

Effect of frond pruning on the vegetative and reproductive performance of local salak palm (*Salacca glabrescens* Griff)

[Kesan pemangkasan pelepah terhadap pertumbuhan vegetatif dan reproduktif salak tempatan (*Salacca glabrescens* Griff)]

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Key words: frond pruning, vegetative, reproductive, *Salacca glabrescens*

Abstract

The effect of frond pruning on the vegetative growth, nutrient levels and the production of male and female inflorescences of salak palm (*Salacca glabrescens*), was studied at MARDI Jerangau Research Station since 1990. The pruning levels significantly affected all the recorded vegetative parameters, which included palm height, girth, leaflet number and frond length. However, the different pruning levels did not significantly affect the macronutrients status of the salak palm leaflets.

The effect of pruning levels on the performance and production of female inflorescence showed that the panicle number reduced significantly with heavy pruning as compared to the control. However, the female inflorescence number did not show any definite pattern with pruning levels. Female inflorescence girth and length also reduced significantly with heavy pruning. The pruning levels did not significantly affect the performance and production of male inflorescence, except on the inflorescence length where the higher pruning levels reduced male inflorescence length.

In general, over pruning of frond will reduce the vegetative growth performance, lower the female panicle production, and result in smaller and shorter inflorescences as compared to the control or minimum pruning. However, the frond pruning of the salak palm needs to be carried out as it will generally help in the field managements of the farm. Frond pruning at seven and higher frond numbers resulted in better palm growth performance as compared to the lower frond levels. While minimum pruning, leaving 9–12 fronds, is more preferable to get higher panicle production, bigger and healthy inflorescences.

Introduction

Salak (*Salacca glabrescens* Griff) cultivation has been expanding tremendously especially in the East of Peninsular Malaysia namely Terengganu, Kelantan and Pahang. In 1995, the acreage of salak in these states was 503 ha and increased to 852 ha in 1999. Growers prefer to grow salak as an intercrop under traditional fruit trees, rubber and

coconuts because it can provide additional income within a short period of time. A good quality salak fruit also fetches a very stable high price between RM8–12/kg.

The fruit has a very nice and complex taste with a combination of sweet, slightly sour with some astringent. The shelf life of salak fruit is more than 7 days, comparatively longer than most other

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tropical fruits. The potential of salak as an indigenous fruit in terms of quality, long shelf life and export potential has been reported by Abd. Jamil and Zaki (1990).

Salak is a shade loving palm and can grow well even under excessive shade (Hashim and Salma 2004). The growth and performance of salak are influenced by many factors including management of shade and frond number. Under normal condition, a healthy salak palm does not produce suckers. However, in many instances, salak produces a lot of suckers, which finally will retard growth and delay maturity. Therefore, frond pruning is a very important management practice to reduce the number of suckers and improve the growth of the salak palm.

Pruning is one of the important activities that need to be carried out in salak cultivation. Hashim (1995a, d) described the pruning techniques for salak, which include the pruning of suckers, frond and rehabilitation pruning. Proper pruning can increase the farm management efficiency and easy harvesting of fruit. Pruning of salak palm can also increase aeration around the base of the tree and helps to reduce incidence of pests and diseases. This study was carried out to determine the effect of frond pruning levels on the vegetative and production performance of salak palm.

Materials and methods

Salak palms planted in 1990 under *Gliricidia* shade trees were used for the experiment. The salak palms were given standard management practices as recommended by MARDI (Hashim 1993a, 1995c). In the first year, the palms were allowed to grow freely. The pruning treatments were started on the second year after field planting (*Table 1*).

The experiment was arranged in a completely randomized block design with three replicates. Each treatment consisted of five male and five female salak palms. Pruning was carried out every three months to retain the required number of frond as

Table 1. Pruning treatments of salak palm

Pruning levels	No. of fronds retained
T1	3
T2	5
T3	7
T4	9
T5	12
T6	Control/no pruning

required by the treatments. The vegetative growth parameters recorded were palm height, frond girth and length and leaflet number/frond, and taken on the fourth year after planting when the palm attained maturity. The number of male and female inflorescences was taken once when salak palm started producing inflorescences on the fourth year after planting.

Leaf sampling was carried out on the second year before the palm attained their maturity stage. Leaf samples were taken from the middle portion of the third frond, dried, ground and analysed for nutrients (Hashim 1993b, 1995b). Chemical analysis was carried out by MARDI Chemical Analysis Laboratory. Leaf nitrogen (N) was extracted using the Kjeldahl digestion procedure and its extract was determined using an autoanalyser (Technicon Autoanalyser II, Technicon Instruments Corp., Tarrytown, N.Y.). While other elements were extracted using Wet Digest Inhouse Method and analysed using an inductively coupled plasma (ICP) emission spectrometry technique (Ahmad 1993). Data were analysed using ANOVA of SAS Procedures (SAS window 6.2 program) and treatment means were compared by the Duncan Multiple Range Test (DMRT).

