EVALUATION OF FIRST YEAR YIELD AND FRUIT COMPOSITION OF TACUNAN COCONUT VARIETY IN MARDI BAGAN DATUK

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ABSTRACT

In the year 2018, the total coconut planting acreage under small holder's management in Malaysia was 78,800 ha comprising of 48, 414 ha in peninsular and 30 386 ha in Sabah and Sarawak. Currently, farmers endure shortage of good and high yielding coconut seedling such as MATAG and other type of hybrids. The price of MATAG hybrid is currently at RM60 per seedling and heavily burdens farmers in obtaining seedlings for their cultivation as cost arise. Inbred seedlings are much cheaper and more cost effective for farmers at RM6-8 per seedlings. The objective of this study is to determine a good inbred dwarf variety which will have good yield and fruit characters similar to hybrids and would be cheaper to produce compared to hybrids thus recommended as planting material. In this study, the yield performance of Tacunan in MARDI Bagan Datuk was observed to determine the suitability of Tacunan as planting material in Malaysia. Twenty Tacunan seedlings were planted in MARDI Bagan Datuk (MBD) in 2016 in four rows with a planting distance of 6.5 m x 6.5 m. The average number of bunches harvested in every observation was 1.89 bunches. The average nut yield in every harvest was 11.2 nuts. The average Tacunan fruit weight was 1411 g. Tacunan has bigger nut weight compared with other dwarfs such as MGD in Indian ecotype at 635 g and MRD in Sri Lankan ecotype at 489.4 g. Tacunan dwarf has high potential as a high-quality planting material for Malaysian farmers. The observation in nut yield must be continued for at least yield stability is achieved to determine exact nut per ha per year yield before recommendation as planting material.

Key words: Tacunan dwarf, nut yield, MARDI Bagan Datuk, coconut kernel weight

INTRODUCTION

In the year 2018, the total coconut planting acreage under small holder's management in Malaysia was 78,800 ha comprising of 48, 414 ha in peninsular and 30 386 ha in Sabah and Sarawak. The total coconut planting area under estate management in peninsular was 5062 ha. The total coconut planted area in Malaysia for commercial nut production was 83862 ha. Malaysian small holder's coconut production in 2018 was at 456,988.3 metric tonne while the estates produced 36,907.9 metric tonnes of coconuts. The hybrid coconut is the most preferred choice as coconut planting material for Malaysian farmers. Previously, MAWA was highly regarded as good planting material but currently MATAG coconut hybrid is the most sought variety by farmers. This is due its lucrative high yielding capacity (32,000 nuts per ha per year) and medium sized fruits which were easily marketable. However very few establishments in the country produces MATAG seedlings such as United Plantations Bhd (UP) and Jabatan Pertanian in Johor and Perak. Meanwhile, the number of farmers interested in cultivating coconut had increased tremendously recently as the price of coconut commodity sees upward trend due to low supply of local coconuts. Malaysia imported approximately RM130 million worth coconuts in the year 2016 and mainly imports nuts from Indonesia to supply Malaysian need in coconut. Currently, farmers endure shortage of good and high yielding coconut seedling such as MATAG and other type of hybrids. The production of hybrid seedlings is a tedious process which requires an establishment of coconut seed garden comprising mother palms and paternal pollen donors in an isolated area (*Peries RRA, 1993*). The high input of labour and time consumed in producing hybrid often hamper coconut cultivation in many countries. In India, the annual demand for hybrids is estimated at 4.2 million compared to its demand of 14 million seedlings per year (*Jayasekhar et al, 2016*). The price of hybrid seedling is also expensive which sells at RM50-RM60 depending on the type of hybrid. In Malaysia, the in availability and high cost of hybrid seedlings caused major problem in establishment of large- and small-scale coconut plantations. Planters especially small holders would mainly seek high yielding, good fruit component character quality and cheap seedlings to avoid high planting cost. Many farmers opt to importing seedlings from foreign countries and also from uncertified seed producers thru online platform to cater the seedlings need. There is a great need to produce non hybrid planting material in Malaysia. The coconut variety must be an early flowering, has a medium fruit size and a high yielder. The dwarf varieties would be a good choice as planting material as they are homozygous and self-pollinating trees. The seeds from the mother plant can be easily used as planting material without going thru laborious assisted hand pollination. Among the new popular coconut variety is the Tacunan variety from the Philippines. Tacunan is categorized as dwarf coconut type as it has a slow growth rate. Tacunan in the origin country showed good plant characteristic such as early flowering and bigger fruit size compared to other dwarf plants. The fruits are heavy with thin husk (*Bourdeix et al, 2010*). The tree yields an average of 100 nuts per palm per year and if planted with 6.5 m x 6.5 m planting distance per hectare would yield 27200 nuts per ha per year. This coconut variety has been declared as commercial planting material in the Philippines. In Malaysia,

