

Analyzing the Diverse Insect Pests Affecting Cucurbit Crops in Nandurbar District, Maharashtra (Family: Cucurbitaceae)"

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ABSTRACT

This study aimed to document the diversity, distribution, and feeding habits of insect pests associated with the crop. A total of 17 insect species from seven orders (Coleoptera, Hemiptera, Diptera, Hymenoptera, Lepidoptera, Orthoptera, and Thysanoptera) were recorded, with Coleoptera (41.18%) and Hemiptera (29.41%) being the most dominant. The family *Chrysomelidae* had the highest representation with four species, while other families had one species each.

The pests were categorized by feeding behavior: defoliators (11 species, 64.71%), sap-suckers (5 species, 29.41%), and tissue feeders (1 species, 5.88%). Chewing insects, especially coleopteran defoliators, were the main cause of crop damage, while sap-sucking pests caused indirect damage through nutrient depletion and pathogen transmission.

These findings provide a baseline for understanding pest dynamics, which is essential for developing effective Integrated Pest Management (IPM) strategies to reduce crop losses while highlighting the need for regular monitoring and management of both defoliators and sap-sucking pests.

Keywords: Insect pests, Defoliators, Sap-suckers, Tissue feeders, Coleoptera, Hemiptera, Integrated Pest Management (IPM)

INTRODUCTION

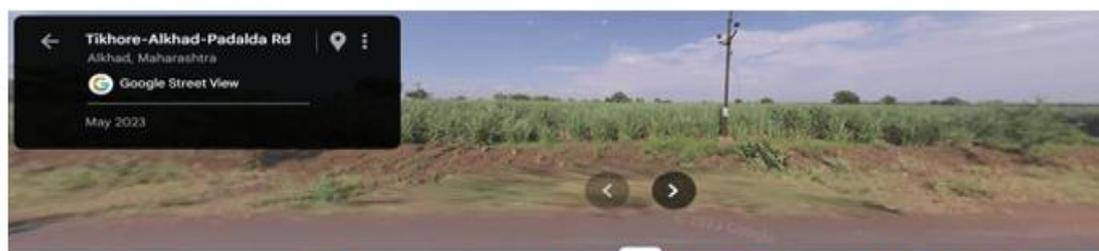
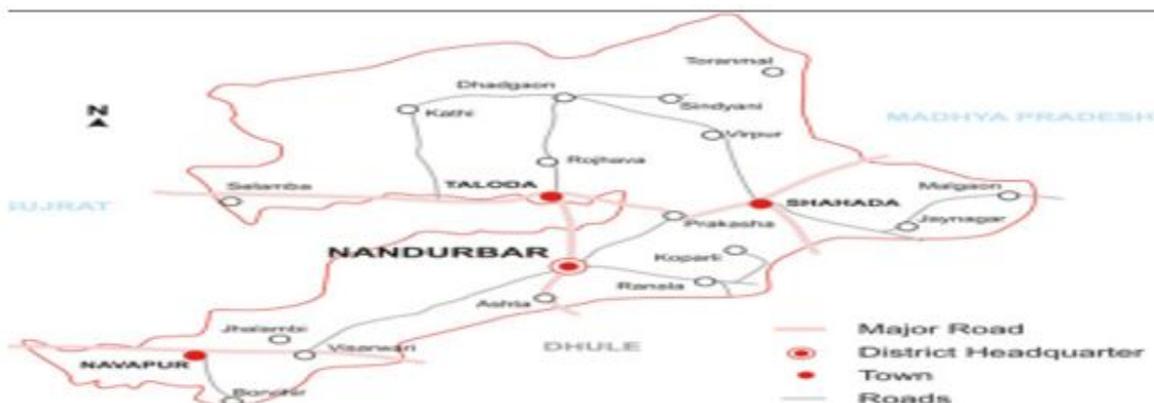
The Cucurbitaceae family is commonly referred to as cucurbits and encompasses a diverse group of vegetables, including cucumber, bitter melon, squash, bottle gourd, ridge gourd, and snake gourd. Cucumbers are often enjoyed in salads and pickles, while various squash and gourds find their place in cooking. Watermelon and muskmelon serve as delightful desserts, and wax gourd can be transformed into jam and biscuits. Globally, there are approximately 120 genera and 1,000 species of cucurbits, primarily found in tropical and subtropical regions, especially in Africa, tropical America, and Southeast Asia. Vietnam hosts 23 genera and 53 species. Part of the Cucurbitaceae family, cucurbits thrive in various climates and are mainly cultivated in spring, summer, and autumn. They contribute significantly to global diets, with India accounting for about 5.6% of worldwide production. As trailing vine crops, they are vital in agriculture, particularly during the summer and rainy seasons.

