



(RESEARCH ARTICLE)



Chronological association of foliage insects among specific olericulture crops i.e. mustard, beet root and kale

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Abstract

Olericulture crops are none woody leafy vegetables that contain high nutrients, vitamins, and iron. Foliage insects show chronological association with their specific host vegetable such as Mustard leaves beat root and kale were the main olericulture crops that were selected to estimate the prevalence and variety of foliage insects. Samples were collected by aerial nets, direct handpicking, and sweep nets and with the help of forceps. Larvae of the many insects were voracious eaters. Hymenoptera, Diptera, Lepidoptera, and Coleoptera were the major foliage insects order that directly or indirectly affect these vegetables. The result indicates that foliage insects show sequential association with their host vegetable. Maximum dominance and variety of insects were found in kale and the least abundance was recorded in Mustard leaves because mustard leaves secretes some toxins that repels the insects. Common insects among 3 of them were flea beetles.

Keywords: Olericulture; Chronological; Insects; Abundance; Mustard; Kale; Beet root

1. Introduction

Biodiversity is the totality and variety of life of living organisms including plants and animals at all the levels of their organization from the genetic level up to the ecosystems they contain. It exists from tiny creatures like small microbes to gigantic types of animals and plants and it is also designated as the variability from all source's aquatic and terrestrial ecosystems [1] Arthropods are a significant part of the ecosystem occupying a vital position in the dynamics of populations, food web, and communities.

Insects are considered as a center for the survival of any ecosystem [2]. They provide their services to humanity in different ways as a pollinator they pollinate about 80% of flowering plants, as decomposers, they essential nutrients back to the environment, also important in the aeration and conditioning of soil. They also play their vital role in food webs and chains and play their commercial role by providing honey and silk [3] .

Olericulture is the subdivision of horticulture that resembles the cultivation of vegetables. Vegetables not only enhance tastiness but also improve hungriiness and provide nutrients (phytochemicals, vitamins, minerals, and dietary fiber). It is a major source of modifying metabolic activation, detoxification of carcinogens and works as a strong antioxidant. Vegetables in their diverse forms confirm suitable intake of fundamental nutrients which contribute to solving many nutritious problems.

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Average vegetable production contributes in Asia is almost 218 million tons. In Pakistan, India, and China production rates of vegetables are the highest. These are considered fruit vegetables that possess leaves and stems. During the present period, almost 3,460,000 ha area is under cultivation for vegetables and almost 13.7 million tonnes of edible vegetables are produced in Pakistan per annum [4].

Skeletonized leaves are one of the biggest damage caused by the feeding habit of insects. All the parts of plants including stem, leaves, roots, and fruits are attacked by many species Aleyrodidae, Aphididae, and Pseudococcidae family. Larvae of the diamondback moth (Lepidoptera), mustard beetle, and herbivory leaf beetle attacked the leaves of Chinese cabbage [5].

By concern of association of foliage insects with vegetables, the present study was executed to draw the variety and prevalence of foliage insects among 3 olericulture crops.

2. Material and methods

2.1. Research area

The research was accomplished to find the “Foliage insect’s variety among olericulture crops the study was lead at Vegetable Research Field, Institute of Agriculture Sciences, University of Okara, Okara. (Punjab), Pakistan (Fig. 1).

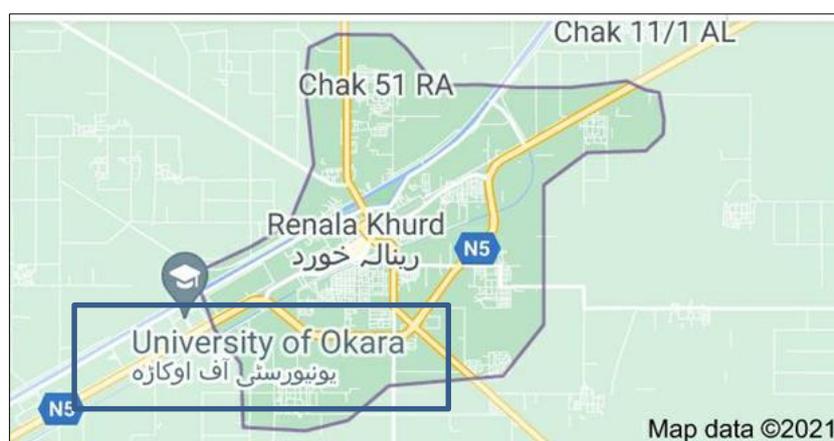


Figure 1 Study site

2.2. Collection

To collect the insects from Mustard greens (*Brassica juncea*), beet root greens (*Beta vulgaris subsp. Vulgaris*), and potherbs kale (*Brassica oleracea var. sabellicafields*), samples were collected weekly for two and half hours a day, and the simple tools were used for the collection of insect fauna i.e. aerial nets, direct handpicking, sweep nets and with the help of forceps. In 70% of alcohol solution, containing glycerine, all the samples were kept in that jar. After that samples were preserved and kept in insulated glass containers which were classified with date, time and name of sample crop.

