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A Study on Biodiversity of Citrus Orchards at Ramganj Mandi, Kota, Rajasthan, India

***Bhujabal Singh Parihar, Subrat Sharma and Surabhi Shrivastava**

Department of Zoology,
Career Point University, KOTA, INDIA
Department of Zoology,
Government College, KOTA INDIA
and
Wild Life Science,
University of Kota, KOTA, INDIA
*Corresponding Author
E-mail: bhujbal.parihar@gmail.com

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ABSTRACT

Area around Ramganj Mandi in Kota district has a distinct place in citrus crop production at national and international levels. The inquiry led to the identification of the insect pests that attack citrus orchards in the Kota region. The most destructive major insect pests of a citrus crop were identified. The most widespread and significant contributor to the production of citrus crops in the citrus orchards of Ramganj Mandi is the mandarin orange *(Citrus reticulata),* along with other citrus crops. Identification and study of these pests were carried out with the help of experts and various reference materials. Observation and collection of insect-pest specimens were done by the sweeping method for further study with a collection of infested plant parts at the citrus orchards of Kota. In the context of the present study, it can be concluded that necessary efforts should be made and implemented to conserve the biodiversity of citrus orchards..

Figures : 04 References : 10 Table : 00
KEY WORDS : Biodiversity, Citrus orchards, Insect, Kota, Pests, Ramganj Mandi.

Introduction

The heterogeneity of living organisms from terrestrial, marine and aquatic ecosystem is considered as diversity. Diversity represents the fundamental property of every living system. The extent of diversity is based on the adaptability of a species to a particular habitat. Insect pests are sensitive biota which get severely affected by environmental variation. Diversity represents variations at genetic, specific species and ecosystem levels. The phrase biodiversity means the vast diversity of life on this blue planet, including evolutionary, ecological and cultural processes that keep life sustained. The biodiversity of earth is so vast that many new species are yet to be discovered. Therefore, species diversity should be regularly monitored to note down the fluctuations. In an urban ecosystem, assessment of man-made habitat destruction and environmental hazards are caused by fast-growing industrialization. One of the most significant crops and one of the largest fruit industries is citrus, which is grown in more than 52 countries[1]. India ranks fifth in its production. In particular, India and China in South East Asia's tropical and subtropical climates are where citrus fruits first appeared[5].

In Rajasthan, citrus orchards are present in Jhalawar, Kota**,** Ganganagar, Hanumangarh. Jhalawar is known to be "Nagpur of Rajasthan as it stands at second position in India after Nagpur of Maharashtra[5].

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Fig. 1 : Citrus Leaf Miner

Fig. 2 : Citrus/Lemon Butterfly, *Papilio demoleus*

The Bhawani mandi, Ramganj Mandi, Jhalarapatan, and other nearby areas form the bulk of the citrus belt.

But the area around Ramganj Mandi in the Kota district has a distinct place in citrus crop production at the national and international levels. The district has more than 20,000 hectares of area under orange orchards[2]. The investigation explains to identify the diversity and abundance of insect pests in various citrus orchards present in the Ramganj Mandi, Kota, Rajasthan and the damage caused by them was also assessed.

Objective: The goal of the study was to identify and categorize the various insect pests that attack various citrus fruits in Ramganj Mandi, Kota, Rajasthan, and to explain their diversity and abundance. Ramganj Mandi was chosen as the subject of the study in order to clarify the variety of insect pests that affect citrus fruit farms in the Kota area. The occurrence and abundance of pest species were measured from November'2021 to February '2022.

- Pest insects that attack citrus orchards in the Ramganj Mandi region have been identified and investigated.
- The most destructive major insect pests of citrus crops were identified.

Materials and Methods

Study Area: The study was conducted in and around the stone city of Ramganj Mandi, which is situated at $24^0$38'50" North and $75^0$56'40" East in the district of Kota in the Indian state of Rajasthan. It serves as the primary agricultural market for Madhya Pradesh's borderlands and Rajasthan. This area is a trading and industrial hub of southeast Rajasthan. The economy of this area is also dependent on business of stone and coriander seeds. This sub-district covers 169 villages and a human population of 41,780. The climate of this region can be divided into three seasons, winter (November to mid of March), summer (mid of March to mid of June) and rainy (mid of June to October). The climate nature of this region is dry, sub-humid and the average annual rainfall is around 850 mm.

Observation and collection of insect-pest specimens were made by sweeping method along with a collection of infested plant parts during different seasons at the citrus orchard of Ramganj Mandi, Kota. The population trends of insect pests were studied in the moderately infested orchard of 100 trees. A random sampling of 10 citrus trees was performed where each sample of twigs was having 12-15 leaves. The twigs were collected from all sides *i.e.* lower, upper and central parts of the tree. The twigs infected with insect pest as samples, were collected from the citrus orchard which were studied in the laboratories under a stereoscopic binocular microscope. The percentage of infested leaves was calculated and studied, some ecofriendly techniques were used for their management.

In agro-climatic requirements, the climatic factors which influence the growth and development of citrus crops are temperature, relative humidity, wind and light intensity. During the coldest months at 15^0C isotherm makes the geological limit for citrus orchards, which more or less prevails in the latitudes of 35^0 top 40^0 north to south. The optimum temperature for citrus orchards favours between 25^0 to 30^0. The citrus orchards require an average well-distributed annual rainfall of at least 875 mm if they are grown without irrigation.

The suitable soil required for citrus orchards is a medium textured soil of recent alluvial origin, uniform,

Fig. 3 : Citrus Psyllid (*Diaphorina citri*)

Fig. 4 : Citrus Blackfly

reasonably deep and fertile, having good internal drainage and free from injurious salts. No water logging should occur in soil for citrus crop. Orange specifically needs well-drained soils without any hard $CaCO_3$ pan layers. The ideal pH range for citrus orchard soil is between 5 and 6.

