Agricultural and Biological Sciences Journal
Vol. 1, No. 4, 2015, pp. 157-161
http://www.aiscience.org/journal/absj

Population Estimation of Thrips Frankliniella Tritici (Fitch) on Different Rose Varieties

Laila Khalid[1, *], Munir Ahmed[2], Humayun Javed[2], Malik Ghulam Yasin[3]

[1]Adaptive Research Farm Vehari, Punjab, Pakistan
[2]Department of Entomology, Pir Mehr Ali ShahArid Agriculture University, Rawalpindi, Pakistan
[3]Zonal Manager Suncrop Company Punjab, Punjab, Pakistan

Abstract

Rose is an important cut flower grown on large scale in Pakistan for commercial purposes. Thrips is one of the most important sucking pests of Rose causing a huge loss to yield and beautification of Roses. The purposed research work was carried out under Randomized Complete Block Design (RCBD) to study the population dynamics of rose thrips at experimental field area of Pir Mehr Ali Shah Arid Agriculture University Rawalpindi on different Rose cultivars, Iceberg, Christan dair, Visky Mac, Love, Surkha rose, Macadi, Perfecta and Gold Medal. Thrips was recorded on buds and flowers by using the magnifying lens and the effect of environmental factors on thrips population was studied. The data was collected from the 1st appearance of thrips on rose cultivars, and was continued until the end of population. Significantly greater thrips populations were observed on Perfecta, Iceberg and Gold Medal. However, significantly lesser thrips observed on Love and Mecadi. The expected results concluded from the studies will be helpful for the end users including gardeners and park managers to improve the health of their roses by knowing about the population fluctuation of rose thrips for its better management.

Keywords

Rose, Thrips, Varieties, Population

Received: March 26, 2015 / Accepted: April 22, 2015 / Published online: June 12, 2015

1. Introduction

Rose (*Rosa indica*) has been the most important crop in the floriculture industry. The genus *Rosa* includes 200 species and 18,000 cultivars (Weiss, 1997; Gudin, 2000). Roses are of different types which includes white rose, pink rose, maroon rose, red rose, yellow rose and orange rose (Palmer *et. al*. 1992). Roses are used for beauty and decoration of garden, extraction of attar for making fragrant mixtures, for tables and house decoration, large formal feasts and public functions cut flowers and sprays on wedding banquets and funeral ceremonies (Sujatha and Gowda, 1997). The current world checklist of Thrips (Thysanoptera) contains about 7400 species-group and 1200 genus-group (Mound, 2007). *Frankliniella spp*. (Thysanoptera: Thripidae) thrips damage a variety of crops, feed on a broad range of hosts, and often migrate into cropping systems from adjacent vegetation. The most common *Frankliniella* species on every plant species was *F. tritici* was highly aggregated in the flowers or flower racemes, rather than leaves or fruit (Northfield *et al*. 2008). The development and reproduction of *F. occidentalis* and *F. tritici* were evaluated, both species showed similar patterns in development and reproduction at 28 ^{o}C (Childers, 1997). MacIntyre *e. al.* 2005 studied flower thrips population dynamics by using both white sticky traps and plant counts, to gain insight into flight height, and to determine the genus and sex of thrips fauna present in monitored fields. *F. tritici* (Fitch) was the most abundant species. In both the fall and spring, significantly more adults occurred in flowers in the upper part of the plant canopy than in flowers in the lower part of the plant canopy. Immature thrips occurred in the

