Pollination mechanism in *Coriandrum sativum* Linn. (Apiaceae)

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Abstract. Exposed nectar, abundant pollen production, actinomorphic flowers and compact umbels are the contrivances which attract in large numbers a wide variety of insect species to coriander flowers. Some of these visitors carry coriander pollen from one flower/umbel to another and by so doing act as potential pollinators; others are only casual visitors.

Keywords. Apiaceae; pollination; pollen load; hymenopterans.

1. Introduction

Grant (1949) considered Umbelliferae unspecialized in respect of pollination system on account of uniform floral structure and the presence of exposed nectar. Bell (1971) also suggested that each visitor to the umbels can be a potential pollinator. Although, several workers recorded insect visitors of umbellifers (Müller 1883; Grant 1949; Bohart and Nye 1960; Hawthorn et al 1960; Bell 1971; Grace and Nelson 1981; Schlessman 1982; Lindsey 1984; Koul et al 1986), only a few (Bohart and Nye 1960; Bell 1971; Grace and Nelson 1981; Schlessman 1982; Lindsey 1984; Koul et al 1986) have attempted to distinguish between casual visitors and actual pollinators. This communication which presents observations on some aspects of the reproductive biology of *Coriandrum sativum* is an attempt in this direction.

2. Materials and methods

Pollination studies were conducted on two populations, each having more than 500 plants, of *C. sativum*, one raised in the University Botanical Garden and the other in the nearby Gujjar Nagar, both at Jammu. The role of wind as a pollinating agent was checked by hanging glass slides smeared with Mayer's albumin from T-shaped wooden stands fixed at varying distances all round the experimental plots at a height of 0.6-2 m above the soil surface. The slides were checked for pollen at 24 h intervals. The mode of pollination was determined by bagging young flowers and umbels and following them for fruit set.

Observations on insect visitors were made by collecting insects from umbels throughout the day at 30 min intervals for 5 days. The visiting insects were identified up to the level of order and where possible up to species. Some insects which could not be identified have been given accession numbers for reference. The pattern of insect movement on the umbels was also recorded. Pollinators and casual visitors were distinguished on the basis of the pollen load on their body parts.

Impact of umbel density, symmetry and shape on insect visitation was determined by deforming certain umbels and recording the percentage frequency of
insect visits. Fruit set was estimated by comparing the number of fruits formed with the number of hermaphrodite flowers present in different umbel orders.

3. Results

3.1 Bagging experiments

None of the 32 flowers bagged individually produced any fruit. On the contrary, 59–68% fruit set was recorded from bagged umbels. This indicates failure of selfing at the level of individual flower but considerable selfing at the level of umbel.

3.2 Wind pollination

Examination of the slides exposed around the experimental plots revealed 0–6 coriander pollen grains per slide. Of the 19 slides scored, only 4 carried 2–6 coriander pollen grains, others had none. Obviously, very little coriander pollen is airborne and therefore wind seems to play no role in the pollination of this species.

3.3 Insect pollination

Umbels of *C. sativum* are visited by a variety of insects right from the initiation of anthesis to the cessation of stigma receptivity. The visual impact of the compound umbel, presence of exposed nectar and availability of abundant pollen are the major attractants and rewards for the insects visiting the umbels.

3.3a Nectar: The nectar is secreted from the stylodium, a bulbous structure capping the ovary. The secretion starts when the flowers reach anther dehiscence stage and continues until the stigma receptivity ceases. The secretion starts every day at 7:00 or 8:00 h and ceases around 15:00 h. The amount of nectar secreted during the receptive phase of the stigma exceeds that secreted during the dehiscence of anthers. The number of insects visiting umbels of Gujjar Nagar cultivation, before and during the receptive phase of stigma is 83 and 129 respectively (for a period of 4 h). The insects visiting the umbels during the receptive phase are mostly lepidopterans.

3.3b Pollen: The pollen discharge from anthers continues for a long time on account of non-synchrony in the dehiscence of anthers within the flower and the umbel. Each anther of the hermaphrodite and staminate flower produces 1,385.6 ± 84.9 and 1,198.0 ± 62.2 pollen grains respectively in the plants raised at the University Botanic Garden and 1,693.1 ± 86.1 and 1,352.0 ± 56.9 in the plants of the Gujjar Nagar fields. The total number of pollen grains produced per hermaphrodite flower is 6,928 and 8,465.7 in the University and Gujjar Nagar populations respectively.

3.3c Visual impact: The colour, symmetry and the size of umbel offer visual attraction to insects. Although small individually, flowers of coriander produce mass effect on aggregation into umbellets and umbels. The density and compactness