

Insect- Infested Vegetables in Winter Under the Green Market Conditions of Sindh, Pakistan

¹ Abdul Ghaffar Khoso, ² Saeed Ahmed, ³ Mansab Khan, ⁴ Farrukh Asghar, ⁵ Khalil Asghar

^{1,3,4} Department of Entomology, Sindh Agriculture University, Tando Jam, 70060, Pakistan
1Khoso05@hotmail.com

² Department of Agronomy, Balochistan Agriculture College, Quetta, 87300, Pakistan

⁵ Department of Plant Breeding and Genetics, Balochistan Agriculture College, Quetta, 87300, Pakistan

Abstract: Insect pests pose a heavy threat to vegetable crops worldwide. The study was carried out on Insect- infested vegetables in winter under the green market conditions of Sindh, Pakistan during January and February months in 2019. The objective of this study is to assess some insect pests in vegetables in winter, their identification, occurrence, and damage in winter under green market conditions. Vegetables like Bitter gourd (*Momordica charantia*), Brinjal/Eggplant (*Solanum melongena*), Cabbage/Cauliflower (*Brassica oleracea*), Carrot (*Daucus carota*), Chilies (*Capsicum annum*), Cucumber (*Cucumis sativas*), Garlic (*Allium sativum*), Ginger (*Zingiber officinale*), Lady Fingers/ Okra (*Abelmoschus esculentus*), Onion (*Allium cepa*), Peas (*Pisum sativum*), Potatoes (*Solanum tubersum*), Radish (*Raphanus sativus*), Spinach (*Spinacia oleracea*) leaves, Sponge gourd/ Tori (*Luffa aegyptiaca*), Tinda Gourd (*Citrullus vulgaris*), Tomatoes (*Lycopersican esculentum*) and Turnip (*Brassica rapa*) were inspected from 40 vegetable vendors' shops randomly in Hyderabad and Shahdadkot towns and infested fruits were also recorded. Various insects were damaged to vegetable fruits. This research has shown that in the cold conditions the maximum insect-infested Spinach (*Spinacia oleracea*) 757 leaves, Tomatoes (*Lycopersican esculentum*) 554 fruits, and the minimum Bitter gourd (*Momordica charantia*) 21 fruits were recorded. These three items were infested by numerous insect pests, i.e. eggplant fruit borer, tomato fruit borer, and melon fruit flies. While in the green markets of these two cities, cabbage, carrots, green chilies, cucumbers, garlic, ginger, onions, potatoes, radishes, tinda gourd, and turnip no insect-infested fruits were found under market conditions. Compared to Hyderabad, the insect-infested vegetables in Shahdadkot are sold in bulk quantities.

Keywords: Insect-infestation, vegetable insect pests, vegetables under market conditions, damaged vegetable fruits, Shahdadkot, Hyderabad.

1. INTRODUCTION

Diet is a natural act in which nutrients are ingested, digested, absorbed and are used to sustain human life. Food provides energy and nutrients, all of which come directly or indirectly from plants, and a significant amount of it comes from plants that are classified as vegetables. Vegetables are a good source of carbohydrates, such as legumes, methy, potato, and sweet potatoes. Vitamins are tomatoes, carrots, peas, tomatoes, garlic, green peppers, and canola crops, minerals (bulk pods) and protein such as peas, beans, garlic and so on are essential for health and body maintenance. About two-thirds of the world's population relies mainly on vegetarian food [6]. Consumption of vegetable is inversely related to the risk and effects on CVDs (Cardiovascular Diseases) based on epidemiological studies, experimental research, and clinical trials, which are significant to the use of rich vegetables healthy diet and many vegetable crops, such as Bitter gourd, soybean, Carrot, broccoli, lettuce Garlic, Ginger, Onion, Potatoes, Radish, Spinach, Tomatoes and Turnip have high medical value and help reduce stroke, diabetes and certain types of cancer, gastrointestinal problems, high blood pressure, eye diseases, people who eat more vegetables may reduce the risk of some chronic diseases, prevention and treatment of CVDs [10]. Vegetable

cultivation is an important alternative source of income, especially in cities and suburbs. More than 40 different types of vegetables have been grown, namely Solanaceae, Cucurbitaceae, Leguminosae, Cruciferae (canola) and tuber crops [5]. However, agricultural production is less due to lack of advanced agricultural technologies and yield losses caused by damaging insect pests in vegetable and economic losses in the global agricultural and food industries (2), [11], and [3]. In view of under market conditions research, it is understood that pest's infestation of vegetables. Different vegetables are used as damage checks under market conditions. Therefore, current research on Insect- infested vegetables in winter under green market conditions of Hyderabad and Shahdadkot will help us determine whether the infested vegetables are also sold at un-infested vegetable price rate in two different cities of Sindh, Pakistan.