Results and discussion

Effect on vegetative growth

The effect of pruning levels on the vegetative growth of local salak palm is shown in *Table 2*. All recorded parameters, namely palm height, girth, leaflet number and frond length were significantly affected by the pruning treatments. Maintaining

Table 2. Effect of frond number on the growth performance of local salak palm before maturity

Frond no.	Height (cm)	Girth (circum.) (cm)	Frond length (leafless) (cm)	Frond length (with leaflet) (cm)	Leaflet no.
3	133.00bc	11.30c	64.27ab	105.87ab	31.93ab
5	127.27c	11.67c	54.73b	97.87b	28.67b
7	157.42ab	12.41bc	69.75a	111.33a	29.75ab
9	159.07a	13.44ab	65.80ab	116.67a	31.60ab
12	156.60ab	13.84a	68.73a	114.20a	32.20ab
Control	154.33ab	14.48a	68.67a	112.33a	33.73a
CV (%)	20.02	12.78	22.14	14.36	15.54

Mean values in the same column with the same letters are not significantly different at $p < 0.05$ using DMRT

Table 3. Effect of pruning on the leaf macronutrients status of salak palm

Frond no.	Nutrients (%)				
	N	P	K	Ca	Mg
3	2.40a	0.17a	1.38a	0.34a	0.26a
5	2.50a	0.17a	1.34a	0.39a	0.29a
7	2.39a	0.17a	1.32a	0.37a	0.28a
9	2.23a	0.15a	1.30a	0.38a	0.26a
12	2.36a	0.15a	1.33a	0.37a	0.26a
Control	2.22a	0.16a	1.30a	0.42a	0.25a
CV (%)	8.08	9.49	7.35	10.36	8.62

Mean values in the same column with the same letters are not significantly different at $p < 0.05$ using DMRT

seven and more fronds resulted in better palm growth in terms of plant height and frond girth as compared to less frond number. Keeping higher frond number increased palm height, frond girth and length. This study generally showed that severe frond pruning should not be carried out on salak palm as it retards vegetative growth. However, frond pruning of the salak palm at vegetative stage leaving not less than seven fronds/palm not only increased growth but could also increase management efficiency. These results were in agreement with earlier report (Hashim 1995a, d).

Leaf nutrients status

The effect of pruning levels on the macronutrients of salak palm before maturity is shown in Table 3. The results showed that the different pruning levels did

not significantly affect the macronutrients status of the salak palm leaves. Nitrogen (N), phosphorus (P), potassium (K), calcium (Ca) and magnesium (Mg) levels in the salak palm leaflets are not influenced by pruning. In general, the nutrients status are rather high as compared to earlier reports of lower N and K status of salak leaflets of about 1.5% and 1.0%, respectively (Hashim 1992). Hashim (1995b) also reported a lower N and K status of 1.77% and 0.84%, respectively.

Effect of pruning on the production of female inflorescences

The effect of pruning levels on the performance and production of the female inflorescences are shown in Table 4. The panicle number was significantly reduced with heavy pruning from almost 5 (9-frond level) to 3 (3-frond level). Heavy frond

pruning of salak palm is not recommended as it reduced the panicle number. In general, frond pruning at maturity leaving 7 and higher frond number is recommended with the optimum panicle production occurred at 9-frond level. In addition, heavy pruning (3-frond level) resulted in significantly shorter panicles (207 mm) as compared to the control (328 mm) or minimum pruning (333 mm). Inflorescence girth and length also reduced significantly with heavy pruning. The inflorescence girth reduced significantly from 27 mm in the control to 22.5 mm in high pruning levels. While the inflorescence length reduced significantly from 72 mm to 51 mm with heavy pruning.

Heavy pruning resulted in lower female panicle production, smaller and shorter inflorescences as compared to the control or light pruning. Therefore, heavy pruning is not recommended in local salak cultivation.

Minimum pruning, leaving 9–12 fronds is therefore preferable to get higher panicles production, bigger and healthy inflorescences.

Effect of pruning on the growth of male inflorescences

The effects of frond pruning levels on the performance of the male inflorescences are shown in *Table 5*. Results showed that panicle number, panicle length and inflorescence number did not show any definite pattern with the pruning levels. The pruning levels did not significantly affect the male inflorescence performance and production. However, pruning levels seemed to show significant effect on the length of the inflorescences. The higher pruning levels reduced the inflorescence length. However, minimum pruning at 12-frond level increased the inflorescence length.

