Performance of Coconut Hybrids Dwarf x Bido Tall
Penampilan Kelapa Hibrida Genjah x Dalam Bido

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ABSTRACT

The desirable future coconut variety characteristics should include (1) short trunk and low height increment, (2) early bearing, (3) high nut yield, and (4) high neera (coconut sugar sap). High yoelding but short coconut palm statures make it easy to harvest the nuts and tap the neera. The Dwarf coconut varieties are generally early bearing with a low height increment and plenty nuts per fruit bunch. The Bido tall coconut bears fruits as early as three years after planting and with high nut yield, a low height increment and a very short trunk. This study aims to evaluate early vegetative growth (2 – 3 years after planting) of eight coconut hybrids derived from combinations of Dwarfs x Bido tall hybridizations. The arrays of hybrid coconuts consisted of hybridization between three Dwarf coconut varieties by Bido tall generated in 2016, and those between five Dwarf coconut varieties by Bido tall generated in 2017. The KHINA-1 hybrid was used as the standard hybrid control. Results of the evaluation showed the evaluated Waingapu Red Dwarf x Bido tall hybrids have the highest stem girth and the highest plant height. On the other hand, Aromatic Green Dwarf x Bido tall hybrids showed the highest leaf numbers. However, all hybrid combinations showed the same stem girth diameter at two years after planting. At two and three years after planting, the Raja Brown Dwarf x Bido tall hybrids were the tallest, while the Nias Yellow Dwarf x Bido tall coconut hybrids have the highest leaf number. All of the Dwarf x Bido tall coconut hybrids showed good vegetative performance at two and three years after planting. The differences in early vegetative performances among the evaluated Dwarf x Bido tall might indicate the differences in early bearing, high nut yield and high neera characters of the hybrids.

Keywords: Coconut hybrid, short-trunked coconut, early bearing, high yielding, vegetative characters, Bido tall.

ABSTRAK


Kata kunci: Kelapa hibrida, kelapa batang pendek, cepat berbuah, produksi tinggi, karakter vegetative, Dalam Bido
INTRODUCTION

For Indonesian people, coconut is part of their life because all parts of the palm can be used to meet economic, social and cultural needs. Coconut area in Indonesia is around 3.59 million ha, with fruit production of 14.6 billion nuts in 2019. The widest distribution of coconut plants in Indonesia is 30.35% in Sumatra, followed by Sulawesi 22.49%, then Java 22.48%, Maluku and Papua 10.92%, Bali, NTB and NTT around 7.89%, and Kalimantan 5.87%.

In the early 1970s there was a decrease in coconut productivity, while the demand for cooking oil increased. To overcome this problem, the government of Indonesia has implemented various programs in order to increase copra production, among others, through the rejuvenation program for old and simile coconut palms and expansion of the area with hybrid coconut types. In order to meet the demand for hybrid coconut seednuts in large quantities and quickly, the government has introduced the PB121 hybrid coconut from Cote d’Ivoire. PB121 hybrid coconut is a cross between Malayan Yellow Dwarf x West African Tall (MYD x WAT), so it is also called MAWA hybrid coconut. In addition, hybrid coconut seed gardens were built in 11 Provinces of Indonesia with an area of 1,856 ha. The type of hybrid coconut produced is the Nias Yellow Dwarf x West African Tall (NYD x WAT), also known as the NIWA hybrid coconut.

The Indonesian government, through the Agricultural Research and Development Agency, produces local hybrid coconut called KHINA, which stands for Kelapa Hibrida Indonesia. KHINA hybrid coconut begins to produce at 3-4 years old, and the copra equivalent production is 4-5 tons / ha / year at the age of 10 years, the copra oil content is 64-65%. This hybrid coconut was released in 1984. There are three varieties of hybrid coconut KHINA, KHINA 1 (Nias Yellow Dwarf x Tenga Tall), KHINA 2 (Nias Yellow Dwarf x Bali Tall) and KHINA 3 (Nias Yellow Dwarf x Palu Tall). Pesik, et al., (2015) report that the estimation of the population structure using STRUCTURE software shows that the presence of high segregation and or recombination event among the KHINA-1 progeny, indicating there has been a mixture of genetic materials from NYD and TAT parents in the KHINA-1 hybrids. More accurate selection using molecular marker should aid the development of more productive coconut hybrids.

