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# Anthecological Relationship Between Endangered *Eremostachys superba* Royle *ex* Benth. (Labiatae) and It's Pollinator

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**ABSTRACT**: The endangered species *Eremostachys superba* Royle *ex* Benth. is pollinated by a bee, *Nomia rustica* West. Scanning Electron Micrographs of the pollen loads attached to the insect body revealed that there is no pollen mixing. The unornamented pollen adhere together by their sticky 'pollenkitt' and get trapped by the dense setae of the bee's hind legs. Precise placement of pollen on the stigma is thereby ensured.

**KEY WORDS:** ***Eremostachys superba*, *Nomia rustica*, Pollen loads, `Pollenkitt'.**

## INTRODUCTION

The study of attachment of pollen grains to the body of it's pollinator constitutes an important aspect of anthecology. Studies on this aspect have been made earlier by different workers like (Free and Durant, 1966; Pant and Chaturvedi, 1985; Leerveld *et al.*, 1981; Stelleman, 1978; Faegri and Pijl, 1979). These workers emphasised the role of different pollen modifications such as viscin threads, pollenkitt (tryphines), oil droplets and excrescences of the exine, as well as strands of regurgitated honey of the bees, in forming pollen lumps and adhering to the pollinator's body. All these adaptations ensure a firm attachment of pollen on the pollinator's body which is a prerequisite for precise placement of pollen on its female counterpart, the stigma, in the event of pollination, without being dropped during subsequent flights of the insect.

The present study has been conducted to establish the mode of pollen attachment of the endangered species, *Eremostachys superba* (Labiatae) on the body of it's insect pollinator, *Nomia rustica* and it' s effective transfer to the stigma in the event of fertilization. This plant species is left with a single population of *ca* 33 (± 10) individuals in the lower Siwalik hills of Uttar Pradesh in India.

## MATERIALS AND METHODS

Visual observations were made on the working method of insects on the inflorescence of *E. superba*. Two insects were trapped from the flowers by inverting polythene bags over the flowering spike after the insects had foraged for sufficient length of time on the flowers.

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These insects were then instantly killed by injecting chloroform in the bags to avoid slow killing and prolonged death struggle.

Careful examination of both insects (*N. rustica*) was made under a compound microscope to check the occurrence of any foreign pollen (pollen other than that of *E. superba*) on their body, especially the hind legs. The insects were then carefully air dried One hind leg from the insect's body was then dissected out and placed on an iron stub on which a piece of adhesive tape was affixed, for scanning electron microscopy (SEM). The specimen was gold coated with Beltec SCD 005 sputter coater and observed under Phillips XL 20 SEM to study the structure of pollen collecting apparatus and mode of pollen attachment on the insect's legs. The manual operations such as catching, killing (which involves death struggle accompanied by wild movements of the insect), identification, storage, mounting and gold coating for SEM resulted in excess pollen abatement from the insect's body leaving only few, very firmly attached grains on the bee's legs. This helped in obtaining clear picture of pollen on the insect's body parts to ascertain the anthecological co-relationship.

