

## Relative abundances and foraging behaviour of honey bee species on minor seed spice crops

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### Abstract

Study of honey bee abundance on crops of anise (*Pimpinella anisum* L.), dill (*Anethum graveolens* L.), nigella (*Nigella sativa* L.) and ajowan (*Trachyspermum ammi* Sprague) showed that bees were main pollinator of these crops. Among different honey bees visited on different seed spice crops, *Apis florea* L. was most abundant and active on these crop during entire flowering period. *Apis dorsata* L. and *Apis mellifera* L. were two other species found pollinating and foraging on these crops. Observation on relative abundance showed that *A. florea* was most active on ajowan followed by dill, anise and nigella. *A. dorsata* was most active on nigella than dill, whereas *A. mellifera* preferred more on nigella and anise crops.

**Key words :** Foraging behaviour, honey bees, relative abundance

### Introduction

Insects pollinate approximately 90% of flowering plant species worldwide (Buchmann and Nabhan,3). Pollinators are important in determining the mating opportunities of plants. Most plant species are generalists in terms of pollination (Waser *et al.*, 15, Olesen 10) relying on multiple pollinator species. However, not all pollinators are equally effective at depositing pollen and effecting seed set (Herrera 6, Wilson and Thomson 16, Mayfield *et al.*,8). Plant can be affected by variation in pollinators (Herrera 7, Price *et al.*, 12). Honey bee (*Apis* spp.) are the most important pollinator of agricultural and horticultural crops. Their body parts are modified to effect pollination and wide range of host range enable them to pollinate many type of crops. Honey bees has longest visiting time on crop and less affected by adverse climatic situation than many other insect pollinators. Their close relation to many of important crops and its foraging behaviour qualify them as most successful pollinators. Honey bees are reported to play a vital role in enhancing the productivity level of different crops including most of seed spices crops (Choudhary and Singh, 5, Abrol,1, Sihag,13). The enhanced quality of seed/fruit in various vegetables crop has been reported when these crops pollinated by managed bee colonies. (Abrol,2,Pratap and Verma,11). Among different species of honey bee, domesticated bee species (*Apis mellifera* and *Apis cerana*) have special value because their population can be managed accordingly to need of crops and flowering duration. Other wild bee species specially *Apis dorsata* and *Apis florea* also play important role in many horticultural and seed

spice crops. ( Sihag,13) . Most of the seed spices crops belong to family apiaceae and have cross pollinated in nature. The quality and production of seed spices are dependent on nature of pollinator and quality of pollination. Insects are prime pollinator to most of the seed spice crops. Flowers of seed spices crops are attractive in colours and also contain high nectar and fragrance, which attract large numbers of insects including honey bees. Honey bees, which comprises major insect visitor as pollinator or foragers on many seed spices crops play significant role in pollination of these crops. Present investigation was carried out to identify important honey bee species associated to minor seed spice crops as pollination agents.

### Materials and methods

Present investigation on foraging activities and relative abundance of different honey bees on minor seed spice crops was carried out at NRC on Seed Spices, Ajmer (Rajasthan) experimental farm during 2009-10 and 2010-11. Seed spice crops namely anise (*Pimpinella anisum* L.), dill (*Anethum graveolens* L.), Nigella (*Nigella sativa* L.) and ajowan (*Trachyspermum ammi* Sprague) was grown during rabi season and standard agronomical practices were followed to raise the crop. . Among different species of honey bee *Apis mellifera* L. colony was maintained at Institute farm and was about 500 m away from experimental crops. Total three colonies were maintained with full population strength. Other species of bee i.e., *Apis dorsata* and *Apis florea* were available naturally in wild plant and shrubs in Institute farm as well as in nearby

areas. These bee species exploited seed spice crops as source of pollen and nectar during cropping seasons. Observation on bee visit to these crops was taken at full bloom during first week of March. Daily observation of bee visit for 07 days was recorded at four times at 7.0-8.0 am, 10.0-11.0 am, 1.0-2.0 pm and 4.0-5.0 pm. The observation were taken on total number of bee visit of different species for 5 minute per umbel at 10 selected umbels in different locations of the crops at different time intervals, thus average bee visit, relative abundance and foraging behaviour was worked out.

**Result and discussion**

Data on relative abundances of different honey bee species on selected seed spices showed that only three species of honey bee *A. dorsata*, *A. mellifera* and *A. florea* was found active on these crops for foraging activities (Table-1). *A. florea* was observed most active on all the crops and constitute major bee species involved in pollination. It constitute 91.62% of total bee population in ajowan, 72.31% in dill and 55.27% in anise crops. *A. dorsata* was most prevalent on nigella than any other species and contributes 37.91% of bee population and were next only to *A. florea* in terms of total population on the crops. *A. mellifera* was observed more active on nigella and anise. Foraging behaviour of bees on crop at different time intervals showed that minimum numbers of bee were noticed during 07-08am and maximum in between 10.0-11.0 am. (Table-2) The second peak activities of bees were observed during evening hours at 4.0 -5.0 pm. In case of numbers of bees visit per 5 minutes, *A. florea* constitutes maximum strength of bee numbers on dill, anise and ajowan crop with maximum of 20 bees per 5 minutes at 10.0-11.0 am in ajowan crop and average of 11.5 bee per 5 minutes followed by *Apis dorsata* on Nigella crop (6.0 bees per 5 minutes) with average of 3.5 bees per 5 minute. Narayanan *et al.* (9) found that *A. florea* constitutes 81% of total bees population in fennel crop. In nigella crop bees *A. mellifera* was found major bee pollinator and maximum activities was noticed at 12.0 noon to 2.0 pm (Waheb and Ebadah, 14). Choudhary and Singh, (5) noticed that *A. mellifera* was main bee species which visited on coriander and its maximum activities was noticed between 11.00am to 4.0 pm. In fennel crop six apoidea species were recorded which contributed 39.5% of the total insect visitors on the crop and the Italian honeybee *A. mellifera* was the most prominent, comprising 32.5% of the flower visitors followed by Indian hive bee *A. cerana* F. (4.3 %) and rock bee *A. dorsata* F. (2.6%) (Choudhary, 4, Abrol, 1) found that *Apis florae* as most dominant pollinator of fennel. Sihag, (13) reported *Andrena leaena*, *Apis florae*, *Apis dorsata* and some dipteran were the most dominant visitor of fennel, coriander and cumin.

**Table 1. Relative abundance of different honey bee species on minor seed spice crops.**

Bee Species	Average visit of Honey bees on minor seed spice crops											
	DILL ( <i>A. graveolens</i> )			Anise ( <i>P. anisum</i> )			Nigella ( <i>N. sativa</i> )			Ajowan ( <i>T. annui</i> )		
	2009-10	2010-11	Average	2009-10	2010-11	Average	2009-10	2010-11	Average	2009-10	2010-11	Average
<i>Apis dorsata</i>	18.54	23.09	20.82	22.78	19.55	21.17	35.13	40.69	37.91	6.57	1.61	4.09
<i>Apis mellifera</i>	6.9	4.54	5.72	26.58	20.54	23.56	34.05	31.39	32.72	3.14	5.41	4.28
<i>Apis florea</i>	74.38	72.31	73.35	50.63	59.9	55.27	30.81	27.9	29.36	90.28	92.96	91.62



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