2. MATERIALS AND METHODS

Shahdadkot is located on the north side of Sindh also known as the Upper Sindh area and Hyderabad is the second large city of Sindh province, Pakistan. Many green vegetable shopkeepers are poor the vegetables sold mainly include Bitter gourd, Brinjal, Cabbage, Carrot, Chilies, Cauliflower, Cucumber, Garlic, Ginger, Lady Fingers, Onion, Peas,

Potatoes, Radish, Spinach leaves, Sponge gourd, Tinda Gourd, Tomatoes and Turnip in Hyderabad and Shahdadt, Sindh, Pakistan. A sample of 40 local green vegetable shops from two cities Shahdadt and Hyderabad were randomly selected. The data collection sheet was formatted using MS Office Excel software and printed out. Data were collected using the data collection sheet. Ten visits were made over one month (January) during 2019, to twenty shops in Shahdadt. Similarly, ten visits were also made over one month (February) during 2019, to twenty shops in Hyderabad. Within 10 small and 10 large vegetable vendor shops were randomly inspected for insect pest symptoms and numbers. Samples were chosen and complete inspected from each selected store (9 am to 12:30 am) at the time of stock delivery and placement of the sales counter. Insect- infested vegetables were easier to spot and counted based on the mode of damage on the surface, boring into and feeding on the inside of the fruits and cut leaves.

3. RESULTS

The data in Table 01 shows that the largest insect-infested 552, 205 spinach leaves and 483, 71 tomato fruits were collected from the green markets of Shahdadt and Hyderabad, respectively. Similarly, the minimum insect-infested 08 Bitter gourds were collected from the green markets of Shahdadt and 06 Toori were collected from the green markets of Hyderabad.

Table 01: Total No. of infested vegetables fruits collected under green markets of Shahdadt and Hyderabad.

| Vegetables | Collection Locations | |
|--|----------------------|----------|
| | Hyderabad | Shahdadt |
| Bitter gourd (<i>Momordica charantia</i>) | 13 | 8 |
| Brinjal (<i>Solanum melongena</i>) | 30 | 48 |
| Cabbage (<i>Brassica oleracea</i>) | 0 | 0 |
| Carrot (<i>Daucas carota</i>) | 0 | 0 |
| Chilies (<i>Capsicum annum</i>), | 0 | 0 |
| Cauliflower (<i>Brassica oleracea</i>) | 0 | 17 |
| Cucumber (<i>Cucumis sativas</i>) | 0 | 0 |
| Garlic (<i>Allium sativum</i>) | 0 | 0 |
| Ginger (<i>Zingiber officinale</i>) | 0 | 0 |
| Lady Fingers (<i>Abelmoschus esculentus</i>) | 16 | 20 |
| Onion (<i>Allium cepa</i>) | 0 | 0 |
| Peas (<i>Pisum sativum</i>) | 54 | 0 |
| Potatoes (<i>Solanum tubersum</i>) | 0 | 0 |
| Radish (<i>Raphanus sativus</i>) | 0 | 0 |
| Spinach (<i>Spinacia oleracea</i>) | 205 | 552 |
| Tinda gourd (<i>Citrullus vulgaris</i>) | 0 | 0 |
| Tomatoes (<i>Lycopersican esculentum</i>) | 71 | 483 |
| Sponge gourd/ Tori (<i>Luffa aegyptiaca</i>) | 6 | 0 |
| Turnip (<i>Brassica rapa</i>) | 0 | 0 |

The data in Table 02 shows that the overall largest insect-

infested 757 spinach leaves and 554 tomatoes fruits were collected from the green markets of Shahdadt and Hyderabad. Similarly, overall the minimum insect- infested 21 Bitter gourds were collected from the green markets of both cities. While in the green markets of these two cities, cabbage, carrots, green chilies, cucumbers, garlic, ginger, onions, potatoes, radishes, tinda gourds, and turnip no insect-infested were collected.

