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INSECT POLLINATORS OF BUCKWHEAT (*FAGOPYRUM ESCULENTUM*) FROM DISTRICT GHANCHE, GILGIT BALTISTAN

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ABSTRACT

Current study was initiated to investigate the insect pollinator fauna of Buckwheat crops at high elevations of District Ghanche, Gilgit Baltistan. In total, 507 specimens were collected during active flowering seasons of crop and yielding 17 species under 13 genera of 7 families belonging to three orders viz, Hymenoptera, Diptera and Lepidoptera. Order Hymenoptera includes family Formicidae, Apidae and Vespidae, Diptera includes Syrphidae, Calliphoridae and Muscidae while Pieridae belonged to order Lepidoptera. Most interesting information related to this research is that *Pieris brassicae* is considered as a pest, but it played major role in pollination of Buckwheat and not documented as a pest. No pest is recorded during whole research period.

1. INTRODUCTION

Buckwheat (*Fagopyrum esculentum)* belongs to family Polygonaceae of order Caryophyllales. It is a non-viscous pseudo cereal crop mainly consumed in China, Eastern Europe, and Japan (Edwardson, 1996). In Pakistan it is cultivated in Northern Areas in maximum quantity. Most farmers of District Ghanche cultivate this crop after harvesting of Oat. In Northern Area its cultivation starts from July and harvested in September every year. It contains starch like cereals, but has greater amounts of amino acids cysteine, methionine and lysine which is more typical of legumes (Zheng *et al*, 1998; Qian *et al*, 1998). It helps in lowering blood cholesterol level (Leiber *et al*, 2012; Tomotake 2000), prevents cancer and minimizes heart diseases. It is cross pollinated crop having triangular shaped seed. Insects play a major role in pollinating this crop and increase its yielding quantity.

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During this whole research honeybee and Bumble bee were found in maximum ratio as major agents of pollination. Ghanche is one of the well-known districts of Baltistan Division regarding to its historical places. It is located 737km north of Islamabad at an altitude of above 8000m from sea level. District Ghanche includes green valleys, highest peaks including Mashabrum, Gashabrum and Chogo Lingsa. Machulo one of the main areas of Ghanche famous for producing apricot and buckwheat. Two varieties of buckwheat are cultivated in Ghanche locally named as Kho Bru (*Fagopyrum esculentum*) and Giavas (*Fagopyrum tataricum*).

As per examination no study has been conceded out on the insect pollinators of buckwheat in Northern Pakistan. Keeping in view the importance of pollination in buckwheat, there is great need to explore the insect fauna of buckwheat from district Ghanche, Gilgit Baltistan.

2. MATERIALS AND METHODS

Present study was conducted within the localities of District Ghanche i.e., Machulo, Talis and Marzi Gond. Insect pollinators were collected with the help of aerial net during the flowering season of buckwheat from first of August to mid of September 2022. Bowl trap method was also used for the collection of insect pollinators. White, blue, and yellow colored bowls were placed to attract bees and other insects. Water was used with soap to fill the bowls. At each sampling location 24 bowl traps (each color has 8 bowls) were placed 6m apart. Insect were killed by using killing jar containing potassium cyanide. Killed specimens were pinned for further identification. Identifications were done up to possible levels with the help of stereo microscope by running them through following identification keys. Bharti *et al.*, (2016), Siddiqui *et al.* (2015), Kumar *et al.* (2010), Mahmood *et al.* (2012), Hassan *et al.* (2017).

3. RESULTS AND DISCUSSION

During whole study 507 specimens were collected from which 17 species were identified. Identified specimens belong to seven families under 13 genus viz i) ***Episyrphus,*** ii) ***Sphaerophoria,*** iii) ***Ischidon,*** iv) ***Eristalis,*** v) ***Syritta,*** vi) ***Lucilia,*** vii) ***Musca,*** viii) ***Pieris,*** ix) ***Bombus,*** x) ***Apis,*** xi) ***Formica,*** xii) ***Vespa,*** xiii) ***Polistes***. The details are given follow:

Order Diptera
Family Syrphidae
Genus *Episyrphus* (Matsumura Adachi, 1917)
Episyrphus balteatus
Machulo, (7♂, 9♀), 23-vii-2022; Talis, (9♂, 5♀), 27-vii-2022; Marzi Gond, (6♂, 4♀), 6-viii-2022, leg. R. Hussain.
Previous Records:
Above-described specie was recorded from Asia, Japan, Canaries, Madeira, Europe, and North Africa (Brunetti, 1923) from Iran and Turkey (Dousti & Hayat, 2006; Hayat & Alaoglu, 1990). Maximum number of this species were recorded in oriental region and from some countries of Asia and Europe.