The production of MAWA and NIWA hybrid coconuts is low, and the fruit is small, and susceptible to bud rot and fruit fall disease caused by Phytophthora palmivora, and less tolerant to drought. KHINA-1, KHINA-2 and KHINA-3 hybrid coconuts are better than imported hybrid coconuts, namely PB121 / MAWA and NIWA from production and resistance to disease. The reduction in early fruit set in Dwarf x Tall coconut hybrids during heat and drought stressed periods can be minimized by using low/no stressed pollen, that were developed under favorable conditions during the final four months, to pollinate the stressed female flowers (Amarasinghe, et al., 2016). However, coconut farmers did not like it anymore when their coconut was rejuvenated with a hybrid coconut at that time. As a result, most community plantations have rejuvenated their families with local tall coconut. All coconut hybrid seed garden in Indonesia, including 14 locations for hybrid coconut seed gardens covering an area of 1,856 ha, were developed in 11 Provinces, which have been logged and their land converted to other crops, such as oil palm, cocoa, and coffee.

Recently the demand for coconut products, such as; VCO, cooking oil, desiccated coconut, coconut water, coconut milk, shell charcoal briquettes, coir fiber, cocopeat, and so on are starting to increase again, including demand from foreign markets. With the large number of overseas market demands for various coconut products, the passion to develop coconut has emerged, including the big entrepreneurs. Private plantations are starting to be enthusiastic again to build coconut plantations with the ultimate goal of developing an integrated coconut industry. The development of coconut plantations requires superior seednuts, and requested by the private sector is the seednuts of hybrid coconut varieties.

Sufficient availability of superior seednuts, especially hybrid coconut types, is still very limited, and has become a problem in coconut plantation development. In order to provide good superior coconut seednuts, available sufficiently as needed, and sustainably, it is necessary to develop a hybrid coconut seed garden. Until 2019, there are six hybrid coconut varieties had been released by the Ministry of Agriculture, namely KHINA-1 to KHINA-5 hybrid coconuts, and the last one released in 2019 was the HENGNIU hybrid coconut, which is the result of crossing the selected mother of the Bali Yellow Coconut (BYD) x Mapanget tall selfing results from generation 4 (MTT-S4). Consumers want hybrid coconut varieties, which besides bearing fruit quickly and producing high yields, also have short stems and are slow to grow become higher.
The results of exploration and observation of team researcher IPCRI in 2016-2017 found a unique coconut namely Bido tall on the island of Morotai, North Maluku Province, which began to bear fruit at the age of 3 years, plenty of fruit production, large fruit size, weight of coconut meat 550 gr / nut, very fast growth of young palms, high yield, and can be used for assembling hybrid coconut varieties that are early bearing fruit, high production, and short trunk.

In Malaysia, the breeding programme emphasized in the creation of Dwarf x Tall hybrids aimed at exploiting the large nut size from the tall and high nut number from the dwarf, for example: MATAG (Malayan Red Dwarf x Taganan Tall) (Arulandoo, et al., 2014). The study coconut hybrid in Vanuatu indicated that the yield performance of the SGD x VTT coconut hybrid was better than the tall coconut types including the local West African Tall (WAT) and compared favourably with the Malayan Yellow Dwarf crossed Vanuatu Tall (MYD x VTT) coconut hybrid (Dare, et al., 2010). The Genetic and Plant Breeding Division of the Coconut Research Institute of Sri Lanka launched a dwarf x dwarf hybridization programme aiming to develop a coconut cultivar suitable for urban home garden, while the home garden which are bigger than urban home garden are recommended the dwarf x tall hybrids (Perera, 2013).

