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Optimisation Of Scion To Increase The Success Of Grafting In Durian Tree *(Durio zibethinus.* Murr)

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Abstract. Vegetative propagation is an option to obtain the best seedlings quality. One of the most common methods used in vegetative propagation is grafting. The propagation of durian using grafting method often fails as the result of incompatibilty of the upper part (scion) and root system (rootstock). The selection of rootstock relates to the growth of plant, where the section tends to grow aktively when cells division occurs. The active growth phase occurs when the plants are still young. If the insertion of scion and rootstock is incompatible, it will produce slow growth and the new plant many eventually die.
The most common problems experienced in stem grafting are the distance to collect the sources of scion and rootstock. Thus, it took a while from the collection of scion to the grafting. Another factor is durian trees continue to undergo vegetative growth, which is inferior to be used as a scion. Moreover, since the number of rootstocks was plenty, the grafting was not able to be finished in one day and unfinished scion were kept to be used in the following day.
Factorial and randomized blok design was selected in the present study. The first factor was the sourcesof scion (S), consiting of three source of stems. The stemswere primary (S1), seconday (S2), and tertiary (S3) stem. The second factor was stoage times of scion (T), comprising four level of time. The levels wee 0 day (T0), two days (T1), four days (T2), and six days (T3). Overall, there were 12 treatments in the study.
In conclusion, the high success of gafting was obtained from secondary stem with a four days storage time.

Keyword: stem grafting, source of scion, storage time, durian tree.

Introduction. Research into cleft grafting has basically been done, yet the combination of scion source and storage time in durian seedling were limited. Manner, Griffis and McDonald (2011) reported that the success of grafting is affected by the diference in stoage time and the condition of scion. Study on the storage time of scion has recently been conducted in avocado (Syah, 2008) and rubber trees (Saefuddin and Wadina, 2014). It was found that there was a difference in the water content of stored scion of rubber trees, while carbohydrate, protein, lipid, and phytohormon content was yet to be investigated (Saefuddin and Wadina, 2014).
Research into the sources of scion was only applied to nutmeg (Rusli and Heryana, 2014). The purpose of their study was to collect a good source of scion for grafting, derived from orthotrop and plagiotrop branches. In the present study, the soucers of scion were primary, secondary, and tertiary stem.
The use of different sources and storage time of scion in durian trre using local variety Konawe Regency Indonesia Country is strategic analysis to support the sustainability of its poduction and to meet the demand for best seedling quality in national scale.

Materials And Methods. The study was conduced in a seedling center located in Anggotoa Village, Wawotobi, Konawe Regency, Indonesia Country from February to

March, 2016. Some materials used in this study were scions collected from different stem, under stump, polybag, plastic rope, bamboo hood, tansparent plastic, paper, soil, manure, and sand. Besides, other used materials were grafting scissor, stairs, knife, razor balde, caliper, ruler, scoop, hoe, and otherr supporting materials. Factorial and randomized block design was selected in the present study. The first factor was source of scion (S), consisting of three sources : primary (S1), secondary (S2), tertiary (S3) stems. The second factor was storage time (T), comprising four different levels of time. The level was 0 day (T0), two days (T1), four days (T2), and six days (T3). Overall, there were 12 treatments witha the following designs : S1T0 (primary stem without storage time), S1T1 (primary stem with scion being stored for two days), S1T2 (primary stem with scion being stored for four days), S1T3 (primary stem with scion being stored for six days), S2T0 (secondary stem whithout scion being stored), S2T1 (secondary stemwhith scion being stored for two days), S2T2 (secondary stemwhith scion being stored for four days), S2T3 (secondary stemwhith scion being stored for six days), S3T0 (tertiary stem whithout scion being stored), S3T1 (tertiary stemwhith scion being stored for two days), S3T2 (tertiary stemwhith scion being stored for four days), S3T3 (tertiary stemwhith scion being stored for six days). Every unit of experiment used 10 plants and conduced in triplicates. Overall, there were 36 plants used through the study.

Statistical analysis. To know the effect of all treatments, the Analysis of Variance (ANOVA) used, if it is different from the reality, the Duncan's multiple range test used at the level of 5% by using the Software SAS (Statistical Analysis System).

