POLLINATION IN *PERGULARIA DAEMIA*

In Asclepiadaceae, to enforce a characteristic mode of entomophily, the stigma co-operates with the stamen by secreting the translator apparatus[1]. Corpusculum, the bulkiest part of the translator, has in the past been stated to be adhesive and even called as a gland[2]. Generalizations on the pollination mechanism in Asclepiadaceae suggest either a glued attachment of the corpusculum to legs of the insect visitor[2] or hooking of a part of the insect leg into the corpusculum[3]. In *Calotropis gigantea*, the two pollinia of a pair get interlocked with the bristles on the tibia of insect leg[4]. The present study was made to elucidate the mode of pollination in *Pergularia daemia* in view of the prevailing uncertainty about the nature of attachment of the translator apparatus with the body of insect visitor.

The investigation was carried out on *Pergularia daemia* (Forsk.) McC. and Blat. growing in the wild in Old Delhi Ridge. In this taxon, the stamens are fused with the stigma to form the gynostegium. There are five spongy corona lobes in the flower, each emerging from the base of the anther. Anthers are bisporangiate and extended side-ways into flap-like structures. In the flower, there are five radially placed stigmatic chambers representing the receptive surfaces of stigma[1]. Each chamber opens outward by means of a narrow slit formed between the adjacent anther flaps. The chamber tapers above, where the corpusculum of non-sticky translator is situated. Corpusculum is cap-like with its open end facing the tapering end of the stigmatic chamber. It also bears a narrow slit on its abaxial surface (Fig. 1D). Corpusculum is connected by retinacula to a pair of pollinia derived from two adjacent locules of contiguous anthers (Fig. 1 A).

The pollinator is *Apis dorsata* Fabr., commonly known as the Giant Honey-Bee of India (Fig. 1 B). The worker category of this species perform pollination. The pollinia are found attached to the legs of the bee (Fig. 1 C). The bee hovers round the flower and as it lands, the flower tilts upon its lax pedicels and this forces the bee to grasp the gynostegium firmly or move the wings vigorously to maintain its forging posture. Projections of the staminal corona over the stigma prevent the footing of the insect on the top of stigmatic disc and force the insect to land its legs on the sides of the gynostegium. As the bee tries to grasp the gynostegium, its legs touch the corona and slip into the space between the contiguous corona lobes. The bee usually moves its probosis either at the base of the stigmatic chamber or at the spurs of the staminal corona. Its tarsi are observed to be repeatedly drawn and slide along the space between the slippery staminal corona. Each claw of the pretarsus moves along the anther-flap on either sides

