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A Survey of Pests of Sugarcane (*Saccharum officinarum*) from Tehsil Mankapur, District Gonda, Uttar Pradesh, India

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Abstract: The field survey of insect pest diversity was observed in the year 2023-2024 from food and cash crop of sugarcane. In the field survey, it was observed that approximately 20 different insect pest species invade sugarcane crop. Out of these 13 were major pests while 7 were minor pests belongs to five orders of class Insecta. Most of the observed insect pests belong to the order Hemiptera, Lepidoptera, Coleoptera, Isoptera and Orthoptera etc. Due to their infestation the quality and yield of sugarcane gets reduced. At the time of survey, different agricultural fields of sugarcane were sampled for assessment of the diversity and relative abundance of insect fauna. In the present study, the diversity of insect pest on sugarcane crops and nature of pests and their damage were evaluated. This study strengthens in future for the application of species specific biological control in sugarcane crops field that will lead towards sustainability of agro-ecosystem.

Keywords: Sugarcane, Pest, Biodiversity, Nature, Damage

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Introduction

India is one of the biodiversity hotspots. There are various bio-geographical areas in our country; these areas have diversity in climate change and habitats, including various agricultural climate areas (Sharma, 2020). Sugarcane is popularly known as food and cash crop. Many factors such as sugarcane variety, climate, soil fertility, traditional farming methods, diseases and outbreaks affect the yield of this crop. Sugarcane is one of the most

important sources of cane sugar in the world which is cultivated in India. India is the original land of origin of *Saccharum* species. Uttar Pradesh is the top producer of ethanol in India. It has 53 ethanol producing distilleries and has an annual installed capacity of 158.44 crore litres. Sugarcane is the main sugar crop, with world volumes exceeding 1.5 billion tonnes since 2007 and rising to 1.9 billion tonnes in 2021. The world largest

producer of sugarcane is Brazil followed by India. Brazil was the largest producer of sugar cane in 2021 and accounted for 38% of the global production, followed by India (22%), China, Pakistan and Thailand (4–6% each). However, Brazilian sugar cane production experienced a large decline in 2021, down to 716 million tonnes (a 5% decrease from 2020) due to low rainfall. This also affected the production of ethanol resources, for which Brazil is the world's second-largest producer after the United States of America. Whereas Indian scenario is quite different *i.e.*, sugarcane is cultivated in an area of 5.42 million ha, with a production of 4.11 million tonnes (Anonymous, 2018). The productivity of important zones for sugarcane cultivation in India is Tropical and Subtropical regions which are grouped into five agro-climatic zones mainly for varietal development. Agriculture is the backbone of Indian economy, because 75% of India's population depends on agriculture or agro-industries for livelihood. According to the report of the Food and Agriculture Organization of the United Nations: Economic and Social Department: Statistics Division (2021), India is second largest sugarcane producing countries, accounting for 22% of world production (FAO, 2021). Nearly dozens of important pests have been reported from India and Pakistan (Chaudhary and Ansari, 1988; Shanthi *et al.*, 2019; Paudel *et al.*, 2021).

The study of insect diversity in the field of sugarcane represents their adaptability to the wide range of environmental conditions. In Indian continent, various species of sugarcane are grown for economic and various purpose in our daily life. It is one of the most affected cultivated food crops by insect pests. Early shoot borer (*Chilo infuscatellus*) belong to the (Pyralidae; Lepidoptera) has been reported as a pest of sugarcane crop from North Bihar. *Chilo infuscatellus* attacks in early phase of plant growth by entering laterally through holes in the shoots and damage complete cane by boring producing 'dead hearts'. Its caterpillars destroy about 20% of the young shoots during April to June (Dhaliwal and Atwal, 2004). In India, it is widely distributed

in sugarcane growing parts of country (Karnataka, Bihar, Haryana, Punjab, Gujarat and Tamil Nadu). Root borer, *E. depressella* has been reported as a pest of sugarcane in India reducing the levels of productivity ranging between 1.3-10% due to infestation and it is the only species of borer infesting the underground portion of canes and hence, generally referred to as 'root borer' (Avasthy and Tiwari 1986) and widely distributed in India and Pakistan. Besides, Gotterell (1954) reported it from Afghanistan and Avasthy and Tiwari (1986) reported from Malaysia and Bangladesh and in north Indian sugarcane belt, northern areas of Gujarat, Maharashtra, Karnataka, and Andhra Pradesh states. It was noted as a rare occurrence in Assam and in the Yamunanagar of Haryana and Muzaffarpur of Bihar were more prone to attack than Haryana.