* Corresponding author
E-mail address: laila_kld@yahoo.com (L. Khalid)

lower part of the plant canopy than in flowers in the upper part of the plant canopy. Differences in seasonal patterns and within plant distribution should be considered in developing sampling protocols and management plans for thrips (Reitz, 2002). Daily occurrence and flight activity of *Frankliniella* spp. (Thysanoptera: Thripidae) is observed in the morning than in the afternoon. Numbers of *F. tritici* (Fitch), *F. fusca* (Hinds) and immature thrips on flowers or foliage did not differ among sample hours. Temperature was an important factor in the flight activity of *F. tritici*. Populations of *F. tritici* peaked earlier in the season and declined sooner than those of *F. occidentalis* (Cho *et al.* 2000). Thrips population growth was mainly dependent on temperature, population density and food availability. The damaged leaf area, caused by the pest infestation, was simulated separately. Thrips samples were taken during the whole cultivation period and larvae and adult thrips were summarized as pest individuals in the population (Nothnagl *et al.* 2008). Their studies showed that thrips puncture the leaves, flowers, or stems with their mouth parts and suck up the exuding sap. Waterhouse and Norris (1989) studied that there are 4 stages, or instars, between the egg and adult. The feeding instars (the first 2 stages) are called larvae and the non-feeding instars are called pupae. Durations of each stage vary depending primarily on temperature. They said that reproduction in many species may occur without fertilization (parthenogenetically). Rosenheim *et al*. (1990) reported that the flower thrips is primarily a flower feeder that eats both the flower petals and pollen. They also feed on foliage of certain hosts and produce a characteristic silvery appearance of thrips damage. Vacante (2000) studied that the flower thrips are harmful to numerous vegetables (tomato, aubergine, pepper, cucumber, strawberry, etc.) and ornamental plants (rose, carnation, gerbera, etc.) grown in (greenhouses). The objective of this research work is as follows: To study the population dynamics of Thrips *Frankliniella tritici* (Fitch) on different rose varieties.

2. Materials and Methods

The research was carried out to study the population dynamics of Thrips on rose under field conditions during 2007-2009. The research was conducted at experimental field area of Pir Mehr Ali Shah Arid Agriculture University, Rawalpindi under Randomized Complete Block Design (RCBD). The plants were selected in the 1st week of November to mid February during 2007 to 2008 and next year during the same months to record two years data. Varieties including Iceberg, Love, Goldmedal, Wiskymac, Perfecta, Meccadi, were selected in four replications. Each plant was divided into upper, middle and lower portions and each portion was further divided into buds and flowers to count the population of thrips by visual counts method. Each experimental plot had a measurement of 576 square feet, from which the population of thrips was recorded. The distance between each plot was 5ft, while the plant to plant distance was 4ft but the 1st plant distance was 2ft from their respective sides. Irrigation was done fortnightly. There were six treatments with four replications. No insecticide was applied in experiment in order to take the actual population of thrips on rose varieties. Excessive use of insecticides can also lead to development of insecticide resistance (Gill and Garg 2014). Plants were selected from each variety of rose and tagged by tagging paper strips. The purpose of selecting the plants was to study the population dynamics of thrips and to see the environmental impacts on their population. Data were recorded on weekly basis during the evening time. Nymphs and adults were counted from buds and flowers by using a magnifying lens. Data were recorded on weekly basis to count the population of thrips (nymphs and adults) on buds and flowers. One bud or flower was selected from the upper portion, 2nd from the middle portion relatively and third from the lower portion of the plant. Then the number of nymphs and adults were counted with the help of a magnifying lens. The percent population of thrips was counted from buds with the help of a formula as given below: % Population on buds = Total number of thrips on buds × 100 Total number of thrips on plants Meteorological data (temperature, humidity and rainfall) were taken from the Regional Agro-Meteorological Centre at Rawalpindi to examine the impact of environmental factors on thrips population during the years 2007-09.The data were collected on weekly basis and analyzed by using ANOVA through MSTAT-C (1991) micro computer statistical programme, Michigan State University, USA.

