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GROWTH PERFORMANCE OF FOURTEEN (14) MCB CLONES AS ROOTSTOCK IN COCOA NURSERY

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ABSTRACT – *Establishment of planting material in the nursery is normally using seed of the cross UIT1 x NA33. The using selection of this seed as a rootstock is due to high resistant with pest and disease and also good in terms of growth performance. However, due to the availability of the seed are greatly reduced by other commercial cocoa tree planting, most of cocoa nursery alternatively grow rootstocks from the seeds obtained from clonal cocoa fields. Therefore, in this study, the alternative seeds used were the MCB's Clones: MCBC 1, MCBC 2, MCBC 3, MCBC 4, MCBC 5, MCBC 6, MCBC 7, MCBC 8, MCBC 9, MCBC 10, MCBC 11, MCBC 12, MCBC 13 and MCBC 14. The study was conducted to determine the growth performance of different seed of 14 MCB clones as rootstock in cocoa nursery. From the result, it can be determined that certain seed of MCB clones can produce a good quality seedling in term of growth and development. It can also be concluded that, MCBC 7 have a potential of being alternative seed as rootstock in nursery due to its vigorous growth while MCBC 3 has the poorest growth as can be seen in diameter and height results. Hence, cocoa clonal seed particularly from MCB clones can be raised alternatively as rootstock under nursery system before it grafted with desired clones.*

Key words: Cocoa seed, rootstock, growth performance, nursery, clone

INTRODUCTION

Cocoa generally planted as seedlings in nursery. Seedlings are the easiest and cheapest planting material to raise, and they develop into trees with a convenient habit of growth. Planting materials as seedling in nursery ultimately determine the yield potential of the tree, bean quality, tolerance to common pest and diseases, and adverse climatic conditions (Malaysian Cocoa Board, 2013).

Normally the establishment of planting material in the nursery was using seed of the cross UIT 1 x NA 33. Others recommended hybrids seed were UIT 1 x SCA 6, UIT 1 x SCA 12, IMC 67 x SCA 9, PA 156 x IMC 67, PA 156 x SCA 9, PA 138 x SCA 9 and PA 173 x SCA 9. The using selection of these seeds as rootstock is due to large bean, high resistant with pest and disease and also good in terms of growth performance (Phua, P. K., 1982). However, due to the availability of the seed of the tree are greatly reduced by other commercial cocoa tree planting, most of cocoa nursery growers alternatively grew rootstocks from the large seeds obtained from clonal cocoa fields. Large seeds were adopted following reports that they produced vigorous seedlings that could be budded earlier (Shepherd *et al*., 1981).

Malaysian Cocoa Board has carried out activities in breeding program since 1992, with purposely to develop superior planting material for cocoa. Until now, there are fourteen clones have been declared for planting commercial (MCBC 1 to MCBC 14). These clones have potential to produce high dry cocoa beans, low pod index, high butter content and resistance to VSD and black pod (Haya *et al*., 2012). Besides that, seeds from these clones were also commonly raised as rootstock seedlings in farmers' nursery, yet the research on MCB clones rootstock still received little research attention.

It is therefore to determine the seed performance from different fourteen MCB clones as rootstock of cocoa seedlings in term of growth and development in the nursery, as suggested by Ascenso and Bartley (1966) that rootstock seedling selection criteria for cocoa should be conducted in the early stage of plant development as it would be valuable in saving time and land. This study also aimed at reassessing the feasibility of using seeds from MCB clones as alternative rootstock in nursery in order to make cocoa establishment successful, less burdensome, and less expensive.

MATERIALS AND METHODS

Trial has been implemented at the end of October 2018, located at Malaysian Cocoa Board Research and Development Centre nursery in Tawau, Sabah. Design for the trial was Randomized Complete Block Design (RCBD). The treatments of selected seeds of clone for the study were T1: - MCBC 1, T2: – MCBC 2, T3: – MCBC 3, T4: – MCBC 4, T5: – MCBC 5, T6: – MCBC 6, T7: – MCBC 7, T8: – MCBC 8, T9: – MCBC 9, T10: – MCBC 10, T11: – MCBC 11, T12: – MCBC 12, T13: – MCBC 13 and T14: – MCBC 14. Each treatment used 10 seeds with 3 replicates and the amount used was 420 seeds. Polythene bags in nursery arranged as per design trial needed. Then, the seeds were sown in polythene bag and covered with thin layer soil. The application of fertilizer (NPK Green – 5g/seedling) was initiated when the first leaf of seedling has hardened. Collecting data started in the early of December 2018, which is the fourth weeks after planted (WAP).

