

# Preliminary Assessment of Foraging Behavior of *Bombus haemorrhoidalis* Smith in Doon Valley, Uttarakhand, India <sup>†</sup>

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**Abstract:** Pollination and pollinators are major keys in the working of almost all terrestrialecosystems. Bumblebees are the key pollinators belonging to family Apidae. Their large and fuzzy body makes them efficient pollinators than any other bee. Because of their thermoregulatory abilities they can efficiently and effectively work in the cold climate of Himalayan region. This study has been conducted in Dehradun valley of Uttarakhand, India which is situated in the foothills of Shiwalik hills of Himalaya. It is a preliminary study of foraging behavior of bumblebees in this region and it is observed that they mainly forage on species of family Asteraceae, Verbenaceae, Tropaeolaceae, Solanaceae and Bignoneaceae.

**Keywords:** *Bombus haemorrhoidalis*; Doon Valley; floral resources

## 1. Introduction

Insects are the most diverse group of animal kingdom. They are important indicators for assessing, managing and monitoring biodiversity in natural ecosystems. The Hymenoptera is second largest group of insects, which includes bees and wasps. They are not only the most successful plant pollinators but also help in protecting the plant diversity in nature and increase productivity of different agriculture and horticulture products like crops, vegetables and fruits. Bees and wasps play an important role in pollination of plant species, which fulfill the requirement of animals as well as humans and their livelihood. There are 12,605 species of Hymenoptera in India out of which 4872 are found in Indian Himalayas. A total of 337 bee species are found in Indian Himalayas. The world bumblebee fauna consists of approximately 250 known species (Williams 1985, 1994, 1998; Pederesen, 1996) out of which 49 species of bumblebees has been reported from this region (Chandra, 2012). In the Himalayan regions bumblebee general distribution has been started from 400 m to 5600 m (William, 1999 & William et al. 2010). They are most abundantly distributed in the mountains to the east of Tibet and in the mountains of central Asia (Williams 1994).

The Himalayas, the longest mountain range in the world is home to high bumblebee diversity due to its variety of suitable habitats. They are efficient pollinators as their large and fuzzy body can carry a larger load of pollen than any other bee. Because of their thermoregulatory abilities they can thrive well in the high altitude and cold ambient temperatures of Himalayan region and can carry out pollination when no other bee is able to do so. They are generalist forager and can forage on a wide range of plants. Bumblebees are

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also used for pollination of tomatoes and other Solanaceous crops in greenhouses and of some leguminous crops. However, some plants do rely on Bumblebees to achieve pollination. Loss of Bumblebees can have far ranging ecological impacts due to their role as pollinators. Around the world Bumblebee number is declining due to a number of factors like- anthropogenic activities, habitat loss, climate change, excessive pesticide uses, introduction of invasive bees, overgrazing of foraging plants etc. Studies showed that decline in Bumblebee number also results in the decline of plants pollinated by them.

## 2. Materials and Methods

Preliminary study on foraging behavior of *Bombus haemorrhoidalis* smith has been conducted in Doon Valley, Dehradun, Uttarakhand, which is surrounded by agroecosystem and subtropical temperate landscape situated at the foothills of outer Himalayan region with an altitudinal gradient of 640 m amsl. The study was conducted from October 2020–April 2021. It is conducted covering four different habitats with the fields; forest area and semi urban areas of Doon Valley.

The insects were collected from the study areas using systematic net sweeps. They were collected in special transparent killing jars so as to preserve the colour of the pubescence, as the colour of the pubescence in bumblebees holds great importance in identification of species. After coming to the laboratory, the specimens were pinned with the help of entomological pins of different sizes, keeping in view the size of specimen. After stretching the specimens were appended with data label containing the important information regarding its locality, altitude, date of collection and name of the collector. Later on, stretched specimens were transferred to the storage boxes, poisoned with ethyl acetate soaked cotton and naphthalene powder filled in the side grooves of boxes.

Collected samples were examined under stereoscopic microscope in the laboratory and identified using published keys for adjoining areas eg. Nepal (William, 2010), India (Saini et al. 2015), Kashmir (William 1991).

## 3. Results and Discussion

Bumblebees are most active during early morning and late noon hours during summer and during winter they are active during late morning till early evening time. They are most active than any other bee like honeybee during winter and can be seen foraging on the available flowering plants. They are generalist foragers and they can efficiently pollinate from late winter (February) to late autumn (November). In the months of October and November they were very abundant and during winter (December–January) their abundance declined due to less availability of foraging plants but even then they were more active than other bees. From early spring (March onwards) their activity increased with the abundance of foraging plants. Since they are active for so many months, they must be able to forage on a wide range of plant species. Their abundance significantly depends on the temperature and weather conditions of that particular area. There is positive correlation between foraging of bumblebee and humidity because nectar secretion rates were higher at high humidity (Peat and Goulson, 2005). It is also observed that bumblebees avoid collecting pollen when the foliage is covered in dew or rain-water droplets, which would make grooming pollen into the corbiculae harder.



Bumblebee on *Lantana* sp.



Bumblebee on *Cirsium arvense*



Bumblebee on *Tecoma stans*

*Bombus haemorrhoidalis* is the predominant species of genus *Bombus* in Doon Valley. Its preferred foraging plant species during the studied period are *Cirsium arvense* (Asteraceae), *Lantana* sp. (Verbenaceae), *Tropaeolum majus* (Tropaeolaceae), *Solanum melongena* (Solanaceae) and *Tecoma stans* (Bignoniaceae). Their foraging activity depends on seasonal availability of floral resources in the study area.

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