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Diversity of Aphids in Terai Region of Kumaun Uttarakhand.

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Abstract-Terai region of Kumaun Uttrakhand known for its fertile soil and diverse crop cultivation is vulnerable to pest infestations, including aphids. Aphids are serious threat to agriculture as well as non-crop plants of Terai region as they may harm by stealing nutrients, spreading diseases, and creating conditions for harmful fungi to thrive. A high diversity of aphids is an indicator of plant disease risk, susceptibility for infestation and agricultural loss. This study was conducted in different localities of Kumaun and 15 aphid species were identified.

Keywords- Diversity, Pest, Harmful, Agriculture, Infestation.

Introduction- Aphids, commonly called greenfly or blackfly, are tiny, soft-bodied insects that damage crops by feeding on plant sap. These pests, belonging to the Aphidoidea superfamily, can specialize in feeding on one type of plant (monophagous) or many (polyphagous). Of the over 5,000 aphid species globally, about 400 attack food and fiber crops. Aphids sometimes form mutually beneficial relationships with ants.These destructive pests not only weaken plants by draining their sap but also spread plant viruses and disfigure plants with their sugary waste (honeydew), which can lead to sooty mold growth. Aphid life cycles are complex, involving both sexual (holocyclic) and asexual (non-holocyclic) reproduction. While found worldwide, aphids are most prevalent in temperate climates and can travel long distances using their wings.There are 4702 species of aphid in the world (Remaudiere and Remaudiere, 1997) of which 250 are serious pests (Minks and Harrewjin, 1987). Ghosh and Singh (2000) studied on the diversity of aphids of India and reported 653 species belong to 208 genera of aphids.Sushila et al. (2023) found that India had 25 genera and 125 species of aphids while Uttarakhand had 4 genera and 125 specis of aphid from plains to high altitude. Ganganalli et al. (2024) recorded 25 species of Aphididae belonging to 17 genera in association with 68 host plants from different localities of Kerala.

Terai region of Kumaun Uttrakhand known for its fertile soil and diverse crop cultivation is vulnerable to pest infestations, including aphids. The variety of aphid species in a given area is directly related to the availability of food sources. Aphids areserious threat to agriculture of terai region as they may harm crops by stealing nutrients, spreading diseases, and creating conditions for harmful fungi to thrive. High number of aphid diversity is an indicator of plant disease risk, susceptibility for infestation and agricultural loss. Knowing the variety of aphid species is key to controlling them, as different types respond differently to pest control methods.

Research Methodology-

Apterous aphids were collected and preserved in 70% ethanol from a variety of plants throughout the Terai region of Kumaun. Each vial, containing specimens gathered directly from host plants, was labeled with location, collection date, and host plant information. The identification of these specimens was expertly carried out by Dr. Sunil Joshi, Principal Scientist at NBAIR Bengaluru.

Result and Discussion-We have found following15species-

1. *Aphis craccivora* Koch1854 **(Cowpea aphid)-**

These small, shiny black aphids form young colonies primarily on the new growth of their host plants, often accompanied by ants. Immature aphids are light brownish with a light waxy coating,exhibit a reddish-brown color. Both the siphunculi (cornicles) and cauda (tail-like structure) are black.The abdomen is predominantly black on the upper side, with the dark pigmentation sometimes spreading to the sides, surrounding the lateral sclerites (hardened plates) and the base of the siphunculi. In smaller aphids, this dark pattern may be less extensive and broken. The antennae are about two-thirds the length of the body. The first two antennal segments, and the tip of the fifth, are dark, while the third, fourth, and base of the fifth segments are pale. The cauda bears 4 to 7 hairs.

Host plant and location-French bean (Kashipur) and Litchi (Kashipur) Amaranth (Kashipur)**.**

2. *Aphis gossypii* Glover1877 (**Cotton aphid or melon aphid)-**

These aphids exhibit significant color variation, especially in wingless (apterae) adults. While larger individuals are typically dark green to nearly black, those developing in crowded, warm conditions can be tiny (under 1 mm) and pale yellow or almost white. Nymphs are usually light green with darker green mottling, featuring dark siphunculi and a pale

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or dusky cauda (tail-like structure). They are frequently observed with ants.Their antennae have dark segments I, II, the apical half of the processus terminalis, and the area around the primary rhinarium of segment VI, while the rest is pale. The cauda is broadly rounded at the tip, often bearing 4-7 hairs, and is dusky but lighter than the siphunculi. The abdominal dorsum lacks pigmentation. A key characteristic of this species is the wide range of color within a single colony, regardless of the host plant.
Host plant and location- Bottle gourd (Ramnagar), Kidney bean (Bazpur), Bitter gourd (Bazpur), Broad bean (Ramnagar), and Brinjal (Ramnagar).