evaluation of Tacunan had reported by UP Bhd and had been used as parental material in their breeding programme (*Arulandoo et al, 2014*). Bagan Datuk is among the major coconut cultivating area in the peninsular. MARDI's coconut research station is situated in Bagan Datuk. An observation of Tacunan yield performance was initiated in 2016. In this study, the yield performance of Tacunan in MARDI Bagan Datuk was observed to determine the suitability of Tacunan as planting material in Malaysia.

MATERIALS AND METHODS

Thirty Tacunan seedlings were planted in MARDI Bagan Datuk (MBD) in 2016 in four rows with a planting distance of 6.5 m x 6.5 m. 10 trees were destroyed by coconut rhinoceros beetle and were culled. Balance 20 trees were used as sample trees to collect yield and fruit characteristic data. All the trees were rain fed. 1 kg of NPK blue fertilizer was applied in 4 splits in the first year per tree and 2 kg of fertilizer in the second year. 3 kg of fertilizer per year per tree was applied in the subsequent years. The majority of the sample trees begun flowering in the year 2018. The first yield data was collected in April 2019. The yield data was observed by counting the matured nut at the bottom bunches which was identified by brown colouring on the coconut fruit. The number of bunches were also recorded. The yield data was taken every two months once. Matured nuts which are collected were subjected for a resting period f 2 week to ensure complete maturation and full browning of the fruits. 20 nuts which were free from deformities were subjected to fruit composition analysis parameters such as fruit weight (g), nut weight (g), husk weight (g), shell weight (g), water weight (g) and kernel weight (kg). There was no replication in this experiment as no other varieties were used for data comparison or observation. Mostly this is caused by in that particular year; only one inbred variety was successfully collected for evaluation. All the yield and fruit composition data was analysed using simple statistic to determine mean values.

RESULTS AND DISCUSSIONS

In this observation, the average number of bunches harvested in every observation was 1.89 (Table 1). This data suggests, Tacunan trees on average gave two fruit bunches in every harvest. The minimum number of bunches was observed in the first and fourth harvest. The maximum bunches were observed in the seventh harvest since the first harvest was done. Table 1 showed the average nut yield in every harvest was 11.2 nuts. This data showed Tacunan trees on average yields 11 nuts per harvest. The first harvest observation showed the lowest yield at 6 nuts per yield and the seventh harvest observation yield the highest value of nuts (24 nuts). The number of coconuts per bunch was highest at sixth (7 nuts) and seventh harvest (6 nuts) (Table 1). The average number of fruits per bunch was 4.27. This observation suggests, in every harvest, minimum of four fruits were present in each bunch. The first yield recorded the lowest number of fruits per bunch at 1 fruit per bunch.