Table 2: Total means infested vegetables fruits collected under the green markets conditions of Shahdadt and Hyderabad.

| Vegetables | Total No. Infestation |
|--|-----------------------|
| Bitter gourd (<i>Momordica charantia</i>) | 21 |
| Brinjal (<i>Solanum melongena</i>) | 78 |
| Cabbage (<i>Brassica oleracea</i>) | 0 |
| Carrot (<i>Daucas carota</i>) | 0 |
| Chilies (<i>Capsicum annum</i>), | 0 |
| Cauliflower (<i>Brassica oleracea</i>) | 17 |
| Cucumber (<i>Cucumis sativas</i>) | 0 |
| Garlic (<i>Allium sativum</i>) | 0 |
| Ginger (<i>Zingiber officinale</i>) | 0 |
| Lady Fingers (<i>Abelmoschus esculentus</i>) | 36 |
| Onion (<i>Allium cepa</i>) | 0 |
| Peas (<i>Pisum sativum</i>) | 54 |
| Potatoes (<i>Solanum tubersum</i>) | 0 |
| Radish (<i>Raphanus sativus</i>) | 0 |
| Spinach (<i>Spinacia oleracea</i>) | 757 |
| Tinda gourd (<i>Citrullus vulgaris</i>) | 0 |
| Tomatoes (<i>Lycopersican esculentum</i>) | 554 |
| Sponge gourd/ Tori (<i>Luffa aegyptiaca</i>) | 6 |
| Turnip (<i>Brassica rapa</i>) | 0 |

The data in Table 03 shows that the maximum *Helicoverpa armigera* insect pest symptoms were identified on Brinjal/eggplants (*Solanum melongena*), Spinach (*Spinacia oleracea*) and Tomatoes (*Lycopersican esculentum*). *Bactocera cucurbiteae* on Bitter gourd (*Momordica charantia*) and Sponge gourd/ Tori (*Luffa aegyptiaca*) were recorded. Similarly, *Earisa vittela*, *Cydia nigricana* on Lady Fingers / Okra (*Abelmoschus esculentus*) and Peas (*Pisum sativum*) were recorded, respectively. While on Cabbage (*Brassica oleracea*), Carrot (*Daucas carota*), Chilies (*Capsicum annum*), Cauliflower (*Brassica oleracea*), Cucumber (*Cucumis sativas*), Garlic (*Allium sativum*), Ginger (*Zingiber officinale*), onions (*Allium cepa*), potatoes (*Solanum tubersum*), Radish (*Raphanus sativus*), Tinda gourd (*Citrullus vulgaris*) and Turnip (*Brassica rapa*) no any pest symptoms were recorded under green markets conditions of Shahdadt and Hyderabad.

Table 3: Insect pests on infested vegetables under the green markets conditions of Shahdadt and Hyderabad.

| Vegetables | Insect pests |
|--|-------------------------------|
| Bitter gourd (<i>Momordica charantia</i>) | <i>Bactocera cucurbitaeae</i> |
| Brinjal/eggplants (<i>Solanum melongena</i>) | <i>Helicoverpa armigera</i> |
| Cabbage (<i>Brassica oleracea</i>) | - |
| Carrot (<i>Daucas carota</i>) | - |
| Chilies (<i>Capsicum annum</i>), | - |
| Cauliflower (<i>Brassica oleracea</i>) | - |
| Cucumber (<i>Cucumis sativas</i>) | - |
| Garlic (<i>Allium sativum</i>) | - |
| Ginger (<i>Zingiber officinale</i>) | - |
| Lady Fingers (<i>Abelmoschus esculentus</i>) | <i>Earisa vittela</i> |
| Onion (<i>Allium cepa</i>) | - |
| Peas (<i>Pisum sativum</i>) | <i>Cydia nigricana</i> |
| Potatoes (<i>Solanum tubersum</i>) | - |
| Radish (<i>Raphanus sativus</i>) | - |
| Spinach (<i>Spinacia oleracea</i>) | <i>Helicoverpa armigera</i> |
| Tinda gourd (<i>Citrullus vulgaris</i>) | - |
| Tomatoes (<i>Lycopersican esculentum</i>) | <i>Helicoverpa armigera</i> |
| Sponge gourd/ Tori (<i>Luffa aegyptiaca</i>) | <i>Bactocera cucurbitaeae</i> |
| Turnip (<i>Brassica rapa</i>) | - |

