

INSECT POLLINATORS' DIVERSITY OF RAPESEED (*Brassica campestris* var. *toria*) IN CHITWAN, NEPAL

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ABSTRACT

The abundance and diversity of rapeseed insect flower visitors were assessed by using insect pan traps, sweep net and visual observations at different blooming stage of rapeseed at Jutpani VDC, Chitwan district, Nepal during 2012-013. The pollinator fauna of rapeseed included twenty one species from six different insect orders. Hymenopteran (77.95%) species were the most abundant insects visiting rapeseed followed by Diptera (12.23%) and Lepidoptera (3.49%). Honeybees were the dominant group of pollinators and among honeybees, *Apis mellifera* L. was the most dominant one (36.34%) followed by *Apis florea* F. (12.45%), *Apis cerana* F. (11.14%) and *Apis dorsata* F. (5.68%). The higher abundance and diversity of pollinators were observed at 12:00 to 1:00 pm and the diversity was related to the crop blooming stage. Therefore, pollinator's friendly cultivation practices should be followed for conservation and management of insect pollinators for higher production and productivity of rapeseed crop under Chitwan condition.

Key words: Rapeseed, Insect pollinators, Diversity

INTRODUCTION

Rapeseed is cross-pollinated crop and requires sufficient pollinating agents for better pollination and seed production. The flowers of rapeseed are very attractive to bees. Honeybees visit rapeseed flowers for collection of both pollen and nectar, which in turn results into florets cross-pollination. Approximately 75% of major crops are animal pollinated which is an essential ecosystem service (Klein *et al.*, 2007). It is prerequisite for pollen tube development and subsequent fertilization of ovules, leading to seed as well as fruit setting in flowering plants. Insect pollinators play crucial role in this process (Dhakal, 2003). Scientific evidence confirms that pollination improves the yield and quality of crops, such as fruits, vegetable seeds, spices, oilseeds and forage crops (Partap and Partap, 1997; Thapa, 2006; Singh *et al.*, 2000, Singh, 2008). For better pollination and productivity of crops, proper methods of utilizing pollinators are important, which are specific for honeybees, other bees and insects (Sihag, 2000).

It has been reported that after heavy use of chemical pesticides all domesticated bees were wiped out in Ilam and Nuwakot districts, furthermore many colonies were destroyed in Chitwan district, Nepal (Sharma, 1994; Thapa, 1994). Similarly, farmers have realized that high level of pesticide application causes negative impact on insect pollinators and pollinator's deficit is a serious problem in Chitwan (FAO, 2011). Low pollinators abundance and diversity has also started appearing in different part of the world (Kasina *et al.*, 2009). Due to continuous use of pesticides and declining of natural habitat, insect pollinators are decreasing rapidly (Richards, 2001). Knowledge of the specific pollinators of rapeseed crop is limited in the context of Nepal although its pollination requirements

have been studied in other countries. Therefore, this study was carried out to collect and identify the insect pollinators of rapeseed crop.

MATERIALS AND METHODS

An experiment was conducted at Jutpani VDC, Chitwan district of Nepal during October 2012 to February 2013. The plot size was 3 m x 5 m (15 m²) separated by 0.5m distance between plots and 1m between replications. Rapeseed variety Pragati was sown on 3rd November, 2012 following all the recommended agronomical practices (Singh *et al.*, 2010; Basnet, 2005). The fertilizers were applied @ 15 ton/ha FYM, 60:60:40 kg NPK/ha and Sulphur @ 30 kg/ha. Full FYM, half nitrogen, full phosphorus and potassium were applied as a basal dose and remaining nitrogen as top dressing at 21 days after sowing (DAS). The seeds were sown at 3-4 cm depth of soil @ 6 kg / ha in well prepared field maintaining 20 cm x 5 cm spacing between row to row and plant to plant, respectively. Two intercultural operations were done to remove weeds during early vegetative growth period at 21 DAS and 35 DAS.