A study conducted in 2023-24 assessed the impact of insect pests on Cucurbitaceae crops and identified natural enemies that could aid future biocontrol efforts. It analyzes insect pests affecting cucurbit crops in Nandurbar District, Maharashtra, with a focus on vegetables such as cucumber, bitter melon, and squash. This region likely hosts various cucurbit species that face threats from pests such as cucumber beetles, squash bugs, and aphids, which can adversely affect crop yield and quality.

Understanding pest dynamics is crucial for effectively managing cucurbit crops. This study focuses on identifying pest species and assessing their impact on cultivation. Some insects, such as certain lepidopterans, can be pests as larvae but act as pollinators as adults. Additionally, insects often labeled as pests, like wasps and bees, can help control other pest populations and assist in pollination.

MATERIAL AND METHOD: STUDY AREA

Nandurbar city is situated in the northwest corner of the state of Maharashtra, India, within the Khandesh region. Its coordinates are 21.37°N and 74.25°E, with an elevation of 210 meters (688 feet). The city is situated near the borders of Gujarat to the northwest, Madhya Pradesh to the east, Dhule district to the southeast, and Nashik district to the southwest. Nandurbar is characterized by its hilly terrain, dry climate, and tropical temperatures, as noted in the Gramin Krishi Mausam Sewa Agromet Advisory Bulletin for the Nandurbar district.



RESULTS AND DISCUSSIONS

An extensive survey was carried out in the study area during Pre-Monsoon, Monsoon, and Post-Monsoon in the year 2023-2024. A total of 21 insect specimens were collected from the field during the study period. (Table. 1)

typical taxonomic structure in such surveys. **Table 2.** Order-wise distribution of insect pests **Table 3.** Family-wise distribution of insect pests **Table 4.** Feeding nature-wise distribution of insect pests **Table.5** Natural Enemies of pests of cucurbits have also been depicted below.

PESTS OF CUCURBITS;

Table 1: Typical Taxonomic Structure in these Surveys

Category	Count
Total taxa observed	21
Pest species	16
Natural enemies	4
Orders represented	7
Families represented	14

Table 2. Order-wise distribution of insect pests

The investigation identified 17 insect pest species across seven orders: Coleoptera, Hemiptera, Diptera, Hymenoptera, Lepidoptera, Orthoptera, and Thysanoptera (see Table 1). Coleoptera was the most dominant, with seven species (41.18%), followed by Hemiptera with five species (29.41%). The other orders had one species each (5.88%).

The prevalence of coleopteran pests is attributed to their broad host range and adaptability to various agro-climatic conditions, a phenomenon noted in previous studies as well, which emphasizes their significant economic impact on crops.

Table 2. Order-wise distribution of insect pests

S. No.	Order	Number of species	Percentage (%)
1	Coleoptera	7	41.18
2	Hemiptera	5	29.41
3	Diptera	1	5.88
4	Hymenoptera	1	5.88
5	Lepidoptera	1	5.88
6	Orthoptera	1	5.88
7	Thysanoptera	1	5.88
Total		17	100.00

Table 2. Family-wise distribution of insect pests

A family-wise analysis revealed that the recorded insect pests belonged to 14 different families (see Table 2). The family Chrysomelidae was the most dominant, with four species contributing significantly to pest infestations. In contrast, all other families were represented by just one species each. The prevalence of Chrysomelidae can be attributed to their leaf-feeding habits and their ability to reproduce quickly under favorable environmental conditions.

