ISSN : 2350-0743

www.ijramr.com

International Journal of Recent Advances in Multidisciplinary Research
Vol. 04, Issue 09, pp.2819-2824, September, 2017

RESEARCH ARTICLE

EFFECT OF SOURCE AND STORAGE TIMES OF SCION TO CARBOHYDRATE, PROTEIN, LIPIDS, AND AUXIN CONTENT AT DURIAN NURSERY (DURIO ZIBETHINUS. MURR)

***,[1]Suharjo, [2]Andi Bahrun, [3]La Ode Safuan and [4]Sarawa Mamma**

[1]Department of Agrotechnology, Lakidende University, Konawe, Indonesia
[2]Department of Plant Physiology, Halu Oleo University, Kendari, Indonesia
[3] Department of Soil Science, Halu Oleo University, Kendari, Indonesia
[4]Department of Plant Physiology, Halu Oleo University, Kendari, Indonesia

ARTICLE INFO

Article History:
Received 29th June, 2017
Received in revised form
14th July, 2017
Accepted 10th August, 2017
Published online 29th September, 2017

Keywords:

Stem grafting,
Source of scion,
Storage time,
Durian tree.

ABSTRACT

Durian nursery can be done by using source of generative and vegetative material. Both sources of propagation have their own weaknesses and strengths. To obtain quality seeds, the combination of two sources of propagation materials each has complementary advantages. The process of merging can be through grafting or bud buds (grafting). Connection method on durian nursery can use side grafting and bud grafting. The purpose of this research is to know the difference of carbohydrate, protein, lipids, and auxin content in various sources and storage times scion. 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. It was concluded that Primary Branches, Secondary Branches and Tertiary Branches have a downward trend in line with the storage times of scion of Carbohydrate Content, Lipids Content, Water Content, and Auxin Contents unless the Protein Content tends to increase in line with the storage times of scion. The highest percentage of live grafting is influenced by carbohydrate content. The highest percentage of dorman scion is influenced by water content, the highest shoot rate is influenced by water content, the highest shoot length is influenced by water content, the highest leaf number is influenced by water content, the highest stem diameter is affected by Auxin , Leaf Area is highest influenced by Auxin, Nisba Leaf Area is highest influenced by Water Content, and Nisba Pupus The highest root is influenced by Moisture Water. Carbohydrates, Proteins, Highest Water Content is found in the Secondary Branch and Auxin is highest in Primary Branch.

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.

Corresponding author:* **Suharjo,
Department of Agrotechnology, Lakidende University, Konawe, Indonesia.

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 360 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

Carbohydrate content

The distribution pattern of carbohydrate content from the treatment of scion source (branch) at each storage times of scion is presented in Fig. 1.

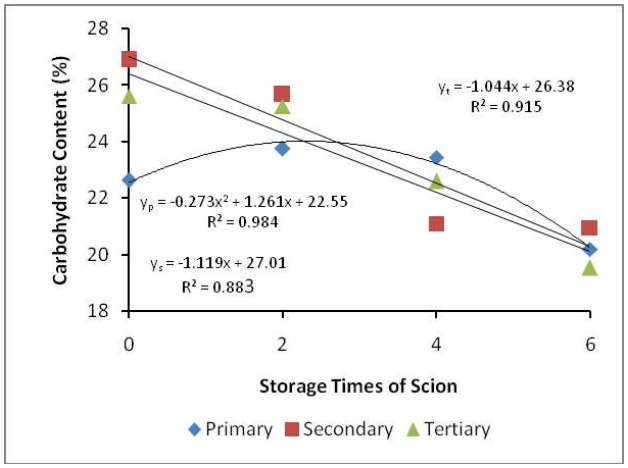

Figure 1. The distribution pattern of carbohydrate content from the treatment of scion source (branch) at each storage times of scion