Genus *Sphaerophoria* Lepeletier & Serville
Sphaerophoria scripta:
Machulo, (9♂, 5♀), 25-vii-2022; Talis, (5♂, 6♀), 1-viii-2022; Marzi Gond, (3♂, 2♀), 2-viii-2022, leg. R. Hussain.
Previous Records:
Arif *et al.* (2001) reported same species from Ber (*Zizyphus jujuba*), Tobacco (*Nicotiana tabacum L.*) and wild grasses. Hassan *et al.* (2017) documented from flowers of different plants including *Brassica campestris* and *Coriandrum sativum*.

Genus *Ischiodon* (Sack, 1913)
Ischidon scutellaris
Material Examined: Machulo, (2♂, 4♀),), 02.viii.2018; Talis, (3♀), 26.vii.2018; Marzi Gond, (8♂, 5♀), 29.vii.2018, leg. R. Hussain.
Previous Records:
This specie is reported from Northern Africa and India (Brunetti, 1923). Sajjad & Saeed (2010) recorded from Southern Punjab of Pakistan and considered as widespread specie.

Genus *Eristalis* Latreille, 1804
Eristalis arbustorum
Material Examined: Machulo, (7♂, 4♀), 02.viii.2022; Talis, (11♂, 5♀), 3.viii.2022; Marzi Gond, (8♂, 9♀), 08.viii.2022, leg. R. Hussain.
Previous Records:
Fazlullah *et al.* (2018) reported first time from Swat. It is also reported from Baluchistan, Gilgit Baltistan, Azad Kashmir and Multan. (Ghorpadé *et al.* 2013, Shehzad *et al.* 2017, Hassan *et al.* 2017, Sajjad & Saeed. (2009).

Genus *Syritta* Lepeletier and Serville, 1828
Syritta pipens
Material Examined: Machulo, (2♂, 4♀), 02.viii.2022; Talis, (6♂, 6♀), 8.viii.2022; Marzi Gond, (3♂, 4♀), 21.viii.2022, leg. R. Hussain.
Previous Records:
Nepal, India. (Ghorpadé 2015, 2014), From Azad Kashmir Hassan *et al.* (2017) collected this specie from different host plants including *Brassica campestris* and *Coriandrum sativum*.

Family Calliphoridae
Genus *Lucilia* (Robineau, 1830)
Lucilia sericata
Material Examined: Machulo, (3♂, 4♀), 28.vii.2022; Talis, (5♂, 4♀), 26.viii.2022; Marzi Gond, (1♂, 3♀), 20.viii.2022, leg. R. Hussain.
Previous Records:
This specie is found all over the world, (Rueda *et al.*, 2010). It is present in all populated areas of Pakistan with variety of climates.

Family Muscidae
Genus *Musca* (Linnaeus, 1758)
Musca domestica
Material Examined: Machulo, (8♂, 11♀), 02.viii.2022; Talis, (4♂, 6♀), 10.viii.2022; Marzi Gond, (7♂, 8♀), 16.viii.2022, leg. R. Hussain
Previous Records:

This is cosmopolitan specie originated from Southern Russia to central Asia, whereas now exists in all continents, in all climates. This specie is present in both rural and urban environment in Pakistan. (Smith, 1986; Ferreira & Lacerda, 1993).

Order Lepidoptera
Family Pieridae
Genus *Pieris*
Pieris brassicae
Material Examined: Machulo, (18), 03.viii.2022; Talis, (9), 17.viii.2022; Marzi Gond, (12), 18.viii.2022, leg. R. Hussain.
Previous Records: Delhi: (Bhalla *et al.*, 1997), Nepal, India, and Tibet (Xizhang) and Yunnan, China.

Order Hymenoptera
Family Apidae
Genus *Bombus* (Latreille, 1802)
Bombus haemorrhoidalis
Material Examined: Machulo, (22☿), 13.viii.2022; Talis, (18☿), 09.viii.2022; Marzi Gond, (19☿), 7.viii.2022, leg. R. Hussain.
Previous Records:
(Brunetti, 1923) reported this specie from Himachal Pradesh,Bengal, Bhutan, Myanmar, Sikkim, Thailand, Nepal, Kashmir, Pakistan, Tibet, and Vietnam.

Genus *Apis* (Linnaeus, 1767)
Apis cerana
Machulo, (3☿), 10-viii-2022, (9☿), 13-viii-2022; Talis, (8☿), 14-viii-2022; Marzi Gond, (9☿), 15-viii-2022, leg. R. Hussain.
Previous Records:
Apis cerana is present throughout the tropical, sub-tropical and temperate zones of Asia including Iran, India, Afghanistan, China, Pakistan, and Sri Lanka. It is also found throughout Korea to Japan (Ruttner, 1988).