To know the presence of pollinators' diversity pan trap, sweep net and visual observations were done at different blooming stage as 10% crop blooming, peak blooming and 10% flowers remaining stage of rapeseed. Three different colors of pan traps, namely yellow, blue and white were placed in three meter distance to each other in alternate way with respect to colors in rapeseed field. After twenty four hours, these pan traps were removed and insect trapped were pinned and identified with the help of dichotomous key. Similarly, sweep net and visual observation were also conducted at different time of the day as 9:00 am, 12:00 noon, 2:00 pm and 4:00 pm in same crop blooming stage. Representatives of the insects species sampled were sorted out, pinned and identified. The total numbers of each of the identified insect species was recorded.

RESULTS AND DISCUSSION

Different pollinators recorded in rapeseed flower are presented on Table 1 and Figure 1. The pollinator fauna of rapeseed included twenty one species from six different insect orders. Hymenopteran (77.95%) species were the most abundant insects visiting rapeseed followed by Diptera (12.23%), Lepidoptera (3.49%), Coleoptera (2.18%), Heteroptera (2.18%) and the lowest Orthoptera (1.97%), respectively. Seven different Hymenopteran families were recorded and among them Apidae was dominant family. Honeybees were the abundant group of pollinators. Among honeybees, *Apis mellifera* L. was the most dominant one (36.34%); followed by *Apis florea* F. (12.45%), *Apis cerana* F. (11.14%) and *Apis dorsata* F. (5.68%). Similarly, *Andrena* sp. (3.71%) and *Megachilus* sp. (0.66%) were also recorded. The other pollinators constituted 22.05%, which included Diptera, Lepidoptera, Orthoptera, Coleoptera and Heteroptera. Among the Dipterans, Syrphid fly (5.9%) were important flower visitors followed by housefly (3.93%). The higher abundance and diversity of pollinators was observed at 12:00 to 1:00 pm and the diversity was related to the crop blooming stage.

Table 1. Relative abundance of insect pollinators occurring on rapeseed flowers in Jutpani VDC, 2012/013

SN	Common Name	Scientific Name	Order: Family	Relative abundance (%)
1	European bee	<i>Apis mellifera</i> L.	Hymenoptera: Apidae	36.24
2	Little bee	<i>Apis florea</i> F.	Hymenoptera: Apidae	12.45
3	Asian bee	<i>Apis cerana</i> F.	Hymenoptera: Apidae	11.14
4	Rock bee	<i>Apis dorsata</i> F.	Hymenoptera: Apidae	5.68
5	Bee	<i>Andrena</i> sp.	Hymenoptera: Andrenidae	3.71
6	Wasp	<i>Polistes</i> sp.	Hymenoptera: Eumonidae	2.18
7	Wasp	<i>Vespa</i> sp.	Hymenoptera: Vespidae	1.10
8	Bee	<i>Megachilus</i> sp.	Hymenoptera: Megachilidae	0.66
8	Ant		Hymenoptera: Formicidae	4.37
9	Tabanid fly	<i>Tabanus</i> spp.	Diptera	2.40
10	Syrphid Fly	<i>Syrphus</i> sp.	Diptera: Syrphidae	5.90
11	Housefly	<i>Musca domestica</i> L.	Diptera: Muscidae	3.93
12	Red pumpkin beetle	<i>Aulacophora foveicollis</i>	Coleoptera: Chrysomelidae	1.75
13	Black Beetle		Coleoptera	0.44
14	Short horned Grass hopper	<i>Oxya</i> spp.	Orthoptera: Acrididae	1.53
15	Long horned Grass hopper		Orthoptera: Tetigonidae	0.44
16	Cabbage butterfly	<i>Pieris brassica nepalensis</i> Doubleday	Lepidoptera: Peiridae	1.97
17	Tiger moth	<i>Nyctemera streama</i>	Lepidoptera	0.44
18	Cowpea pod borer	<i>Lampides boeticus</i>	Lepidoptera: Lycaenidae	0.87
19	Rice skipper	<i>Pelopidas</i> spp.	Lepidoptera: Hesperidae	0.22
20	Green bug	<i>Nezara viridula</i> (L.)	Heteroptera: Pentatomidae	2.18