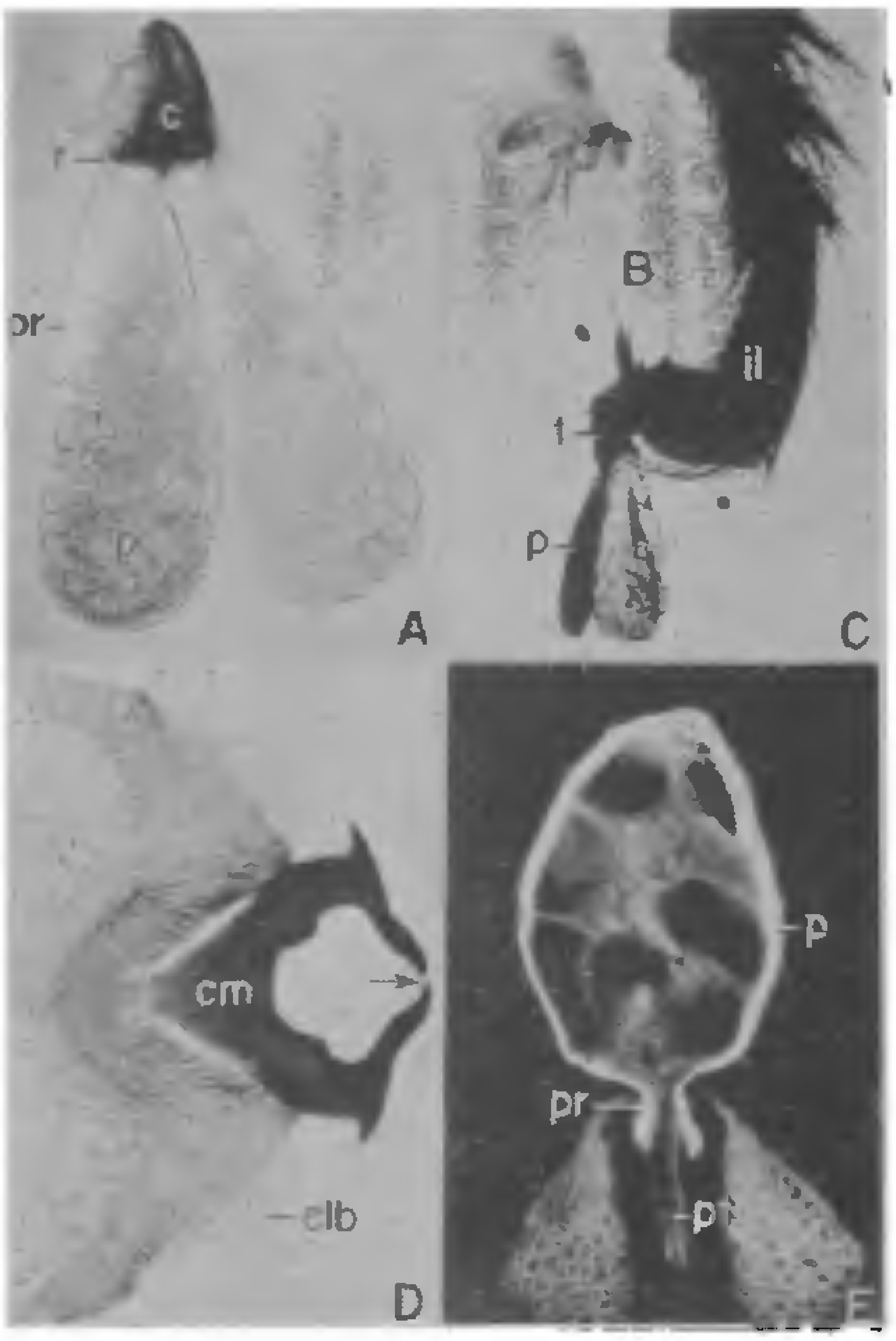

FIG. 1 A–D. *Pergularia daemia*. A–D, in normal optics; E, in darkfield fluorescence optics. A. Whole-mount of a pair of pollinia alongwith translator apparatus (× 53). B. The pollinator, *Apis dorsata* Fabr. (× 0·6). C. Terminal portion of insect leg carrying a pair of pollinia alongwith translator apparatus (× 21). D. Transection of translator. Arrow indicates dorsal slit of hollow corpusculum (× 167). E. Transection of a part of pollinated flower to show the germinating pollinium (× 179). (*c* = corpusculum; *clb* = lateral blades of corpusculum; *cm* = main body of corpusculum; *il* = insect leg; *p* = pollinium; *pr* = ridge of pollinium; *pt* = pollen tube; *r* = retinaculum; *t* = translator apparatus).

of the slit of stigmatic groove whereas the pulvillus moves in the slit. The slit gradually tapers toward the corpusculum situated above. Bristles of the tarsi also come frequently in contact with the translator apparatus. The tarsi slide up in the grooves of the gynostegium when the bee concludes its visit and flits away. Of the 40 bees caught for investigation, eight bees had a total of twenty-one pairs of pollinia attached to the rake of tibia and to the marginal hairs of basitarsus, and nineteen pairs attached to the pulvillus of pretarsi. Rest of the bees had, in total, sixty-three pairs of pollinia fastened with their pulvilli. Thus in *Pergularia daemia*, hooking of the corpusculum by the pretarsal pulvillus is the prevalent mode of attachment of the translator to the insect leg.

Anatomy of the pollinated flowers reveals that the pollinium is held with its ridge clasped between the adjacent anther flaps (Fig. 1 E). The pollen tubes push through the common germ pore present in the ridge of the pollinium and traverse toward the receptive lining of the stigmatic chamber. Role of the characteristic morphology of the pollinium in orienting the pollen tubes toward the receptive surface of stigma has been discussed elsewhere[5].

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EFFECT OF ROCK PHOSPHATE AND GLUCOSE CONCENTRATION ON PHOSPHATE SOLUBILISATION BY *ASPERGILLUS AWAMORI*

THERE are large deposits of low grade rock phosphate in the country which are estimated to be about one hundred million tonnes. Substantial deposits of these rock phosphates are low in phosphate content and thus are not suitable for superphosphate manufacture or utilisation as such as phosphatic fertilizers in non-acidic soils which cover a very large farm area of this country. For proper utilisation of these vast resources of low grade rock phosphates, it is necessary to use them alongwith efficient phosphate solubilising bacteria or fungi. The microbial solubilisation of insoluble phosphates has been studied[1–3]. However, the report on the factors affecting phosphate solubilisation is meagre. Carbon source for their active proliferation and for production of organic acids by these organisms is an important factor in phosphate dissolution. The optimum amount of rock phosphate to be applied in the milieu for maximum phosphate dissolution efficiency is an important parameter. With these points in view, the effect of different concentrations of rock phosphate and energy source on phosphate solubilisation by *Aspergillus awamori* in culture medium was investigated.

Three concentrations of Mussoorie rock phosphate were added per 100 ml of Pikovaskaya's medium. The flasks with medium were sterilised at 15 lb pressure for 15 minutes. After sterilisation they were inoculated with 0·5 ml of mycelium and spore suspension of *Aspergillus awamori*, keeping uninoculated control. Each treatment was duplicated. The average room temperature was 25° C ± 2. Two flasks from each treatment were removed at periodic intervals for the determination of available phosphorus and the pH.