The results of this study indicate that carbohydrate content from various sources (Branch) continues to decrease with the storage times of scion, the scion source from the secondary branch decreases more slowly than the primary and tertiary branches. Carbohydrate content will decrease as long as storage time of scion comes from primary branch, secondary branch and tertiary branch. Scion from secondary branches decrease carobohdrat content significantly more than scion derived from both primary and tertiary branches. In addition, secondary branches in durian plants contain more carbohydrates than the primary or tertiary branches. This is in accordance with the opinion of Xue, *et al* (2008) that differences in the accumulation of Water-Soluble Carbohydrate (WSC) in stems among genotypes could potentially result from various factors such as photosynthesis capacity, carbon use efficiency, and carbon partitioning between stem reserve deposition and other physiological processes. (e.g. maintenance respiration, growth, and cell wall synthesis). These processes involve many carbohydrate metabolic genes in a number of major carbohydrate metabolic pathways: the Calvin cycle,gluconeogenic, glycolytic, Suc, and fructan synthetic pathways, etc. Fructans and Suc are the major components of wheat stem WSCs (Ruuska *et al*., 2006)

The results research of storage times of scion show that scion durian plants stored will decrease the carbohydrate content, the longer tersimpat carbohydrate content will decrease. This is because scion during storage is still experiencing respiration. Storage scion need to pay attention to things that can reduce the content that can interfere with the growth of scion itself. Control of loss factors of carbohydrates and nitrogen in scion of plants needs to be done because carbohydrates and proteins are substances that are important for the growth of scion. The need for carbohydrates is very important for the growth of scion was evidenced by the presence of carbohydrates contained in scion, leaves, and roots of starch. The starch is stored in granular form during the dormancy period and will then be used for subsequent growth. Scion in the preparation usually perform physiological activity of respiration. One of the environmental factors that can affect respiration is the content of substrate such as starch, fructan, sugar. If the substrate content is low in number, the respiration rate is also low (Salisbury and Ross, 1992). The results of the test of correlation between carbohydrate content with the success and compatibility of the gafting on the treatment source and storage times of scion are presented in Table 1.

Table 1. Correlation between carbohydrate content with the success and compatibility of the gafting on the treatment source and storage times of scion

No	Pearson Correlation	Carbohydrate Content	
		Coefficients (r)	(Prob > r|)
1	Percentage Live Grafting	0.53694**	0.0009
2	Percentage Dorman Scion	-0.58984**	0.0002
3	Shoot Number	0.63589**	<.0001
4	Shoot Lengthy	0.25039ns	0.1468
5	Leaf Number	0.62910**	<.0001
6	Stem Diameter	0.21646ns	0.2117
7	Leaf Area	0.46468**	0.0049
8	Nisba Leaf Area	0.39380*	0.0193
9	Nisba Pupus Root	0.32891*	0.0537

Description : ** = Verry Significant, * = Significant, ns = Non Significant

Table 1 shows that the carbohydrate content in scion gives the highest positive contribution to the increase of shoot number followed by the number of leaves, the percentage of live grafting, leaf area, nisba leaf area, nisba pupus root, shoot length, and stem diameter, while carbohydrate contribute negatively to percentage dorman scion. Contribution is positive which means carbohydrates in scion can spur the growth of these parameters, while negative contribution means will inhibit the growth of the parameters. This is in line with the role of carbohydrates as an energy source for plant growth, especially the formation of shoots and leaves in plants. At the beginning of the plant growth is limited by the availability of food reserves in the food. If the plant material derived from scion then the organic materials contained in it is a food reserve. Growth growth takes place through a series of events that include, among others, the formation of carbohydrates

(photosynthesis process), absorption process, translocation, metabolism, respiration. The success of grafting that are characterized by a high percentage of live grafting and low dormanent scion percentage depend on the formation of gafting links caused by the formation of the kallus. The process of forming the kallus is strongly influenced by the carbohydrate content contained in the scion because the compound is a source of energy in the formation of the kallus. Carbohydrates play a key role in all aspects of plant life. Carbohydrate deficiencies will be impacted on metabolic processes and plant growth (Chun et.all, 2002).

