 c	84.72 ab	88.42 a	66.66	80.55 a	72.22 a	74.99 a	66.66	91.67 a	91.67 a	85.00 a	66.66	80.39 b	82.87 ab	82.80 ab
T_3	66.66	76.09 abc	86.52 ab	82.82 abc	66.66	66.66 a	76.67 a	75.00 a	66.66	95.10 a	95.24 a	95.24 a	66.66	79.33 b	87.17 ab	84.35 ab
T_4	66.66	83.94 ab	87.27 ab	83.94 abc	66.66	83.33 a	94.44 a	83.33 a	66.66	83.33 a	91.67 a	100.0 a	66.66	83.53 ab	91.13 a	89.09 a
T_5	66.66	80.01 abc	91.62 a	86.28 ab	66.66	71.11 a	64.44 a	65.55 a	66.66	81.11 a	81.11 a	81.11 a	66.66	77.41 b	79.06 b	77.65 b
T_6	66.89	77.18 abc	86.41 ab	83.83 abc	66.66	86.67 a	82.22 a	75.55 a	66.66	87.78 a	87.78 a	83.03 a	66.66	83.87 ab	85.47 ab	80.80
T_7	66.66	80.28 abc	80.83 b	73.33 d	66.66	74.99 a	80.55 a	74.99 a	66.66	84.72 a	90.28 a	90.28 a	66.66	79.99 b	83.89 ab	79.54 b
T_8	66.66	80.08 abc	83.42 ab	77.31 cd	66.66	82.22 a	82.22 a	67.22 a	66.66	95.24 a	95.24 a	88.57 a	66.66	85.84 ab	86.96 ab	77.70 b
T_9	66.66	86.97 a	80.60 b	63.43 e	66.66	86.11 a	88.89 a	83.33 a	66.66	100.00 a	100.0 a	94.44 a	66.66	91.02 a	89.83 ab	80.40
T_{10}	66.66	02.56 d	05.33 c	00.00 f	66.66	05.13 b	04.76 b	07.51 b	66.66	04.17 b	8.33 b	10.83 b	66.66	03.96 c	06.14 c	6.11 c