Original Research Article

MULTI-LAYER BUDDING OF OVERSIZED RUBBER (*Hevea brasiliences*) SEEDLINGS

Comment [u1]: The topic needs to be reframed so as to include soil medium since it was part of the research.

ABSTRACT

The study on Multi-layer budding of oversized rubber seedling aimed at evaluating the success of multiple budding operation on single seedling of rubber tree species comprising of 4 to 7 budding layers per seedling. The experiment used randomized complete blocked design layout with 3 treatments replicated 4 times.

Results revealed that the highest number of budding layers succeeded significantly higher as compared to 4 and 5 layers. The main survival percentage is about 79.17% for the 7 layers, 76.52% for the 5 layers and only about 55.36% for the 4 layers.

Pure garden soil reported to have significant results on sprouting rate, sprout length, stalk diameter and number of leaves.

This findings emphasized that budding of rejected oversized rubber seedlings grown in an abandoned nurseries can be reutilized for mass production of budded cuttings through multiple budding of 7 layers per seedlings to maximize planting materials derived from single seedlings.

Comment [u2]: Include soi medium as the results from different soil media was also presented.

Keywords: *Multi-layer budding, oversized rubber seedlings, survival, forest management, Philippines*

INTRODUCTION

Rubber *(Hevea brasiliensis)* is a plant belongs to the family of Euphorbiaceae originated in tropical South American which produces a latex, a milky white sap.

Budding describes any of several techniques in which a section of a stem with leaf buds is inserted into the stock of a tree or seedling.

The quality of buds is one of the major variables which decide the quality of the offspring in terms of development. The choice of buds in a budwood at the time of bud uniting is exceptionally imperative to guarantee compatibility and generation of quality planting materials inelastic. Budding is among the foremost costly proliferation strategies, outperforming even micropropagation. Budding, which could be a shape of uniting, is three times more exorbitant than cuttings and fourteen times more costly than seedling engendering. The cultivation and ranger service businesses have looked to create clonal proliferation frameworks that maintain a strategic distance from labor-intensive graftage.

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Industrial propagation by rooted cuttings of mature selected clones of *Hevea brasiliensis*is among the most expensive propagation techniques. The significance of *Hevea brasiliensis*(elastic tree) as a cash trim keeps expanding justifying the improvement of unused and more effective methods than the bud-grafting customarily utilized for mass-producing superior planting material, (Julien and Boedt , 2013).

While budding technique in rubber seedling is an effective methods in plant propagation, it is noted however, that no studies conducted to determine multiple budding in a single seedlings, thus, the researchers tried to assess the success of multilayer budding in single oversized rubber seedling to utilize and maximize planting materials derived from unused seedlings in the abandoned nurseries of rubber planters.

Comment [u4]: Include 'is' before among

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Comment [u6]: Replace with 'method'

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METHODOLOGY

The study utilized simple randomization of experimental materials such as assigning of the number of budding in a single seedlings such as 4, 5, and 7 buds inserted in a single seedlings.

Preparation of the Experimental Area for Multilayer budding

Rootstock Preparation

A healthy oversized rubber seedling was used as the rootstock of the multistage budding.The area of seedlings was cleaned to become a smooth working area.

Selecting and handling of budwood

The rubber variety (RRIM 600) of best quality scion was collected early in theday then detached with clean knives and immediately placed in a moistenedplastic bag.

Methods of Budding

A healthy rubber bud eye was collected. Discard the soft tips of the bud sticks then insert the bud stick to the rootstock. Wrap the bud sticks in moist burlap, moss, or paper to prevent drying out. The rubber seedling had at least 4-7budded with 20cm apart.

After 21 days, the buds are inspected and harvested by cuttings of the successful buds and planted in a prepared polybag filled with growing media.

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Comment [u9]: Replace with 'at'

Preparation and planting

An area of 4m x5m was cleaned thoroughly with free weeds and was closed byfencing to protect the area from disturbances.The cut budded stems were soaked in a diluted root hormones (Figure 1) before planting in a prepared 6"x 8" polyethylene bags filled with different soil media.

