Transplanted Sucker Stem Growth in Sago Palm (*Metroxylon sagu* Rottb.) Before Trunk Formation

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Abstract

Sago palm sucker stems transplanted in fields creep along the ground surface during a rosette stage, later forming a vertical trunk. Many suckers grow at the stem bottom before trunk formation. Thinning and pruning of suckers, known as sucker control, is extremely important to maintain an appropriate density of trunks and to produce much starch in sago plantations over time. Selection of suckers with consideration of the suckers' creeping growth is necessary to determine the appropriate spread of trunks in a field. Nevertheless, few reports describe the creeping growth of sucker stems. This study was undertaken to clarify the creeping growth of suckers transplanted in a field under sucker control before trunk formation. Suckers were transplanted in a field in Mukah, Sarawak, Malaysia on September 3, 2005. The plant density was 330 plants ha^{-1}. The growth of 12 suckers was monitored and the sucker stem lengths were measured every year during 2008–2011. The average stem lengths were 74.2 ± 4.7 cm and 155.3 ± 6.3 cm, respectively, at 1,201 days and 2,120 days after transplantation. The length increased linearly at 31.5 cm $year^{-1}$ ($Y = 0.0862X - 25.301$, $r = 0.993$, $P < 0.001$, where Y is the stem length and X is the days after transplanting). Each year, 10.5 leaves expanded. Although sucker growth differs among soil types, regions, and varieties, the information collected in this study is expected to be useful for predicting the trunk position.

Keywords: creeping growth, sago palm, stem, sucker, sucker control

Introduction

Sago palm sucker stems transplanted in fields creep along the ground surface during a rosette stage, later forming a vertical trunk. Many suckers grow at the stem bottom before trunk formation. These suckers derive carbohydrates from the mother palm, the transplanted sucker, until the photosynthetic apparatus is sufficiently developed and absorbs enough sunlight (Flack, 1977). Emergence and growth of many suckers at the stem bottom are expected to exacerbate competition between the suckers and their mother-palm for nutrition from soil because of their proximity. For that reason, the mother-palm growth might be suppressed. Reportedly, the rate of leaf emergence of non-controlled suckers is significantly lower than that of controlled suckers during the first five months of growth (Nakamura *et al*., 2009). Consequently, thinning and pruning of suckers, known as sucker control, is extremely important to promote the growth of mother palm, to maintain an appropriate density of trunks, and to maintain higher starch productivity in sago plantations over time. Selection of suckers with consideration of the suckers' creeping growth is therefore necessary to determine the appropriate spread of trunks in a field. Nevertheless, few reports describe the creeping growth of sucker stems. This study was undertaken to clarify the creeping growth of suckers that had been transplanted in a field, with sucker control applied before trunk formation.

Materials and Methods

Suckers were transplanted in a field in Mukah (N 02°56'31", E 112°18'26"), Sarawak, Malaysia on 3 September 2005. The plant density was 330 plants ha^{-1}; the plant mean area was 30.5 m^{-1}. The growth of 12 suckers was monitored: the sucker stem lengths were measured each year during 2008–2011. The transplanted sucker stem length was defined as the distance from its end to its shoot apex, which was covered with thick leaf sheaths. We were able to monitor their growth. Therefore, the shoot apex position was estimated from anatomical features of young sago palms sampled in the same field in 2008 (Figure1). The leaves of suckers were marked for monitoring using a marker pen. The number of expanded leaves was recorded. The number of their green leaves was also recorded each year.

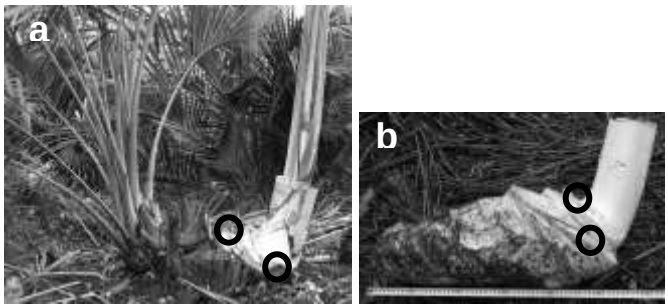

Figure 1. Mother palm sampled in the field in 2008 (a) and its stem, from which leaf sheaths were removed (b). Circles show the estimated position of the shoot apex.

Results and Discussion

All transplanted suckers grew well during 2005-2011 (Figure 2). The average stem lengths were 74.2 ± 4.7 cm and 155.3 ± 6.3 cm, respectively, at 1,201 days (17 December 2008) after transplanting (1,201 DAT) and 2,120 DAT (24 June 2011) (Figure 3), which suggests that the length increased linearly at 31.5 cm $year^{-1}$ ($Y = 0.0862X - 25.301$, $r = 0.993$, $P < 0.001$, where Y is the stem length and X is the DAT). The stem length was observed to increase gradually, probably increasing exponentially until the start of linearly incremental extension of the stem length (Goto *et al*., 2010). Because some suckers that start trunk formation were observed at 1,201 DAT, the rate of creeping growth of sucker is expected to decrease. The final stem length is reached soon thereafter.

Figure 2. Mother palm, of which the stem has been creeping, at 2,120 days (in 2011) after transplantation.

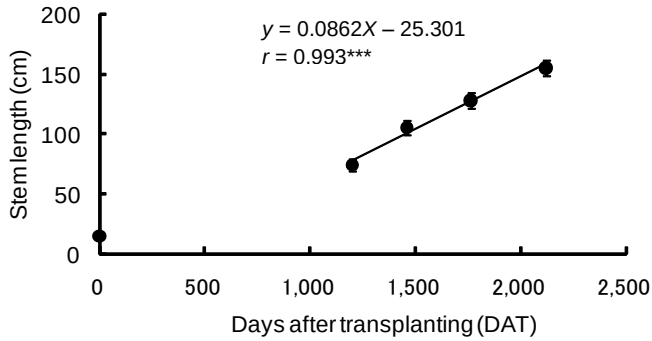

Figure 3. Stem length of the sucker after transplanting. Vertical bars represent standard errors.

The average numbers of living leaves of the suckers were 16.0 ± 0.6 and 11.2 ± 0.5, respectively, at 1,201 DAT and 2,120 DAT (Figure 4). The green leaf number tended to decrease, although the total and each area of leaves increased. It was observed that the size of leaves and the number of leaflets at 2,120 DAT was greater than those at 1,201 DAT. Results of leaf position data showed that 26.5 new leaves expanded from 1,201 DAT to 2,120 DAT, suggesting that 10.5 leaves expanded each year.

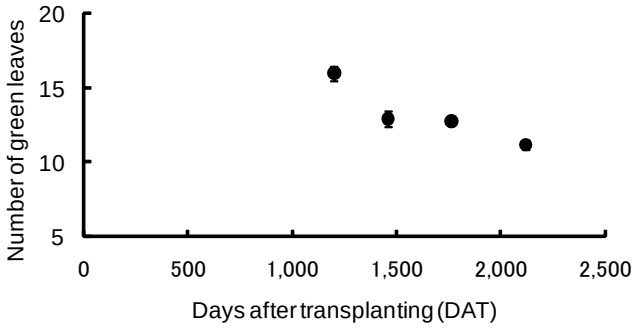

Figure 4. Number of green leaves of the sucker after transplanting. Vertical bars represent standard errors.

Conclusions

In conclusion, the rate of creeping growth of sucker stem in a field was specified after transplantation by monitoring the stem length. Although sucker growth is expected to differ among soil types, regions, and varieties, the information collected in this study will be useful for predicting the trunk position in a field.

Acknowledgements

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