Since 2016-2017, coconut hybrids have been carried out between the Dwarf x Bido tall. The purpose of this study is to evaluate the vegetative growth of 8 coconut hybrids of Dwarfs x Bido tall that has been aged 2 and 3 years after planting. It is hoped that several types of new hybrid coconuts will be obtained any kind of Dwarf x Bido tall which bear fruit at 3 years, the production of fruit, copra or sap and coconut sugar is high yield, and the performance of the stems is short and slowly gets higher.

MATERIALS AND METHODS

Assembling coconut varieties that have early bearing, high yielding, and short stems and slow to high is carried out through the selection and hybridization methods Dwarf x Bido tall coconut. The hybridization of Dwarf x Bido tall coconut is done in two phase. The first crossing is done in 2016 where are using three Dwarf varieties, namely: Bali Yellow Dwarf (BYD), Raja Brown Dwarf (RBD) and Nias Yellow Dwarf (NYD), and the control coconut hybrid is Nias Yellow Dwarf x Tenga tall or KHINA-1 (NYD x TAT). The hybridization is done in two location, which are Mapanget Experimental Garden for female palm of BYD, RBD, TTD, WRD, JGD and AGD, then at Paniki Experimental Garden for NYD and SGD. The second crossing is done in 2017 with using five Dwarf varieties, namely: Tebing Tinggi Dwarf (TTD), Waingapu Red Dwarf (WRD), Jombang Green Dwarf (JGD), Salak Green Dwarf (SGD) and Aromatic Green Dwarf (AGD). Male flowers of Bido tall coconut as a source of pollen are collected directly from selected Bido tall in Bido village, Morotai island, North Maluku Province, and the pollen of Tenga tall is collected from selected Tenga tall in Mapanget Experimental Garden, North Sulawesi Province. The emasculation and control pollination are implemented in five bunches in every Dwarf varieties done both in 2016 and in 2017. The purpose is to get the seednuts of coconut hybrids is close age to each other.

The coconut seednuts have been harvested, germinated and seeded on April until June 2017 and 2018. The vegetative growth has been observed and reported germination and seedlings development by Santosa, et al. (2019). Planting materials of coconut hybrids in the field at Kayuwatu Experimental Garden have been carried out on January 2018 and 2019. The nine hybrid coconuts have been planted in single blocks side by side in one location at Kayuwatu Experimental Garden. Every kind of Dwarf x Bido tall were planted as much as 50 palms single block, which are planting distance 8.5 m x 8.5 m square. Observations have been made on vegetative data (stem circumference, increase in number of leaves and plant height) aged 1-2 years after planting. The maintenance of coconut hybrids in the field are land clearing, ring weeding, fertilizer of NPK, control and treatment pestiside for pests and diseases.

The vegetative data of five coconut hybrids aged one year after planting, and four coconut hybrids aged two year after planting is gathered on January 2019 and 2020. The nine types of hybrid coconut are:

1. Tebing Tinggi Dwarf x Bido Tall (Planted on January 2019)
2. Waingapu Red Dwarf x Bido Tall (Planted on January 2019)
3. Jombang Green Dwarf x Bido Tall (Planted on January 2019)
4. Salak Green Dwarf x Bido Tall (Planted on January 2019)
5. Aromatic Green Dwarf x Bido Tall (Planted on January 2019)
6. Bali Yellow Dwarf x Bido Tall (Planted on January 2018)
7. Raja Brown Dwarf x Bido Tall (Planted on January 2018)
8. Nias Yellow Dwarf x Bido Tall (Planted on January 2018)
9. Nias Yellow Dwarf x Tenga Tall or KHINA-1 (Planted on January 2018).

The stem circumference, plant height and number of leaves data collected was analyzed on average, standard deviation and coefficient of variance, as well as comparing between coconut hybrids.