3. ***Aphis fabae*** Scopali1763 (**Bean aphid)-**
This species is matt black in appearance. Antennae's first two segments, the tip of the sixth segment, and the process terminal are dark. The middle segments (III, IV, and the base of V) are white in live aphids. Legs upper two-thirds of the femora are dark, as are the tips of the tibiae and the tarsi.Cauda and siphunculi both are dark.Older aphids exhibit white waxy markings.Young colonies found on young shoots.Older colonies spread across most above-ground parts of the plant.Colonies are regularly attended by ants.These are widely distributed in temperate regions of the Northern Hemisphere, South America, and Africa.Less commonly distributed in hot tropical and Middle Eastern regions of the world and very common in India.
Host Plant and location- Fenugreek (Ramnagar), Kidney bean, (Ramnagar), and Pigeon pea (Bazpur).

4. ***Aphis spiraecola*** Patch1914 (**Spirea aphid)-**
Body is bright greenish-yellow to apple green in appearance. Head is brown Legs and Antennae are mostly pale. Siphunculi and Cauda are dark brown to black. Causes leaf curling and distortion in host plants.Generally found on new growth (stem apices) and flower heads.Usually attended by ants. In alataehead and thorax are dark brown in appearance. Abdomen shows yellowish-green with dusky patches on the sides of each segmentwhie upper surface shows smooth and lacks any dark patch. Antennae are almost half the length of the body.
Host Plant and location-Coriander (Ramnagar), Potato (Bapur)

5. ***Aphis nerii*** Boyer de fonscolombe1841 **(Oleander aphid)-**
Morphological description- Body is dark yellow in colour. Body length is about 1.5-2.6mm.Oval shaped head with randomly distributed pointed hairs. Antennae are dark in colour and bear 6 segments with hairs. Antennae are shorter in the length than the body. Flagellum bears 4 segments. Thorax possesses wax pores which are oval in shape. Abdomen is oval in shape with 8 segments with randomly distributed pointed hairs. Siphunculi is dark, thick at the base and thin at the tip. Cauda is thin at the base and wide at the tip with dens hairs. Cauda is dark and smaller than the siphunculi.
Host Plant and location- Oleander (Ramnagar, Kashipur and Bazpur).

6. ***Lipaphis pseudobrassicae*** Davis 1914 **(Turnip aphid)-**
Apterae (wingless) form are yellowish-green, grey-green, or olive-green with a white wax bloom and 1.4-2.4 mm, while alatae are 1.4-2.2 mmin size. Alatae (winged) shows dusky green abdomen with dark side plates (lateral sclerites) and dusky wing veins. These causes leaf curling and yellowing. Generally found undersides of leaves and inflorescences.Equidistant oily patches on the sides of abdominal segments 1-4 as distinctive marking is seen.Larger oily patches down the center of abdominal segments 5-7.Oily patch at the base of each siphunculi are present.
Host Plant and location-Radish(Bazpur) ,Brassca nigra (Kashipur and Ramnagar).

7. ***Greenidea psidii*** van der Goot 1917 (**Guava aphid**)-
Adults are pale to dark brown with a pear-shaped body while nymphs are yellowish-brown with dark brown spots on the abdomen's upper surface (dorsum). Alatae (winged forms) shows more slender body, and longer darker siphunculi. Apterae siphunculi are long, yellowish-brown, approximately one-third of the body length, and curved outwards at the tips while in alatae it is very long, dark, about three quarter of the body length. Generally present on young shoots and undersides of young leaves.Antennaeisapproximately 0.8 times the length of the body.
Host plant and location-Guava (Bazpur).

8. ***Greenidea ficicola*** Takahashi 1921 (**Guava aphid**)-
Body of apterae is small to medium-sized, and pear-shaped.Yellowish-brown to dark brown in colour.Siphunculi are dark brown, very long (at least one-third of the body length), curved outwards at the tips, and hairy. In alatae (winged) form body is elongated, abdomen with dark brown and siphunculi are dark brown in appearance, approximately two-thirds of the body length. Antennae are 0.7-0.8 times the length of the body. Processus terminalis is 2.8 times longer than the base of the last antennal segment.Siphunculi are 0.34 times as long as the body length.
Host Plant and location- Guava (Ramnagar).

