

MARKER ASSISTED SELECTION CHARACTERS FOR HIGH PRODUCTIVITY OF SAGO PALM (*Metroxylon sagu* Rottb.)

Yeni Rahayu*, Fitmawati, and Herman

Department of Biology, Faculty of Mathematics and Science

University of Riau, Pekanbaru. Riau. Indonesia

*Writer for correspondency: riinayu@yahoo.com

ABSTRACT

In the sago plantation, high production plants are preferred, and then the selections of seedlings are done to sustain the productivity. This paper reports a study of the correlation between some of the vegetative characters with the productivity of sago palms. This study aims to determine the characters of the marker assisted selection of sago with high productivity. The twenty-five morphological and agronomic characters of spiny and spineless sago were analyzed. The result showed that several characters were correlated to each other and one of the characters is the color of shoot sago seedlings were positively correlated with length of trunk and number of leaflets. The color of shoot sago seedlings thought to be a selection marker of superior sago in the future.

Key words: Marker assisted selection, *Metroxylon sagu* Rottb., sago palm, spineless sago, spiny sago, color, sago seedlings.

INTRODUCTION

Riau Province is a large of sago starch-producing areas in Indonesia. Local people, as well as a material for noodle and traditional cakes still consume sago starch. Sago plantation areas are often found in around the islands and it is the main economic sectors of Riau coastal society, such as in Padang Island, Meranti Archipelago.

In the sago plantation, high production plants are preferred. Selections processing of sago seedlings are done to sustain the productivity. The character is commonly used as selection of the sago seedlings liked the size of the suckers. The suckers, which are the larger one, are more preferred because it has a larger percentage of survival rates (Irawan *et al.*, 2011). However, its character does not guarantee the higher productivity of mature plants. Because of this condition, exploration on the marker characters for the superior sago selection needs to be done. This study aims to determine the characters of the marker assisted selection of sago with high productivity.

MATERIALS AND METHODS

Fieldwork in Padang Island was conducted from January 2011 to March 2012. The nineteen samples of spiny sago, spineless sago and a hybrid palm who called sago “sengke” were collected using a random sampling method. Individuals of sago palms were only sampled if they were in the initial stage of flowering (‘nyorong’), to produce comparable results (Kjaer *et al.*, 2004; Barahima, 2006). Samples of leaves, midribs and pieces of the pith stem brought to the botany laboratory, University of Riau for further analysis. The twenty-five morphological and agronomic characters were observed and analyzed of correlation with Minitab software, version 14.

RESULTS AND DISCUSSION

The results of morphological and agronomic characterization of 19 individuals of Sago (*Metroxylon sagu* Rottb.) from Padang Island was found three variations of sago palm. There are

spiny sago which the local name is '*duri*', spineless sago which the local name is '*bemban*' and '*sengke*' sago (Figure 1). The population of spiny sago mostly found on the small islands, while spineless sago can be found up to the mainland of big islands. The '*Sengke*' is a wild type sago palm varieties that evolved from natural hybrid of spiny ('*duri*') and spineless ('*bemban*') sago. Because of that, its presence was rare if compare with two parentals population that evolved by clones.

Presence and absence of spines on the midrib used as main character that made difference between the three types of sago. The '*duri*' have a high density of spines, the spines size up to 10 cm long with pointy tip and '*sengke*' have short spines measuring 0.5 to 2 cm long with a blunt tip, whereas '*bemban*' have no spines on the midrib (Figure 2).

The correlation analysis showed that there are several characters were highly intercorrelated (Table 1), and the superior ones of the characters is the color of shoot sago seedlings. The color of shoot sago seedlings was correlated with the number of leaflets and height of trunks with the level of confidence of 93%. It found in spiny sago and correlated with almost all of spines characters (except the density of spines). There are two variations of shoot sago seedlings, which are red shoots and the green ones (Figure 3).

The individuals of sago with red shoots seedlings have more number of leaflets (over a hundred pairs per midrib) and the trunks grow higher than the green ones. The more number of leaflets support greater sustainability of photosynthesis. Thus, the growth of trunks becomes optimum (shown with the height of trunks) and allows for accumulation of the starch is also greater. It means, the color characteristic of shoot seedlings could be a marker selection of superior sago, which has a high productivity.

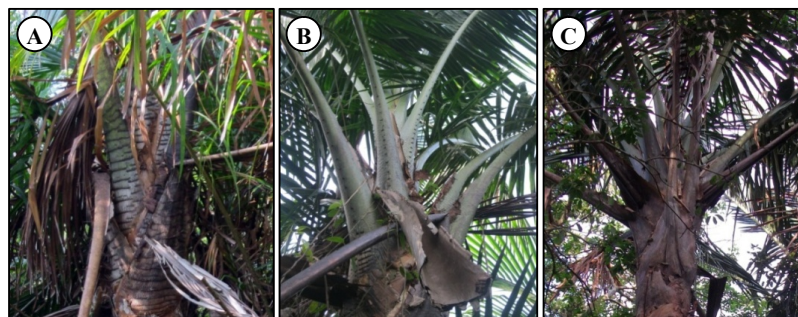


Figure 1. The variation of sago in Padang Island; A = spiny sago ('*duri*'), B = '*sengke*' sago and C = spineless sago ('*bemban*').