RESULT AND DISCUSSION

Hybridization Dwarfs x Bido Tall

The observations of the growth of dwarf x Bido tall hybrid coconut seedlings showed that the characters of plant height, stem circumference and number of coconut leaves in Bido tall were generally higher than dwarfs x Bido tall coconut hybrids, and KHINA-1 hybrid as the control. Waingapu Red Dwarf x Bido tall hybrid coconut and Salak Green Dwarf x Bido tall are the two best Hybrid coconuts which have characteristics of plant height, stem circumference and number of leaves close to or equal to the parent coconut Bido tall, and more vigor than other hybrid coconuts including the comparison KHINA -1. The Coconut Waingapu Red Dwarf and Salak Green Dwarf are thought to have the best combining ability with Bido tall coconut in seedling level (Santosa, et al., 2019).

The vegetative growth data of five hybrid coconuts dwarf x Bido tall at the age of 1 year after planting are presented in Table 1. The observations of the vegetative characters of the five hybrid coconuts showed that the largest stem girth characters were found in the Waingapu Red Dwarf x Bido tall hybrid coconut, with an average of 25.35 cm, and the lowest in the Salak Green Dwarf x Bido tall, with a stem girth of 19.40 cm. The other three hybrid coconut crosses, namely Tebing Tinggi Dwarf x Bido tall, Jombang Green Dwarf x Bido tall and Aromatic Green Dwarf x Bido tall vary between 20.55 cm - 23.05 cm. Furthermore, the character of plant height obtained the highest in the Waingapu Red Dwarf x Bido tall hybrid coconut, which was around 231.45 cm, and the lowest was in the Tebing Tinggi Dwarf x Bido tall, which was 169.40 cm. The height of other three hybrid coconuts ranges from 182.30 cm - 208.05 cm. Finally, the character data for the increase in the number of leaves during the last 6 months (July-December 2019), the most in the Aromatic Green Dwarf x Bido tall hybrid coconut crosses with 4.50 leafs, and four other crosses with 3.35 until 3.95 leaf per six month.

The results of the observation of the growth and development of five Dwarf x Bido tall hybrid coconuts at the age of one year after planting, it can be concluded that the largest stem girth and the highest plant height are Waingapu Red Dwarf x Bido tall hybrid coconut, and for the highest number of leaves increase is Aromatic Green Dwarf x Bido tall coconut hybrid.

The vegetative observation data of three hybrid coconut Dwarf x Bido tall are presented and compared to the control, KHINA-1 aged 1 and 2 years after planting in Kayuwatu Experimental Garden (Table 2). The stem girth character in 1 years after planting shown that Raja Brown Dwarf x Bido tall is more bigger, it get 17.60 cm, compare the other coconut hybrids 16.66-16.91 cm. In 2 years after planting the stem girth character, the three crosses of Dwarf x Bido tall, namely Raja Brown Dwarf x Bido tall, Bali Yellow Dwarf x Bido tall and Nias Yellow Dwarf x Bido tall, do not look much different from the stem girth of KHINA-1 hybrid coconut palms as a comparison, which is between 30.15-31.35 cm compared to 31.00 cm on the control. But in the plant height character it turns out that the Raja Brown Dwarf x Bido tall coconut hybrid is the highest, which is an average of 150 cm in 1 year after planting compare to other coconut hybrids. And in 2 years after planting still RBD x Bido tall is the highest, it is 267 cm followed by KHINA-1, the GKN x Bido cross with a height of 240.65 cm, apparently higher than KHINA-1 with a plant height of 221.11 cm, and the lowest was at Bali Yellow Dwarf x Bido tall, namely 210.05 cm. The highest increase in the number of leaves was obtained in the Nias Yellow Dwarf x Bido tall coconut hybrid as much as 4.26 leafs for 6 months, while the Raja Brown Dwarf x Bido tall and Bali Yellow Dwarf x Bido tall hybrid coconut obtained 3.60 leafs and 3.79 leafs compared to the control KHINA-1 coconut hybrid of 4.00 leafs. The same number of leaf when the coconut hybrids in 1 years after planting. In Figure 1 is shown the performance of Waingapu Red Dwarf x Bido Tall at one year after painting, and the second picture is Raja Brown Dwarf x Bido Tall at two years after panting.

