

Role of Insect Pollinators in Enhancing Coriander Yield

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Abstract The experimental trial on role of insect-pollinators in enhancing coriander yield was conducted during rabi of 2008-09. The extent of pollination on coriander cremocarp characteristics. The cremocarp length and width were significantly more under open pollination than for the rest being 5.47 mm and 4.05 mm, respectively. Consequently, the number of seeds in 5 gram weight was significantly the lowest under open pollination (602.58). The mean weight of 5 plants was the maximum under hand was the lowest under caged conditions. This clearly depicts the positive effect of insect pollinators in augmenting the seed yield of coriander.

Keywords Insect-pollinator, Coriander, Cremocarp, Open, Hand pollination.

Introduction

The genus *Coriandrum* includes the cultivated plant *C. sativum* and the wild species *C. toridylum*. Coriander is an annual herb and, according to the climatic conditions, is cultivated as a summer or winter annual crop. Rajasthan, Madhya Pradesh, Karnataka, Tamil Nadu and Uttar Pradesh are the leading states in the country in the production of coriander

(*Coriandrum sativum* L.). In Rajasthan coriander occupies a prime place amongst seed spices, which are cultivated in the districts of Baran, Kota, Jhalawar, Bundi, Sikar, Jaipur, Tonk, Nagaur and Bikaner. Rajasthan alone shares 40% in the production of coriander. India contributes 543000 hectare area of coriander with a production of 523000 tones and an average productivity of 964 kg/ha [1]. Scientific evidence confirms that pollination improves the yield and quality of crops, such as fruits, vegetable seeds, spices, oilseeds and forage crops [2, 3]. Losey and Vaughan [4] emphasized that insect pollinators provide an important ecosystem function to global crop production through their pollination services, Although the roles of insect pollinators are very important, they are negatively impacted by different factors. Different scientists notice that we may be in the middle of global pollination crisis (Steffan-Dewenter et al., 2005 ; Biesmeijer et al. [5, 6]. Insect pollination results in a uniform crop and also improved the quality of fruit. Honey bees and some closely related social Hymenoptera exclusively derive their food in the form of nectar and pollen, while thus foraging they incidentally reciprocate by performing valuable pollination services. The important pollinators are honey bees, solitary bees (*Xylocopa*, *Andrena*, *Halictus*), bumble bees (*bombus*), stingless bees (*Trigona*, *Melipona*) and many kinds of flies (*Syrphus*, *Bombilius*), beetles, black ants, thrips and moths. Among insects, the members of the super-family Apoidea (Hymenoptera) are the most important pollinators. Of the 95% cross pollinated flowers, 85% depend on insect pollination. Bees are responsible for almost 80% of pollina-

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Table 1. Effect of pollination treatments on the yield attributing characteristics of coriander at Udaipur. NS = Non-significant.

Pollination Treatments	Length (mm)	Width (mm)	Number of seeds (in 5 g weight)	Weight (g) of seeds [5-plant total]
Caged	5.08 ^a	3.64	877.43 ^b	5.29 ^a
Hand pollinated	5.04 ^a	3.71	669.29 ^a	8.65 ^b
Open pollinated	5.47 ^b	4.05	602.58 ^a	7.33 ^{ab}
SEM±	0.108	0.113	44.46	0.857
CD (5%)	0.33	NS	136.58	2.64

tion and their role in enhancing crop yields is well recognized. Keeping this point in view, studies were carried out to evaluate on role of insect pollinators in enhancing coriander yield.

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Materials and Methods

The experimental trial on role of insect-pollinators in enhancing coriander yield was conducted on Horticultural farm of Rajasthan College of Agriculture, Udaipur during *rabi* of 2008–09 to know the role of insect pollinators in enhancing crop yield, three treatments, i.e., Hand pollinated, Caged and Open pollinated were compared each with 7 replications. For the treatments caged and hand pollinated, muslin cloth covered cages were installed in such a way that 5 plants were included within each cage. The cage size was 20 × 20 × 48 cubic inches as length × breadth × height. Under caged conditions care was taken to avoid plant / flower contact with the muslin cloth. Under the treatment of hand pollination, pollination was done manually using fine camel hair brush in the early hours daily all through the flowering period. In the open pollination treatment, allowed free for insect visits, 5 plants from each replication were selected at random and tagged. Observations on various yield parameters from the selected 5 plants in each replicate were taken. The yield parameters con-

sidered were length and width of the cremocarp, weight of seeds of 5 plants and number of fruits per 5-gram seed weight. Since the plant height and number of umbels per plant did not vary significantly, the data were not included. Standard statistical procedures were used and ANOVA was computed.

