

RESEARCH NOTE

Effect of Sago Palm (*Metroxylon sagu* Rottb.) Maturity on Sucker Food Reserve and Survivability during Nursery Stage

PETER STANLEY HOWELL*¹, PETRUS BULAN², NUR ASHIKIN PSYQUAY
ABDULLAH², NORAINI BUSRI¹ & MAKE JIWAN²

¹CRAUN Research Sdn. Bhd, Lot 3147, Block 14, Jalan Sultan Tengah, 93055 Kuching, Sarawak, Malaysia; ²Universiti Putra Malaysia Kampus Bintulu, Jalan Nyabau, Peti Surat 396, 97008 Bintulu, Sarawak, Malaysia

*Corresponding author: ps_howell@yahoo.com

ABSTRACT

Sago palm (*Metroxylon sagu* Rottb.) which accumulates starch in its trunk can be propagated through suckers which are normally nursed for at least six months before planting them to the field. Using suckers had been long practiced by local sago farmers as it is the most reliable source of planting materials for sago cultivation. However, effective and efficient sago suckers selection and extraction methodology had yet to be documented. The objective of the study was to determine the effect of sago palm maturity that influences the sucker food reserve availability and survivability during nursery stage. Sucker survivability was recorded from the observation and monitoring on nursed suckers using polyethylene nursery bag for six months. Chemical analysis on the sucker's rhizome for sugar and starch content were determined using Anthrone and Somogyi-Nelson method, respectively. The result showed that sucker derived from mature mother palm have higher survival rate of 82.5 % than those from young mother palm with only 45% during nursery stage. Chemical analysis on the rhizome for sucker from mature mother palm showed higher percentage of starch and sugar with 29.21% and 4.38%, respectively as compared to suckers from young mother palm with only 9.37% starch and 3.92% sugar. The result showed that sago suckers derived from mature mother palm have higher food reserve stored in their rhizome for roots and leaves development which was critical for their survivability. This outcome strongly suggested that only sago suckers from mature mother palm are suitable to be selected as planting material than those from young mother palm.

Keywords: Food reserve, nursery stage, palm maturity, sucker survivability

Sago palm (*Metroxylon sagu* Rottb.), which belongs to the Arcaceae family, is largely cultivated for the starch in its trunk. It is found to grow vigorously in the coastal region and flood plains of rivers in the swampy area of southern Thailand, Peninsula Malaysia, Borneo, Indonesia, central and southern Philippines, New Guinea and the Solomon Island. The ability of sago palms to produce suckers and seeds gives sago palms the advantage as a commercial starch producing palms. Propagation of sago by using sucker had been long practiced by farmers (Schuiling & Flach, 1985; Jong, 1995) and usually nursed on a bamboo rafts floated beside river banks and well-drained canal or nursed in a polyethylene nursery bag for about six months before it is ready for field planting. Having the potential as commercial starch producer, sago palm has been planted at large scale in Sarawak which require

high number of planting materials.

Demand for planting materials for supplying large sago plantations have increased tremendously resulting in improper selection and extraction of sago suckers. This resulted in high mortality of sago suckers experienced by sago plantations and farmers during nursery stage.

Omori *et al.* (2002) reported that starch content in sucker's rhizome was observed to reduce during nursery stage. This suggested that sucker utilized food reserve in the form of starch stored in the rhizome for early development of roots and leaves. It was also showed those suckers need to store adequate amount of food reserve in the rhizome while attaching to the mother palm. Normally suitable sago suckers were extracted from harvested trunking palms or prior to harvesting to avoid any negative effect

on the yield of the mother palm (Schuiling & Flach, 1985). This study was conducted to determine the influence of sago mother palm maturity on the availability of food reserve and survivability during nursery stage. The outcome of this study can provide the basis for the determination of standard procedures for sucker selection and extraction to improve survivability during nursery stage.

Materials – Suckers extracted from mature and young sago mother palm were used for the study. Mature mother palm is a sago palm that reached the maximum trunk formation or harvesting stage (Figure 1(a)), while young mother palm is a sago palm that have not reached any trunk formation or still in the early trunking stage (Figure 1(b)). Only suckers having L-shaped rhizome and girth size in the range of 30 to 35 cm were used (Figure 1(c)) because these are the characteristics normally chosen by local sago planters.

Sucker survivability – Suckers extracted from different mother palm growth stages were trimmed and planted in a 38 cm x 20 cm polyethylene nursery bag using the mixture of peat and mineral soil at ratio of 2 to 1. Planted suckers were arranged in Randomized Complete Block Design (RCBD) with three replicates and nursed under 30% shade for a period of six months. Monthly monitoring and recording for survivability and growth performance was done for the period of six months.

Food reserve determination – Rhizome (Figure 2) from suckers extracted from different

mother palm growth stages were trimmed, cleaned and sliced into smaller pieces and dried at 60°C until constant weight was attained. The dried samples were then made into fine powder and analysed for the determination of total starch and total sugar content.

Total sugar and starch content were determined using Anthrone method and the Somogyi-Nelson method as mentioned by Parthiban *et al.* (2011).

Data analysis – Analysis of variance (ANOVA) using Statistic Analysis System software version 9.3 (SAS 9.3) was used to analyse collected data for rhizome food reserve determination. Duncan New Multiple Range Test (DNMRT) at $P = 0.05$ was used for means comparison.

Sucker survivability – Early development of leaves was observed as a spear-like structure as early as two weeks after planting and a fully developed frond was observed at the end of the second month. The survival rate for the period of six months was shown in Figure 3.