The result of Dwarf x Bido tall coconut hybrids two years after planting found that the growth and development of the vegetative character of the Dwarf x Bido tall it was the girth of the stem was not different, the plant height of the Raja Brown Dwarf x Bido tall was the highest, and the highest increase in leaves was in the Nias Yellow Dwarf x Bido tall. Research results from the coconut germplasm at the "Subtropical Horticulture Research Station" (SHRS) in Miami, Florida found that the early maturing varieties of the Fijian coconut ("Niu Leka") are the most productive
types of Dwarf coconut, having short leaf crowns, dark green leaf color, so it is very suitable as an ornamental plant, landscapers and gardens (Meerow and Silva, 2008).

The results of the coefficient of variance (CV) in Table 1 of five hybrid Dwarf x Bido tall at one year after planting shown that most of the CV is lower than 20%, which are indicated that among the palm individual of the same coconut hybrid uniform or homogene, except on Tebing Tinggi Dwarf x Bido tall in plant height and number of leaves, 21.99% and 23.93%. Then in Table 2 could be shown that almost the three of Dwarf x Bido tall found the CV up than 20, except for Nias Yellow Dwarf x Bido tall in character number of leaves, it is 13.18. The value of the coefficient of variance is large enough indicated that still need to be done more stringent selection for uniformity of mother palms of Dwarf coconut, and Bido tall coconut as source of pollen. Improvement the Bido tall population as pollen source will be produced better Dwarf x Bido tall coconut hybrid. Selvaraj, et al., 2016) mentioned that the seedlings of the hybrid are more vigorous, producing higher number of leaves within 12 months, having higher leaf area and dry weight indicating precocity in growth and development. The flowering, morphological and fruit component traits of the hybrid were compared with parental palms are found superior.

Table 1. Characteristics of five coconut Dwarf x Bido Tall at one year after planting

<table>
<thead>
<tr>
<th>Crossing Persilangan</th>
<th>Variable Keragaman</th>
<th>Stem girth (cm)</th>
<th>Plant height (cm)</th>
<th>Number of leaves per 6 months Pertambahan jumlah daun per enam bulan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tebing Tinggi Dwarf x Bido Tall</td>
<td>Average Rataan</td>
<td>20.55</td>
<td>169.40</td>
<td>3.45</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>3.60</td>
<td>37.25</td>
<td>0.83</td>
</tr>
<tr>
<td></td>
<td>SB</td>
<td>17.54</td>
<td>21.99</td>
<td>23.93</td>
</tr>
<tr>
<td>Waingapu Red Dwarf x Bido Tall</td>
<td>Average Rataan</td>
<td>25.35</td>
<td>231.45</td>
<td>3.95</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>2.96</td>
<td>21.62</td>
<td>0.62</td>
</tr>
<tr>
<td></td>
<td>SB</td>
<td>11.68</td>
<td>9.34</td>
<td>15.74</td>
</tr>
<tr>
<td>Jombang Green Dwarf x Bido Tall</td>
<td>Average Rataan</td>
<td>21.65</td>
<td>189.05</td>
<td>3.35</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>3.01</td>
<td>25.14</td>
<td>0.59</td>
</tr>
<tr>
<td></td>
<td>SB</td>
<td>13.92</td>
<td>13.30</td>
<td>17.53</td>
</tr>
<tr>
<td>Salak Green Dwarf x Bido Tall</td>
<td>Average Rataan</td>
<td>19.40</td>
<td>182.30</td>
<td>3.10</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>3.70</td>
<td>37.12</td>
<td>0.55</td>
</tr>
<tr>
<td></td>
<td>SB</td>
<td>19.10</td>
<td>20.36</td>
<td>17.82</td>
</tr>
<tr>
<td>Aromatic Green Dwarf x Bido Tall</td>
<td>Average Rataan</td>
<td>23.05</td>
<td>208.05</td>
<td>4.50</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>2.93</td>
<td>31.15</td>
<td>0.76</td>
</tr>
<tr>
<td></td>
<td>SB</td>
<td>12.70</td>
<td>14.97</td>
<td>16.91</td>
</tr>
</tbody>
</table>
Figure 1. Waingapu Red Dwarf x Bido Tall 1 year old (a) and Raja Brown Dwarf x Bido Tall 2 years old (b)
Gambar 1. Genjah Merah Waingapu x Dalam Bido umur 1 tahun (a) dan Genjah Raja x Dalam Bido umur 2 tahun