9. ***Myzus persicae*** Sulzur 1776 (**Green peach aphid**)-

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These are small to medium-sized in apterous form.Colour variation can be seen as they are whitish green, pale yellow-green, grey-green, mid-green, pink, red, or almost black.This species is uniformly colored, and not shiny in appearance. Abdomen with black central patch on the dorsal surface (dorsum). These are generally found on tobacco plants are often pink or red.Antennae are approximately 0.62 times the length of the body.
Host Plant and location-Cauliflower (Ramnagar), Peach (Kashipur).

10. *Rhopalosiphum padi* Linnaeus 1758 **(Oat bird cherry aphid)-**Body broadly oval in shape.Color is green mottled with yellowish-green or olive-green, or dark-olive to greenish-black. Distinctive markings is seen in the form of rust-colored patches around the bases of the siphunculi, sometimes merging on the abdomen's upper surface (dorsum). In alatae (winged) formabdomen is pale to dark-green. Body length is about 1.4-1.5 times the length of the antennae. Processus terminalis is more than three to four times the length of the base of the last antennal segment.Siphunculi is more than 1.5 times the length of the cauda, uniformly dark (paler at the base in black specimens). Patches are fond around the siphunculi.Apterae are found on grasses and cereals.
Host Plant and location-Wheat (Bazpur, Ramnagar and Kashipur).

11.*Macrosiphum rosae* Linnaeus 1758 **(Rose Aphid)-**
Aptera is green or dark pink in colour. Body is large in the size about 1.7-4.2mm in length. Head is dark and soft with fine developed lateral tubercle. Antenna is black possesses 6 segments and longer than the body. Flagellum imbricated. Abdomen possesses 8 segments with dark apex. Dorsal part of the abdomen having small hairs which are pointed and no patch present. Siphuncules are black and cylindrical in profile. Siphinculi are longer than the cauda which is somewhat arched at the tip. Cauda is pale yellow in colour and having numerous hairs, without basal grooves. Cauda is tapering in orientation with numerous randomly distributed hairs which are 9 in numbers.
Host Plant and location-Rose(Bazpur, Ramnagar and Kashipur)

12. *Toxoptera citricida* Kirkaldy 1907 **(Black citrus aphid)-**
Aptera is dark black in shade. Body length is about 1.5-2.4mm. Alate having forewing with yellowish pterostigma. Antenna is dark brownish in colour with 6 segments. Body is dark brown in shade. Head contain hairs with pointed tip. Lateral frontal tubercle feebly developed. Antenna is 6 segmented without closely imbricaed and smaller than body length. Flagellum bears 4 segments. Abdomen contains 8 segments and multilateral reticulation seen. Siphunculi is cylindrical in shape and shorter than the body. Cauda is shorter than the siphuncli and bears numerous hairs with sharp tip. Cauda is tense at the middle and rounded at tip.
Host Plant and location- Citrus maxima (Ramnagar and Kashipur)

13. *Hyadaphis coriandri* Das*1918* **(Coriander aphid)-**
Morphological description- Body is green in shade. Antenna bears 6 segments. Body length is about 1.3-2.1 mm. Abdomen bears 8 segments and is light green in shade. Antenna is dark, longer than the body length. Siphunculi is dark, cylindrical in shape and dusky at the tip due to wax deposition. Red rusted patches are present at the base of siphunculi.
Host Plant and location- Coriander (Ramnagar and Kashipur).

14. *Macrosiphoniella sanborni* Gillette 1908 **(Chrysanthemum aphid)-**
Morphological account- Body is dark brown in shade. Body length is about 1.0-2.10mm. Lateral frontal tubercle well developed in the head region. Antenna bears 6 segments with numerous minute hairs and longer than body in length. Abdomen bears 8 segments and minute hairs present over the dorsal part. Abdomen had numerous patches on the dorsal part. Siphunculi are dark, smaller than cauda in length. Cauda is dark, longer than siphunculi and had basal contriction with numerous minute pointed hairs.
Host Plant and location- Chrysanthemum (Ramnagar and Kashipur)

15. *Acrythosiphum pisum* Harris 1776 **(Pea aphid)-**
Morphological description- Body is green in shade with a very thin layer of wax. Nymphs are covered more with wax than the adult. Body length is about 1.50-2.8. Head is smooth with well developed lateral frontal tubercle. Antennae with light coloured base as compare to apex and bears 6 segments. Legs are large, thin and dark in shade. Abdomen bears 8 segments, yellow-green shaded with scleritse. Siphunculi are cylindrical in orientation with wide base and a distinct apical flange. Cauda is dark in shade with broad base and pointed tip. Cauda bears stiff hairs.
Host Plant and location- Pea (Ramnagar and Kashipur)

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