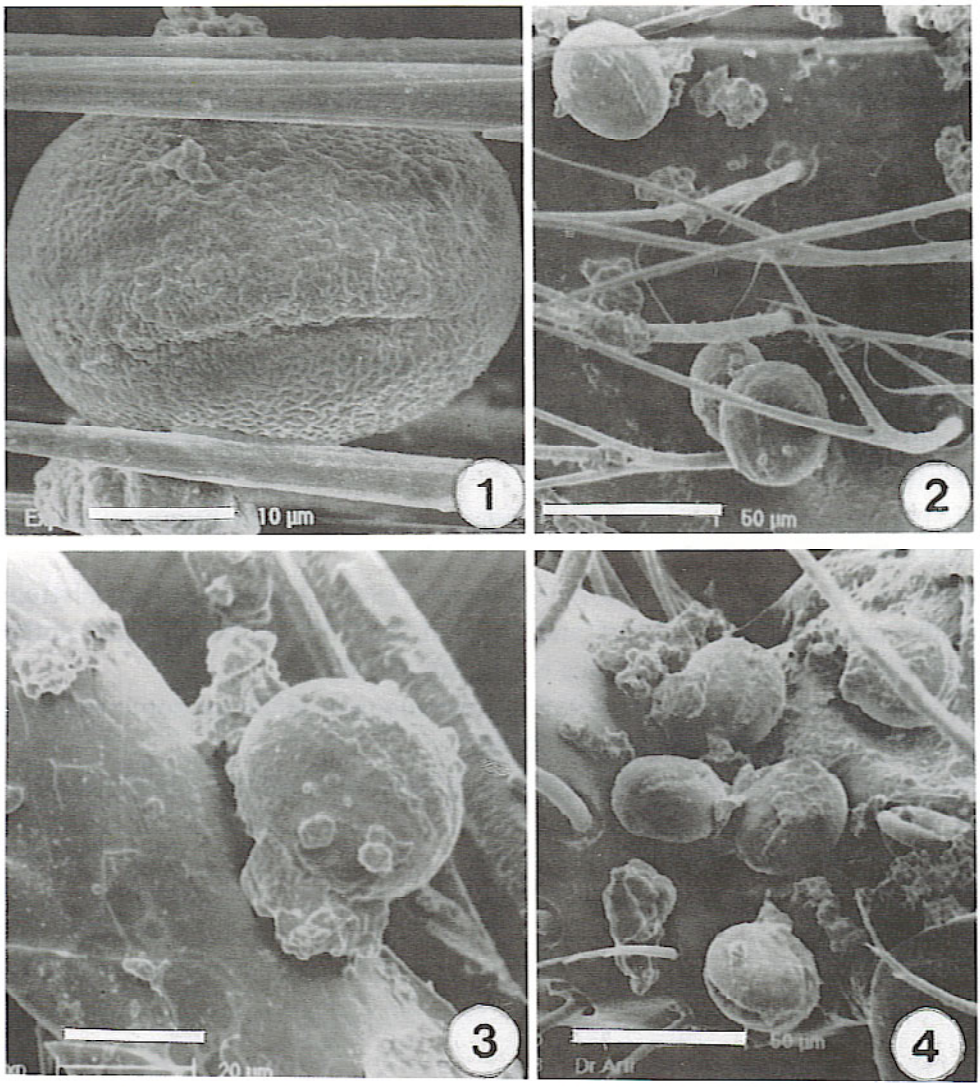
## RESULTS AND DISCUSSION

The efficacy of pollen transfer to the stigma depends not only on the activity and mobility of the insect on the flower but also upon a number of other factors such as the floral constancy, adhesive power of pollen on the insect body and on the stigma, presence of pollen on those parts of the insect body which comes in contact with the stigma (and a number of other factors such as stigma morphology and incidence of self-incompatibility). The only insects which actively and frequently collected pollen from *E. superba* flowers was the bee species *N. rustica* West. (Hymenoptera). This reflected a biotic pollen transfer. The bees collected pollen actively from the flowers in an inverted position, manipulating the anthers with its front legs and combing the pollen back to the hind legs for storage. The bee was not found feeding on other, often more attractive plant species in vicinity. Thus it appeared to be a habitual visitor of the species and served as its only pollinator (Garg and Rao, 1996).

The pollen gathered by *N. rustica* were conspicuous as cream coloured pollen loads in the middle region of the bees' hind legs and were also copiously dusted on the ventral surface of its entire body which comes in direct contact with the stigmatic surface.

Light microscopic examination of the insect showed that there was no pollen of any other species on the insect's body (indicating a flower constancy of the insect). Pollen were found to be held in the palynophilous pubescence all over the bee's body and were especially held among the bunch of hairs (setae) on it's hind legs.

Scanning electron microscope studies revealed that the pollen of *E. superba* had a homogenous reticulate surface. In anthecological studies such pollen may be termed unornamented *i.e.* without excrescences to help in pollen attachment. The bee's hind leg had a dense patch of setae in the middle region with two spur-like toothed projections comprising the pollen collecting apparatus of the pollinator. Pollen were seen entangled in this region (Figs. 1-4) as well as on the smooth chitinous parts, as was also observed in *Salvia* of Labiatae by Stelleman (1978). They were not bound by threads of regurgitated honey nor they possessed viscin threads as is also the case reported in *Coleus thyrsoides* by Pant and




Figs. 1-4. SEM: hind leg of *Nomia rustica* showing the mode of pollen attachment. Fig.1: enlarged pollen of *E superba* classped in between setae; Fig. 2: pollen held in the palynophilous pubescence; Fig. 3: pollen held on spur; Fig. 4: pollen held on smooth chitinous surface of the leg.

Chaturvedi 1985. The pollen are cemented together with the help of their sticky 'pollenkitt' which is found in almost all entomophilous pollen. The pollenkitt covers the pollen surface as an electron dense more or less viscous and strictly homogenous film often filling up the lumina of the reticulum. This gets dissolved on acetolysis of the pollen. The pollen clusters so formed get entangled in the palynophilous pubescence of the bee's body (Fig. 2) and the dense setae of its hind legs. Individual pollen are also held tightly between the setae (Fig. 1) The sticky pollen also adhere to the smooth chitinous parts (Figs. 3 & 4) of the insect's body The bee's legs come in direct contact with the stigmatic head. Hence a precise placement of pollen on the stigma during pollination is ensured by these pollinators.

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# 瀕臨絕種的印度沙穗(唇形科)和其傳粉者之花部生態學關係

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## 摘　　要

瀕臨絕種邊緣的印度沙穗(*Eremoatachys superba* Royle ex Benth.)是由一種學名為鄉野牧場集蜂(*Nomia rustica* West.)的蜂類所傳粉。以掃描式電子顯微鏡分析由此蜂身上所取得之花粉團(pollen load)，結果顯示其組成為同一種花粉。這種沒有花紋的花粉由花粉脂 (pollenkitt) 黏著成團，並且一起黏附在鄉野牧場集蜂具有許多剛毛的後腿。因此花粉落在柱頭上的正確位置得以被確定。

關鍵詞：印度沙穗、鄉野牧場集蜂、花粉團、花粉脂。

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