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Short Note

Insect pollination studies on onion under mid hill conditions of Himachal Pradesh

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Onion (*Allium cepa* L.) is an important spice crop and is grown all over India. This crop depends on insects for cross-pollination. It comes in bloom during March-April in the mid hill region of Himachal Pradesh. During flowering period, it is visited by number of insect species but honey bees are reported to be the chief pollinator of this crop (Rao and Lazer, 1980; Mc Gregor, 1976; Singh and Dharamwal, 1970; Ewies and El-Sahhar, 1977; Jadhav, 1981; Kumar et al.; 1985). Keeping in view the importance of the crop, the present investigation was carried out to record the insect visitors and effect of mode of the pollination in onion crop.

Studies were conducted during 2005-06 at the farm site of Seed Production Scientist, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur (H.P.) at an altitude of 1280 m.a.s.l. Patna Red variety of onion was selected during the investigation. The bulbs were raised during 2005 with a field spacing of 20 x 40 cm. The crop was raised as per Package of Practices for Kharif Crop (Anonymous, 2002). Insect species visiting onion bloom were collected during April 2006 and later on got identified from IARI, New Delhi and Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan (H.P.).

The population of insect visitors was recorded by Counter method of Smith and Townsend (1952) by taking 30 counts each of 10 seconds per m^2 at 1100h on clear sunny day and later on relative abundance (%) was calculated. Depending upon their number/ frequency of visits they were categorized as more frequent, frequent and less frequent insect visitors. The modes of pollination comprising two treatments viz., inflorescences exposed to the insect visitors (open pollination), and inflorescences caged without insects (self pollination) were studied. For each treatment 10 uniform umbels were selected. In self-pollination, umbels were enclosed with nets just before opening of the flowers. The nets were removed after completion of the flowering. The umbels were harvested after maturity from these treatments and observations were taken on parameters like per cent capsule set, seed weight per umbel, number of seeds per capsule, 1000-grains weight and seed germination. Seed germination test was conducted after 2 months of harvesting by keeping 100 seeds on wet blotting paper in petri plates. Germination was noted after 7 days at normal room temperature.

Insect visitors

Fourteen insect species were recorded to visit the bloom of onion. Out of these, *Apis cerana* F., *Eristalis tenax* L., *Episyrphus balteatus* (De Geer) and *E. arvorum* Walker were more frequent insect visitors whereas *A. mellifera* L. *was* frequent and the rest were less frequent insect visitors to the crop during blooming period (Table-1). Mc Gregor (1976), Singh and Dharamwal (1970), Ewies and El-Sahhar (1977) and Rao and Lazer (1980) have reported honey bees as most numerous and effective pollinator of onion. However, during the present investigation *E. tenax* was most abundant than any other insect visitor including honey bees. *A. cerana* ranked second on the basis of relative abundance. *A. mellifera* was less abundant on the bloom. It might be attributed to the distant apiary of the *A. mellifera* and other competing flora available in between the site and the apiary. The present investigation finds support of Bohart *et al.* (1970) as they have reported that native insect species are as good as or better than honey bee in pollinating onion.

Table 1. Insect visitors of onion bloom during 2006

Scientific name	Common name	Order, Family	Relative abundance (%)
Apis cerana F. ***	Indian honey bee	Hymenoptera, Apidae	14.5
Apis mellifera L **	Italian honey bee	Hymenoptera, Apidae	5.0
Vespa auraria (Smith) *	Golden wasp	Hymenoptera, Vespidae	0.5
Vespa cincta Fab *	Yellow banded wasp	Hymenoptera, Vespidae	0.4
Eristalis arvorum Walker ***	Syrphid fly	Diptera , Syrphidae	12.4
Eristalis angustimarginalis Burn *	Syrphid fly	Diptera, Syrphidae	0.7
Eristalis tenax L. ***	Syrphid fly	Diptera , Syrphidae	21.8
Eristalis sp. *	Syrphid fly	Diptera, Syrphidae	0.8
Episyrphus balteatus (De Geer) ***	Syrphid fly	Diptera, Syrphidae	37.3
Orthellia sp. *	-	Diptera, Muscidae	1.0
Pieris brassicae L. *	Cabbage butterfly	Lepidoptera, Pieridae	0.9
Dysdercus koenigii (Fab.) *	Red cotton bug	Hemiptera, Pentatomidae	0.7
Musca domestica L. *	House fly	Diptera, Muscidae	3.6
Helicoverpa armigera (Hubner) *	Tomato fruit borer	Lepidoptera, Noctuidae	0.4

*** Most frequent visitors (> 10%) ** Frequent visitors (5-10%) * Less frequent visitors (< 5%)

Modes of pollination

Different modes of pollination viz. self and open pollination were also studied. Under these treatments, the characters like fruit set, seed weight per umbel, number of seeds per capsule, 1000-grain weight and seed germination were studied. Fruit set was recorded highest under open pollination (94.2%) whereas it was 7.3 per cent in case of self-pollination (Table-2). Seed weight per umbel was less under self-pollinated treatment (0.704 g) as compared to open pollinated treatment (3.106 g). Number of seeds per capsule was more under open pollination (5.30) as compared to self- pollination (1.75). Weight of 1000 grains was slightly higher in open pollinated treatment (4.014 g) than self-pollinated treatment (3.802 g). Seed germination was influenced more under self pollination (52%) whereas it was less affected in case of open pollination (92.6 %). The present findings are in conformity with the results obtained by various workers on different cultivars of onion (viz., Jadhav, 1981; Singh and Dharamwal, 1970; Ewies and Sahhar, 1977). Rao and Lazer (1980) reported less seed

Table 2. Effect of different modes of pollination on qualitative and quantitative characters of onion

Character	Self pollination	Open pollination	C D $_{(0.05)}$	Transformation
Capsule set (%)	7.3 (2.68)	94.2 (9.64)	(0.198)	vn
Seed weight/ umbel (g)	0.704 (1.091)	3.106 (1.906)	(0.045)	vn+0.5
Number of seeds/ capsule	1.75	5.30	0.433	-
Weight of 1000 grains (g)	3.802	4.014	0.226	-
Seed germination (%)	52.0 (7.25)	92.6 (9.60)	(0.39)	vn

germination i.e. 7.5% which is contrary to the present findings. This may be attributed to different variety selected during the present investigation. However, the present results are in close proximity with Jadhav (1981).

From the ongoing investigation, it is concluded that *Episyrphus balteatus*, *E. tenax* (Syrphid flies) and *A. cerana* (Indian honey bee) are the important pollinators of onion under mid hill conditions of Himachal Pradesh; hence they should be conserved and utilized in enhancing the yields.

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