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Pollen viability and stigma receptivity in vanilla (*Vanilla planifolia* Andrews)

Y G Shadakshari, D Madaiah, M Dinesh Kumar, K V Shivakumar & K H Bhagavantha Goudra

University of Agricultural Sciences
Regional Research Station
Mudigere- 577 132, Chikkamagalur - Dist.,
Karnataka, India

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Abstract

Pollen viability and stigma receptivity period before and after complete flower opening was studied by hand pollinating the flowers/flower buds with its own pollen and fresh viable pollen. Based on the results, the pollen viability periods were 23 h before complete flower opening and 16 h 30 min after complete flower opening. The stigma receptivity periods were 41 h before complete flower opening and 17 h after complete flower opening under hill zone conditions.

Key words: fruit set, pollination, *Vanilla planifolia*

Vanilla (*Vanilla planifolia* Andr.) is a climbing orchid belonging to the family Orchidaceae. It is known for its pleasant flavor and natural source of vanillin. The cultivation of this high valued crop has been concentrated in the tracts of Western Ghats of India.Vanilla cultivation can be taken up as an inter crop in coffee, cardamom, coconut and arecanut plantations (Rao *et al.* 1993). Price instability in most of the principal crops grown in the hill zone of Karnataka paved way for change in the existing cropping pattern and also introduction of crops that suit the climate of the zone. Vanilla is one such crop introduced to the zone quite recently. It is cultivated as an inter crop in coffee, cardamom and arecanut under natural shade using glyricidia, erythrina, silver oak, mangium, mulberry, robusta coffee, etc. as standards. The extension of this crop necessitated location specific package of practices for proper exploitation of the crop.

Generally hand pollination is practiced by farmers from 6 AM to 1 PM. Information on pollen viability and stigma receptivity may help in adjusting the time for hand pollination for successful fertilization and effective fruit setting, information on which is very meager and therefore the present study was undertaken.

Based on earlier information on fruit set in vanilla (Shadakshari *et al.* 1996) an experiment was conducted at Regional Research Station, Mudigere during 2001 in an existing 3 year old vanilla garden trained on *Erythrina indica* grown under natural shade. The soil was sandy loam in texture and acidic in pH. For this study, 6 AM was considered as complete flower opening time and the total pollen viability and stigma receptivity periods after and before complete flower opening were determined separately by hand pollinating the flowers/flower buds with its own pollen/fresh viable pollen as follows.

For determining pollen viability and stigma receptivity after complete flower opening, sufficient flowers were labeled on the day of bloom-

ing at 6 AM and at each time four flowers were pollinated with its own pollen at an interval of 30 min for 24 h and the time up to which successful fruit set observed was recorded and confirmed again. Pollination was continued further from this time onwards at an interval of 30 min by using fresh viable pollen collected from the flower buds expected to bloom in the early morning and the time up to successful fruit set was recorded.

Similarly, pollen viability and stigma receptivity before complete flower opening was determined by tagging sufficient flower buds at 6 AM which are expected to bloom within 24 h. The pollination and recording of fruit set were carried out as described earlier. Pollination was continued further from this time onwards at an interval of 30 min up to 48 h with fresh viable pollen collected from the fresh flowers bloomed on that day/flower buds expected to bloom in the early morning and the time up to which successful fruit set observed was recorded. After pollinating flower buds with its own pollen or fresh viable pollen, blooming in each labeled flower bud on the right day was confirmed. Successful fertilization of each pollinated flower/flower bud was confirmed by observing fruit set in them for ten days after pollination. By using the data collected on successful fruit set, total pollen viability period and stigma receptivity period before and after complete flower opening were worked out.