Results And Discussion

Successful Grafting.

a. Percentage of **Live Grafting.** The effect of different sources and storage time of scion are presented in Table 1, and the dynamic of persentage of successful grafting (percentage of live grafting) is presented in fig. 1 and 2.

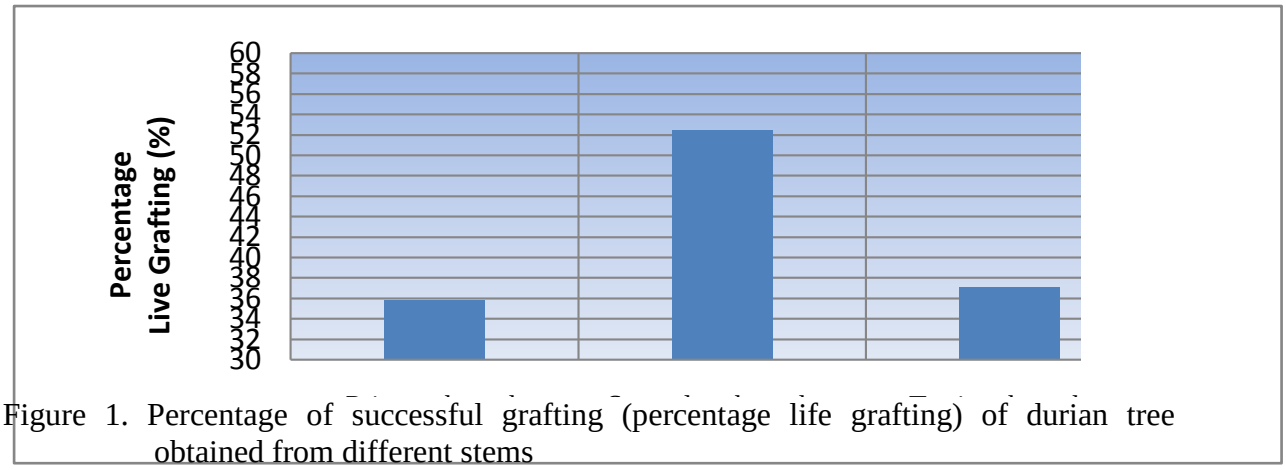

Figure 1. Percentage of successful grafting (percentage life grafting) of durian tree obtained from different stems

We found that the highest percentage of successful grafting was in secondary stems. This might be caused by the joints formed by grafting were well inosculated between the grafted tissue, and the newly grafted tissues maybe genetically compatible. Ashari (1995) reported that the grafted plants will generate a high percentage of compatibility if the selected scion are in good physiological cnditons, thus it is esssential for contain sufficient nutrients to from callus and new cambiums.

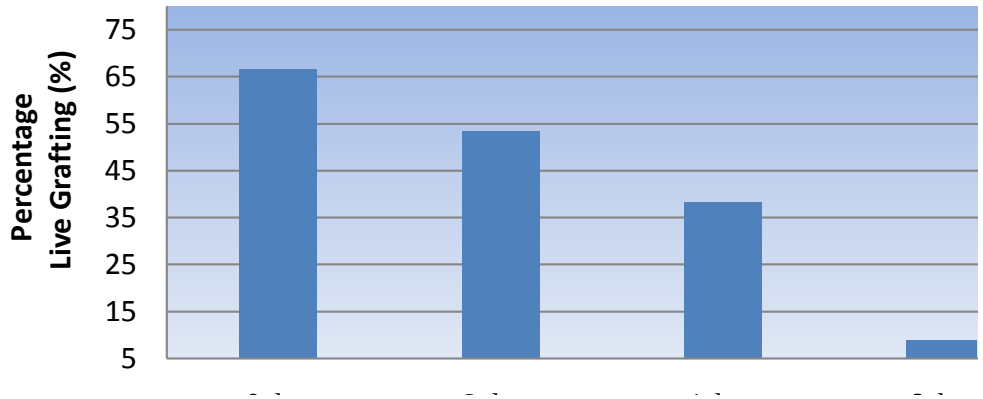

Figure 2. The percentage of successful grafting (percentage of life grafting) of durian tree in different storrage times.

It was observed that the highest percentage of successful grafting was in 0 day. Longer storage may result in the depletion of food reserves and water content, which are used for metabolism in scions. When scions were stored, the process of respiration remained take placeand it affected the food reserve in the scions, thus the percentage of successful grafting reduced due to food defletion. Scion are living plants and carry out metabolism and respiration in orde to survive (Rahardjo and Djauhariya,2004). In a normal situation, the process of respiration takes place in harmless extent, but environmental changes could affect the respiration in scions as it releases energy.