Protein Content

The distribution pattern of protein content from the treatment of scion source (branch) at each storage times of scion is presented in Fig. 2.

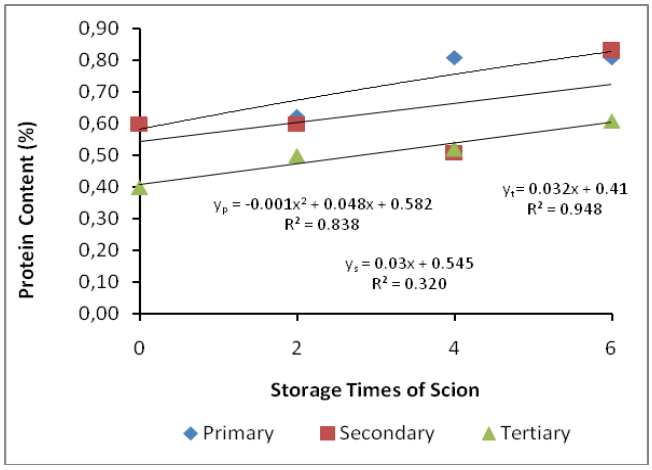

Figure 2. The distribution pattern of potein content from the treatment of scion source (branch) at each storage times of scion

The results of this study indicate that the protein content of various sources continues to increase with the storage time of scion, source of scion from primary branches increased faster than the secondary and tertiary branches. Protein content will increase as long as storage time comes from primary branch, secondary branch and tertiary branch. Scion derived from the primary branch more quickly have an increase in protein content compared with scion derived from secondary branches and tertiary branches. The highest protein content was obtained at the scion source treatment from the secondary branch with a 6-day storage times of scion. The results of this study indicate that the protein lies in all the branches that exist in the durian plant and the highest is located on the secondary branch. It is suspected that the proteins in the tertiary branches have been widely used for the needs of the plants themselves whereas the proteins in the secondary branches are still stored for use after the tertiary branches have been used by the plant itself. Several studies have shown that the presence of proteins has different locations, some located on seeds, leaves, and stems of plants. In cereal families such as wheat, rice, legumes and protein corn are in the seeds. In tobacco plants, many proteins are found in the leaves. While in the bag semar, protein is found on the part between the stems with flowers, in addition to the petai fruit contain high protein content. The formation of proteins stems from the process of anabolism and then overhauled in the plant through the process of catabolism. In plant proteins can be seen from the content of Nitrogen in plants. Nitrogen content is the dominant element affecting the growth of the plant. So plants desperately need Nitrogen for protein formation in plants and when Nitrogen deficiency can be interpreted as a protein deficiency. The results of the test of correlation between protein content with the success and compatibility of the gafting on the treatment source and storage times of scion are presented in Table 2.

Table 2. Correlation between protein content with the success and compatibility of the gafting on the treatment source and storage times of scion

No	Pearson Correlation	Protein Content	
		Coefficients (r)	(Prob > r|)
1	Percentage Live Grafting	-0.56362**	0.0004
2	Percentage Dorman Scion	0.53124**	0.0010
3	Shoot Number	-0.39993*	0.0173
4	Shoot Lengthy	-0.20092ns	0.2471
5	Leaf Number	-0.49920**	0.0023
6	Stem Diameter	0.06069ts	0.7291
7	Leaf Area	-0.17353ns	0.3188
8	Nisba Leaf Area	-0.27508ns	0.1097
9	Nisba Pupus Root	-0.45795**	0.0057