3. Results and Discussion

3.1. Thrips Population During the Year 2007-08

3.1.1. Mean Population of Thrips Nymph on Flowers and Buds

The comparison of varietals means for the population of nymph thrips as mentioned in table 1 on flowers and buds by Duncan's multiple range test at 0.05 level of probability during the year 2007-08. Statistically there were observed high significant population of nymph on rose flowers at variety Perfecta (10.41) most susceptible then on Wiskymac (9.09) and Iceberg (8.78). Minimum population was observed on Mecadi variety which is most resistant (2.68) Gold medal (7.59) and Love as (7.04) showed similar population with little difference. The sudden decline in population was due to rainfall. Shower of rainfall reduced the population of thrips

(Rustmani *et al.* 1999). Weather conditions alter the activity and reproduction of thrips (Chambers *et al.* 1985). While in case of buds, statistically significant population of nymphs was observed on buds of Iceberg (8.25), then on Goldmedal (6.09). The rose varieties Perfecta and Love showed similar population i.e 4.67 and 3.86. Chellemi in 1994 said that *F. tritici* followed by *F. bispinosa*, *F. occidentalis* and *F. fusca*. *F. tritici* was the most abundant species in Dec. to Feb. and August. The minimum population was observed on Mecadi and Wiskymac which are resistant varieties i.e 3.06 and 2.64. Overall thrips nymph population observed high on flowers than on buds.

3.1.2. Mean Population of Thrips Adults on Flowers and Buds

The comparison of varietals means for the population of adult thrips on flowers and buds as mentioned in table 1 by Duncan's multiple range test at 0.05 level of probability during the year 2007-08. Statistically there was observed high significant population of adult thrips on rose flowers variety Perfecta (3.13) and Wiskymac (3.08) which shows susceptibility. The minimum population was observed on Mecadi the most resistant variety (0.67). Reitz in 2002 said that thrips are much more abundant in the spring than in the fall. Love, Iceberg and Goldmedal varieties showed similar population with minimum difference (2.54, 2.07 and 2.32). In case of buds, statistically highly significant population of adult thrips was observed on rose variety Iceberg and Goldmedal which are susceptible as compared to the rest varieties (1.54 and 1.48). Wiskymac, Perfecta, Love and Mecadi varieties showed similar population (0.93, 0.93, 0.77 and 0.89). Leskey *et al.* (1997) showed that for diets with and without pollen, thrips adult longevity significantly decreased with increasing temperature.

3.2. Thrips Population During the Year 2008-09

3.2.1. Mean Population of Thrips Nymph on Rose Flowers and Buds

The comparison of varietals means for the population of nymph thrips on flowers and buds as showed in table 2 by Duncan's multiple range test at 0.05 level of probability during the year 2008-09. Statistically there were observed high significant population of thrips nymph on rose flower varieties Wiskymac Goldmedal, Perfecta and Iceberg (11.03, 9.89, 9.84 and 9.78). The minimum population was observed on Mecadi variety which shows resistance (3.54). Love showed average mean population for thrips nymph (7.98). While in case of buds, statistically there were observed high significant population of thrips nymph on Perfecta which is susceptible variety (5.87). Population on Iceberg, Goldmedal and Love were non-significantly different (4.94, 5.00 and 4.35). Chyzik and Ucko in 2002 assumed that the thrips has survived the hottest months by aestivation and migrated to the plants when air temperature decreased. The minimum population was observed on Mecadi and Wiskymac rosé resistant varieties (3.46 and 3.75).

Table 1. Comparison of varitial means for the population of thrips on rose flowers and buds during 2007-08 by Duncan's Multiple Range Test.

S.no	Varieties	Means on flowers		Means on Buds	
		Nymphs	Adults	Nymphs	Adults
1	Perfecta	10.41 a	3.13 a	8.25 a	1.54 a
2	Wiskymac	9.09 ab	3.08 a	6.09 b	1.48 a
3	Iceberg	8.78 bc	2.55 b	4.67 c	1.17 b
4	Goldmedal	7.59 cd	2.33 b	3.86 cd	0.93 b
5	Love	7.05 d	2.08 b	3.06 de	0.93 b
6	Mecadi	2.69 e	0.67 c	2.64 e	0.89 b

Table 2. Comparison of varitial means for the population of thrips on rose flowers and buds during 2008-09 by Duncan's Multiple Range Test.