The effect of varying dosage of glucose was investigated on rock phosphate solubilisation by *A. awamori*. Rock phosphate was added at 50 mg P_2O_5/100 ml medium. The experiment was done during October with an average room temperature of 30° C ± 2. Available phosphorus was determined by the method of King[4] improved by Sharman (Jackson[5]) using Hilgers absorptiometer. The pH of the filtrate was determined by Elico pH meter.

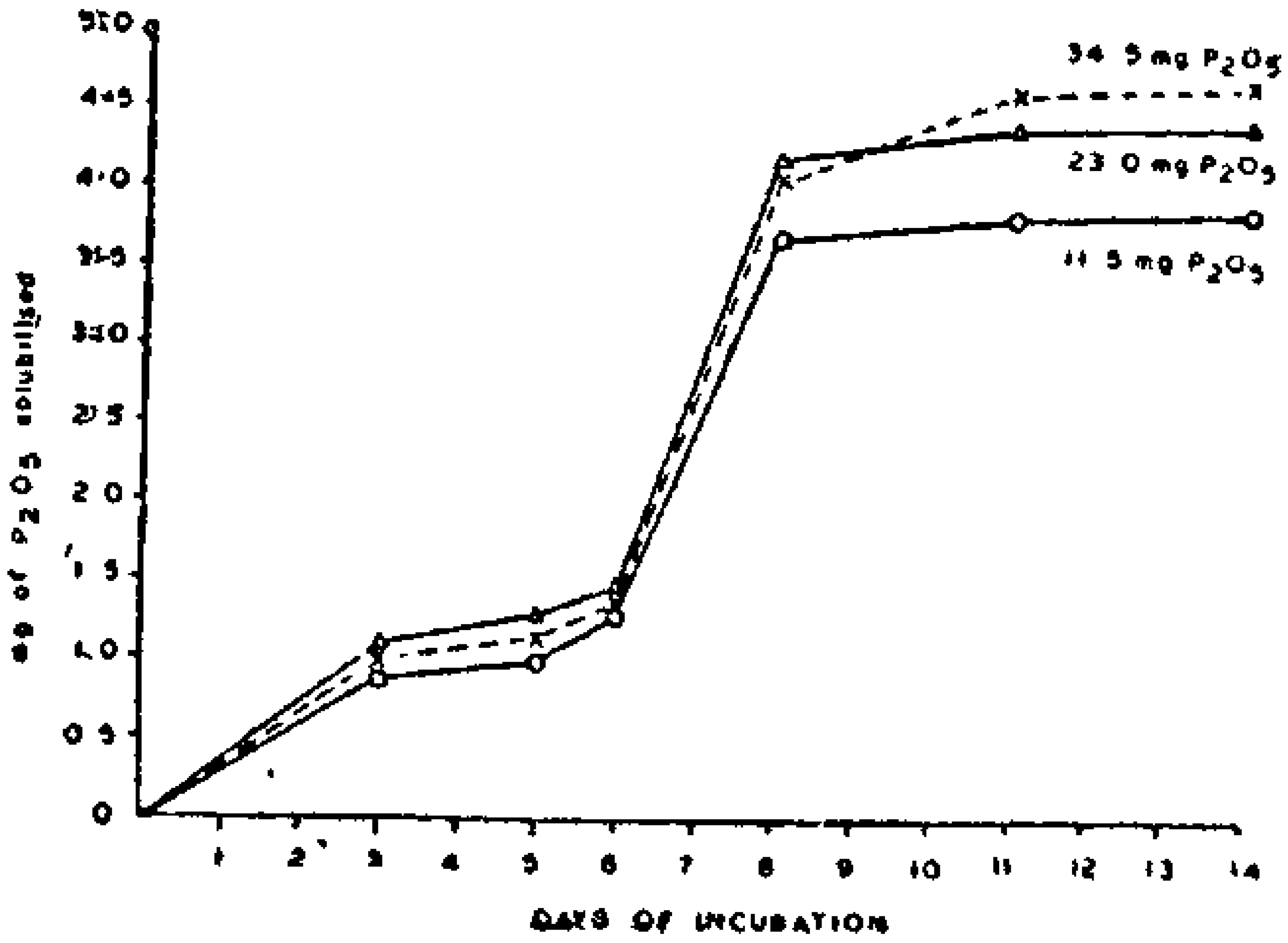

FIG. 1. Microbial solubilisation of different concentration of rock phosphate.

The results of P_2O_5 solubilised from different concentrations of rock phosphate during two weeks of incubation are presented in Fig. 1. The quantity of phosphate solubilised, increased with progressive incubation. During 6 days, the amount of phosphate solubilised was 1·3 and 1·5 mg P_2O_5 out of 11·5 and 23·0 mg of P_2O_5 added in the medium. Maximum solubilisation was obtained between 6th and 8th day