Description : ** = Verry Significant, * = Significant, ns = Non Significant

Table 2 shows that the presence of proteins has not been able to contribute to the growth of grafting seedlings and even the tendency to inhibit growth. The percentage of live grafting is the highest growth parameter inhibited by protein existence followed by leaf number parameter, nisba pupus root, shoot number, nisba leaf area, shoot length and leaf area. Some studies show the presence of proteins that have different locations in plants. In cereal families such as wheat, rice, legumes and protein corn are on the seeds. In tobacco plants, many proteins are found in the leaves. While in the bag semar, proteins are often found on the part between the stems with flowers, in addition to the petai fruit contains protein content. The formation of proteins stems from the process of anabolism and then overhauled in the plant through the process of catabolism. In plant proteins can be seen from the content of Nitrogen in plants. Nitrogen content is the dominant element affecting the growth of the plant. So plants desperately need Nitrogen for protein formation in plants and when Nitrogen deficiency can be interpreted as a protein deficiency.

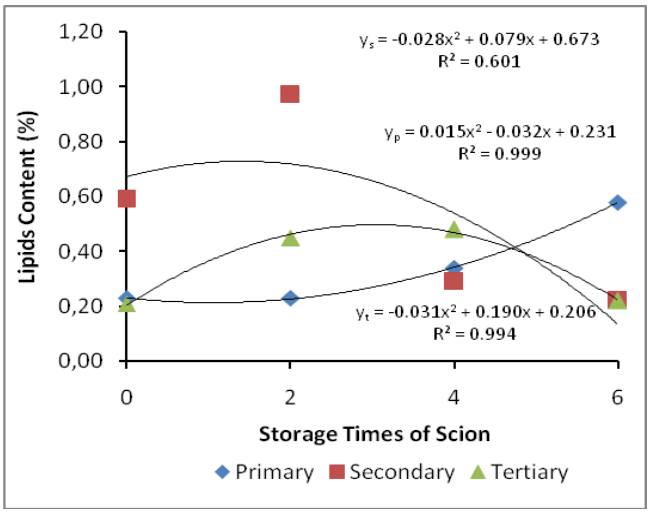

Figure 3. The distribution pattern of fat content from the treatment of scion source (branch) at each storage times of scion

Lipids Content

The distribution pattern of lipids content from the treatment of scion source (branch) at each storage times of scion is presented in Fig. 3. The results of this study showed that the secondary and tertiary branch lipids content continued to decrease with the storage time of scion, while the primary branch increased. The results of the test of correlation between lipids content with the success and compatibility of the gafting on the treatment source and storage times of scion are presented in Table 3.

Table 3. Correlation between lipids content with the success and compatibility of the gafting on the treatment source and storage times of scion

No	Pearson Correlation	Lipids Content	
		Coefficients (r)	(Prob > r|)
1	Percentage Live Grafting	0.17589ns	0.3122
2	Percentage Dorman Scion	-0.05334ns	0.7609
3	Shoot Number	0.22571ns	0.1923
4	Shoot Lengthy	0.15762ns	0.3658
5	Leaf Number	0.14812ns	0.3958
6	Stem Diameter	-0.08665ns	0.6207
7	Leaf Area	-0.04211ns	0.8102
8	Nisba Leaf Area	0.15471ns	0.3749
9	Nisba Pupus Root	-0.00372ns	0.9831

Description : ** = Verry Significant, * = Significant, ns = Non Significant

Table 3 shows that the lipids content present in entres does not contribute to plant growth parameters. If observed from the correlation coefficient value there are some growth parameters that are negative value meaning that the presence of lipids will interfere with plant growth, especially the observed parameters are percentage scion dorman, bud diameter, leaf area, and nisba pupus root. Lipids or fat consist of elements of carbon, hydrogen and oxygen. The main function of lipids and oil reserves in grains is as an energy source. This reserve is one of the most important forms of energy storage for growth. The decomposition of lipids chemically generates a greater amount of energy about twice that of the energy produced from the breakdown of carbohydrates (Salisbury and Ross 1995)

Water Content

The distribution pattern of water content from the treatment of scion source (branch) at each storage times of scion is presented in Fig. 4.

