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Dichogamy studies of pecan cultivars

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Abstract

In order to find out the matching cultivars for optimum cross-pollination, an attempt has been made to record the dates of pollen shed and stigma receptivity of 8 pecan cultivars growing in the orchard of department of Horticulture, CSK HPKV, Palampur during 2005 and 2006. The number of days of overlap of pollen shed and stigma receptivity ranged from 1-4 and varied within cultivars. The studies indicated that actual pollen release and stigma receptivity dates are more important in selecting pollinizer cultivars than type of dichogamy. On the basis of time of pollen shed and stigma receptivity, various cultivar combinations have been suggested whose time and duration of pollen shed and stigma receptivity synchronized which can be inter-planted to get adequate pollination. Therefore, it may be advisable to select multiple cultivars to provide early, mid and late season pollens with the stigma receptivity rather than attempting to choose a certain number of protandrous and protogynous cultivars.

Key words: Pecan, stigma receptivity, pollen shed, overlap, pollination and cultivar combination.

Introduction

Pecan (*Carya illinoensis* Wang K. Koch) is a promising tree nut crop of the northwestern Himalayan regions. It is a deciduous, monoecious, wind pollinated and highly dichogamous tree. Many commercial orchards yield poorly as a result of either poor cross- pollination or from excessive self-pollination. Dichogamy often poses a major difficulty in pollination especially in case of isolated plantings of one or few cultivars. Nuts arising from cross-pollination are usually larger and better filled than those arising from self-pollination, due to heterosis (Wolstenholme, 1967). Self pollination may reduce a pecan crop by 35 to 75 per cent and also reduce nut quality (Polles and Long, 1980). In selecting combination of cultivars to ensure good cross pollination, 3 or 4 protandrous cultivars should be interplanted with 3 or 4 protogynous cultivars (Madden and Brown, 1975). Complete and incomplete dichogamy are not fixed but vary seasonally between cultivars in specific localities (Haulk and Holtzhausen, 1987; Sparks, 1987), but cultivars follow the same chronological order for pollen shedding and pistil receptivity (Madden and Brown, 1975). Different cultivars which shed pollen at different dates in an orchard can help to ensure adequate pollination by spreading pollen shed over a longer period. The information on the overlap of pollen shed and stigma receptivity for pecan cultivars growing in India especially under mid hill conditions of Himachal Pradesh is not available. Therefore, the present studies were undertaken to find out the number of days of overlap of pollen shed and stigma receptivity in pecan cultivars in order to select suitable cultivar combinations which can be interplanted or top worked for effective cross- pollination and to obtain good yields in pecan.

Material and Methods

The studies were undertaken on 8 pecan cultivars, namely Mahan, Nellis, Burkett, Western Schley, Success, Calaro, Oconee and Moreland planted in the experimental pecan block of the department of Horticulture, CSK HPKV, Palampur, situated at 1290m a.m.s.l., 76°3' East longitude, 32°6' North latitude and experiencing 2500 mm average annual rainfall. Standard and uniform cultural practices were followed. Trees were visited

daily during flowering season and dates of pollen shed and stigma receptivity for each tree were recorded. The first pollen shed date was taken when the yellow mass started sticking on the fingers while catkins were touched. The pollen shed was considered completed on the date when pollens could no longer be observed. The pollen shed period was thus recorded to be the period between these two dates. Presence of shinning on the stigmatic surface when observed under the magnifying glass was taken as time of stigma receptivity. The duration of pollen shed and stigma receptivity were diagrammatically plotted in order to find out the duration of synchronization of two characters in different pecan cultivars.

Results and Discussion

The studies on pollen shed and stigma receptivity (Fig.1 and 2) revealed that three cultivars viz., Burkett, Mahan and Moreland behaved as protogynous, whereas, Western Schley, Success, Calaro, Nellis and Oconee were protandrous cultivars. Among protogynous cultivars, the earliest stigma receptivity was observed in Burkett, whereas, Oconee was last to have stigma receptive. Among protandrous cultivars, Calaro was observed to be the earliest pollen shed cultivar, whereas Western Schley was the last to dehisce.

The number of days of overlap of pollen shed and stigma receptivity ranged from 1-4 days and varied within cultivars (Table1). The longest period of 4 days for synchronization of pollen shed and stigma receptivity was recorded in Western Schley, Success, Calaro, Oconee and Moreland. The cultivar Burkett showed 1-2 days of overlap of pollen shed and stigma receptivity. The number of days of pollen shed and stigma receptivity ranged from 8-13 and 7-11 days, respectively. The shortest pollen shed period (8-9 days) and stigma receptivity (7-8 days) was observed in Burkett, whereas, longest duration of pollen shed was recorded in Mahan and Success cultivars. The stigmas of Nellis and Calaro remained receptive for a period of 9-11 and 8-11days, respectively. Similar observations on pollen shed and pistil receptivity have also been made by Young and Mullenax (1971); Worley *et al.* (1983) and Sparks (1987).