The results of the study revealed that the opened flowers hand pollinated on the same day with the pollen of the same flower from 6 AM up to 10.30 PM recorded effective fruit setting and those pollinated after 10.30 PM did not set fruits. Hand pollination of the flowers continued af-

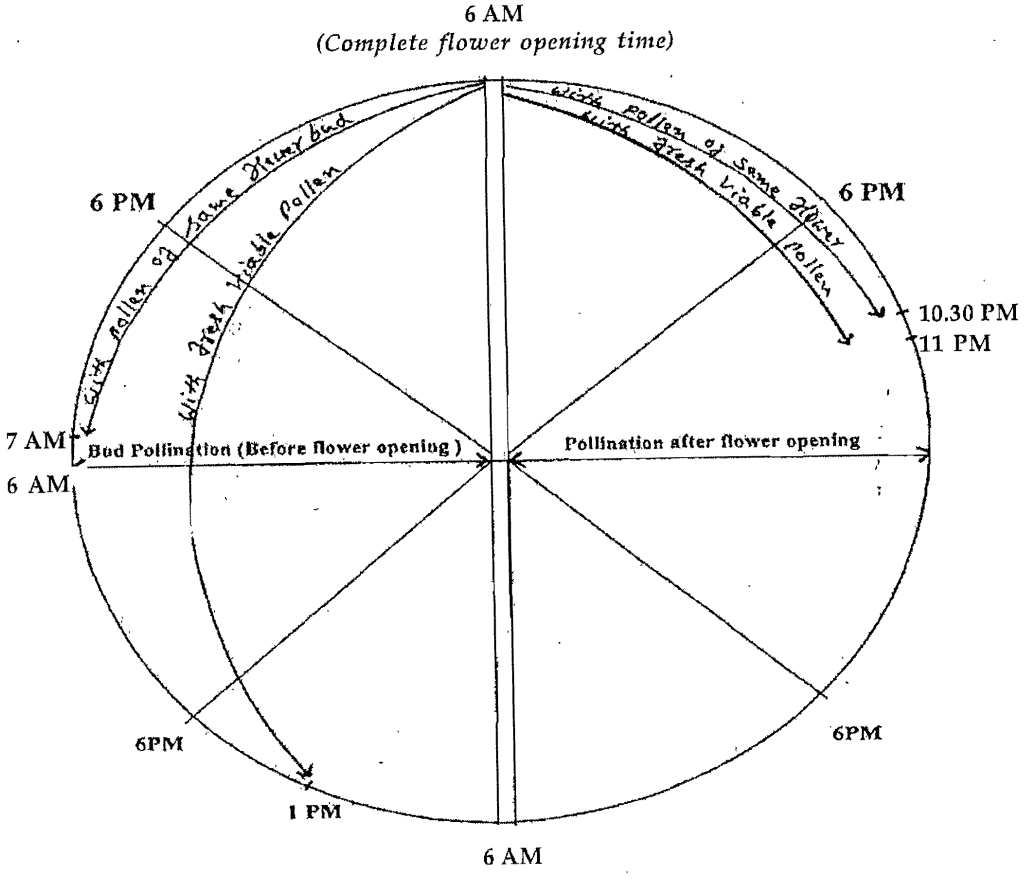

Fig. 1. Effective fruit set time before and after complete flower opening in vanilla

ter 10.30 PM with the fresh viable pollen collected from the flower buds expected to bloom in the early morning of that day, showed effective fruit set up to 11 PM only. This indicated the pollen viability and stigma receptivity period of 16 h 30 min and 17 h, respectively after complete flower opening (Fig.1).

Flower buds which are expected to bloom next day, pollinated at an interval of 30 min up to 24 h before complete flower opening indicated that flower buds which would open next day, pollinated with its own pollen up to 7 AM resulted in effective fruit set but before 7 AM on previous day did not set fruit. Bud pollination further extended beyond this time at an interval of 30 min for 24 to 48 h before complete flower opening, with fresh viable pollen of fresh flowers/flower buds, revealed effective fruit setting up to 1 PM only, indicating pollen viability period of 23 h and stigma receptivity period of 41 h before complete flower opening.

By this study, effective fruit set in vanilla was observed for 16 h 30 min after complete flower opening by hand pollinating the flowers opened on the same day with its own pollen and for 17 h by using fresh viable pollen from other flower buds expected to bloom in the early morning. Before complete flower opening, effective fruit setting was noticed for 23 h by hand pollinating the flower buds with its own pollen and for 41 h by using fresh viable pollen from other flowers/flower buds. A total pollen viability period of 39 h 30 min (23 h before complete flower opening and 16 h 30 min after complete flower opening) and total stigma receptivity period of 58 h (41 h before complete flower opening and 17 h after complete flower opening) was observed in vanilla under hill zone conditions.

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