There were two parameters taken for this trial; stem diameter and plant height. The plant height and stem diameter were measured on a weekly basis. Plant height measured using a measuring tape, taken from the soil surface to the apical tip of the plant, while plant stem diameter was measured using veneer calipers by marking around the stem 5 cm from the ground. All these parameters were analyzed statistically by using computer software package SPSS to determine the morphological growth variation at the end of study.

RESULTS AND DISCUSSION

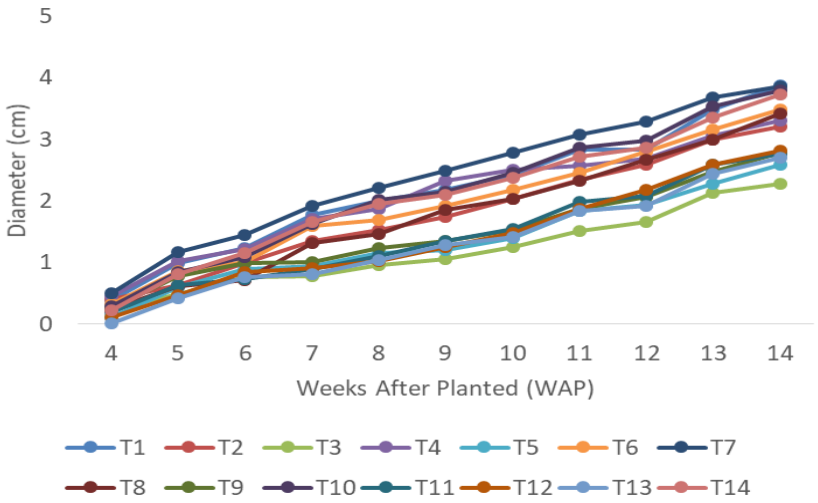
Table 1 presented the effect of different seed of MCB clones as rootstock on total mean diameter after 14 WAP. The highest total mean diameter of the seedlings and has significantly different ($p<0.05$) was in MCBC 1 (6.93 cm) and the lowest and has significantly different ($p<0.05$) was in MCBC 3 (4.77 cm) treatments.

In Figure 1, all treatments have showed a consistent of diameter increment throughout the three-month experiment, although such difference cannot be seen due to its small increment per week. Despite of that, it is known that the slightest differences of the diameter increment eventually will affect the actual height of seedlings.

Table 1. Total mean diameter after 14 WAP for each treatment

Treatment	Mean Diameter (± S.D)
MCBC 1	6.93 ± 0.56 a*
MCBC 2	6.14 ± 0.85 ab
MCBC 3	4.77 ± 0.23 c
MCBC 4	6.52 ± 0.11 ab
MCBC 5	5.73 ± 0.37 abc
MCBC 6	6.32 ± 0.41 ab
MCBC 7	6.62 ± 0.11 ab
MCBC 8	6.27 ± 0.41 ab
MCBC 9	5.49 ± 0.48 bc
MCBC 10	6.30 ± 0.36 ab
MCBC 11	5.40 ± 0.47 bc
MCBC 12	5.51 ± 0.45 bc
MCBC 13	5.43 ± 0.38 bc
MCBC 14	6.66 ± 0.04 ab
F-Test	6.402
CV (%)	11.63

*column means followed by the same letter are not significantly different ($p>0.05$, Tukey Test)



Note: T1: - MCBC 1, T2: – MCBC 2, T3: – MCBC 3, T4: – MCBC 4, T5: – MCBC 5, T6: – MCBC 6, T7: – MCBC 7, T8: – MCBC 8, T9: – MCBC 9, T10: – MCBC 10, T11: – MCBC 11, T12: – MCBC 12, T13: – MCBC 13 and T14: – MCBC 14

Figure 1. Effects of different seed of MCB clones on the plant diameter increment