Table 1. Duration of pollen shed and stigma receptivity in pecan cultivars

Cultivar	No. of days of pollen shed	No. of days of stigma receptivity	No. of days of overlap
Burkett	8-9	7-8	1-2
Mahan	11-13	9-10	2-3
Western Schley	9-10	9-10	3-4
Success	11-13	8	2-4
Calaro	10-11	8-11	4
Nellis	10-11	9-11	2-3
Oconee	9-10	8	3-4
Moreland	10	9-10	3-4

On the basis of observations recorded on the time and period of pollen shed and stigma receptivity, various cultivar combinations have been recommended whose time and duration of pollen shedding and stigma receptivity synchronized which can be inter-planted for adequate pollination and to get good yields (Table 2).

The present studies revealed that synchronization of pollen release and stigma receptivity is more important and crucial in selecting pollinizer cultivars than type of dichogamy. Madden and Brown (1975) also reported that three or four protandrous cultivars should be interplanted with three or four protogynous cultivars to ensure good pollination. Similar observations have also been reported by Worley *et al.* (1992).

Table 2. Cultivar combinations having synchronized time of pollen shed and stigma receptivity

Sr. No.	Main Cultivar	Cultivars having synchronized pollen shed and stigma receptivity with main cultivar
1.	Burkett	Western Schley, Nellis, Oconee
2.	Mahan	Western Schley, Nellis, Oconee
3.	Nellis	Burkett, Mahan, Moreland
4.	Western Schley	Burkett, Mahan, Moreland
5.	Success	Western Schley, Nellis, Oconee
6.	Moreland	Burkett ,Western Schley, Nellis, Mahan
7.	Calaro	Success, Western Schley, Nellis, Oconee
8.	Oconee	Mahan, Burkett, Nellis, Western Schley

Fig. 1. Time and duration of pollen shed and stigma receptivity in pecan cultivars (2005)

