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SEARCHING FOR WEST SUMATRAN SAGO AS ALTERNATIVE SOURCES OF FOOD

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Abstract

West Sumatra is one of major sources of sago germplasms. However, human-made disturbance to the environment and pest and diseases attacks have resulted in genetic drifting of sago which will be a serious loss for the plant breeders to make up new genotypes. Information on types and characteristics of sago plants in West Sumatra has not been reported yet. Research to collect information on various types of sago and their relationship in all municipalities in the Province of West Sumatra has been carried out from April to November 2009. As much data on sago plant morphological characteristics were collected including leaf shape, leaf colour, leaf length, leaf width, spine colour, spine length, spine position, diameter of trunk, fruits, and flowers. Results indicated that various types of sago plants found in West Sumatra as demonstrated by the petiole and leaf sheets. The petioles differ in colour, lines and line colour in the middle of the petiole, and the spine on the petiole. Variations in the colour and size of the leaves distance between leaflets, leaflet tips, and leaf spines were also recorded. Sago plant leaves vary around 240 – 940 cm length with 80 – 180 leaflets. The size of leaflets varies around 42 – 170 cm length and 6 – 11 cm width.

Keywords
Sago, characteristics, morphological, West Sumatra.

INTRODUCTION

Sago is one of the most important food sources for its high starch content and being the highest-producing starch. One sago plant may produce up to 200 kg sago per year and equivalent to 20 – 25 t/ha/year (BPPT, 2007a). Sago has been used not only in food industry such as noodles and crackers but also in making papers, textiles, and cosmetics. It also included in large-scale industries such as bio-ethanol, high-fructose-content syrup, and biodegradable plastic (Flach, 1997). Sago leaves have been used for making roof and the petioles are woven to produce wall for houses in villages throughout Indonesia (Haryanto and Pangaloli, 1992).

Indonesia produces sago as much as 200,000 tons per year that is only about 5% of the national sago potential. This low figure is not surprising for a relatively simple and traditional ways of sago processing by local farmers. In fact, the way farmers slash the sago trees is alarming its sustainability. An increase in the utilization and market demand on sago starch has resulted in serious exploitation of sago plants. However, this practice is not followed by an effort for land rehabilitation and improvement. This problem has been occurring for decades leading to genetic drifting of some sago accessions with high production potential. Indonesia has approximately 1.25 millions hectares of sago forest in Papua and Moluccas and 148,000 ha of semi-cultivated sago farm in Riau islands, Mentawai, Sumatra, Kalimantan, Sulawesi, Papua, and Moluccas. All these sago forest and farms are the biggest in the world (BPPT, 2007b).

Sago plants grow naturally in their niche. Human intervention to improve the growth and development of sago is not yet serious as to other starch producing plants. An intensive cultivation of sago plant is necessary to improve the growth and development of the plants to achieve optimum content of the starch. This can be achieved through providing good quality of propagules (Haryanto and Pangaloli, 1992). Suckers are the most common form of propagules in sago propagation and give a quite uniform plant growth. However, this method of plant propagation can not be applied in commercially-large-scale farms as the number of suckers around the mother plants is limited. Besides, one sago sucker is 2 – 5 kg weight that becomes another constraint in its transportation form the nursery to the field. Therefore, an alternative method to produce propagules must be sought.

Plant genetic drifting, including sago, will be a serious loss for the plant breeders. Gene(s) of desired characteristics is required to make up new plant varieties. Isolation and identification of desired gene(s) from sago germplasms are prerequisite for genetic characterization of the plants. Biodiversity of plant species can be demonstrated by genetic relationship within the species. The characterization of germplasms can be identified through various approaches including morphological, biochemical, and molecular (DNA).

Each species uses its own identifying call during the breeding season, so distinctive in combination with habitat choice as to leave little room for mistakes and the creation of hybrids. The possibility of error has no limit, and so intrinsic isolating mechanisms are endless in variety (Wilson, 1992). Sago plants are grouped into plants that set flower once only in their life time and the plants that set flower twice or more in their life cycle (Haryanto and Pangloli, 1992). Morphological characteristics have been used as practical and relatively accurate clues to identify various genotypes of sago plants in their niche. The morphological characteristics that usually used are trunk height and diameter, the number of leaves, the number of petioles, rachis length, and the amount of leaflets. Trunk height has high

diversity (CV > 20%) though other aforementioned vegetative characteristics has quite low diversity (CV < 20%).