Table 4. Effect of pruning on the production and quality of female inflorescences

Frond no.	Panicle no.	Inflorescence no.	/ Inflorescences		Panicle length (mm)
			Girth (mm)	Length (mm)	
3	3.0b	23.4a	22.57c	51.09b	206.80b
5	4.0ab	11.64a	23.16bc	56.78b	247.18ab
7	4.73a	18.13a	23.55bc	54.00b	268.13ab
9	4.91a	14.91a	24.16abc	64.77ab	298.55ab
12	4.50a	16.86a	26.07ab	71.83a	333.29a
Control	4.54a	16.46a	27.02a	72.59a	328.62a

Mean values in the same row with the same letters are not significantly different at $p < 0.05$ using DMRT

Table 5. Effect of pruning levels on the performance and production of male inflorescences

Frond No.	Panicles		? Inflorescences		
	Number	Length (mm)	Number	Width (mm)	Length (mm)
3	4.44a	372.89ab	50.56a	18.36a	71.93a
5	4.33a	274.42b	43.42a	18.69a	76.23a
7	4.86a	417.50a	57.00a	18.21a	86.26a
9	4.00a	327.00ab	54.14a	19.21a	87.79a
12	4.00a	428.64a	49.64a	18.70a	135.86a
Control	4.73a	436.00a	58.53a	9.34a	94.88a

Mean values in the same column with the same letters are not significantly different at $p < 0.05$ using DMRT

Conclusion

The pruning levels imposed on salak palm significantly affected the vegetative and reproductive growth of salak palm. However, the different pruning levels did not significantly affect the macronutrient status of the palm. The effect of pruning levels on the performance and production of the female inflorescence showed that the panicle number reduced significantly with heavy pruning and produced shorter panicle as compared to the control or minimum pruning.

Nevertheless, the female inflorescence number did not show any definite pattern with pruning levels. Female inflorescence girth and length were reduced significantly with heavy pruning. While pruning levels did not significantly affect performance and production of male inflorescence except on the inflorescence length. Higher pruning levels reduced the male inflorescence length.

In general, over pruning of frond reduced vegetative growth, lower female panicle production, produced smaller and shorter inflorescence as compared to the control or minimum pruning.

In summary, frond pruning of salak palm is recommended to help in the general field maintenance of the farm. Frond pruning at seven and higher frond numbers resulted in better vegetative palm growth. However, minimum pruning, leaving 9–12 fronds was recommended to get higher panicle production, bigger as well as healthy inflorescences.

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Abstrak

Kajian kesan pemangkasan pelepah terhadap pertumbuhan vegetatif, kandungan nutrien di dalam daun serta pengeluaran bunga jantan dan betina bagi salak tempatan (*Salacca glabrescens* Griff) telah dikaji di Stesen Penyelidikan MARDI Jerangau sejak tahun 1990. Aras pemangkasan pelepah mempengaruhi (secara bererti) semua parameter yang dicatat termasuk tinggi pokok, lilitan pelepah, bilangan anak daun dan panjang pelepah. Walau bagaimanapun aras pemangkasan yang berbeza tidak mempengaruhi (secara bererti) kandungan nutrien utama di dalam anak daun.

Kesan pemangkasan terhadap prestasi dan pengeluaran jambak bunga betina menunjukkan bahawa bilangan jambak berkurangan (secara bererti) dengan pemangkasan yang berlebihan berbanding dengan kawalan. Walau bagaimanapun bilangan bunga betina tidak menunjukkan bentuk tertentu kesan daripada pemangkasan. Lilitan dan panjang bunga betina juga berkurangan (secara bererti) dengan kesan pemangkasan pelepah yang berlebihan. Manakala aras pelepah tidak mempengaruhi (secara bererti) prestasi dan pengeluaran bunga jantan kecuali panjang bunga jantan, dengan aras pemangkasan tinggi mengurangkan (secara bererti) panjang bunga jantan.

Pada umumnya pemangkasan yang berlebihan mengurangkan pertumbuhan tampang pokok, menghasilkan bilangan jambak bunga yang rendah, lebih kecil dan lebih pendek berbanding dengan kawalan atau pemangkasan minimum. Walau bagaimanapun, pemangkasan pelepah perlu dilakukan pada tanaman salak kerana ia banyak membantu dalam pengurusan peringkat ladang. Pemangkasan dengan meninggalkan tujuh atau lebih pelepah menghasilkan pertumbuhan yang lebih baik berbanding dengan bilangan pelepah rendah. Manakala pemangkasan minimum, dengan meninggalkan 9–12 pelepah adalah lebih baik bagi mendapatkan pengeluaran bilangan jambak bunga yang lebih banyak, lebih besar dan lebih sihat.