S.no	Varieties	Means on flowers		Means on Buds	
		Nymphs	Adults	Nymphs	Adults
1	Perfecta	9.84 a	2.31c	5.87 a	1.06 ab
2	Wiskymac	11.03 a	2.45 c	3.75 cd	1.01 ab
3	Iceberg	9.78 a	3.57a	4.94 b	1.23 a
4	Goldmedal	9.89 a	3.40 ab	5.00 b	1.26 a
5	Love	7.98 b	3.00 b	4.35 bc	1.10ab
6	Mecadi	3.54 c	0.98 d	3.46 d	0.89 b

3.2.2. Mean Population of Thrips Adults on Flowers and Buds

The comparison of varietals means for the population of adult thrips on flowers and buds as mentioned in table 2 by Duncan's multiple range test at 0.05 level of probability during the year 2008-09. Statistically significant high population of thrips adults was observed onflowers of Iceberg which is most susceptible variety (3.57) then on Goldmedal (3.40). The minimum population was observed on Mecadi which is resistant variety (0.98). Perfecta and Wiskymac varieties showed similar population (2.31 and 2.45). Magalhaes *et al.* (2007) reported that the prey refuges are expected to affect population dynamics of thrips. While in case of buds, statistically there were observed high significant population of adult thrips on Goldmedal and Iceberg which are susceptible varieties (1.26 and 1.23). Wiskymac, Perfecta and Love varieties showed similar average population (1.01, 1.06 and 1.01). Jaskiewicz (2003) found that increase in temperature and rainfall is the main factors affecting thrips population. There was no significant difference between mean thrips population observed on Goldmedal, Iceberg, Wiskymac, Perfecta and Love. Mean thrips population on Mecadi was minimum (0.89). Cho *et al.* (2000) reported that temperature is an important factor in the flight activity of *F. tritici.* Populations of *F. tritici* peaked earlier in the season and declined sooner. The results concluded from the studies will be helpful for the end users including gardeners and park managers to improve the health

of their roses by knowing about the population fluctuation of rose thrips for its better management.

Fig. 1. Different Rose Varieties.

Fig. 2, 3 and 4. Observation with magnifying lens.

References

[1] Chambers, R. J., K. G. Sunderland, D. L. Stacey and I.J. Wyatt. 1985. Control of thrips on winter rose. Journal of annals of applied Biology, 108: 219-23.

[2] Chellemi, D. O., J. E Funderburk and D. W. Hall 1994. Seasonal abundance of flower-inhabiting *Frankliniella* species (Thysanoptera: Thripidae) on wild plant species. Environmental Entomology. 2: 337-342.

[3] Childers, C. C. 1997. Feeding and oviposition injuries to plants. *Thrips as Crop Pests* (ed. T. Lewis), CAB International, Wallingford, UK. 339- 433.

[4] Cho, K., J. F. Walgenbach and G. G.Kennedy. 2000. Daily and temporal occurrence of *Frankliniella* spp. (Thysanoptera: Thripidae) on rose. Applied Entomology and Zoology. 2: 207-214.

[5] Chyzik, R. and O. Ucko. 2002. Seasonal abundance of the western flower thrips *Frankliniella occidentalis* in the Arava valley of Israel. Phytoparasitica. 4:335-346.

[6] Gill, H. K., and H. Garg. 2014. Pesticide: Environmental Impacts and Management Strategies, pp. 187-230. In: S. Solenski, and M. L. Larramenday (Eds.). Pesticides- Toxic Effects. Intech. Rijeka, Croatia. (http://www.intechopen.com/books/pesticides-toxic-aspects/pesticides-environmental-impacts-and-management-strategies).

[7] Gudin, S. 2000. Rose: Genetics and breeding. Plant Breeding. 17: 159–189.

[8] Jaskiewicz. 2003. Population dynamics of *Frankliniella* spp. on rose in the green areas of Lublin. Annales Universities Mariae- Curie-Skodowska-Sectio- EEE, Horticulture. 13:271-278.

