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Comparison of Different Methods to Control Fruit Fly *Acanthiophilus helianthi* Rossi (Diptera: Tephritidae) in Iran

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Abstract: Problem statement: The safflower fly is one of the most important insect pests of safflower in Iran. Losses caused by larval feeding on receptacle tissue or seeds leads to disrupted plant activities, reduction in flower buds and ultimately, to decreased quality and quantity of crop. **Approach:** To evaluate the efficiency of different methods of fruit fly control on Safflower, a field experiment was carried out at the Agricultural Research Station in Gachsaran, Iran in 2009. Five diverse methods, insecticides, baiting, cultural, Integrated Management and no treatment were assessed on weight of one thousand seeds, percentage of oil, percentage seed damage and harvest/ha. **Results:** Damage percentage and harvest/ha varied significantly in various control methods. Integrated Management and insecticide control indicated best results with harvest potential of 1850 and 1723 kg/ha with a least damage of 5% and 8% respectively. The minimum harvest (1103 kg/ha) and the most damage (39.4%) were recorded in plants where no treatment was applied. Bait trap method produced a harvest of 1405 kg/ha along with a damage of 20%. **Conclusion:** The results indicate the integrated management was significantly more successful compored to other methods.

Key words: Safflower; fruit fly; damage; integrated management.

INTRODUCTION

Fruit flies (Tephritidae) are one of the largest families of the acalyptrate Diptera, numbering over 4300 different species worldwide (Norrbom, 2004). Many species of fruit flies, especially the subfamily Tephritinae attacks the plants' family of Asteraceae (Freidberg and Kugler, 1989). Some species infest the flower heads of Asteraceae. Tephritidae infests with or without the induction of galls. Some species induce the formation of galls in the flower head, stems, or roots of Asteraceae (Choon *et al*., 2008; Freidberg, 1984; Hoe *et al*., 2009; Houri and Doughan 2006).

Fruit flies are one of the serious pests of safflower (*Carthamus tinctorius*), which is a multipurpose plant that supplies seed, which is used as edible oil, birdseed, aniline dyes and medicine at the same time. Safflower is mostly seen in Iran, Turkey and India and is cultivated in most part of Iran (Anon, 1983; Dezianian *et al*., 2010).

The capsule fly (*Acanthiophilus helianthi*) in Tephritidae family is one of the serious pests attacking the safflower (*Carthamus tinctorius*), a plant which is cultivated as an oil crop (Hegazi and Moursi 1983; Kazemi and Jafarloo, 2008 and Ting *et al*., 2009).

Field's experiment conducted to find out the appropriate insecticides against capsule fly, *Acanthiophilus helianthi* (Rossi) indicates that three sprays at 90, 110 and 130 days after sowing was more effective than two sprays at 110 and 130 days after sowing. However, 130-day-old crop was the most critical stage for insecticidal application against capsule fly (Selim, 1977). Bating, insecticidal and cultural practices for management of fruit flies have been tried in separate studies but not in an integrated manner (AI-Ali *et al*., 1977; Donal, 2008; Hallman, 2008; Ricci, and Ciriciofolo 1983).

The present study was designed to find out the best and the most effective method in fruit fly control in order to reduce losses and improve harvest/ha along with a better quality of safflower seed.

MATERIALS AND METHODS

An experiment was conducted on an established safflower genotype namely 'Sina' and four methods of control of capsule fly, including insecticide Danitol (Fenpropathrin @ 100gm/acre); baiting with Biolure (ammonium acetate), cultural (plant residue burning and collection of fallen flower heads after harvesting), integrated management (insecticide, baiting and cultural) and these four were compared with no treatment.

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These five treatments were arranged in a randomized complete block design with three replications on fifteen plots. Each plot with a size of 2 × 10 square meters have ten rows so that at the time of harvest six rows in the middle from each plot were selected for each treatment. Distance between each plot was kept as 10m. All other agronomic practices were applied equally in all methods. Information on different factors was recorded and analyzed statistically by Fishers analysis of variance. Seed damage and yield per plot in different methods were compared by using Least Significance Difference (LSD) test at 5% (Bashir *et al.,* 2005).

RESULTS AND DISCUSSION

Analysis of variance in the seed characters revealed that there was significant variation in weight of one thousand seeds, percentage of oil, percentage of damage and harvest/ha. among five different methods of control safflower capsule fly, at $p<0.05$ (Table1).

The coefficient of variation (C.V) was recorded for weight of one thousand seeds, percentage of oil, percentage of damage and harvest/ha as 4.5, 1.48, 1.55 and 0.43, respectively.