Table 2. Family-wise distribution of insect pests

S. No.	Order	Family	Number of species
1	Coleoptera	Chrysomelidae	4
2	Coleoptera	Meloidae	1
3	Coleoptera	Coccinellidae	1
4	Coleoptera	Curculionidae	1
5	Diptera	Tephritidae	1
6	Hymenoptera	Formicidae	1
7	Hemiptera	Aphididae	1
8	Hemiptera	Dinodoridae	1
9	Hemiptera	Aleyrodidae	1
10	Hemiptera	Pentatomidae	1
11	Hemiptera	Coreidae	1
12	Lepidoptera	Pyralidae	1
13	Orthoptera	Pyrgomorphidae	1
14	Thysanoptera	Thripidae	1

Table 3. Species-wise list of insect pests with feeding nature

Species documentation highlighted diverse feeding habits among insect pests (Table 3). Coleopteran species like *Aulacophora foveicollis*, *Epilachna vigintioctopunctata*, and *Myloccerus sp.* caused severe defoliation, leading to significant loss of photosynthetic area. The dipteran pest *Bactrocera cucurbitae* damaged plant tissues, particularly affecting fruit development. Sap-sucking pests from the order Hemiptera, including *Aphis gossypii*, *Bemisia tabaci*, *Nezara viridula*, and *Cletus bipunctatus*, extract sap, resulting in chlorosis, stunted growth, and potential transmission of plant pathogens.

Table 3. Species-wise list of insect pests with feeding nature

S. No.	Order	Family	Species	Nature of damage
1	Coleoptera	Chrysomelidae	<i>Aulacophora foveicollis</i>	Defoliator
2	Coleoptera	Chrysomelidae	<i>Aulacophora sp.</i>	Defoliator
3	Coleoptera	Chrysomelidae	<i>Charidotella sp.</i>	Defoliator
4	Coleoptera	Chrysomelidae	<i>Diabrotica undecimpunctata</i>	Defoliator
5	Coleoptera	Meloidae	<i>Mylabris phalerata</i>	Defoliator
6	Coleoptera	Coccinellidae	<i>Epilachna vigintioctopunctata</i>	Defoliator
7	Coleoptera	Curculionidae	<i>Myloccerus sp.</i>	Defoliator
8	Diptera	Tephritidae	<i>Bactrocera cucurbitae</i>	Tissue feeder
9	Hymenoptera	Formicidae	<i>Camponotus compressus</i>	Defoliator
10	Hemiptera	Aphididae	<i>Aphis gossypii</i>	Sap sucker
11	Hemiptera	Dinodoridae	<i>Coridius chinensis</i>	Sap sucker

12	Hemiptera	Aleyrodidae	<i>Bemisia tabaci</i>	Sap sucker
13	Hemiptera	Pentatomidae	<i>Nezara viridula</i>	Sap sucker
14	Hemiptera	Coreidae	<i>Cletus bipunctatus</i>	Sap sucker
15	Lepidoptera	Pyralidae	<i>Diaphania indica</i>	Tissue feeder & defoliator
16	Orthoptera	Pyrgomorphidae	<i>Atractomorpha</i> sp.	Defoliator
17	Thysanoptera	Thripidae	<i>Thrips palmi</i>	Sap sucker

Table 4. Feeding nature-wise distribution of insect pests

Based on feeding behaviour, the insect pests were categorized into **defoliators, sap suckers, and tissue feeders** (Table 4). **Defoliators constituted the major group**, accounting for **11 species (64.71%)**, followed by **sap suckers with five species (29.41%)**, while **tissue feeders were represented by one species (5.88%)**. The predominance of defoliators suggests that foliage damage is the primary constraint affecting crop growth in the study area. The presence of multiple sap-sucking pests also indicates the potential risk of indirect damage through nutrient depletion and disease transmission.

Table 4. Feeding nature-wise distribution of insect pests

S. No.	Feeding nature	Number of species	Percentage (%)
1	Defoliators	11	64.71
2	Sap suckers	5	29.41
3	Tissue feeders	1	5.88
Total		17	100.00

Table 5: Natural Enemies of pests of cucurbits.

SR.NO	ORDER	SPP
1	COELOPTERA	<i>Coccinella septumpunctata</i>
		<i>Cheilomenes sexmaculata</i>
		<i>Coccinella transversalis</i>
2	MENTODEA	<i>Mantis religiosa</i>

Note-

- Percentages calculated based on total species observed (n = 17).
- Diaphania indica*, showing a dual feeding habit, was considered under defoliators for statistical analysis

Overall Pest Scenario

The pest complex identified in this study clearly shows that both chewing and sucking insect pests are major contributors to crop damage. Notably, the higher proportion of defoliators underscores the urgent need for targeted management strategies aimed at leaf-feeding insects. Implementing Integrated Pest Management (IPM)

approaches that combine cultural, biological, and strategic chemical control measures will effectively reduce pest incidence and significantly minimize yield losses.