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Table 1. The effect of storae time (single treatment) on the percentage of live gafting (%)

Single Treatment T Factor	Mean	DMRT 0.05
T0	66.67 [b]	2 = 36.74
T1	53.33 [b]	3 = 38.62
T2	38.33 [ab]	4 = 39.75
T3	8.89 [a]	

Description: The number followed by the same letter in the same column indicates insignificant difference based on a confidence level of DMRT 95%.

Analysis of variance showed that scions obtained from different stem sources were not sifnificantly effect on the percentage of successful grafting. It means that scions obtained from primary, secondary, and tertiary stems did not affect the success of grafting.

The percentage of successful grafting was significantly affected by storage time in the treatment T0 compared to the scion stored for four and six days (Table 1), but the treatment was not significanly different from the scions stored for 2 days. This may be caused by the variation in the level of carbohydrate, protein, lipid. And water content. The same results were observed by Tubbus (1974) and Webster (1995) in the apple trees. It seems that longer scion storage resulted in lower percentage of succesful grafting. Low production in upper stem was also found by Jawal (2008) which keeps avocado scion for two and four days in the age of 3 months after grafting. This may be caused by higher transpiration as scion are kept longer, thus the food reserves and water content reduced (Ombrello, 2011). A fresh upper stem will quickly restore water and continue to grow.

The unsuccessful grafting indicated that the scion failed to graft well. This was caused by the inability of tissues to graft, inhibiting the formation of xylem and floem. This inhibition prevents essential nutrients and wate from soil to be transported to upper stem and the products of photosynthesis in the leaves is unable to be transported to the lower stem.

In durian tree, the success of grafting was affected by the storage time. The present study showed that scions stored for two days lowered the successs of gafting to 13%. This finding was tallied with the study done by Sukarman (2011) that scions kept for a day reduced the success of grafting to 13.3%

Longer scion storage leads to the depletion of food reserves and water content to be used for metabolism. During storage, scions respiration remains take place. Longer respiration leads to more utilisation of food reserves, thus low percentage of successful gafting. Rahardjo and Djauhariya (2004) reported that scions are living plant and carry out metabolism and respiration in order to survive. In normal situation, respiration takes place in harmless level, but changes in respiration will occur when environmental factors have changed, and this involves energy release. Transpiration remains take place during storage (Abdul, 1994). Longer transpiration leads to loss water content, thus the percentage of successful scion increasingly reduce.

b. Percentage of Dorman Entres. The effect of source and storage time on the percentage of scion dormant is presented in Table 2. The dynamic of scion dormant from different sources and storage time of scion is presented in figure 3 and 4.