The total number of bunches harvested in six harvest in this observation was 11.3 bunches per palm. This finding was similar with the observation of 11.81 bunches per palm per year in Malayan Green Dwarf (MGD) as reported by Tripura et al in the 2018. Arulandoo et al, in 2003 reported the number of bunches per palm in that particular year was 17 for Tacunan dwarfs. They had also reported the three year mean for number of bunches per palm was at 15.9 bunches. The difference in that parameter may have been caused by the fact that coconut stabilizes after certain time frame after first flowering and the trees in MARDI Bagan Datuk have not reached the stability in yield. The average nut per palm per year for Tacunan trees in MBD was 67.2 nuts. The number of nuts per palm per year in UP Bhd was recorded as 100 nuts. The Philippines Coconut Authority (PCA) had reported the nut per palm per year in their country at 94 nuts. However, matured Tacunan in Cote d Ivoire only produced 30 – 50 fruits per palm (*Bourdeix et al, 2010*).

The average Tacunan fruit weight was 1411 g as shown in Table 2. The smallest fruit weight observed was 880g and the highest fruit weight observed was 2128 g. However, fruit weight mean in the first harvest was observed as the lowest at 1137 g. Subsequent mean of fruit weight were higher in second, third and fourth harvest (Table 2). The average nut weight of Tacunan was 1027.7 g and the lowest nut weight observed was 565 g while the heaviest nut weight was 1574 g (Table 2). It was also observed the first harvest mean of nut weight was the lowest (889.1 g) compared to other harvest analysis. Table 2 also showed the mean husk weight value at 383.2 g for Tacunan coconuts. The mean husk weight ranged from 204 g to 712 g. Mean of husk weight was lowest (247.9 g) in the first harvest as shown in Table 2. Another important fruit component analysis is the shell weight. The heavier the shell, it's more protective of the kernel during fall of the matured nut. Table 2 showed the average shell weight for Tacunan was 222.8 g. The shell weight observation at the first (207.8 g) and fourth (202.7 g) harvest was low compared to the second (243.2 g) and third (234.1 g) harvest. Water in coconut plays an important role in coconut germination. In this observation, the average mean of water weight in Tacunan was 371.1 g as shown in Table 2. The highest water weight observed was 884 g and lowest weight was 121 g. Water in the nut was again observed lowest in the first yield at 291.7 g compared to the second, third and fourth of harvest. The most important trait of coconut selection is the kernel weight. The kernel weight determines the quantity of coconut milk and oil. In this study, the average mean of kernel weight in Tacunan was 433.7 g (Table 2). The lowest Tacunan kernel weighs 260 g of kernel while the highest kernel weight was at 665 g as shown in Table 2.

The average Tacunan fruit weight in MBD was observed at 1411 g and the PCA had published the Tacunan fruit as larger than normal dwarf[1]. Bourdeix et al had reported that Tacunan maximum fruit weight at 1350 g. The weight of other dwarfs in MBD was observed as 732.7 g for Malayan Yellow Dwarf, 1040.4 g for Malayan Brown Dwarf and 1118.1 g for Niu Leka Dwarf (*Ahmad et al, 2011*). Mean Fruit weight of Tacunan dwarf in MBD showed higher weight compared to Malayan Green Dwarf planted in Indian ecotype observed at 963.9 g (*Thomas et al, 2015*). The average nut weight of Tacunan in MBD was 1027 g and average Tacunan nut weight in Vanuatu was recorded at 1028 g (*Bourdeix et al, 2006*). This finding indicates Tacunan has similar nut weight in both locations. Tacunan has bigger nut weight compared with other dwarfs such as MGD in Indian ecotype at 635 g (*Thomas et al, 2015*) and MRD in Sri Lankan ecotype at 489.4 g (*Perera et al, 2014*). The average kernel weight in Tacunan trees in MBD (433.7 g) had similar kernel weight of Kamandala (451.2 g) which belongs to tall type coconut which usually have a much

bigger fruit size compared to dwarf coconuts (*Perera et al, 2014*). Tacunan in MBD also exhibit similar kernel weight when compared to kernel weight of MATAG (432.0 g) in MBD as reported by Sivapragasam et al in 2009.