***Aulacophora foveicollis* (Fig. 4) Coleoptera; Chrysomelidae.** A key foliar pest that feeds on leaves, buds, and flowers, causing defoliation and reduced plant vigor. They have been recorded on pumpkin, bottle gourd, and sponge gourd (Vinutha et al. 2017; Sharma et al. 2016).

***Aulacophora indica sp* (Fig. 5)(Coleoptera; Chrysomelidae).** *A. foveicollis* is a defoliator that reduces the crop's photosynthetic activity, and its grubs attack the roots for nourishment. (Neha Jamwal* and Sanjay Bhatia 2018)

***Aulacophora abdominalis* (Fig. 6)(Coleoptera; Chrysomelidae)** Common name: Leaf Beetle. These beetles feed on the foliage and flowers of host plants, often clustering on a single leaf while leaving others untouched. Heavy infestations can destroy seedlings and severely impact young plants. They feed between veins, cutting out circular discs to eat, while larvae tunnel into roots, causing swelling, discoloration, and potential plant death. (Neha Jamwal* and Sanjay Bhatia 2018)

***Charidotella sp.* (Fig. 7) Coleoptera; Chrysomelidae)** A species of Golden tortoise beetle was found feeding on the leaves and soft stems of sponge gourd, pumpkin, and bitter gourd. They defoliate the plants by chewing away the leaves, which leads to significant damage.

***Mylabris Phalerata* (Fig. 8)(Coleoptera; Meloidae).**

The Banded Blister Beetle is a serious pest of cucurbits, especially during the rainy season when its population spikes. It damages crops by defoliating and eating flowers. It has been recorded on pumpkin, bitter gourd, bottle gourd, and ladyfinger.

***Epilachna vigintioctopunctata* (Fig. 9) Coleoptera; Coccinellidae** The Hadda Beetle is a light orange pest with 28-30 dots, affecting cucurbits like bitter gourd, bottle gourd, and pumpkin (Sharma et al. 2016). Both larvae and adults damage the crop by defoliating the plants.

***Mylocerus sp.* (Fig. 10) (Coleoptera; Curculionidae).** Their presence on the host plant was found very few times during the survey, feeding on the leaves of the host plant. So it may be regarded as the potential pest of cucurbits in our state.

***Bactrocera cucurbitae* (Fig. 11)(Diptera; Tephritidae).** Commonly called the Melon Fruit Fly, it is widely distributed throughout the tropical, subtropical, and temperate regions worldwide. It is found to infect a vast variety of cucurbits, including pumpkin, sponge gourd, bottle gourd, and muskmelon (Sapkota et al. 2010; Dhillon et al. 2005). Singh et al. 2000) reported a total damage of 30% on bitter gourd and watermelon. The adults lay eggs on the surface of the fruits, and the larvae bore into the fruit, thereby making it unpalatable.

***Camponotus compressus* (Fig. 12) (Hymenoptera; Formicidae).** This species of Black ants forages on the younger leaves, buds, and tendrils of the plant, acting as defoliators. They infest the crop in abundance and cover the tender tips of the newly growing leaves, tendrils, and buds, resulting in crippled growth of the young shoot. (Neha Jamwal* and Sanjay Bhatia 2018)

***Aphis gossypii* (Fig. 13) (Hemiptera; Aphididae).** These are very small, commonly called Green flies. They act as serious pests by sucking the sap of the tender leaves, stems, and buds (Sharma et al. 2016). They have piercing and sucking mouthparts and feed mostly on bottle gourd, pumpkin, and sponge gourd. They cause yellowing of the leaves, which finally turn brown, and the overall yield of the crop reduces due to reduced photosynthetic activity. They were present in abundance under the leaves in the studied area.

***Coridius chinensis* (Fig. 14) (Hemiptera; Dinidoridae).** This is a species of stinkbugs, commonly known as Cucurbit Stink Bug. This also destroys the crops by feeding on the sap of young growing shoots using its piercing and sucking mouthparts. Leaves, after turning yellow, fall to the ground, leading to a low yield of the fruit crop. It was found in pumpkin, sponge gourd, and bottle gourd.

***Bemisia tabaci* (Fig. 15) (Hemiptera; Aleyrodidae).** This is commonly called as Whitefly and is polyphagous in nature, found feeding on various plants, including the cucurbits (Coudriet et al. 1985). Among cucurbits, they infect pumpkin, sponge guard, and bottle gourd the most.