West Sumatra has been known to be one the major centers of sago germplasms in Indonesia. People in this province do not consume sago as their stapple food except in Mentawai islands. Sago plants grow naturally in their niche and human go to the sago forest to harvest the plants. This practice has been going on for decades without any effort to replanting. Consequently, the population and diversity of sago germplasms is endangered to extinct. Urban development, yet is another threat for sago ecosystem. People cut down the sago trees and build houses and business compounds to satisfy human's need while at the same time reducing sago population in a short period of time.

In this article, we reports on our works in collecting information on various types of sago and trying to find the relationship through morphological characteristics in all municipalities in the Province of West Sumatra. This is a preliminary study in our efforts to collect as much information on morphological and genetic characteristics of West Sumatran sago germplasms that, in the long run, can be used to produce good quality of sago plants.

MATERIALS AND METHODS

Research has been carried out in all areas where sago grow in the Province of West Sumatra form April to November 2009. Exploration of sago plants and recording as much morphological characteristics has been conducted in areas where sago plants are abundant and their niche is naturally undisturbed. The characterization was conducted in the field via observation, measuring, and comparing sago genotypes. The observations included the whole plant, trunk, leaves, inflorescence, and fruit characteristics. All plant or plant part characters observed were measured and photographed for the purposes of comparing and analyzing their genotype relationship.

RESULTS

Visual observations in some municipalities have revealed that there are some morphological variations within the sago genotypes. Sago leaves, specially the petioles and laminates being the key determinant for the variation. Some sago plants have spines along the petioles while others do not. Heyne in 1950 *cit.* Notohadiprawiro dan Louhenapessy (1992) proposed that genuine sago plants are grouped according to the spines along the petioles. Sago plants with spines included *Metroxylon rumphii* Mart. being the major type in this group, and *M. longispinum* Mart., *M. micracanthum* Mart., *M. sylvester* Mart. Deinum (1948) stated that *M. elatum* Mart. dan *M. filare* Mart. are of this group. Non-spinal petiole is from *Metroxylon sagus* Rottb. which has been a sago species people harvest. The spines are also varied in colour, distance from each others, and length of the spines (Figure 1). Figure 1a shows spines colour of light red with short distance one to another, Figure 1 b shows grey spines and more spatious than ones in Figure 1 a, and light brown spines densely sit along the petioles.

Figure 1. Spines on the petioles of sago leaves

Variation is also found on the color of the base of leaf blade. It is obvious that the base of leaf blade is green but we found some leaves with light red lines at the base (Figures 2 a & 2 b).

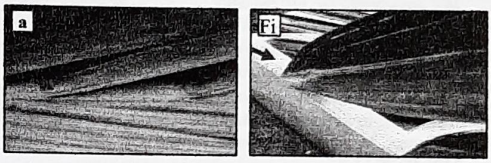

Figure 2. Sago leaves with different color of leaf base

Although some variations were found within sago leaves in all areas, we found some similarities such leaf tips (sharp and pointing), leaf shape (blade-like), leaf base (rounded), leaf position (crossing but facing each other), and the shape of leaf nerves (parallel). Two types of leaf surface are recorded i.e. smooth and slightly coarse. Leaf color varies from light green, green, and dark green.

The shape of sago trunk is relatively similar that is round with coarse surface (Figure 3). However, we found variation in the color such brown, reddish brown, yellowish brown, and light brown with diameter ranging from 56.6 – 195 cm.

Figure 3. The trunks of sago plants

All sago plants found in West Sumatra can be classified into genuine sago as they set flower only once in their life cycle. Sago from this group will die following the set of flowers and fruits and defoliation.

CONCLUSION

- There are variations in the morphological characteristics of sago plants in West Sumatra, particularly at the petiole and leaf blade.
- Some sago plants have spines at the petiole while others do not. Variations on the petioles were recorded at the color and other ornaments of the petioles, color, existence of lines and the color of the lines at the middle of the petiole, and spine length, color and density
- Sago leaves varies from 240 – 940 cm with 80 – 160 leaflets, leaflet length ranging from 42 – 170 cm and 6 – 11 cm width.

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