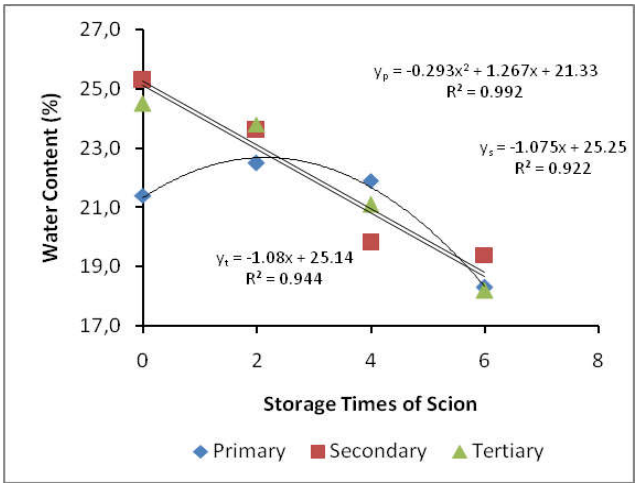

Figure 4. The distribution pattern of water content from the treatment of scion source (branch) at each storage times of scion

The results of this study showed that the content of water content in secondary and tertiary branches continued to decrease linearly in line with the duration of storage of scion, while the primary branch decreased quadratically, before the decrease in T2 treatment (4 days) On the sixth day (T3). Water in the body of plants is found in all cells and tissues that vary depending on the type of cell, type of tissue and plant species. The storage area has significant effect on the water content, caused by the airless storage, the material holds the balance of water content with the surrounding air so that the water content becomes high. Whereas airtight storage can keep moisture low. Decrease in water content in each branch will continue to occur as a result of transpiration and respiration activities. During the process of tanspiration and water respiration will increase. If the water content is small then respiration goes slow by it to accelerate the respiration of the seeds soaked in water for respiration to run quickly (Saefuddin and Wardana, 2014). Water losses to the material during storage can occur due to a transpiration process. Transpiration begins with the evaporation of water by the mesophyll cells into the intercellular cavity present in the leaf. Transpiration can be interpreted as a process of water loss in the form of steam from plant tissues through stomata, cuticles and lenticels (Salisbury and Ross, 1995). According to Abdul (1994) during storage entres, transpiration process still occurs and the longer the process of transpiration takes place the more moisture content is lost.

The results of the test of correlation between water content with the success and compatibility of the gafting on the treatment source and storage times of scion are presented in Table 4.

Table 4. Correlation between water content with the success and compatibility of the gafting on the treatment source and storage times of scion

No	Pearson Correlation	Water Content	
		Coefficients (r)	(Prob > r|)
1	Percentage Live Grafting	0.55590**	0.0005
2	Percentage Dorman Scion	0.62495**	<.0001
3	Shoot Number	0.64435**	<.0001
4	Shoot Lengthy	0.25926ns	0.1326
5	Leaf Number	0.64423**	<.0001
6	Stem Diameter	0.23240ns	0.1791
7	Leaf Area	0.48627**	0.0031
8	Nisba Leaf Area	0.39560*	0.0187
9	Nisba Pupus Root	0.35407*	0.0369

Description : ** = Verry Significant, * = Significant, ns = Non Significant

Table 4 shows that the moisture content present in the scion contributes the highest positive to the number of shoots followed by the number of leaves, the percentage of dormant scion, the percentage of live gafting, the leaf area, the nisba leaf area and the nisba pupus root. Contribution is positive which means water content in scion can spur the growth of the parameter. The related parameters significantly indicate that the moisture content present in entres contributes to plant growth parameters. The content of water in the plant material to determine the freshness and durability of the material itself. Much of the change in crop material changes takes place in water media added or derived from the material itself. If observed from the value of correlation coefficient of growth parameters whose value is positive which means with sufficient water content will increase plant growth. The water

in the stem is water absorbed by the roots. New water always goes into the root osmosis. Stems store food in the form of starch and store water. Water comes from the roots, and the starch is made from sugar transported from the leaves. One benefit of storing water on the stem is to avoid drought. Water helps keep stem cells stiff (Kimbal, 1989).