The flowers of rapeseed are very attractive to bees and honeybees visit rapeseed flowers for collection of both pollen and nectar. Higher number of *Apis mellifera* L. colonies kept by farmers resulted in their higher population during rapeseed flowering period. Similar results on insect visitors were reported by Dhakal (2003) on rapeseed field. Atmowidi *et al.* (2007) listed four orders of insect family, namely: Hymenoptera, Lepidoptera, Diptera and Coleoptera occurring in rapeseed field. Similarly, Rader (2010) observed five insect orders, namely: Hymenoptera, Lepidoptera, Diptera, Coleoptera and Hemiptera in rapeseed field. Present finding reports the most dominant honeybee species *Apis mellifera* L. but Mishra *et al.* (1988) argued that among many insect flower visitors, *Apis cerana* F. *indica* was the most common pollinating species in India. This was due to higher number of *Apis mellifera* L. colonies near the experimental field in the present study. Viraktmath *et al.* (2001) recorded 29 insect species, of which 15 species belonged to Hymenoptera, 8 species to Diptera and 6 species to Lepidoptera from sunflower, sesame, mustard and niger flowers, respectively. Similarly, the pollinator fauna of niger included 14 species, as honeybees are the dominant group of pollinators and among honey bees, *Apis dorsata* proved to be the most dominant one (Dhurve, 2008).

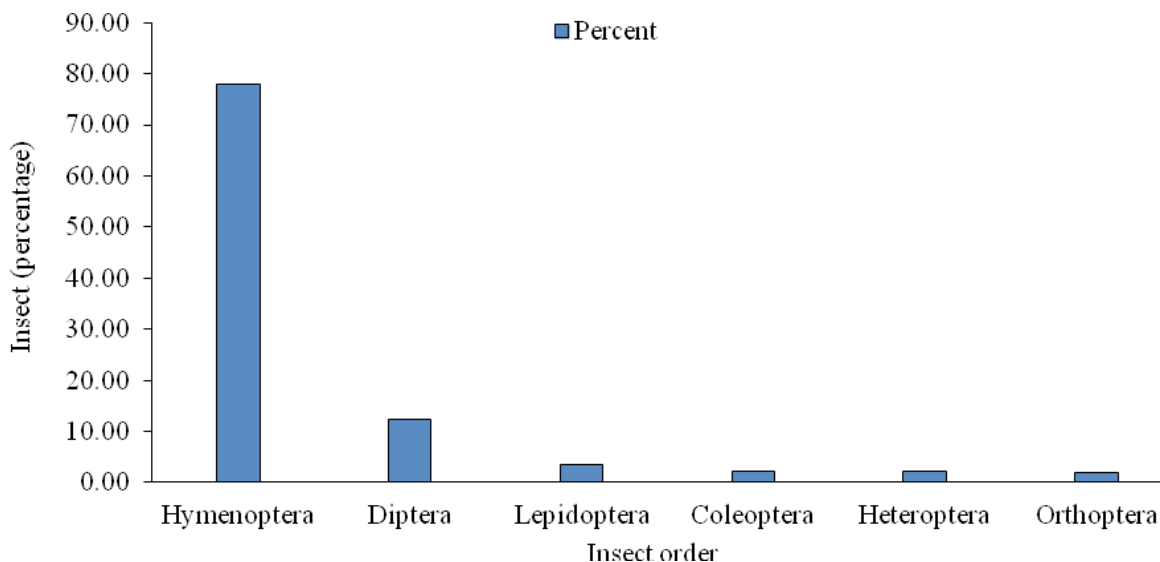


Figure 1. Relative abundance of insect pollinators during rapeseed flowering in Jutpani VDC Chitwan, 2012

CONCLUSIONS

The above study concludes that the honeybees are the major insect pollinators of rapeseed and among honeybee *Apis mellifera* L, is the major pollinators. Among pollinators, bees are the most diverse groups of insects. The higher abundance and diversity of pollinators observed at 12:00 to 1:00 pm and the diversity was related to the crop blooming stage. Hence, pollinator's friendly cultivation practices should be practiced for conservation and management of insect pollinators for higher production and productivity of rapeseed crop under Chitwan condition.

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