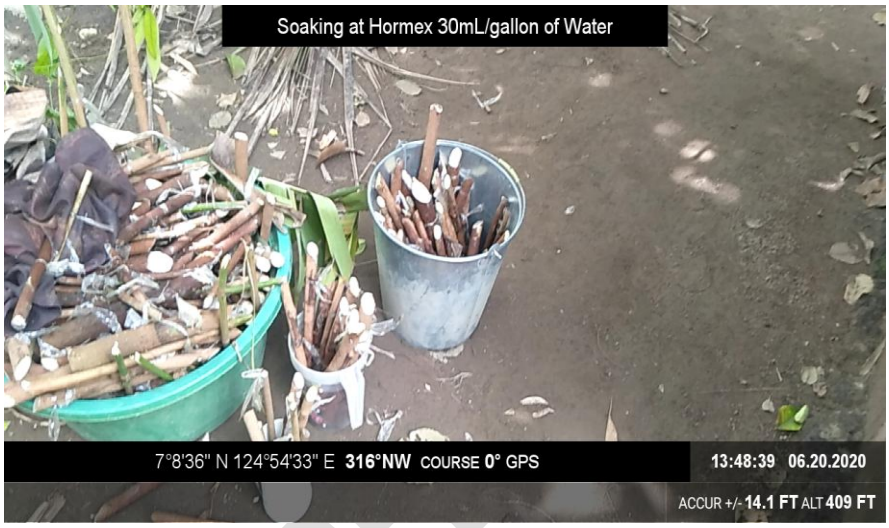

Figure 1. Soaking of budded stem cut rubber in diluted growth hormone

RESULTS AND DISCUSSION

Success Rate

The succeeded buds in a different layer per seedling was presented in table 1.The multiple layer budding was conducted in February 2020 during the dryseason (Figure 2). Out of 339 budded in different layers, it was about74.34%(252 buds) survived. The highest rate of bud successwas in a 7 layersof 79.17%,whereas, the 4 layershas the lowest success rate of only 55.36%(31 buds).

The findings is supported by Kuriakose 2005 who stated that brown budding has only 60 – 80 % success rate while young budded plants has 95 – 98% success level.

Comment [u10]: The statement should be part of methodology.

Comment [u11]: Put in bracket

Table 1. The successful rate of multiple budded rubber seedlings

No. of bud layer per Seedling	No. of budding	Successful buds	Percentage
4 layers	56	31a	55.36%
5 layers	115	88b	76.52%
7 layers	168	133c	79.17%
TOTAL	**339**	**252**	**74.34%**

Means with the same letter subscript are insignificantly different at 5% using LSD

Figure 2. Multi-layer buds

Growth Performance of Stem-budded rubber in different soil media

Table 2, shows the growth performance of the multi-layer budded stem-cut rubber using different soil media, such as pure garden soil,1:1 ratio of soil and goat manure, 1:1 ratio of soil with sugarcane mudpress, and 1:1:1 ratio of soil, goat manure, and sugarcane mudpress.Thepure garden soil has the highest sprouting growth rate of 85% which is significantly higher compared to the other soil media. The highest mortality of 1:1 ratio of soil and sugarcane mudpress was supported by the study that states using of 100 percent sugarcane filltercake compost (a natural waste by-product of sugarcane processing mills; bagasse) for the seeds sown resulted in lower total percent germination(Calvert, et.al. 2013). Additionally, the 25% SBA consistently produced the greatest cantaloupe seedling growth across various plant parameters measured (Shrefler, et. al, 2015). The pure garden soil produced the highest plant height of 7.90cm, stalk diameter of 4.69mm and the number of leaves (7 pcs) which is also significantly higher as compared to other treatments or soil media used in the experiment.

Comment [u12]: (Calvert et al., 2013)

Comment [u13]: ??? indicate what it means at the initial use before using the abbreviation in subsequent occasions.

Comment [u14]: et al., 2015

Table 2. Growth Performance of the Stem-budded rubber using different soil media

Treatment	Days of Sprouted (%) 35DAYS	Sprout length (cm)	Stalk Diameter (mm)	No. of Leaves
Soil Media				
Pure Garden Soil	85a	17.90a	4.69a	7.00 a
Treatment 2	66.3a	6.91 b	3.66b	5.00 b
Treatment 3	25b	2.56 b	3.17b	2.75 c
Treatment 4	38.8b	6.84 b	3.50b	4.12 b

Means with the same letter are not significantly different.

Conclusion

The researchers concluded that multi-layer budding operation in oversized rubber seedling is very much possible having a success levels of about 79% for 7 layers budding in single plant. A pure garden soil can be an effective media in growing stem cut budded rubber seedlings obtaining a sprout growth rate of 85% in 35days after planting.

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Recommendation

Following the results of the experiment, the researchers recommended to utilize the seedlings grown of bigger sizes in abandoned nurseries for propagation of quality planting materials of rubber tree species. This can reduce cost, time, and labor in producing planting materials from seeds and other young seedlings of buddable size.

References

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Comment [u16]: initials of the authors.

Comment [u17]: put in italics