Apis florea
Machulo, (11☿), 16-viii-2022, (11☿), 22-viii-2022, (9☿), 25-viii-2022; Talis, (8☿), 11-viii-2022, (5☿), 20-viii-2022; Marzi Gond, (7☿), 15-viii-2022, (4☿), 21-viii-2022 leg. R. Hussain.
Previous Records:
According to Bashir *et al.*, (2018) with respect to total pollinators Megachilidae, Halictidae and Apidae were the species-richest families with relative abundance of 29.92%, 33.21% and 8.64%, respectively recorded from four forested ecosystems of Southern Punjab. Among Apidae family *Apis florea* has relative abundance of 46 out of total 449.

Apis dorsata
Material Examined: Machulo, (5☿) 28.viii.2022; Talis, (7☿), 29.viii.2022; Marzi Gond, (9☿), 30.viii.2022, leg. R. Hussain.
Previous Records:
In west this specie is found from Southern Afghanistan, Pakistan, and India while Indonesia to Sri Lanka in east. North-south distribution ranges from Indonesia to southern part of China (Abrol, 2006; Hussain et al., 2019). It is considered as most common flower visitor in Himalayan region. (Chandel *et al.*, 2002).

Family Formicidae
Genus *Formica*
Formica fusca (Forel, 1894)
Material Examined: Machulo, (9☿), 02.viii.2022; Talis (4☿), 14.viii.2022, (6☿), 16.viii.2022, leg. R. Hassan.
Previous Records: Pakistan: Rasheed *et al*, 2019; Hussain et al., 2019, India: (Bharti *et al*, 2016).

Formica truncorum (Forel, 1894)
Material Examined: Machulo, (4☿), 02.viii.2022; Talis (5☿), 14.viii.2022, (3☿), 16.viii.2022, leg. R. Hussain.
Previous Records: Pakistan: (Seifert, 2018; Rasheed *et al*, 2019), India: (Bharti *et al*, 2016).

Family Vespidae
Genus *Vespa* (Linnaeus, 1758)
Vespa orientalis Linnaeus, 1771
Macterial Examined: Machulo, (4♂), 11.viii.2022, (2♂), 22.viii.2022; Talis, (6♂), 18.viii.2018. Marzi Gond, ((5♀), 10.iv.2022, leg. R. Hussain.
Previous Records: Gilgit-Baltistan, Azad Kashmir, Khyber Pakhtunkhwa; Punjab (Mahmood *et al.*, 2012; Hassan *et al.*, 2019; Siddiqui *et al.*, 2015).

Vespa velutina Lepeletier, 1836
Macterial Examined: Machulo, (1♂, 1♀), 02.viii.2022; Talis, (2♂, 1♀) 14.viii.2022; Marzi Gond, 10.viii.2022, (5♂, 4♀) leg. R. Hussain.
Previous Records: Gilgit-Baltistan, Azad Kashmir, Punjab, Khyber-Pakhtunkhwa (Dvořák, 2007; Carpenter & Kojima, 1997; Faiz *et al.*, 2016; Mahmood *et al*., 2012; Hassan et al., 2019; Siddiqui *et al*., 2015).

Genus *Polistes*
Polistes dominula (Christ, 1791)
Material Examined: Machulo, (4♂), 12.viii.2022, (1♀), 03.vi.2022; Talis, (9♂) 06.vi.2022, leg. R. Hussain.

Previous Records: Pakistan, Azad Kashmir (Hassan et al., 2019); America, Australia, India (Dvořák 2007).

4. CONCLUSION

The current research work was conducted to investigate the insect pollinators of buckwheat from Machulo, Talis and Marzi Gond Valley Gilgit Baltistan. It is concluded that *Bombus haemorrhoidalis* were an active visitor among others while *Formica truncorum* were least in numbers. Out of 507 insect visitors, 59 were *Bombus haemorrhoidalis* followed by *Apis florea* 55, *Eristalis arbustorum* and *Musca domestica* 44, *Episyrphus balteatus* 40, *Pieris brassicae* 39, *Apis c*erana 33, *Sphaerophoria scripta* 30, *Syritta pipens* 25, *Ischidon scutellaris* 22, *Apis dorsata* 21, *Lucilia sericata* 20, *Formica fusca* 19, *Vespa orientalis* 17, *Vespa velutina* 14, *Polistes dominula* 13 and *Formica truncorum* 12. It is further concluded that *Pieris brassicae* is found as a serious pest among the nearby vegetable crops, but we have recorded *Pieris* as an active pollinator of buckwheat.

5. CONFLICT OF INTEREST

All authors have declared that there is no conflict of interests regarding the publication of this article.

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