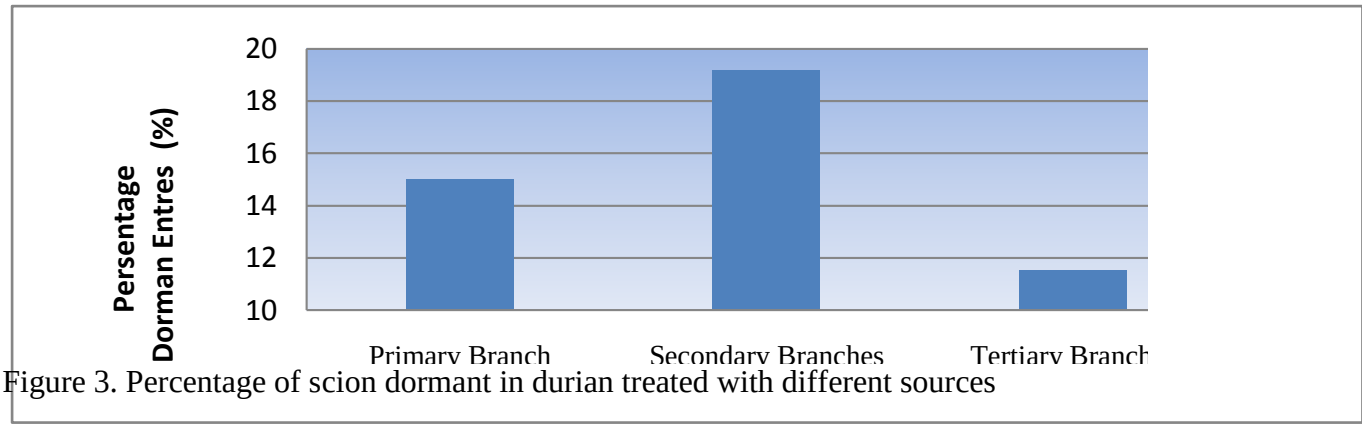

Figure 3. Percentage of scion dormant in durian treated with different sources

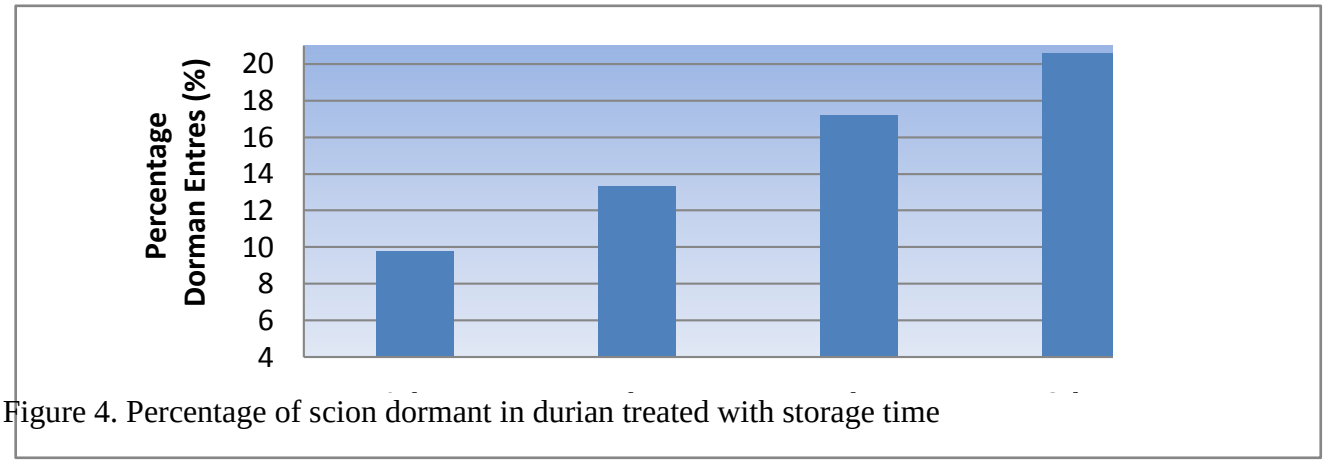

Figure 4. Percentage of scion dormant in durian treated with storage time

Table 2. The effect of source and storage time of scion on dormant percentage (%)

Single Treatment	Average	DMRT 0.05
S Factor		
S1	15.00 [ab]	2 = 6.83
S2	19.17 [b]	3 = 7.18
S3	11.25 [a]	
T Factor		
T0	9.44 [a]	2 = 6.83
T1	13.33 [ab]	3 = 7.18
T2	17.22 [bc]	4 = 7.39
T3	20.56 [c]	

Description : The number followed by the same letter in the same column indicates insignificant difference based on a confidence level of DMRT 95%.

We found that dormant scions were not affected by different sources and storage time. This was related to the condition of dormant scion collected from the original plant. The dormant scion will be slow in grafting and makes shoot difficult to grow (Sunarjono, 2000). In single treatment, the effect of scion soucer on dormant percentage was found lowest in tertiary stem and significantly different from promary stem. This relates to the water content in scion sources. When buds are in dormant condition, water imbibition is inhibited causing metabolism of food reserve and its mobilasation is impeded. This will clearly inhibit respiration since it requires glucose to convert into enegy.

In single treatment, the effect of scion storage time on dormant percentage was lowest in scion stored for 0 day and siginificantly different from the other treatments. This was related to the variation in auxine content due to scion storage. Auxine is an important hormone to maintain the dormancy of bud and mostly used for micropropagation work. Moreover, it works with nutrients to take care of the growth of organs, such as shoot (Sunarjono, 2000).

Conclusion. The highest success of grafting was found in secondary stem with the storage time four days. We recommend that the combination of secondary stems and root stock from different ages will be interesting to evaluate for future study.

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