Figure 2. Performance of JGD x Bido tall (a), WRD x Bido tall (b), TTD x Bido tall (c), and SGD x Bido tall (d) in 2 years old after planting.
Gambar 2. Penampilan GHJ x Dalam Bido (a), GMW x Dalam Bido (b), GTT x Dalam Bido (c), dan GSK x Dalam Bido (d) umur 2 tahun sesudah tanam
Table 2. The results of observations of three hybrid coconut Dwarfs x Bido tall and the control was KHINA 1 at 1-2 years after planting in Kayuwatu Experimental Garden

<table>
<thead>
<tr>
<th>Crossing Persilangan</th>
<th>Variable Keragaman</th>
<th>Stem girth (cm)</th>
<th>Plant height (cm)</th>
<th>Number of leaves per 6 months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>Ages (year)</td>
<td>Ages (year)</td>
<td>Ages (year)</td>
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<td></td>
<td></td>
<td>Umur (tahun)</td>
<td>Umur (tahun)</td>
<td>Umur (tahun)</td>
</tr>
<tr>
<td>Raja Brown Dwarf x Bido tall</td>
<td>Average</td>
<td>17.60</td>
<td>30.15</td>
<td>150.00</td>
</tr>
<tr>
<td>Genjah Raja x Dalam Bido</td>
<td>Average</td>
<td>16.55</td>
<td>30.30</td>
<td>127.00</td>
</tr>
<tr>
<td>Bali Yellow Dwarf x Bido tall</td>
<td>Average</td>
<td>16.80</td>
<td>31.35</td>
<td>132.65</td>
</tr>
<tr>
<td>Genjah Kuning Bali x Dalam Bido</td>
<td>Average</td>
<td>16.91</td>
<td>31.00</td>
<td>143.18</td>
</tr>
<tr>
<td>Nias Yellow Dwarf x Bido tall</td>
<td>Average</td>
<td>16.91</td>
<td>31.00</td>
<td>143.18</td>
</tr>
<tr>
<td>Genjah Kuning Nias x Dalam Bido</td>
<td>Average</td>
<td>16.91</td>
<td>31.00</td>
<td>143.18</td>
</tr>
<tr>
<td>KHINA 1 (NYD x TAT) (Control)</td>
<td>Average</td>
<td>15.54</td>
<td>24.58</td>
<td>21.38</td>
</tr>
<tr>
<td>KHINA 1 (GKN x DTA) (Pembanding)</td>
<td>Average</td>
<td>16.80</td>
<td>31.35</td>
<td>132.65</td>
</tr>
</tbody>
</table>

Notes: NYD = Nias Yellow Dwarf; TAT = Tenga Tall
Keterangan: GKN = Genjah Kuning Nias; DTA = Dalam Tenga

The characteristics of this hybrid and its performance indicated the potential to increase the productivity and over all coconut production. The growth and development of these hybrids in 2 and 3 years after planting have been not yet gathered the data vegetative. But the performance of some coconut hybrids of Dwarf x Bido tall at that ages of 2 and 3 can be shown in Figure 2 and Figure 3.