In Malaysia, there are many dwarf varieties such as Malayan Yellow Dwarf, Red Dwarf and Green Dwarf. All these varieties are high yielders and early bearers. However, the limitation to these varieties is the small fruit size which fetches low price in the market. Tacunan which is also a dwarf variety however produces bigger and heavier fruits compared to other Malayan dwarf varieties. Tacunan also is an early bearer and self-pollinating variety. Thus, producing elite planting material for planters will be much easier than producing hybrid planting material. Since hand assisted pollination is not required, the price of seedlings will be much cheaper than hybrid seedlings. The use of dwarf trees as planting material has gain popularity in many coconut growing countries recently (*Nampoothiri et al, 2019*). Even though only first year data is gathered currently, Tacunan dwarf showed promising characters as planting material in Bagan Datuk research station. Further observation is needed to gather more data for safely introduce Tacunan as planting material for farmers in Malaysia.

CONCLUSION

Tacunan being a dwarf variety usually an early bearer with bunches touching the ground in the several early fruit bearing bunches. This was also observed in MBD. Tacunan is being promoted as quality high yielding seedlings for farmers in the Philippines. As discussed earlier, Tacunan seedlings are being sought by Malaysian farmers. As reported by the PCA, a long trial period of Tacunan observation gave the number nuts per palm per year as 90 to 100 nuts. Since the data presented merely a first-year data and coconut usually requires a lengthy time period for yield stabilization, the number of nuts per palm will increase gradually and more data need to be taken to determine the actual nut production per year for Tacunan in MBD. Tacunan fruits were noticeably bigger in fruit size and heavier in fruit weight when compared with other dwarf fruits such as MGD, MYD and MRD. Thus, Tacunan fruits would be more expensive than normal dwarf coconut farm prise. Similarly, the dehusked nut weight of Tacunan is also higher in weight compared to most dwarf coconuts. Kernel weight in coconut determines the quantity of coconut milk and oil thus having a high weight of kernel makes the fruit preferable to coconut milk sellers and Virgin Coconut Oil (VCO) producers. Tacunan fruits in MBD exhibit high kernel weight compared to other dwarf coconuts. Tacunan dwarf has high potential as a high-quality planting material for Malaysian farmers. The observation in nut yield must be continued for at least yield stability is achieved to determine exact nut per ha per year yield before recommendation as planting material.

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Table 1: Mean of yield in Tacunan coconut

No of harvest	No of bunches	Nut yield	Nut per bunch
1st	1.15	4.2	1.33
2nd	1.5	6.3	2.51
3rd	1.95	11.1	4.0
4th	0.95	4.85	3.29
5th	2.0	13.7	5.83
6th	2.15	14.5	6.69
7th	3.55	24.05	6.26
Mean	1.89 ± 1.47	11.2 ± 12.0	4.27 ± 3.87
CV	78.0	106.8	90.9
SE	0.12	1.0	0.32

Table 2: Mean values of physical characteristic of Tacunan

No of harvest	Fruit weight (g)	Nut weight (g)	Husk weight (g)	Shell weight (g)	Water weight (g)	Kernel weight
1st	1137.0	889.1	247.9	207.8	291.7	389.5
2nd	1591.6	1123.6	468.0	243.2	416.0	464.3
3rd	1566.3	1115.5	450.7	234.1	427.2	454.2
4th	1358.6	983.2	375.4	202.7	350.9	429.5
Mean	1411.0 ± 373.5	1027.7 ± 225.7	383.2 ± 133.8	222.8 ± 45.1	371.1 ± 152.6	433.7 ± 73.31
CV	23.9	21.9	34.9	20.2	41.1	16.9
SE	38.9	26.0	15.4	5.2	17.6	8.46
Min	880.0	565.0	204.0	142.0	121.0	260.0
Max	2128.0	1574.0	712.0	320.0	884.0	665.0