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The rationale for deflowering in pepper (*Piper nigrum* L. var. Kuching) cultivation

P. Y. Yau* and I. Abdul Rahman Azmil*

Key words: *Piper nigrum*, deflowering, plant growth, cumulative yield

Abstrak

Satu percubaan telah dijalankan di MARDI, Keluang dari tahun 1981 sehingga 1985 terhadap keperluan membuang bunga pada peringkat awal pertumbuhan lada. Keputusan yang didapati selepas 27 bulan menunjukkan bahawa tiada perbezaan yang ketara dari segi ketinggian pokok, garis pusat batang dan sudur pokok bagi perlakuan-perlakuan pembuangan bunga yang dikaji. Begitu juga bagi hasil yang tidak menunjukkan perbezaan yang ketara pada tahun keempat, kelima dan pada jumlah hasil keseluruhannya. Oleh itu, pembuangan bunga lada sehingga tahun kedua penanaman tidaklah perlu kerana tidak berfaedah.

Abstract

A study was carried out at MARDI, Keluang from 1981 to 1985 to determine the rationale for deflowering (floral spike removal) in the early stage of pepper vine growth. The results obtained showed that there were no significant differences in plant height, stem diameter and canopy spread up to 27 months of plant growth regardless of the duration of deflowering. Similarly, there were no significant differences in their fourth year, fifth year and total cumulative yields. Thus, deflowering in pepper cultivation is not necessary as no benefit is gained in the first 2 years of planting.

Introduction

Pepper, *Piper nigrum* L., is commercially propagated through vegetative means, that is, by stem cuttings. Pepper vines propagated through this method flower very early. Traditionally, the floral spikes are removed manually for the first 2 years before allowing them to go into production (de Waard 1964; Chan and Ti 1973). This has been a standard practice because the growers believe that deflowering (removal of the floral spikes) in the early years will minimize interference with normal growth and subsequently result in healthier vines and better yield production.

Deflowering is both time and labour-consuming; for example, it requires about 30 min to completely deflower a 2-year-old vine. Attempts to induce floral spike abscission by using chemicals such as *Ethephon* (2-chloroethyl phosphoric acid) have not been successful (Anon. 1982b). Deflowering is costly. The costs, inclusive of pruning and tying, may range from 20% to 35% of the field maintenance costs per hectare in the first 2 years of planting (Anon. 1982a; Chong and Yau 1985). Chua and Wong (1981) reported that deflowering in the first 2 years might cost as much as M$2 470/ha.

*Miscellaneous Crops Research Division, MARDI, P.O. Box 525, 86007 Keluang, Malaysia
Authors' full names: Yau Peng Yam and Abdul Rahman Azmil Idris

Table 1. Six durations of deflowering carried out on pepper at MARDI, Keluang

Duration of deflowering	Description
T1	All young floral spikes were allowed to come into production after transplanting
T2	All young floral spikes were removed for the first 6 months after transplanting and subsequently the floral spikes were allowed to come into production
T3	Similar to T2 but the floral spikes were removed for the first 12 months after transplanting
T4	Similar to T2 but the floral spikes were removed for the first 18 months
T5	Similar to T2 but the floral spikes were removed for the first 24 months
T6	Similar to T2 but the floral spikes were removed for the first 30 months

Table 2. Effect of deflowering durations on plant height, diameter of stem and canopy spread of pepper

Duration of deflowering	Plant height (cm)			Canopy diameter (cm)			Stem diameter (cm)		
	9+	18	27	9	18	27	9	18	27
T1	85.7	141.7	303.4	48.3	73.3	107.9	0.60	1.02	3.60
T2	85.7	145.0	311.2	54.3	75.0	109.6	0.59	0.98	3.41
T3	81.0	146.0	307.6	50.7	75.7	110.6	0.64	1.11	3.70
T4	79.7	157.3	311.5	48.0	77.3	113.0	0.59	1.05	3.90
T5	82.3	150.0	317.4	48.7	76.3	112.1	0.60	1.05	3.52
T6	82.0	145.7	321.9	50.0	74.0	113.2	0.63	1.02	3.68
Mean	81.7	147.6	312.2	50.0	75.3	111.1	0.61	1.04	3.64
F value (5%)	ns	ns	ns	ns	ns	ns	ns	ns	ns
C.V. (%)	7.1	12.3	6.6	10.2	8.1	5.0	5.6	6.1	14.0

+age of plants in months
ns = not significant

The high cost incurred by deflowering may make the practice uneconomical. However, the prospect of additional yield obtained later on may compensate for the labour cost and makes the practice attractive. To date, there have been no reports indicating the rationale of deflowering in pepper cultivation. Due to this controversy and no research on this subject, an experiment was conducted at MARDI, Keluang to determine the rationale of deflowering in pepper cultivation.

Materials and methods

The experiment was conducted on Rengam series soil with the treatments arranged in a randomized complete block design. The treatments consisted of six deflowering durations *(Table 1)* and were repeated three times. Rooted pepper cuttings of Kuching variety were planted at a distance of 2.4 m x 2.4 m with each treatment plot consisting of 25 vines.