Results and Discussion

The extent of pollination on coriander cremocarp characteristics. Tables 1 showed that the cremocarp length and width were significantly more under open pollination than for the rest being 5.47 mm and 4.05 mm, respectively. Consequently, the number of seeds in 5 gram weight was significantly the lowest under open pollination (602.58). The mean weight of 5 plants was the maximum under hand was the lowest under caged conditions. This clearly depicts the positive effect of insect pollinators in augmenting the seed yield of coriander. A study on the effect of pollination on cremocarp characteristics indicated that the cremocarp length and width were significantly more when the crop was under open pollination. Consequently, the number of seeds in 5-gram weight was the lowest under open pollination and the mean weight of 5 plants was the maximum under hand pollination followed by that under open pollination. Literature abounds in reports stating that insect pollination of crops is an essential crop management practice and should be utilized skillfully by harnessing the activity of domestic honey bees, wild bees and other pollinators including solitary bees. Achievement of desired pollination lies in the planned and efficient use of honey bees to increase the yield as well as improving the qualitative parameters of the crop yield. Mupade et al. [7] observed that *Apis florea* colony has done seed setting highest percent (95.22%) and highest percentage (90%) of germination. Chandel et al. [8], who reported increase in seed germination in bee pollinated crop. Of late, Sabbahi Rachid et al. [9] observed an improvement in seed yield of canola (46%) in the presence of three honeybee hives per hectare, compared to that without hives. Santos et al. [10] observed that without pollination, cucumber plants produced a low number of fruits and the fruits were smaller and less heavy than in those experimental areas where pollination occurred. Faria junior et al. [11] conducted an experiment by planting 12

Table 2. Influence of insect pollination on the yield parameters of coriander at Udaipur. * Data presented are mean of 12 observations.

Treatments	Sample No.	Linear measurements of schizocarp			
		Length (mm)	Width (mm)	Quantity (Number) of seeds in 5 gram	Seed weight (g) of 5 plants
Caged	1	5.08	3.91	928	5
	2	5.25	3.66	978	3
	3	5.25	3.20	830	5
	4	4.40	3.20	910	3
	5	5.08	3.80	852	7
	6	5.30	3.91	817	6
	7	5.20	3.80	827	8
	Total	35.51	25.48	6142	37
Hand pollinated	1	5.08	3.60	458	4
	2	4.70	3.80	646	10
	3	5.00	3.70	716	9
	4	4.91	3.50	623	5.83
	5	4.91	3.66	761	10
	6	5.80	4.08	713	11.66
	7	4.91	3.60	768	10
	Total	35.31	25.94	4685	60.49
Open pollinated	1	5.58	3.91	770	8
	2	5.25	4.08	757	10
	3	5.16	4.00	525	5
	4	5.50	4.16	582	8.3
	5	5.50	4.08	401	5
	6	6.00	4.16	565	8.75
	7	5.33	3.91	608	6.25
	Total	38.32	28.30	4218	51.3

plots of Sweet Pepper '*cascadura Ikeda*' subjected to the following treatments: (1) open-pollinated plots freely visited by insects (2) caged plots ; (3) caged plots containing a hive of honey bees. They observed that fruits yielded in treatments (1) and (3) were heavier, had higher diameter, thicker pericarp and more seeds per fruit than fruits in treatment (2). Results showed that fruits from insect pollinated plots presented better quality. Honeybees were efficient pollinators in comparison to other insects. Sharma et al. [12] recorded highest yield / plant (69.20 and 74.93 gram two years respectively) of carrot in open pollination condition. These studies support our findings that have shown that insect pollination had a significant positive effect in increasing the seed yield of coriander.

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