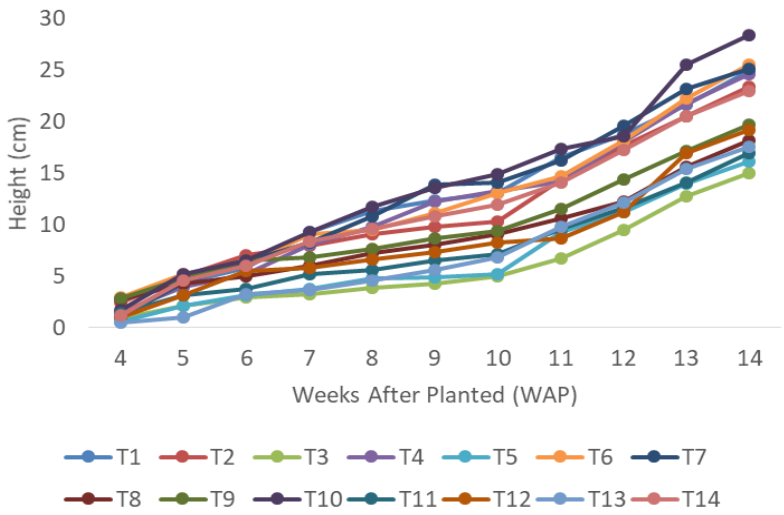
Table 2. Total mean height after 14 WAP for each clones

Treatment	**Mean Height (± S.D)**
MCBC 1	43.09 ± 2.19 abc*
MCBC 2	41.79 ± 5.95 abc
MCBC 3	32.87 ± 0.36 c
MCBC 4	45.21 ± 2.43 ab
MCBC 5	34.18 ± 3.13 bc
MCBC 6	42.03 ± 2.14 abc
MCBC 7	47.59 ± 0.08 a
MCBC 8	38.96 ± 5.51 abc
MCBC 9	38.01 ± 4.12 abc
MCBC 10	44.47 ± 2.73 ab
MCBC 11	33.96 ± 5.94 bc
MCBC 12	36.69 ± 4.83 abc
MCBC 13	39.11 ± 4.82 abc
MCBC 14	41.12 ± 2.92 abc
F-Test	4.082
CV (%)	13.51

*column means followed by the same letter are not significantly different (P>0.05, Tukey Test)

Table 2 presented the effect of different seed of MCB clones as rootstock on total mean height after 14 WAP. The highest total mean of height and significantly different ($p<0.05$) was in MCBC 7 (47.59 cm), and still the lowest and has significantly different ($p<0.05$) height was in MCBC 3 (32.87 cm) treatments.

The differences can be clearly seen in Figure 2 whereas all treatments have showed differences of mean height increment throughout the four-month experiment including the rapid increment for MCBC 7, while MCBC 3 gave the slowest increment.



Note: T1: - MCBC 1, T2: – MCBC 2, T3: – MCBC 3, T4: – MCBC 4, T5: – MCBC 5, T6: – MCBC 6, T7: – MCBC 7, T8: – MCBC 8, T9: – MCBC 9, T10: – MCBC 10, T11: – MCBC 11, T12: – MCBC 12, T13: – MCBC 13 and T14: – MCBC 14

Figure 2. Effects of different seed of MCB clones on the plant height increment

Significant differences were observed for vegetative growth parameters among seedlings grown in different seed of MCB clones. It is revealed that seeds from each MCB clones have consistency increment both in girth and height measurement throughout the growth period of the seedlings, but with significant variation among them. According to Joe (2004), rootstock seedlings that have vigorous growth will have higher yields than small or dwarf rootstock. Thus, it is expected that rootstock seedling from MCBC 7 have a potential of being alternative seed as rootstock in nursery due to its vigorous growth while MCBC 3 has the poorest growth as can be seen in diameter and height results.

The reason for this variation most probably because of the influenced by varieties (Adenikinju, 1969) and bean maturity at the time of sowing (Adenikinju, 1978). However, it is further suggested that the selection based on seedling vigor has to be verified in the field based on yield performance.

CONCLUSIONS

Based on the result obtained, it can be determined that certain seed of MCB clones can produce a good quality seedling in term of growth and development particularly MCBC 7 due to its vigorous growth among the other clones. Hence, cocoa clonal seed from MCB clones can be raised alternatively as rootstock under nursery system before it grafted with desired clones.

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