Insect feed on every plant part as leaves, stem, tuber and also it serve as vectors of plant pathogen (Munyaneza *et al.*, 2006; Hansen *et al.*, 2008). Insects make up the majority of all living species on earth, accounting for at least 90% of their diversity. Most insects are venomous, predatory, and destructive. Insect pest and their relative importance vary from region to region with highest number of economically important pest species occurring in potato agro-ecosystem of the neotropics in countries of potato origin (Kroschel *et al.*, 2009). Insect pests account for 16% of the crop losses of potato (*Solanum tuberosum* L.) worldwide and reductions in tuber yield and quality can be between 30% and 70% for various insect pests. Agriculture or allied practices employ more than 75% of the total population, which is substantially dominated by the subsistence mode of farming. Insect pests seriously impair agriculture that produces food for people to eat and animal feed. The primary pests connected with wheat are aphids, thrips, dipterans, and other insects. Worldwide, crop losses from insect pests are enormous, and the use of broad-spectrum chemical pesticides to manage them also threatens pollinators and contaminates the environment. Between these factors, insects that cause widespread damage to sugarcane

quality, yield and sugarcane sugar content have been identified. The sugarcane crop matures in about ten to eighteen months for production in subtropical states, so it falls in the category of long-term crops. Due to its long-term feature, it is likely to be attacked by many diseases and insects. Among the various factors, the outbreak of insects plays an important role in reducing sugars and productivity (Kumarsinghe, 1999; Kumar and Pal, 2019).

The main purpose of the present survey is to know about the damage caused by different type of pests, which affects the production of crops. In the present study, the field survey of insect pest was made during the year 2023-2024 from sugarcane crops.

Materials and Methods

During August 2023 to December 2024, surveys were conducted on a monthly basis in various sugarcane fields in some villages under Mankapur tehsil, district Gonda, Uttar Pradesh, India. In the field survey, we recorded information about various insects including major sugarcane and small insects in the area of different villages (Fig. 1). Study area is one, situated at an elevation of about 106m (341ft) above the sea level, covered with Agricultural and forest and lies between 27°02'23"N' and 82°13'37"E. and other situated at an elevation of 98m (325ft) above the sea level, covered agricultural area lies between 27°06'2'452"N' and 82°53'5'337"E. Data was collected by visiting regular area and recording pests on sugarcane. The insects were collected by hand raising and sweep netting and preserved in drought or 60% ethanol. The collected pests were identified using suitable literature references and were classified as prominent and small insects (Sathe, 2003; Thamaraiselvi and Dayana, 2015; Kumar *et al.*, 2019; Paudel *et al.*, 2021, Gautam *et al.*, 2023, Rout *et al.*, 2024) and the presence of insects was documented based on their symptoms.

Results and Discussion

In this survey 20 pests were recorded on sugarcane. Out of which 13 species of insect pests

were major while remaining 7 were minor pests (Table 1).

The result showed that out of 5 orders, Hemiptera is the major and dominant crop pests of the study area followed by order Lepidoptera, Coleoptera, Isoptera and Orthoptera (Table 1). In the order Hemiptera, total eight species were observed that belongs to seven different families viz., Aphididae (1 species), Lygaeidae (1 species), Aleyrodidae (2 species), Pseudococcidae (1 species), Diaspididae (1 species), Lophopidae (1 species), and Delphacidae (1 species), respectively. In the order Coleoptera three species were observed which belongs to three different families viz., Chrysomelidae (1 species), Coccinellidae (1 species) and Scarabaeidae (1 species). These were found to be most dominant. In the order Lepidoptera total 7 species were observed, which belongs to two distinct families viz., Pyralidae (4 species), Nymphalidae (1 species), Lasiocampidae (1 species) and Crambidae (1 species), respectively. Similarly, in the order Isoptera only one species was seen to infect the cane crop that belongs to family Termitidae, which were found to be the least dominant. An order of Orthoptera has also observed during the present survey, in which only one species seen belonging to family Acrididae.

Major pests affect the sugarcane yield and sugar level of cane compared to the minor pests. Results obtained by Patil *et al.* (2004); Gautam *et al.* (2023) and Raut *et al.* (2024) supports the present findings. Therefore, there is a necessity to implement the appropriate effective control measures for control of these destructive insect pests.

Top shoot borer, *Sciropophaga excerptalis* (Pyralidae; Lepidoptera) is considered to be major pests of sugarcane in different parts of India--Bihar, West Bengal, etc., reducing the yield and sugar contents up to 51% and 2.0 units, respectively. It is recorded in Indian cane fields and also damaging the other crops like millets, other grasses. It attack in the tunnelling of midrib