Compound fertilizer of formulation 12:12:17:2 + T.E. and ground magnesium limestone (36% CaO and 17% MgO) were applied at the rate of 376 and 30 g/vine per year respectively, in four equal split applications during the first year of planting. The amounts applied were doubled and tripled in the second and third subsequent year. Standard cultural practices of pepper cultivation were followed as described by Chan and Ti (1973).

Growth parameters such as plant height, original orthotropic stem diameter

Table 3. Effect of deflowering durations on the yield of pepper

Duration of deflowering	Yield of fresh pepper berries (kg/ha)					Cumulative
	1981	1982	1983	1984	1985	
T1	89.7	639.2	1 362.4	9 161.3	7 697.9	18 950.5
T2	61.7	605.5	1 323.2	8 303.5	8 438.0	18 731.9
T3	–	756.9	1 597.9	8 381.9	7 608.3	18 345.0
T4	–	403.7	1 659.6	7 602.6	7 832.5	17 498.4
T5	–	–	1 104.5	8 432.4	8 224.9	17 761.8
T6	–	–	1 418.2	9 621.0	8 292.3	19 331.5
Mean	75.7	601.3	1 410.9	8 583.8	8 015.7	18 436.5
F value (5%)				ns	ns	ns
C.V. (%)				15.8	38.3	20.9

ns = not significant

Table 4. Estimated deflowering cost and net return per hectare for the first 5 years of planting

Management system	1. Cumulative yield (kg/ha)	2. Gross return (M$)	3. Harvesting and processing cost (M$)	4. Deflowering cost (M$)	5. Net return (M$)	6. Reduction in net return (%)
T1	18 950.5	56 851.5	8 527.7	–	48 323.8	–
T2	18 731.9	56 195.7	8 429.4	270.0	47 496.3	1.7
T3	18 345.0	55 035.0	8 255.3	540.0	46 239.7	4.3
T4	17 498.4	52 495.2	7 874.3	1 050.0	43 570.9	9.8
T5	17 761.8	53 285.4	7 992.8	2 100.0	43 192.6	10.6
T6	19 331.5	57 994.5	8 699.2	2 625.0	46 670.3	3.4

1 = from *Table 3* (fresh berry yield 1981–85)

2 = based on 30% conversion rate of fresh berries to black pepper, price of M$10/kg black pepper

3 = Harvesting rate at 50 kg fresh berries/man-day, labour cost of M$15/man-day, and processing cost at 5% of the gross return of processed black pepper

4 = based on total man-days involved and $15/man-day
T2 = 18 man-days T3 = 36 man-days T4 = 70 man-days
T5 = 140 man-days T6 = 175 man-days

5 = net return (2 – 3 – 4) excluding the establishment and other maintenance costs which are the same for all the treatments

6 = percentage reduction in net return compared with T1

and canopy spread at 6 inches above the soil level were measured at 9-month intervals for 27 months. Yield data from all the vines were collected up to the fifth year of planting. The results were analysed using Analysis of Variance.

Results and discussion

Plant growth

There were no significant differences in plant height, stem diameter and canopy spread regardless of the deflowering durations *(Table 2)*. The vegetative growth of the pepper vines was not adversely affected by the early berry production as was generally believed by the smallholders. This may also indicate that the diversion of nutrients for flower and berry production in the early years is not sufficiently great to increase vegetative growth when floral spikes are removed.

Plant yield

When the floral spikes were not removed, an early cumulative yield as high as 730 kg fresh berries per hectare can be collected from the first 2 years of planting. Based on 30% conversion rate and M$10/kg black pepper (Chan and Ti 1973; Anon. 1986), a gross income of M$2 200/ha could be obtained. This income from the early cropping can help the farmer recoup some income from his high initial capital investment in pepper cultivation. Moreover, this early cropping did not hinder berry production in the later years as there were no significant differences in the yield for the fourth and fifth year of planting regardless of the deflowering durations. This, therefore, indicated that the vines with early cropping were able to sustain comparable yield with those which came into production later.

The cumulative yield did not differ significantly in all the deflowering durations up to the fifth year of planting *(Table 3)*. The slight increase in the cumulative yield with 30 months of continuous deflowering as compared with that of no deflowering can be attributed to experimental error or chance variation.

The labour cost for deflowering was quite substantial during the first 30 months of pepper cultivation. As can be seen from *Table 4*, the cost incurred increased from M$270/ha (first 6 months of deflowering) to M$2 625/ha (first 30 months of deflowering). This cost is comparable to that incurred in Sarawak (M$2 470/ha) as reported by Chua and Wong (1981).

The net return per hectare based on 5 years cumulative yield, taking into account the deflowering periods ranging from 6 months to 30 months, was M$43 192–M$47 496 *(Table 4)*. The net return from vines without deflowering over the same period of time was M$48 323. Thus, no deflowering of pepper vines during the first 30 months was more profitable since there was a reduction of net returns ranging from 1.7% to 10.6% for the deflowered vines. It follows that deflowering does not appear to give any extra benefits as has been often claimed and on the contrary, it incurs additional costs.

Conclusion

This study showed that early berry production did not hinder plant growth and yield during the first 5 years of planting. In addition, early cropping by allowing the floral spikes to go into production not only brings early returns to capital investment but saves a sizeable labour cost of deflowering in the first 2 years of pepper cultivation. Thus, it is wise to retain the floral spikes and harvest all the available berries to reap early profits.

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