Table 1: Means squares of ANOVA for all traits.

ANOVA	Df	Weight of one thousand seeds(gram)	Percentage of oil	Percentage of damage	Harvest/ha.
BLOCK	2	0.20	1.61	3.20	1265.40
TREATMENT	3	33.85	35.80	556.32	254306.56
ERROE	6	1.43	0.17	0.70	43.317

a. Percentage Damage:

Percentage damage of safflower seed was significantly different among the various methods tested for fruit fly control. The highest seed damage of 39.4% was observed in case of safflower plants where no treatment was adopted. The lowest damage of 5% of Safflower plants was recorded where integrated management practices were carried out. This method had a significant differences with insecticide control method in which 8% damage was recorded (Table2). Ricci and Ciriciofolo (1983) had reported that pest damage levels on small, medium and large flower heads are 14, 38 and 79 percent respectively in no treatment practice. Furthermore, Keyhanian (2007) reported a 10-33% damage of the flower head due to feeding of this fly.

b. Harvest kg/ha.:

Final seed harvest is a function of cumulative effect of various harvest parameters. Seed yield differs significantly among varied methods of fruit fly control. Integrated Management produced a significantly highest harvest of 1850 kg/ha. followed by insecticides control method, which gave a harvest of 1723 kg/ha (Table2). The lowest harvest of 1103 kg/ha was recorded in case of plants where no treatment was applied. With respect to the most important measure from commercial perspectives -the amount of harvest- the control method (no measure taken) was recognized as the least productive. Therefore, the necessity of adopting the most appropriate method of controlling capsule flies is a need which will determine the profitability of cultivating safflower.

Table 2: Comparison of different methods to control fruit fly (*Acanthiophilus helianthi*) on Safflower.

Method employed	Weight of one thousands seeds(gr)	Percentage of oil	Percentage of damage	Harvest (kg/ha)
Control	22.6000 c	24.5667 c	39.4333 a	1103.000 e
Insecticide	29.2667 a	28.3000 b	8.0000 d	1723.333 b
Bait	26.3333 b	25.1500 c	20.0000 b	1405.000 d
Cultural	24.000 c	28.2333 b	14.0000 c	1566.667 c
Integrated management	30.5000 a	33.2667 a	5.1667 e	1850.000 a
LSD value (0.05)	2.2556	o.7828	0.5076	12.392

Means with at least a common letter significant, in the ANOVAs test at 5% level have significant difference.

C. Weight of One Thousands Seeds (g.):

Weight of one thousands seeds of safflower was significantly different among the various methods tested for fruit fly control. The minimum weight of one thousands seeds 22.6g was observed in case of Safflower plants where no control measure was adopted. The maximum weight of one thousands seeds 30.5g was recorded in the case where integrated management practices were carried out. Integrated management had a non-significant difference with insecticide control method in which 29.2g were recorded. Among the four methods compared to the control case, the Cultural method was observed to be the least successful method with respect to the measure of one thousands seeds weight (Table2).

d. Percentage of Oil (%):

Percentage oil of safflower seed was significantly different among the various methods tested for fruit fly control. The lowest percentage oil seed of 24.56% was observed in case of Safflower plants where no control measure was adopted. The highest percentage of oil seed of 33.26% was recorded in case of safflower plants in which integrated management practices were carried out. Integrated management had significant differences with insecticide control method in which 28.3% were recorded. In case of the measure of percentage of oil, the cultural methods was found to be as successful as the insecticide method. However, with the exception of the integrated management method, the other methods compared to the control method were found roughly yielding close results, although they are statistically different.

Conclusion:

In the current research, the researchers have compared four methods to control the safflower's capsule fly (insecticide, bait cultural and integrated management). The four methods were then compared in four established measures (weight of one thousands seeds, percentage of oil, percentage of damage, and harvest). Results revealed that the integrated management method among other methods was significantly more successful in all the four measures. The means achieved for the integrated management with respect to the measures of harvest (kg/ha) and percentage of oil were observed economically prosperous. Furthermore, the integrated management method, based on the results achieved, revealed to be ecologically promising. The integrated pest management treatment can be used as a safe insecticidal to the environment. It builds better conditions for growth of plant and could decrease pest population and damage; hence, it can increase crop harvest. The relatively high percentage of damage under no intervention condition (39%) compared to the acceptable level of 5% damage under the integrated management method would justify the necessity to utilize the economically proven and ecologically verified integrated management method in order to improve the crop produce and decrease the percentage of damage.

