

## **Floral morphology and pollination process of red-fleshed dragon fruit *Hylocereus polyrhizus* grown in an open field**

### **ABSTRACT**

*Hylocereus polyrhizus*, commonly known as red-fleshed dragon fruit, is an exotic fruit crop whose commercial fruit production depends to a great extent on fruit weight, often with the grower's intervention for optimal fruit production. The purpose of this study was to characterize the floral structure, the morphology of pollen and stigma, and the reproductive process involving pollen-stigma interaction and pollen tube growth in red-fleshed dragon fruit plant grown in an open field using light, scanning electron, and fluorescence microscopy. Flowers of *H. polyrhizus* typified the floral traits of Cactaceae, in which large and white-coloured flowers with nocturnal anthesis are accompanied by strong floral emission. The extension of floral anthesis also indicated mixed pollination syndromes of nocturnal and diurnal pollinators. Self-incompatibility of the plant is evidenced by spatial segregation of the sexual organs with approach herkogamy and dry-type stigma. Numerous stigma lobes positioned above the anthers create a large area that enhances a large amount of pollen deposition. The highly ornamented, echinate sculpture of the pollen plays crucial roles in the attachment and adhesion of pollen grains on the stigma, and the presence of pellicles on papillae surfaces are specialized adaptations for pollen tube growth in dry-type stigma. The pollen germinated two hours after pollination with pollen tube elongation underneath the papillae tissues. Infertile pollen grains or incompatible pollination can be observed at 1 day after pollination (DAP), as indicated by the collapsed or dehydrated pollen grains, whereas compatible pollen grains travelling downward through the style transmitting tissues were observed at 2 DAP. After pollination, most of the pollen tube took approximately 4 days to reach the ovary cavity and fertilized the ovules leading to eventual fruit set.

**Keyword:** Dry stigma; Exine; Papilla; Pollen-stigma interaction; Self incompatibility