2.3. Identification

The collected specimens were recognized with a magnifying glass, the stereomicroscope, and a light microscope. According to their classification collected fauna of insects was classified up to the level of species [6] and on electronic means that accessible on the internet.

2.4. Statistical analysis

According to the insect morphology and nomenclature, the data is arranged in tabular form from order to species level. To observe the different varieties like abundance and uniformity among insects, the Shannon diversity index was used [7].

3. Results and discussion

The whole research was completed according to the scheme, Total of 203 specimens were collected out of which 43 were collected from Mustard greens, 81 from Beetroot greens, and from Kale 79 insects species were recorded and they all comprises different classification. Diversity and taxonomy were studied in Okara, Pakistan total of 203 specimens was recognized that belong to 8 orders, 16 families, and 16 species



Figure 2 Specimens of foliage fauna



Figure 3 Collected specimens in a jar

Chaudhary [8] found the abundance of wild pollinators on mustard rapeseed and rapeseed. [9] Documented the diversity of insect pollinators about a seed set of mustard. Overall documented and analyzed data from kale showed that the highest abundance 31.64% (N = 25) recorded for Harlequin cabbage bug, But, low prevalence (N ≤ 5) was recorded for various species. Mustard: Maximum relative abundance from Mustard field 46.21 % (N = 20) was noted for flea beetles. However minimum abundance (N ≤ 3) was recorded for many species. Beet root Highest abundance 30.86% (N = 25) was documented for Groundnut aphid and flea beetles and common house mosquito But, the least relative abundance (N ≤ 5) was recorded for many species as shown in (Table 1).

Table 1 Recorded relative abundance among Mustard, Beet root, and kale

Order	Family	Species	Mustard	Beet root	kale
Diptera	Culicidae	<i>Culex pipiens</i>	0.00 [0]	20.98 [17]	7.59 [6]
	Muscidae	<i>Musca domestica</i>	0.00 [0]	0.00 [0]	1.26 [1]
	Syrphidae	<i>Syrphidae</i>	0.00 [0]	1.23 [1]	0.00 [0]
Lepidoptera	Nymphalidae	<i>Aglais urticae</i>	4.65 [2]	0.00 [0]	1.26 [1]
	Noctuidae	<i>Xestia oblata</i>	0.00 [0]	2.46 [2]	1.26 [1]
Orthoptera	Acrididae	<i>Schistocerca americana</i>	0.00 [0]	2.46 [2]	0.00 [0]
Hemiptera	Aphididae	<i>Aphis craccivora</i>	0.00 [0]	30.86[25]	18.98 [15]
Odonata	Libellulidae	<i>Pachydiplax longipennis</i>	13.95[6]	0.00 [0]	0.00 [0]
		<i>Sympetrum flaveolum</i>	16.27[7]	0.00 [0]	0.00 [0]
	Aeshnidae	<i>Anax junius</i>	0.00 [0]	0.00 [0]	7.59 [6]
	pentamidae	<i>Murgantia histrionica</i>	0.00 [0]	0.00 [0]	31.64 [25]
Coleoptera	Coccinellidae	<i>Harmonia axyridis</i>	0.00 [0]	9.87 [8]	7.59 [6]
	Chryomelidae	<i>Alticini</i>	46.51[20]	30.86[25]	22.78 [18]
Hymenoptera	Apidae	<i>Bombus</i>	2.32 [1]	0.00 [0]	1.26 [1]
		<i>Apis mellifera</i>	11.62 [5]	0.00 [0]	0.00 [0]
	Vespidae	<i>Vespula vulgaris</i>	4.65 [2]	1.23 [1]	0.00 [0]
Plecoptera	Perlidae	<i>Acroneuria abnormis</i>	0.00 [0]	0.00 [0]	0.00 [0]
Total			43	81	79

4. Conclusion

The chronological association describes the sequential association of insects in growing vegetables along with the time. Vegetables are an excellent source of human food and nutrition since immemorial time. The diversity of insects was recorded for 3 fields that are Mustard, beet root, and kale. They describe the sequential relationship with foliage insects and it is concluded that there is positive and negative impact in the diversity of foliage insects and abundance among the fields. Maximum abundance was recorded from the kale field. This study remained pre-requisites for every management strategy. It has been concluded from the present study that insects inhabit these 3 vegetable fields alternatively. It is suggested that further studies will help more in exploring the diversity of foliage insects.

Compliance with ethical standards

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