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REFERENCES

Al-Ali, A.S., I.K. AI-Neamy, S.A. Abbas, A.M.E. Abduel-Masih, A.S.A.L. Ali, Neamy, IK-AI., Masih,AME-Abdul., 1977. On the life-history of the safflower fly Acanthiophilus helianthi Rossi (Dip., Tephritidae) in Iraq. Z. Ang. Entomol. 83(2): 216-223.

Anon., 1983. Safflower descriptor.IBPGR Sectetariat. Rome., pp: 20.

Bashir, A.R., A. Anjum, A.M. Ahmad, M. Yousaf, W. Muhammad, 2005. Comparison of different methods to control fruit fly (Carpomyla vesuvlana) on BER (Zizyphus mauritlana). Pak. Entomol., 27: 3

Choon-Fah, J. Bong, Chin-Chin, Er, Pong-Hung, Yiu and Amartalingam Rajan, 2008. Growth Performance of the Red-Stripe Weevil Rhynchophorus schach Oliv. (Insecta: Coleoptera: Curculionidae) on Meridic Diets., American Journal of Agricultural and Biological Science, 3(1): 403-409.

Dezianian, A., A.S. Sajap, W.H. Lau, D. Omar, H.A. Kadir, R. Mohamed and M.R.M.Yusoh, 2010. Morphological Characteristics of P. xylostella Granulovirus and Effects on Its Larval Host Diamonback Moth Plutella xylostella (Lepidoptera: Plutellidae). American Journal of Agricultural and Biological Science. 5(1): 43-49.

Donal, B.T., 2008. A safe and effective propylene Glycol based capture liquid for fruit fly (Diptera: Tephritidae) traps baited with synthetic lures.The Florida Entomologist. 91(2): 210-214.

Freidberg, A., 1984. Gall Tephritidae (Diptera).In: Biology of gall insects Ananthakrishnan, T.N. ed. Oxford & IBH, New Delhi, pp: 129-167.

Freidberg, A., J. Kugler, 1989. Fauna Palestrina. Insecta IV. Diptera: Tephritidae. Israel Academy of Sciences and Humanities, Jerusalem.

Hallman, G.J., 2008. Potential in fruit fly (Diptera: Tephritidae) interceptions using ionizing irradiation phytosanitary treatments. Journal economic entomology, 101(3): 716.

Hegazi, E.M., K.S. Moursi, 1983. Studies on the distribution and biology of capsule fly, Acanthiophilus helianthi Rossi on wild plants in Egyptian western desert. Z. Angew. ENT. 96(4): 333-336.

Hoe, P.K., C.F.J., Bong, K. Jugah and Amartalingam Rajan, 2009. Evaluation of Metarhizium anisopliae var. anisopliae (Deuteromycotina: Hyphomycete) Isolates and their Effects on Subterranean Termite Coptotermes curvignathus (Isoptera: Rhinotermitidae). American Journal of Agricultural and Biological Science. 4(4): 289-297.

Houri, A. and D. Doughan, 2006. Behavior Patterns of the Pine Processionary Moth Thaumetopoea wilkinsoni Tams; (Lepidoptera: Thaumetopoeidae). American Journal of Agricultural and Biological Science. 1(1): 1-5.

Kazemi, M.H. and M. Mashhadi Jafarloo, 2008. Laboratory Investigation of the Biology of Bactrocera tremblayi Wag. (Homoptera: Triozidae) a New Pest in Onion Fields of Iran. American Journal of Agricultural and Biological Science, 3(4): 686-688.

Keyhanian, A., 2007. Seasonal abundance of the safflower fly, Acanthiophilus helianthi Rossi (Diptera: Tephritidae), and its infestation on safflower, Carthamus tinctorius L. in Ghom province. Pajouhesh and Sazandegi, 78: 57-62.

Norrbom, A.L., L.E. Carrol, F.C. Thompson, I.M. White, A. Friedloerg, 2004. Systematic database of names, PP. 65-251& 7.104 records. In: F.C. Thompson, ed., Fruit Fly Expert Identification System and Biosystematics Information Database.

Ricci, C., E. Ciriciofolo, 1983. Observations on Acanthiophilus helianthi Rossi (Diptera, Tephritidae) injurious to safflower in central Italy. Redia, 66: 577-592.

Selim, A.A., 1977. Insect pests of safflower (Carthamus tinctorius) in Musol northern. Iraq. J. Agric. 12(1): 75-78.

Ting, A.S.Y., M.T. Fong and C.S. Tee, 2009. Assessment on the Effect of Formulative Materials on the Viability and Efficacy of Serratia marcescens a Biocontrol Agent Against Fusarium oxysporum f. sp. cubense race 4. American Journal of Agricultural and Biological Science, 4(4): 283-288.