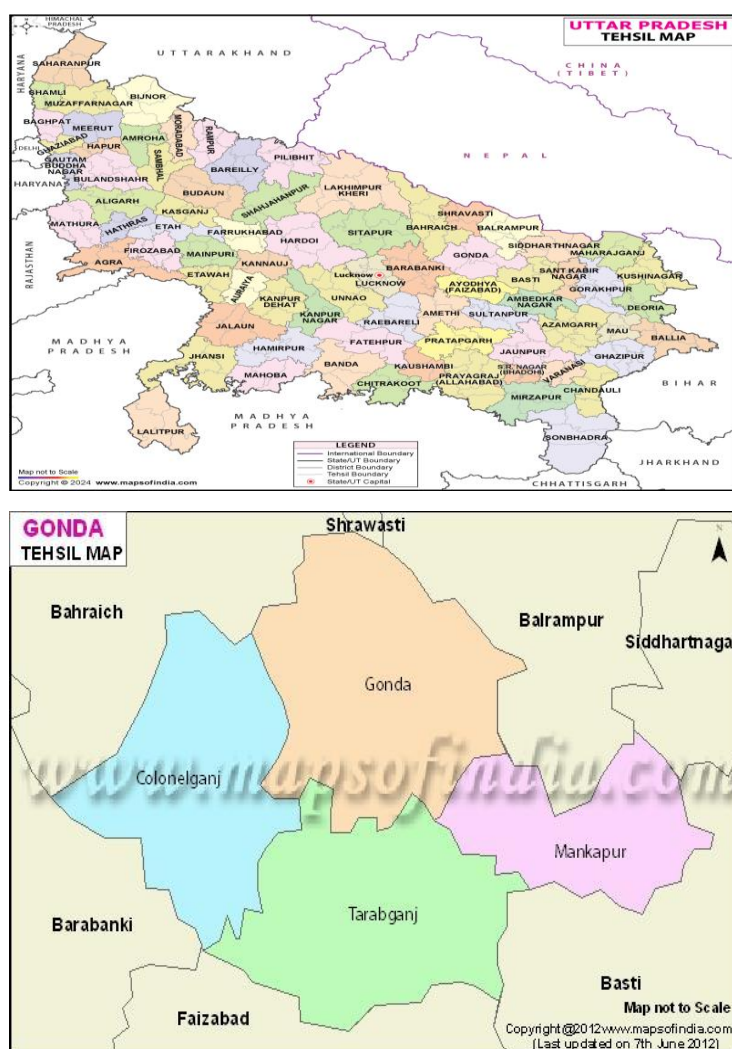


Fig. 1: Map of Study area showing Mankapur Tehsil of District Gonda (UP), India. (source: www.mapsofindia.com).

Table 1: List of pests of sugarcane observed during August 2023 to December 2024

S. No.	Common name of pest	Scientific Name	Orders of the pest	Family of the pest	Nature of damage
1	Sugarcane wooly aphid	<i>Ceratovacuna lanigera</i>	Hemiptera	Aphididae	On leaves black sooty moults
2	Sugarcane black bug	<i>Cavelerius excavates</i>	Hemiptera	Lygaeidae	Suck the cell sap
3	Sugarcane white fly	<i>Aleurolobus barodensis</i>	Hemiptera	Aleyrodidae	Sucking the cell sap of cane
4	Sugarcane spotted fly	<i>Neomaskellia bergii</i>	Hemiptera	Aleyrodidae	Dazzling of cane and drying of leaves
5	Sugarcane mealy bug	<i>Saccharicoccus sacchari</i>	Hemiptera	Pseudococcidae	Shooty mould causes
6	Sugarcane scale insect	<i>Aulacaspis tegalensis</i>	Hemiptera	Diaspididae	Sucking sap, leaves become pale yellow and curl up
7	Sugarcane leafhopper	<i>Pyrilla perpusilla</i>	Hemiptera	Lophopidae	Sucking cell sap, leaves become pale yellow and curl up, cane dry up

8	Brown planthopper	<i>Nilaparvata lugens</i>	Hemiptera	Delphacidae	Damage all stages of plant
9	Sugarcane root borer	<i>Emmalocera depresella</i>	Lepidoptera	Pyrilidae	Sugar content and cane weight is reduced
10	Sugarcane stalk borer	<i>Chilo auriculus</i>	Lepidoptera	Crambidae	Water shoots and ratoon crop
11	Sugarcane node borer	<i>Chilo (Sacchariphagus) indicus</i>	Lepidoptera	Pyrilidae	Cane tissue becomes red
12	Sugarcane early shoot borer	<i>Chilo infuscatellus</i>	Lepidoptera	Pyrilidae	Causes dead hearts
13	Sugarcane top borer	<i>Scirpophaga nivella</i>	Lepidoptera	Pyrilidae	Kills the central shoots
14	Buckeye	<i>Juninia coenia</i>	Lepidoptera	Nymphalidae	Caterpillar on leaves
15	Rose myrtle lappet moth	<i>Trabala vishnou</i>	Lepidoptera	Lasiocampidae	Causing to the crown layer
16	White grub	<i>Holotrichia consanguinea</i>	Coleoptera	Scarabaeidae	Cutting the root and nodule of plants
17	Red pumpkin beetle	<i>Aulacophora foveicollis</i>	Coleoptera	Chrysomelidae	Shooty damage
18	Lady bugs	<i>Coccinella transversalis</i>	Coleoptera	Coccinellidae	It preys on the plant eating insect
19	Termites	<i>Odontotermes obesus</i>	Isoptera	Termitidae	Feeds on cellulose and damage roots
20	Locust	<i>Omocestus viridulus</i>	Orthoptera	Acrididae	Eat leaf blades down to midrib

