Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2017; 5(5): 800-803

Received: 14-07-2017
Accepted: 15-08-2017

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Population and incidence of pests on different tomato (*Lycopersicon esculentum* L.) varieties from district Mansehra Pakistan

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Abstract
The present investigation was conducted to study the population and incidence of pests on different Tomato (*Lycopersicon esculentum* L.) varieties from District Mansehra Pakistan. Several field trips were carried out and pest species were collected and taken to lab for the observation. The pest species were sorted out into four groups i.e: Aphids, Whitefly, Lepidopteran and Leaf minors. During the present study, the highest population of Leaf minor was observed in tomato variety of Syngenta TO – 1057 with 21%. In 1225 Hybrid F1 23% of white fly were observed. In Mission 102 F1 28% Aphids were observed. In Super prince F1 30% Aphids were observed. In Polo 295 F1 14% lepidopterans were present. In Larica F1 15% Whitefly were observed and 11% Lepidopterans were observed in F1 hybrid. The Lowest population in Sygenta TO – 1057 is 8% of lepidopteran. 16% of Leaf minors in 1225 Hybrid F1. 15% of Whitefly in Mission 102 F1. 21% of Whitefly in Super prince F1. 9% of Aphids in Polo 295 F1. 8% of Aphids in Larica F1 and 5% OF Aphids in F1 Hybrid.

Keywords: Pest, Tomato, lepidopterans, Aphids, Whitefly, Varieties

1. Introduction

Tomato (*Lycopersicon esculentum* L.) Karst is one of the most important dominant vegetable crop after potato by virtue of its high nutritive value and is grown throughout the world [1]. It is a rich source of vitamin A, B and C and used for different food purposes, no culinary preparation is complete without tomato [2]. Tomatoes have become one of the most popular and widely grown vegetables in the world. Out of 15 vegetables listed by the FAO, tomato is placed sixth in terms of total annual world production. Agroclimatic conditions of Pakistan ranging from tropical to temperate allow growing 40 different kinds of vegetables and 21 types of fruits [3]. Tomato is a heavy feeder of nutrients, especially potash as compared to cereals [4]. On an average, a tomato crop producing 30 t ha-1 would require approximately 280 kg N, 55 kg P2O5 and 540 kg K2O ha-1 [4, 5].

Traditionally SOP and MOP are being used as source of potash all over the world; however, MOP is considered a relatively cheaper source of K. Both the K sources have similar effects on a number of crops tested [6]. Green revolution has no doubt led to increased world food supplies, but at the same time it has caused several ecological, environmental and socioeconomic problems. Green revolution technology relied on the use of dwarf and semi dwarf high-yielding varieties of crops, increased use of agrochemicals and irrigation. All these practices favored the build-up of crop pests, with the result that the intensity of several pests has increased, many minor pests have assumed the status of major pests and several new pest problems have appeared in certain regions. In addition, the misuse and overuse of pesticides has led to problems of pesticide resistance, resurgence and contamination of different components of the environment. In spite of a variety of control measures applied against pests, crop losses have consistently shown an increasing trend [7]. In addition, the climate change exerts a profound effect on the intensity of pest problems [8].

Tomato varieties differ in characters like fruit shape, size, firmness, yield and quality [9, 10, 11]. Tomato varieties 'VFN Bush' and 'Shain' had slightly oblong fleshy fruits with maximum fruit weight in all the entries tested for growth and yield [12]. The observed difference in fruit maturation, plant height, fruits per plant, fruit weight and yield [13].

Tomato fruit worm, *Helicoverpa armigera* (Hubner) (Lepidoptera: Noctuidae) is a polyphagous pest and major threat to tomato crop causing significant yield loss [14].

Worldwide annual crop losses due to *H. armigera* alone are approximately 5 billion US dollars [15]. In Pakistan, 32-35% fruit infestation was observed in tomato [16, 17] recorded 53% fruit losses in tomato in Peshawar, Khyber Pakhtunkhwa Province. Severity of the pest incidence can be judged from the fact that in Pakistan 80% of the total insecticides are used against this pest [18].

District Mansehra is among the main vegetable growing areas of Pakistan. Due to its different localities and high altitude the vegetables of this region act as natural off-season vegetables [32]. Tomato is main crop of this region, specifically grown for seed Tomato in high altitude of Mansehra. At high altitude, temperature is low and there are minimum chances of insect's attack [32]. But a very little research is available on insect pests of Tomato in this region. The present study is designed to investigate the pest population and their incidence in the tomato crop.

2. Materials and Methods

2.1 Study site

Mansehra is located at 34° 14' and 35° 11' North latitudes and 72°49' and 74°08' East longitude. This district is blessed with high mountains, beautiful valleys, lakes and plains. altitude 3349 feet) is at a distance of 10.8 km from Mansehra City via Pano road. District Mansehra is situated in the Khyber Pakhtunkhwa Province of Pakistan. District has two distinct seasons; the summer season which lasts from April to September and winter season which is from October to March. The mean maximum and minimum temperatures during the month of June are about 35 °C and 21 °C respectively. Mansehra has a fertile soil which is very suitable for growing of the tomato crop, as Tomato is the major crop of this District

2.2 Collection, preservation and Identification

Collection and preservation was done according to a modified method originally described by Gullan and Cranston [19]. Collection of the pests was done from the crops, using a wet finger, fine–hair brush, forceps. Such techniques were useful for relatively slow-moving insects, such as immature stages and sedentary adults that may be incapable of flying. Netting was used as it is a popular technique for capturing active insects. For fast flying, mobile insects such as butterflies and flies, a net with a longer handle and a wider mouth was used. For collection of insects local taping methods was also used e.g. Tomato moth pheromone traps, yellow sticky trap and pheromone trap.