[9] Leskey, T. C., D. A. J. Teulon and E. A. Cameron. 1997. Effects of Temperature and Sugar Maple Pollen on Oviposition and Longevity of Pear Thrips (Thysanoptera: Thripidae). Environmental Entomology. 3: 566-571.

[10] MacIntyre, A. J., Scott, C. D. Dupree, J. H. Tolman and C. R. Harris. 2005. Evaluation of sampling methodology for determining the population dynamics of thrips (Thysanoptera: Thripidae) in Ontario flower fields. Journal of Economic Entomology. 6: 2272-2281.

[11] Magalhaes, S., P. C. J. Van Rijn, M. Montserrat, A. Pallini and M. W. Sabelis. 2007. Population dynamics of thrips prey and their mite predators in a refuge. Oecologia 4:557-568.

[12] Mound, L. A. 2007. Thysanoptera (Thrips) of the World - a Checklist. Commonwealth Scientific and Industrial Research Organization, Entmol. Canberra, Australia. http://www.ento.csiro.au/thysanoptera/worldthrips.html.

[13] MSTAT-C, Manual. Micro statistical programme, Michigan State University, USA (1991).

[14] Northfield, T. D, D. R. Paini, J. E. Funderbur, and S. R. Reitz. 2008. Reitz Annual cycles of *Frankliniella* spp. (Thysanoptera: Thripidae) thrips abundance on north Florida uncultivated reproductive hosts: Predicting possible sources of pest outbreaks. Annals of the Entomological Society of America. 4 : 769-778.

[15] Nothnagl, M., A. Kosiba, B. W. Alsanius, P. Anderson and R. U. Larsen. 2008. Modelling population dynamics of *Frankliniella occidentalis* pergande (Thysanoptera: Thripidae) on greenhouse grown chrysanthemum. Europ. J. of Hort. Sci. 73: 12-19.

[16] Palmer, J. M., L. A. Mound and G. J. D. Heaume. 1992. II Guides to insect of importance to man. Thysanoptera (London) International Institute of Entomol. Brit. Nat. Hist. Mus. 1-73 pp.

[17] Reitz, S. R. 2002. Seasonal and within plant distribution of *Frankliniella* thrips (Thysanoptera: Thripidae) in North Florida tomatoes. Florida Entomologist 3: 431-439.

[18] Rosenheim, J. A., S. C. Welter, M. W. Johnson, R. F. L. Mau and L. R. Gusukuma-Minuto. 1990. Direct Feeding Damage on Cucumber by Mixed-Species Infestations of *Thrips palmi* and *Frankliniella occidentalis* (Thysanoptera: Thripidae). J. Econ. Entmol. 83: 1519-1525.

[19] Rustmani, M. A., S. A. Sheikh, N. Memin, M. H. Leghari and M. H. Dhaunroo.1999. Impact of wheat plant phenology on the development of Greenbug, *Schizaphis graminum* (Rondani). Pakistan J. Zoology. 31 (3):245-248.

[20] Sujatha, K. and J. V. N. Gowda. 1997. Population technology of rose. In: I.S. Yadav and M. L. Choudhary (Eds.). Progressive Floriculture. Production technologies of important commercial flowers. The House of Sarpan(Media) Bangalore, 231 pp.

[21] Vacante, V. 2000. Animali dannosi alle ortive da serra. In: (a cura di). Manuale di Zoologia Agraria. Ed. By Baccetti, B.; Barbagallo, S.; Su¨ss, L.; Tremblay, E. Roma: Delfino.544-765 pp.

[22] Waterhouse, D. F. and K. R. Norris. 1989. *Frankliniella occidentalis* (Pergande). In: Biological Control Pacific Prospects - Supplement 1. Aust. Centre Int Agric. Res. Canberra. 24-35 pp.

[23] Weiss, E.A. 1997. Rosaceae. In Essential Oil Crops. E.A. Weiss, ed (Oxon, UK: CAB International Wallingford), pp. 393–416.