All suckers survived in the first month with the early development of a new frond but the survival rate started to decrease in the second month with 92.5% and 90% for suckers from mature and young mother palm, respectively. The survival rate of the suckers from mature mother palm showed a steady rate of 92.5% after which it dropped to 82.5% in the fifth month but maintained the same survival rate until the end of the study. However, the survival percentage of the suckers from young mother



Figure 1. Different sago palm growth stages (a) mature mother palm, (b) young mother palm and (c) extracted sago suckers. Photo credit: © CRAUN/Peter Stanley.

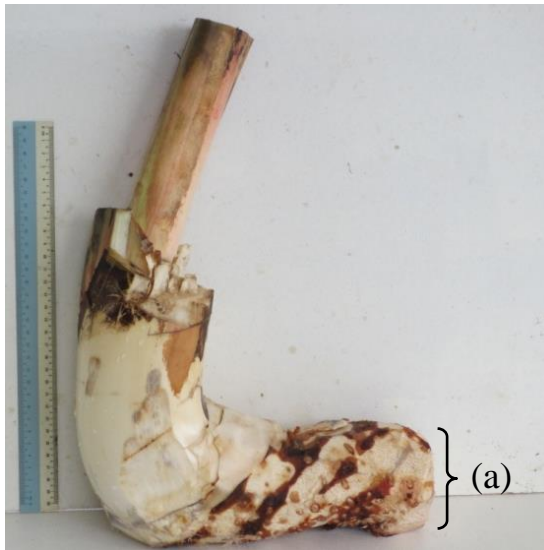


Figure 2. Rhizome section (a) used for total starch and sugar content determination.

palm generally decreased with increasing month to 45% at the end of the sixth month.

The results showed that suckers collected from mature mother palm showed better survivability compared to those of the young mother palm. High survival rate during nursery stage as shown by suckers from mature sago palm, demonstrated that these suckers were mature and physiologically well prepared to grow independently and should be able to form a new sago cluster as also recommended by Schuiling and Flach (1985).

Food reserve determination – The percentages of total starch and total sugar in the rhizome were shown in Table 1. The total starch content in the rhizome of suckers from mature

mother palm was significantly higher with 29.21% than those from young mother palm with only 9.37%. Higher starch content in the rhizome indicated that suckers from mature mother palm had been fully supplied with adequate amount of food reserve to enable it to survive and grow independently when separated from the mother palm. High food reserve in the rhizome provided optimum energy and biomass which were critical for the development of new leaves and roots. This result was consistent with the findings by Schuiling and Flach (1985), Omori *et al.* (2002), Bintoro (2011), and Irawan *et al.* (2011) who reported that adequate starch reserve in the rhizome is essential for the optimum development of roots and leaves before autotrophism took over for the synthesis of needed energy for further development. High mortality rate experienced by suckers from young mother palm during nursery stage, might be best explained by the earlier exhaustion of food reserve in the rhizome even before roots and leaves were fully developed and functioning.

On the other hand, there was no significant difference for total sugar content in sucker’s rhizome from both mature and young mother palm with 4.38% and 3.92% respectively. Sugar present in the rhizome might be synthesized from the previous photosynthesis activities before being separated from the mother palm or from the earlier breakdown of starch. The presence of sugar in the rhizome even in a small amount as compared to starch, did not suggest the insignificant of sugar for sucker survivability. Sugar might not be the main food reserve, nevertheless it was the first

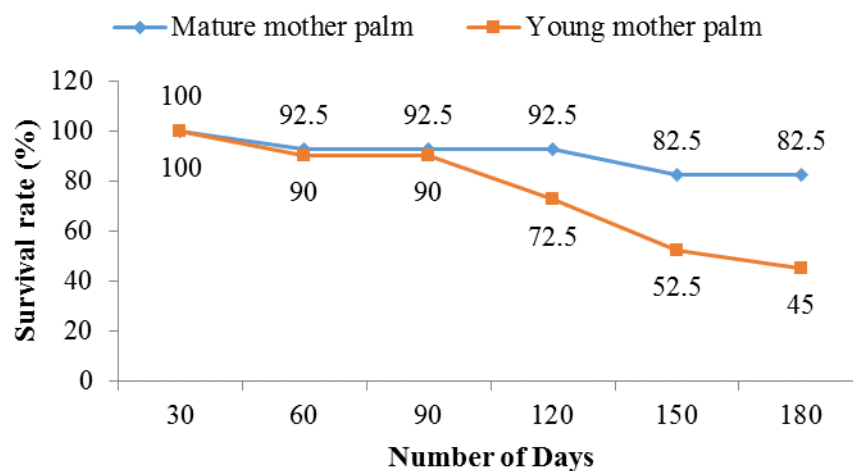


Figure 3. Survival percentage of suckers from mature and young mother palm nursed for six months.

Table 1. Mean percentage of total starch and total sugar content from the rhizome of suckers from different mother palm maturity.

Sago mother palm	Total starch (%)	Total sugar (%)
Mature	29.21a ± 2.96	4.38b ± 0.35
Young	9.37b ± 1.66	3.92b ± 0.76

Note: Mean value ± standard error. Values followed by the same alphabetical letters by column indicates the absence of a significant.

carbohydrate to be utilised for metabolism and early development of new leaves and roots.

The outcome of the study showed that suckers extracted from mature mother palm have adequate starch and sugar stored in their rhizome which enables them to survive and fully developed their roots and leaves during nursery stage. The results strongly suggest that sucker from mature mother palm should be recommended as the source of suitable planting materials. Nevertheless, future study should be conducted to determine the survivability of suckers of different size and shape of rhizome which may further improve the suckers' selection and extraction methodology for vegetative propagation.

ACKNOWLEDGEMENTS

We sincerely appreciate the support from the management of CRAUN Research Sdn. Bhd. for the usage of nursery and assisting in the chemical analysis for the completion of the study.

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