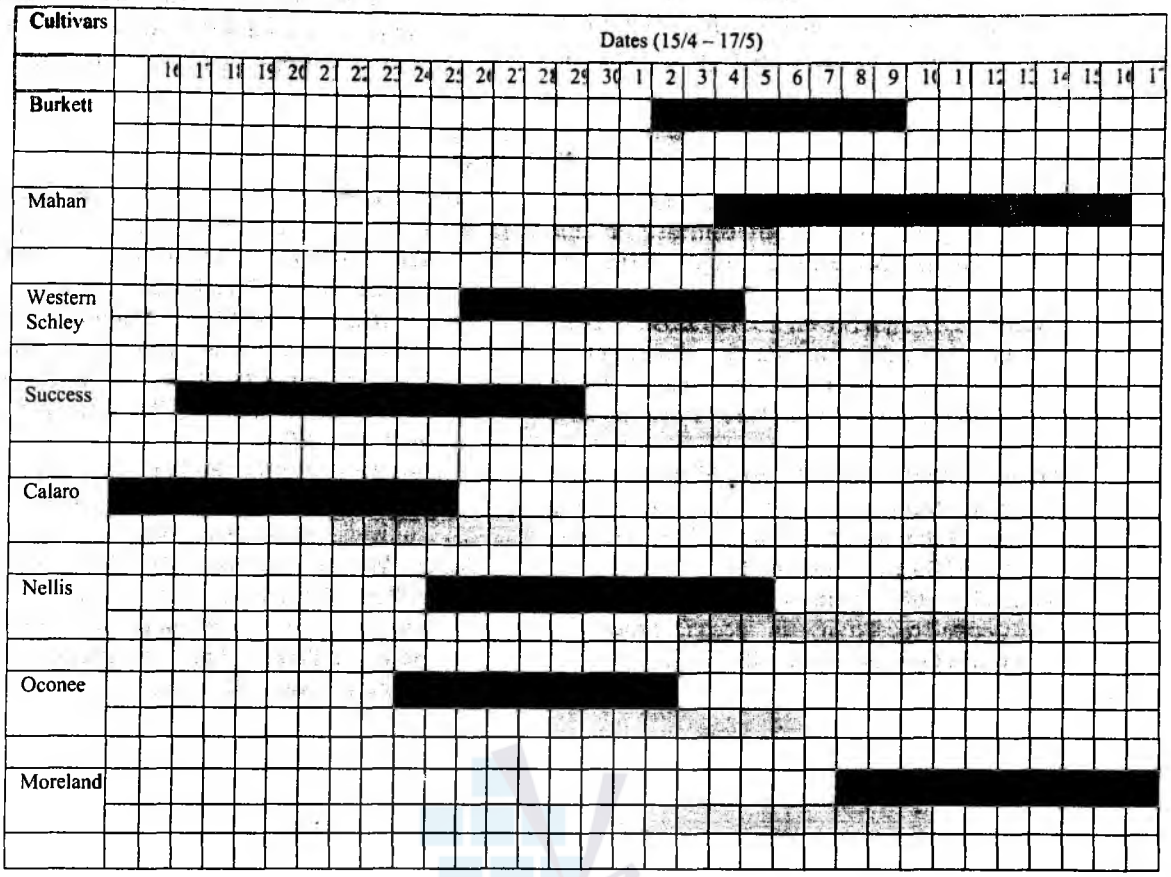
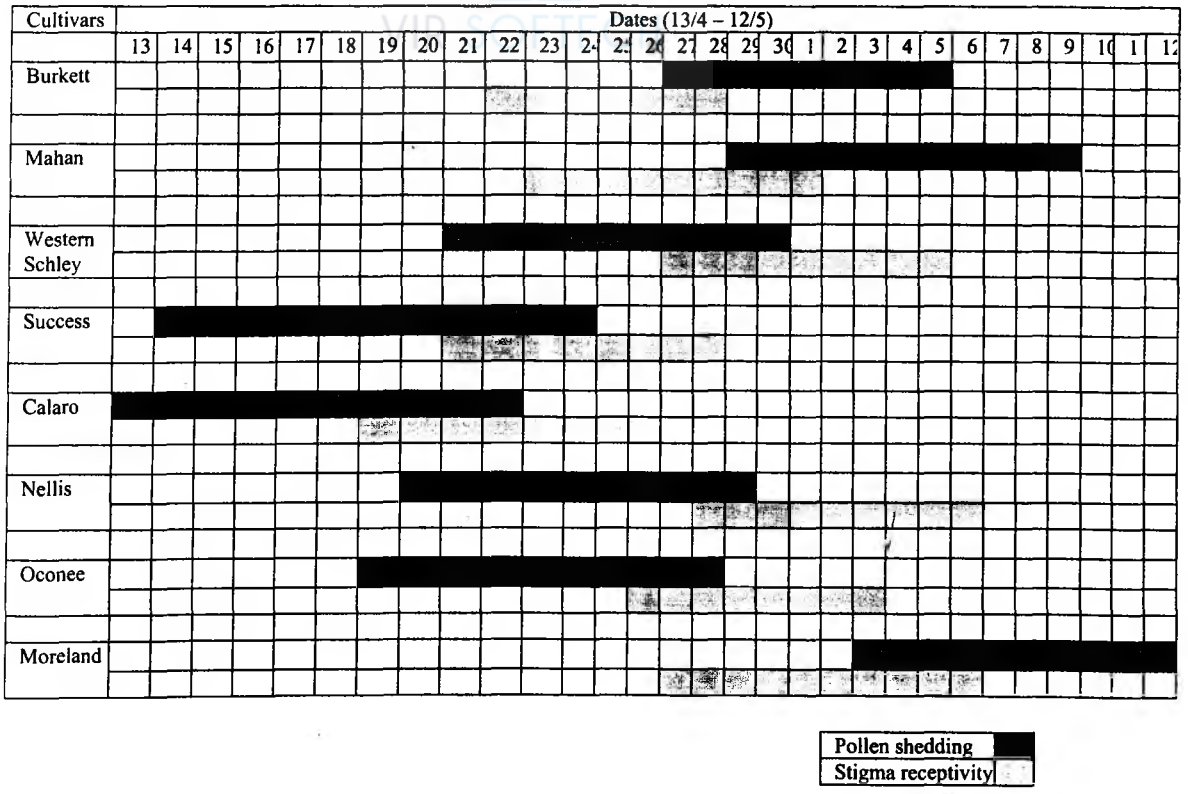


Fig. 2. Time and duration of pollen shed and stigma receptivity in pecan cultivars (2006)



Therefore, it can be concluded from the present studies that combination of 3-4 cultivars may be planted for maximum cross-pollination and to get good yields in pecan.

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