Result and Discussion

The higher and more satisfying rainfall provides higher production of citrus crops. Mandarin (*Citrus reticulata*), sweet orange (*Citrus sinensis*) and acid lime (*Citrus aurantifolia*) are the most common and commercial species present in the above-mentioned areas[9]. These species produce a maximum contribution to the production of citrus crops not only in Rajasthan but overall India. The most prevalent and important species for the production of citrus crops is the Mandarin Orange *(Citrus reticulata)*, dominates the citrus orchards of Ramganj Mandi in the Kota district[10]. Citrus crops are rich in various vitamins such as C, A, B complex including phosphorous. It can be utilized as fresh as well as in the form of fresh and canned juice, jam, squash and syrup[5]. They are also the main source of the peel oil, citric acids and cosmetics which have international market value. Kinnow, mandarin is the most significant member of the citrus family especially for fresh consumption[6].

A total number of 6 species of insect pests in citrus orchards were collected from two different areas of Kota region during the study period *i.e.* from November'2021 to February'2022. The most abundant species were the trunk borer, *Anoplophora versteeg, Citrus psylla, Diaphorina citri and* black aphids *(Toxoptera aurantii and Toxoptera citricidus).* The rapidly changing atmosphere has adversely affected the distribution of insect pests in citrus orchards in the Ramganj Mandi of Kota region. The devitalisation of plants occurred due to poor fruit set, fruit drop both at bearing and maturity stage, stem tunnelling, bark removal, girdling *etc.* on account of the attack of different insect pest *viz.* black fly, *Citrus psylla,* citrus leaf miner, bark eating caterpillar, mealy bugs, citrus aphids, fruit fly, mites *etc.,* which resulted in poor performance by tree in terms of quality fruit production[4].

Insect pests in citrus orchards in these areas were observed and recorded accordingly. Identification and study of these pests were carried out by entomologists and various reference materials. Damage levels by different pests were graded and recorded and will be used for further study[8].

Insect Pests observed in Citrus Orchards

Citrus White Fly*, Dialeurodes citri; Aleurocanthus voglumi*

The population trends of citrus black fly and its related insect pests have been studied in the moderately infested orchard of 100 trees in Ramganj Mandi. A random sampling of 10 citrus trees was performed. Each sample consisted of twigs having 12-15 leaves from all directions of each tree. The collected twigs were taken from all parts *i.e.* lower, upper and central of the tree. Then samples were examined in the laboratories under a stereoscopic binocular microscope. The percentage of infested leaves was calculated. The nymphs and adults of this pest suck the sap of the leaves of a plant. Then its secrets honeydew which develops in sooty molds on the leaves. The whole orchard looks black during the severe infestation even the fruits turn black and have no taste. Generally, the attack occurs on the shady side of the citrus tree.

Citrus psylla, *Diaphorina citri* (Psyllidae:Hemiptera)

Citrus psylla adults and nymphs inject a harmful substance into the citrus crops by sucking the sap from their fragile buds, leaves and branches. The nymphs

excrete white crystalline waxy pellets where black sooty mould might generate. It minimizes the photosynthetic area of citrus plant. In cases of extreme severity, the leaves get increasingly deformed, eventually become curled up and finally fall off, defoliating the citrus plant completely. It acts as a vector for the illness that causes oranges to turn green.

Bark Borer, *Inderbela tetraonis,* (Cossidae:Lepidoptera)

This pest's caterpillar attacks the tree's branches, breaks them and as a result weaken it. A web-like mass of chewed wood fragments from a caterpillar's excreta is discovered plastered on a tree trunk and eventually causes harm through burrowing.The insect mostly disrupts the movement of cell sap, which ultimately interferes with the citrus plant's growth and fruiting[3].

Citrus Leaf Miner, *Phyllocnistis citrella* (Gracillaridae:Lepidoptera)

The internal components are consumed by the citrus leaf miner larva, which is found between the two epidermal layers of the leaves. Both the nursery and adult phases of the citrus plant are harmed by this pest. It feeds in the leaf's layers of the epidermis attacking delicate leaves by forming serpentine lines where air becomes trapped, giving the leaf a silvery sheen.[3] After infestation, leaves turn pale yellow, slowly distorted, and then crumpled. These leaves gradually dry and finally die away. This attack results in citrus canker disease.

Citrus Aphids, *Toxoptera ciricida, Myzus persicae* and *Aphis gossypii* (Aphididae: Hemiptera)

Black aphids and green aphids are vectors of the *Citrus tristeza* virus (CTV). At the time of flowering infestation of aphids results in reduced fruit[7]. The adults and one nymph sip sap from young shoots and leaves. Infected leaves get yellow, curl, become slowly distorted, and progressively wither. Even the growth of young shoot is also severely affected. The secretion excreted by aphids on honeydews develops sooty moulds which results in stunted plant growth.

Citrus or Lemon Butterfly, *Papilio demoleus* (Papilionidae: Lepidoptera)

Lemon butterfly is the most destructive pest in nurseries. The caterpillars feed on the young foliage at the nursery stage and young flush on grown-up trees. It eats voraciously on leaf lamina leaving only the midrib.

Conclusion

Various high yield species of citrus crops and Insect pests of citrus crops were investigated in Ramganj Mandi of Kota region. Major insect pests of citrus orchards causing maximum damage were assessed. In the context of the present study, it can be concluded that necessary efforts should be taken and implemented to conserve the biodiversity of citrus orchards from insect pests. The research would also be oriented to increase the citrus crop yield and to understand the ecology of the Kota region.

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