Auxin content

The distribution pattern of auxin content from the treatment of scion source (branch) at each storage times of scion is presented in Fig. 5.

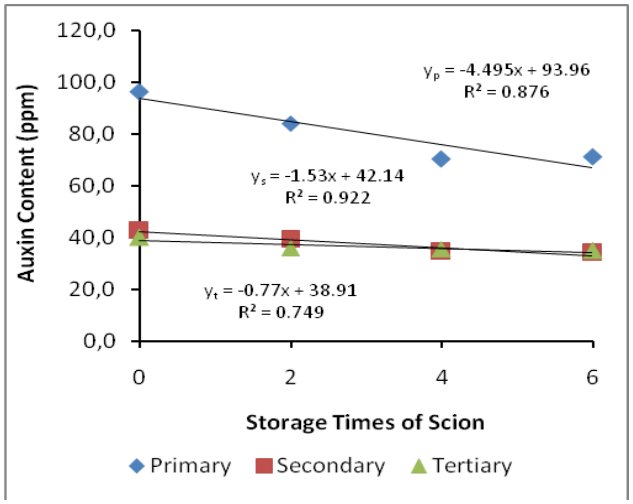

Figure 5. The distribution pattern of auxin content from the treatment of scion source (branch) at each storage times of scion

The results of this study showed that the auxin content of primary, secondary, and tertiary branches continued to decrease linearly in line with the duration of storage times of scion. Auxin decline is inseparable from the physiological processes that occur during plant stem storage, this is considering the function and role of auxin in the process of growth and development of a plant so large. The results of research on auxin metabolism showed that the concentration of auxin in plants affect plant growth. The results of the test of correlation between auxin content with the success and compatibility of the gafting on the treatment source and storage times of scion are presented in Table 5.

Table 5. Correlation between auxin content with the success and compatibility of the gafting on the treatment source and storage times of scion

No	Pearson Correlation	Auxin Content	
		Coefficients (r)	(Prob > r|)
1	Percentage Live Grafting	0.01149ns	0.9478
2	Percentage Dorman Scion	-0.18875ns	0.5716
3	Shoot Number	0.09897ns	0.2775
4	Shoot Lengthy	0.25322ns	0.1422
5	Leaf Number	0.18556ns	0.2859
6	Stem Diameter	0.45001**	0.0067
7	Leaf Area	0.52349**	0.0013
8	Nisba Leaf Area	0.21704ns	0.2104
9	Nisba Pupus Root	0.09393ns	0.5915

Description : ** = Verry Significant, * = Significant, ns = Non Significant

Table 5 shows that the relationship is not significant except stem diameter and leaf area shows a significant relation. However, if seen from existing data then the auxin on the stem of the plant contribute the highest on the growth of the leaf area followed by the increase of stem diameter, shoot length, leaf area ratio, dormant entresase percentage, life. This illustrates that auxin in plants is not related to the presence of carbohidate, fat, and water content so it is suspected auxin function and role in spurring plant growth is not optimal, this can be seen from the auxin relationship with parameters pertumubhan not show a significant relationship. According to Roni *et al*. (2002) that one of the main signals produced by young leaves is auxin, which moves in a polar way toward the roots and will beperan maximum at the right concentration.