***Nezara viridula* (Fig. 16) (Hemiptera; Pentatomidae).** Commonly known as the Green Stink Bug, this pest is an occasional visitor to the cucurbits and hence, is a minor pest (Sharma and Tara, 2017). This pest was recorded on bottle gourd and pumpkin from the study area.

***Cletus bipunctatus* (Fig. 17) (Hemiptera; Coreidae).** It is popularly known as the Squash Bug, although a minor pest was found feeding on cucumber and pumpkin. Adults and nymphs caused the damage by sucking the leaves and turning them yellow. They were recorded on pumpkin, bitter gourd, bottle gourd, and sponge gourd.

***Diaphania indica* (Fig. 18) (Lepidoptera; Pyralidae).** Commonly called the Cucurbit Moth, this is one of the major pests of cucurbits and was found infesting pumpkin, bottle gourd, and sponge gourd. The adults lay eggs on the underside of leaves, and the larvae, being voracious feeders, defoliate the plant, thereby reducing the overall yield of the fruits.

***Atractomorpha* sp. (Fig. 19) (Orthoptera; Pyrgomorphidae).** This is the species of Green slant-faced grasshoppers. They act as defoliators (Vinutha et al. 2017) by chewing away the foliage and hindering the photosynthetic activity of the plants. They were found to be associated with the cucurbit crops occasionally, which suggests that they are only a minor pest in the studied area.

***Thrips palmi* (Fig.20) Thysanoptera (Terebrantia: Thripidae)** The melon thrips damages plants by killing surface cells with its piercing and sucking mouthparts during feeding. At low levels, there may be no visible sign of damage. In high numbers, melon thrips produce silvery, yellowing, and bronzing of affected areas. Leaves may crinkle and die; growing tips may become stunted, discoloured, and deformed; and fruits may abort or develop scar tissue.

NATURAL ENEMIES OF PESTS OF CUCURBITS 1. *Coccinella septumpunctata* (Fig. 21) (Coleoptera; Coccinellidae). This is the most commonly found ladybird beetle. Also called the seven-spotted Ladybird beetle, it was present in abundance where the aphid population was very high. This helps to reduce the pest population very effectively (Singh and Singh, 2016).

***Cheilomenes sexmaculata* (Fig. 22) Coleoptera; Coccinellidae)** Commonly known as the six-spotted zigzag ladybird beetle, it was found feeding on the aphids. Singh and

Singh (2016) recorded similar observations. Both larvae and adults were engaged in the biocontrol.

***Coccinella transversalis* (Fig. 23) (Coleoptera; Coccinellidae).** Another species of ladybird beetle, commonly known as T Transverse banded ladybird beetle, was recorded feeding on aphids.

***Praying Mantis Mantis religiosa* (Fig. 24).** The praying mantis nymph was observed feeding on insect pest larvae and nymphs affecting cucurbits. A study by Sharma and Tara (2017) in Maharashtra highlighted significant damage from Hemipteran insects on these crops. The current research identified major pest species primarily from Coleoptera and Hemiptera, with contributions from Diptera, Lepidoptera, Hymenoptera, and Orthoptera. Key pests included *Aulacophora foveicollis* (Coleoptera), *Bactrocera cucurbitae* (Diptera), and *Diaphania indica* (Lepidoptera).

CONCLUSION

1. The insect pest complex associated with the crop is **diverse**, involving multiple orders and families, with **Coleoptera and Hemiptera dominating**.
2. **Defoliators are the major contributors** to crop damage, indicating that management strategies should primarily target leaf-feeding pests.

3. Sap-sucking pests, although fewer in number, can **indirectly affect crop health** by causing nutrient loss and transmitting plant pathogens.
4. **Integrated Pest Management (IPM)** strategies combining **cultural, biological, and judicious chemical control** are recommended to minimize yield losses.
5. The documentation of pest diversity and feeding habits provides a **baseline for future pest monitoring and management programs** in the region.



Fig.4



Fig.5



Fig.6



Fig.7



Fig.8



Fig.9



Fig.10



Fig.11



Fig.12



Fig.13



Fig.14



Fig.15



Fig.16



Fig.17



Fig.18



Fig.19



Fig.20

NATURAL ENEMIES OF PESTS OF CUCURBITS

1. *Coccinella septempunctata* (Fig. 19)



Fig.21



Fig.22



Fig.24



Fig.25



Fig.26



Fig.27



Fig.28

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