4. DISCUSSION

This present study was carried out on Insect- infested vegetables in winter under the green market conditions of Sindh, Pakistan during January and February months in 2019. The objective of this study is to assess some insect pests in vegetables in winter, their identification, occurrence, and damage. Vegetables like Bitter gourd (*Momordica charantia*), Brinjal/Eggplant (*Solanum melongena*), Cabbage/ Cauliflower (*Brassica oleracea*), Carrot (*Daucas carota*), Chilies (*Capsicum annum*), Cucumber (*Cucumis sativas*), Garlic (*Allium sativum*), Ginger (*Zingiber officinale*), Lady Fingers/ Ochra (*Abelmoschus esculentus*), Onion (*Allium cepa*), Peas (*Pisum sativum*), Potatoes (*Solanum tubersum*), Radish (*Raphanus sativus*), Spinach (*Spinacia oleracea*) leaves, Sponge gourd/ Tori (*Luffa aegyptiaca*), Tinda Gourd (*Citrullus vulgaris*), Tomatoes (*Lycopersican esculentum*) and Turnip (*Brassica rapa*) were inspected from 40 vegetable vendors' shops randomly in Hyderabad and Shahdadtown towns and infested fruits were also recorded. Various insects were damaged to vegetable fruits. This research has shown that the data in Table 01 shows that the largest insect-infested 552, 205 spinach leaves and 483, 71 tomatoes fruits were collected respectively. Similarly, the minimum insect- infested 08 Bitter gourds were collected from the green markets of Shahdadtown and 06 Toori were collected from the green markets of Hyderabad. The data in Table 02 shows that the overall largest insect-infested 757 spinach leaves and 554 tomatoes fruits were collected. Similarly, overall the minimum insect- infested 21 Bitter gourds were collected from the green markets of both cities. While in the green markets of these two cities,

cabbage, carrots, green chilies, cucumbers, garlic, ginger, onions, potatoes, radishes, tinda gourds, and turnip no insect-infested were collected. The data in Table 03 shows that the maximum *Helicoverpa armigera* insect pest symptoms were identified on Brinjal/eggplants (*Solanum melongena*), Spinach (*Spinacia oleracea*) and Tomatoes (*Lycopersican esculentum*) and *Bactocera cucurbitaeae* on Bitter gourd (*Momordica charantia*) and Sponge gourd/ Tori (*Luffa aegyptiaca*) were recorded. Similarly, *Earisa vittela*, *Cydia nigricana* on Lady Fingers / Okra (*Abelmoschus esculentus*) and Peas (*Pisum sativum*) were recorded, respectively. While Cabbage (*Brassica oleracea*), Carrot (*Daucas carota*), Chilies (*Capsicum annum*), Cauliflower (*Brassica oleracea*), Cucumber (*Cucumis sativas*), Garlic (*Allium sativum*), Ginger (*Zingiber officinale*), onions (*Allium cepa*), potatoes (*Solanum tubersum*), Radish (*Raphanus sativus*), Tinda gourd (*Citrullus vulgaris*) and Turnip (*Brassica rapa*) were not any pest recorded under green markets conditions of Shahdadtown and Hyderabad. Compared to Hyderabad of Sindh province, Pakistan, the insect-infested vegetables in Shahdadtown are sold at high prices. The present study agrees with [7] described that the various insects cause damage to vegetable plants at all stages of growth including eggplant shoot and fruit borer, tomato fruit borer, tobacco caterpillar and melon fruit fly. Most of the vegetables were susceptible to pest damage, and their seeds, roots, stems, leaves as well as fruits were all subjected to injury. The present study agrees with those of [4] described that many insect pests attack Bitter gourd (*Momordica charantia* L) crop in Peshawar Valley but among one is very important Fruit fly. The *Bactocera cucurbitaeae* (fruit fly) attacks the crop on fruiting stage. The present study partially agrees with [1] conducted a survey of insect pest infestations on the dried vegetables. The result showed that the vegetables, chill pepper (*Capsicum frutescens* L.) Tomato (*Lycopersicon esculentum* Mills) and Bell-shaped pepper (*Capsicum annum* L.) were severely infested while dried okra (*Abelmoschus esculentus* L. Moench) was less infested during the three months storage period. The present study also agrees with [8] reviewed that most vegetables are available all year round, but winter vegetables are particularly attractive and juicy and freshest. Insects observed, common pest-affecting vegetables are several species of Lepidoptera and Diptera orders. Most vegetable crops are damaged by pests and fruits are susceptible. Their identity is an essential first step. The present study also partially agrees with [9] described that the knowledge of the species and habits of insect pests that damage to dry vegetables gives a basis for the planning control program. The possibility of insect species involving damaging stored dried products and deals with some of the control measures to get rid of losses.

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