Conclusion

Primary Branches, Secondary Branches and Tertiary Branches have a downward trend in line with the Storage Times of scion of Carbohydrate Content, lipids Content, Water Content, and Auxin Contents unless the Protein Content tends to increase in line with the Storage Times of scion. The highest percentage of live grafting is influenced by carbohydrate content. The highest percentage of dorman scion is influenced by water content, the highest shoot rate is influenced by water content, the highest shoot length is influenced by water content, the highest leaf number is influenced by water content, the highest stem diameter is affected by Auxin , Leaf Area is highest influenced by Auxin, Nisba Leaf Area is highest influenced by Water Content, and Nisba Pupus The highest root is influenced by Moisture Water. Carbohydrates, Proteins, Highest Water Content is found in the Secondary Branch and Auxin is highest in Primary Branch.

Acknowledgements

We deeply thank to Mr Prof. La Ode Masihu Kamaluddin, PhD as the Lakidende University Rector who has provided motivation, Mr Prof. Ir. Sahta Ginting, PhD. And Mrs Prof. Dr. Ir. Gusti Ayu K Sutariati, M.Si, who has provided direction from research plan to writing this article. We are also deeply thank to the Ministry of Research and Technology of Higher Education of the Republic of Indonesia who has funded this research.

REFERENCES

Abdul M.B. 1994. Growth analysis of Pimpinella anisum under different irrigation regimes and amount of super absorbent polymer. *International Research Journal of Applied and Basic Sciences*, 3 : 112 – 122

Chun Yao Li, David Weiss, Eliezer E. Goldschmidt, 2003. *Effects of carbohydrate starvation on gene expression in citrus root*. The Institute of Plant Sciences and Genetics in Agriculture, Faculty of Agricultural, Food, and Environmental Quality Sciences, The Hebrew University of Jerusalem, *Journal of Plant Biology, Heidelberg*, Vol 216 no. 1

Kimball, JW. 1989. Biologi Fifth Edition, Addison-Wesleyn Publishing Company, Inc.

Manners, M. M., Griffis, J.L. & McDonald, T.G 2011. *Time After Scion Harvest and grafting Method Influence Graft Success Rate for Purple Fuited Pianga*. Froc. FLA Starr Hort Sec, 124, 28-30

Roni Aloni, Katja Schwalm, Markus Langhans, Cornelia I. Ullrich, 2002. Gradual shifts in sites of free-auxin production during leaf-primordium development and their role in vascular differentiation and leaf morphogenesis in Arabidopsis Received, *Journal Planta- Springer-Verlag*., 216: 841–853

Rusli and Heryana, 2014. *The influence of new sources of entries on nutmeg plants, Research Institute for Industrial Crops and Fresheners*. Road Parungkuda Sukabumi, 43357 - West Java

Ruuska SA, Rebetzke GJ, van Herwaarden AF, Richards RA, Fettell NA,Tabe L, Jenkins CLD. 2006. Genotypic variation in water-soluble carbohydrate accumulation in wheat. *Funct Plant Biol*., 33: 799–809

Saefuddin and Edi Wardiana, 2014. The Influence of Period and Entres Storage Media on the Success of Green Okulation and Entres Water Content On Rubber Plants, Research Institute for Industrial Crops and Sukabumi Refreshing. *TIDP Journal*, 2 (1) March 13-20, 2015

Salisbury, F.B dan C.W. Ross., 1995. Plant Physiology. Translated by Diah R Lukman and Sumaryono ITB, Bandung

Syah, M. Anwarudin. 2008. The Influence of Storage Entres on Succession of Shoots of Some Varieties of Avocado, Indonesian Tropical Fruits Research Institute, Road Solok Aripan, Solok 27301. *J. Hort*., 18 (4): 402-408, 2008

Xue, G.P; C. Lynne McIntyre, Colin L.D. Jenkins, Donna Glassop, Anthony F. van Herwaarden, and Ray Shorter 2008. Molecular Dissection of Variation in Carbohydrate Metabolism Related to Water-Soluble Carbohydrate Accumulation in Stems of Wheat. *Journal Plant Physiology*, Vol. 146, pp. 441–454.

****