In the Figure 2 can be shown that the proformance of coconut hybrid morphology of Jombang Green Dwarf (JGD) x Bido tall, Waingapu Red Dwarf (WRD) x Bido tall, Tebing Tinggi Dwarf x Bido tall and Salak Green Dwarf x Bido tall in 2 years after planting are not different to much in height of palm, girth of stem and number of leaf among them.

In Figure 3 can be shown that there are different performance among the four coconut hybrids. The crown, number of leaf, girth of stem and height of palm of coconut hybrid Bali Yellow Dwarf (BYD) x Bido tall and Raja Brown Dwarf (RBD) x Bido tall is the better growth and development compare to both other coconut hybrids, which are Nias Yellow Dwarf (NYD) x Bido tall and Nias Yellow Dwarf (NYD) x Tenga tall (KHINA-1) as a control. The data statistic will be better to explain and good to evaluate the differences among these coconut hybrids Dwarf x Bido tall.
The differences of vegetative characters and performance of these coconut hybrids Dwarf x Bido tall, be expected will influence in the bearing first of the plams, high yielding of fruit and or sap production in the next ages.

Selected of mother palm Bido tall for selfing and crossing to get the better population Bido tall can be done not only base on morphology, inflorescence, production, and fruit component analysis, but also by using molecular markers. The mapping of the spread of coconut varieties based on SNP analysis shows that it is clear that coconut varieties Bido tall have different genetic varieties compare to other tall or dwarfs. The cluster of Bido tall samples is significant different than other group clusters of tall and dwarf varieties from the same location in Morotai island, or other islands such as: Papua, West Papua and Sulawesi (Novarianto, et al., 2018). The study selected nine microsatellite markers with the potential to identify Green Dwarf x Yellow Dwarf hybrids and 16 microsatellites with the potential to identify Red Dwarf x Yellow Dwarf hybrids. The SSR marker based on DNA fingerprinting allowed the accurate identification of legitimate intravarietal hybrids since, for those crosses, the methodology of identification based on seedling color is not a viable alternative (Alinne, et al., 2018). One may use the developed SNAP markers to investigate the possible association between markers and other relevant phenotypes in coconuts (Pesik, et al., 2017).

In Hainan, China, there have been many coconut research on molecular markers for coconut breeding. The results of phylogenetic clustering indicated that populations in Hainan were domesticated separately from (and earlier than) other coconut accessions, and that differentiation existed within populations within Hainan. Taken together, these findings provide a preliminary scenario of genetic diversity and origins of coconut populations in Hainan (Pan, et al., 2018). Molecular markers studies provide a better understanding of individual identity, genealogical relationships and geographic origins of coconut germplasm, and can
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contribute to the conservation and more efficient use of germplasm for future coconut breeding (Liu, et al., 2011). Assembling hybrid coconuts for varieties that have high cold tolerance, evaluation of fast fruiting, high yield varieties have been carried out by crossing quickly Wenye # 2 x in Hainan and obtained F1 with the name Wenye 78 (Yang, 2013).

CONCLUSION

Dwarf x Bido tall coconut hybrid at one year after planting have shown the largest stem girth and highest plant height is the hybrid Waingapu Red Dwarf x Bido tall, and for the highest number of leaves the increase is the crossing of Aromatic Green Dwarf x Bido tall. The vegetative character of Dwarf x Bido tall hybrid coconut at the age of two years after planting showed that the girth of the stems was almost the same, the height of the Raja Brown Dwarf x Bido tall coconut hybrid was the highest, and the highest increase in leaves was in the Nias Yellow Dwarf x Bido tall coconut hybrid. The differences of vegetative characters and performance of these coconut hybrids Dwarf x Bido tall, be expected will influence in the bearing first of the plams, high yielding of fruit and or sap production in the next ages.

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