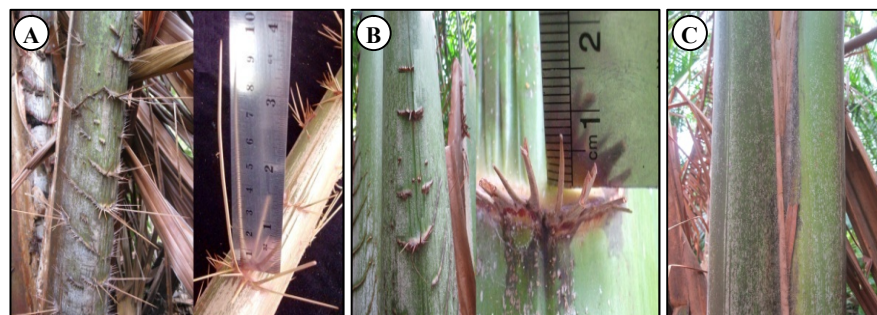


Figure 2. The character of spines. A = long spines with pointy tip in '*duri*' cultivar, B = short spines with blunt tip in '*sengke*' varieties, and C = spineless in '*bemban*' cultivar.

In the field observed, the sago palms that have more number of leaflets formed a random pattern of spines at the base of midrib, while sago palms that have a small number of leaflets formed patterns of spines as like as triangles or straight at the base of midrib, and some of them are spineless sago (Figure 4). Accordingly, the selection of sago seedlings in the future can be done using the character of red shoot seedlings, especially from the spiny sago and be specific which has a random pattern of spines at the base of the midribs.

Table 1. The Pearson's correlation between the color of shoot sago seedlings with the other characters of sago in Padang Island.

	HT	CSS	NL	S	SP	SA	PSBM	SD	SS	DSG
HT	1	0,61	-	-	-	-	-	-	-	-
CSS		1	0,72	-	0,61	0,74	0,81	-	0,68	0,62
NL			1	-	-	-	0,65	-	-	-
S				1	0,89	0,94	0,93	0,85	0,90	0,83
SP					1	0,88	0,77	0,66	0,77	0,81
SA						1	0,93	0,71	0,88	0,9
PSBM							1	0,73	0,87	0,81
SD								1	0,76	-
SS									1	0,75
DSG										1

Codes: HT (the height of trunks), CSS (the color of shoot sago seedlings), NL (the number of leaflets), S (spines-the presence of spines), SP (spines position in the midribs), SA (the spines arrangement), PSBM (pattern of spines at the base of midrib), SD (spines density), SS (the sizes of spines), DSG (the direction of spines growth).



Figure 3. The color variations of shoot sago seedlings; the red shoots (left) and the green shoots (right).

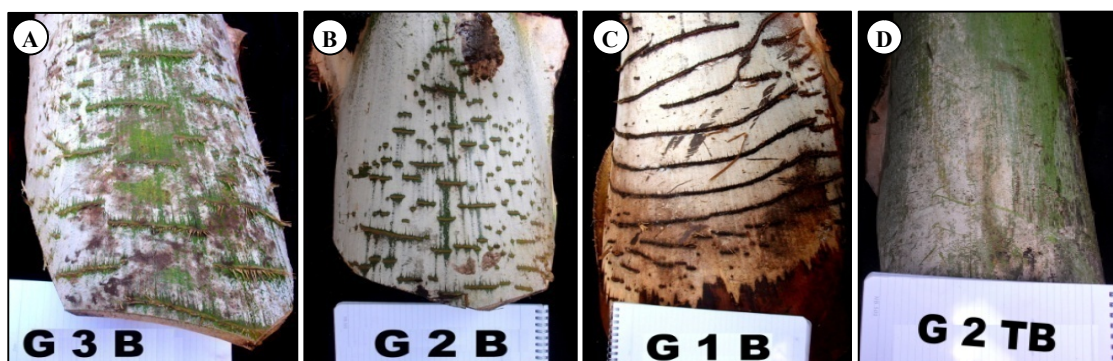


Figure 4. Pattern of spines at the base of midrib; A = random pattern, B = pattern liked triangles, C = straight pattern, and D = midrib of spineless sago.

The analysis also showed a significant correlation from all of the spines characters. The individual, which has spines position is only on one side in the midrib, has a vertical spines arrangement, while individual, which has spines position around the midrib, has random spines arrangement, commonly.

CONCLUSIONS

The color of shoot sago seedlings correlated with several other characters related to productivity, like the number of leaflets, the height of trunks and spines.

The red shoot of sago seedling can be proposed as marker assisted selection characters, so it can be useful in the assortment of superior sago seedlings and increase productivity of sago palms harvest.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the support for this study provided by the CSR Kondur Petroleum SA. and POKJA Merbau, Padang Island, Meranti Archipelago.

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