2.3 Statistical Analysis

After the collection and identification, data was transferred to Excel for statistical analysis.

3. Results and Discussion

During the present study seven tomato varieties were observed in order to see the effect of pest species. Several field trips were carried out and pest species were collected and taken to lab for the observation. The pest species were sorted out into four groups i-e; Aphids, Whitefly, Lepidopteran and Leaf minors. During the present study, the highest population of Leaf minor was observed in tomato variety of Syngenta TO – 1057 with 21%. In 1225 Hybrid F1 23% of white fly were observed. In Mission 102 F1 28% Aphids were observed. In Super prince F1 30% Aphids were observed. In Polo 295 F1 14% lepidopterans were present. In Larica F1 15% Whitefly were observed and 11% Lepidopterans were observed in F1 hybrid. The Lowest population in Sygenta TO – 1057 is 8% of lepidopteran. 16% of Leaf minors in 1225 Hybrid F1. 15% of Whitefly in Mission 102 F1. 21% of Whitefly in Super prince F1. 9% of Aphids in Polo 295 F1. 8% of Aphids in Larica F1 and 5% OF Aphids in F1 Hybrid (Fig.1).

Tomato fruit worm, *Helicoverpa armigera* (Hubner) (Lepidoptera: Noctuidae) is a polyphagous pest and major threat to tomato crop causing significant yield loss [20]. The most destructive pest infesting these crops is a highland whitefly, *Trialeurodes vaporariorum* Westwood (Homoptera: Aleyrodidae) [21] that sucks the sap of plant leaves, stems, buds and flowers. Insecticides have been substantially used to control this pest in Malaysia [22] and other parts of the world, particularly in the United States during the past decade [23, 24]. At these places, warm and dry climates and overlapping availability of multiple crop hosts throughout the year caused the population to be very high [24] Consequently, the whitefly *Bemisia tabaci* Gennadius (Homoptera: Aleyrodidae) has developed resistance to numerous conventional insecticides throughout the world [25] leaving fewer effective insecticides to control the pest in the market [26]. Meanwhile several species of natural enemies have been reported to reduce the population of whiteflies in the fields [27].

Thrips merit attention because they cause direct and indirect damage. Thrips feed on plant tissue by rasping and sucking sap, resulting in tissue scarification and depletion of the plant's resources [28, 29]. The scarification reduces the photosynthetic capacity of leaves and causes blemishes on fruits. Indirectly, thrips transmit the tomato spotted wilt virus (TSWV) on tomato. The direct injury and the virus disease result in discoloration of fruits, thus lowering the quality of the fruits. Kagezi *et al*. [30] found that thrips cause a tomato yield loss of 23.7%. Aphids remove sap using their piercing-sucking mouthparts. Some aphids feed on foliage, while others feed on the twigs, limbs, branches, fruits, flowers or roots of plants. If aphid populations are left untreated, they can stunt plant growth, deform and discolor leaves and fruit. Tomato russet mites can also damage stems, leaves and fruit of tomatoes and related plants by inserting their mouthparts into plants and removing the plant cell contents. Their damage causes the appearance of small clusters of empty cells that appear from a distance like stipples. These stipples turn brown or bronze, with most of the damage occurring around major leaf veins. Plant injury starts at the base of the plant and spreads from the stems to the leaves and fruit. In Texas, there is a growing interest in using naturally derived insecticides for controlling all insects [31]. Present study will form a guideline for the pest control agencies to control this pest at an appropriate time.

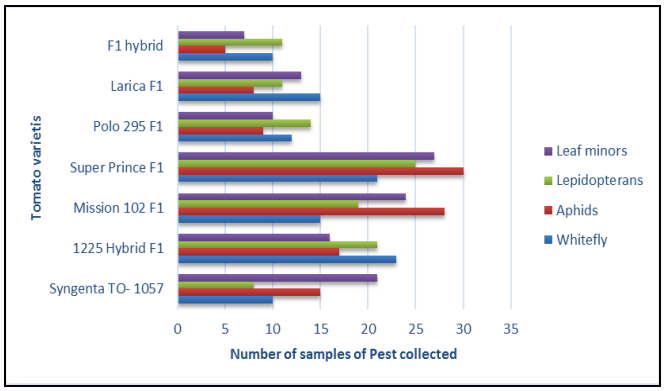

Fig 1: Showing the No of samples & % of Pest collected from different tomato varieties

4. Conclusion

During the present study insect pests of tomatoes were determined at various localities of Mansehra district. White fly, Aphids, Lepidopterans and leaf minors were recorded. Furthermore, the identification and distribution of pest species have been provided. Hopefully present study will be beneficial for pest control agencies.

5. Acknowledgment

The authors are highly thankful to the farmers and Halimullah, Shoiab Ali, Iqtidar for helping out in collection of pests.

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