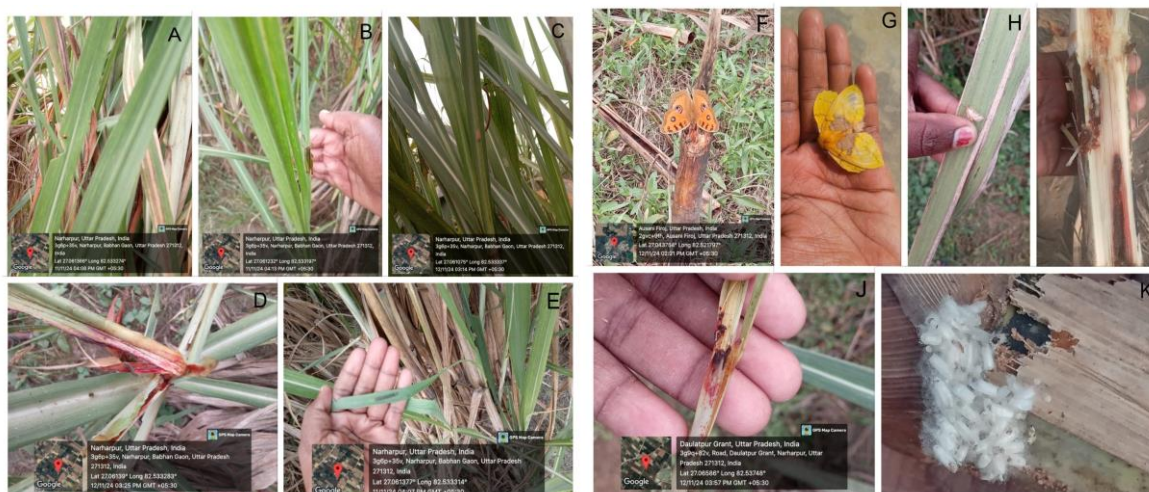


Fig. 2: Different type of insect pest and their stages – caterpillar, larva and eggs are found on the sugarcane crops identified and collected from fields of sugarcane crops of several villages of tehsil Mankapur, district – Gonda, Uttar Pradesh, India. (A) lady bugs of order Coleoptera, (B) grasshopper of order Orthoptera, (C) Brown plant hopper of order Hemiptera, (D) caterpillar of order Lepidoptera, (E) caterpillar of order Lepidoptera, (F) buckeye of order Lepidoptera, (G) rose myrtle lappet moth of order Lepidoptera, (H) *Scirpophaga insertulus* of order Lepidoptera, (I) caterpillar of order Lepidoptera, (J) sugarcane red rot disease, and (K) Eggs/cocoons of moth of order Leidoptera on sugarcane dead leaf.

in a leaf, small holes in a parallel lines in the freshly leaves, appeared as dead heart reddish in brown and a bunchy top grown up of the crop.

Stalk borer, young larvae feed within the top leaf sheaths and later bore inside cane stalks causing dead hearts and also attacking in the other

field of the vegetables, paddy and cereals. The grubs feed on the tap roots of the seedlings and the damaged plants wilt and die (Bandara, 1990). Woolly aphid, *Ceratovacunal lanigera* is a sap sucking insect pests and their infestation has been recorded in India, Nepal, and throughout East and

South-East Asia, (David *et al.*, 1986; Varma, 1993).

The most destructive pests (Fig. 2) includes white grub beetle, mealy bug, wooly aphid, *Pyrilla*, shoot borer, root borer, top borer, stalk borer, internodes borer, scale insects, and termites. The present study showed that biodiversity parameters as the richness diversity and composition of these insect communities differ from month to month. The above observation supports the findings of the several investigators (Thamaraiselvi and Dayana, 2015; Paudel *et al.*, 2021; Preeti *et al.*, 2023; Rout *et al.*, 2024).

Ethical Statement

The authors confirm that all ethical issues have been dealt with the research ethics guidelines provided by the Acharya Narendra Dev Kisan P. G. College, Babhnan, district-Gonda (Uttar Pradesh), India.

Author Contributions

Each author has contributed equally to the study's planning, analysis, writing, and editing. All authors have read and agreed to the published version of the manuscript.

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Conflict of Interest

The authors declare no conflicts of interest.

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