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Identification of Development Phases and Changes Shoots Flowering Orange Siam Plants

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Reducing sugar;
Shoots not flowering;
Total sugar;

Abstract

Citrus is a tropical fruit that is preferred by the majority of the Indonesian people. But availability does not comply with this requirement due to the increase of population, income generation, public awareness of the importance of nutrition in addition to the development of agro-industries This is because one of them is the presence of buds induced and not induced in which to manipulate flowering citrus crop is still relatively difficult, because information limited to flowering as the flowering phase and an endogenous substance which causes the flowers induced or not induced. This study uses the citrus crop was ten years old, aims to identify phases-phase of the development of flowers and learn the changes in endogenous substances suspected to affect flowering buds flowering shoots induced or not induced. The results showed that the flowering buds induced marked by enlargement and swelling at the base of prospective new shoots, while the buds are not induced longitudinal prospective new shoots grow straight, and do not experience enlargement and swelling at the base Citrus plants flower development consists of four phases: (1) induction, (2a) late or early induction of differentiation (2b) differentiation, (3) maturation of the organ of interest and (4) flower bloom Flowers induced marked by a sharp increase in total sugar content and nutrient phosphate and potassium in leaf tissue on the plant citrus Siam that is equal to 66.25% on a reducing sugar content and 138.50% on the total sugar content.

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Contents

1. Introduction

In the proses of growing up production of fruit plant integrate between endogenous factors and environmental factors. One was to the phenomenon of flowering plants is largely determined by factors endogenous. Plant it self-floral transition is a key factor determining the productivity especially for fruit trees. Flowering is a complex incident, the morphological changes of the vegetative phase to the reproductive phase. Flowering occurs at the commencement of the transition from a relatively simple leaf structure becomes more complex rate structure. It was preceded by the cessation of the candidate leaves and meristem forming organ begin to produce flower [7].

Siam citrus (Citrus Siam var Microcarpa L) Siam citrus is a plant flowering and fruiting characteristics depending on the climate and environment [3]. Citrus plants are known to be a very short flowering period that has past or future juvenile plants to produce flowering often encounter obstacles because it requires special requirements to be induced flowering and fruiting [2]. Citrus plant flowers appear from top/armpits previously dormancy [8]. Siam citrus is a plant that has the properties of orange flower and fruit seasonal plant known to be a very short flowering period that has past or future juvenile plants to produce long flowering often encounter obstacles because it requires special conditions or can be induced flowering and fruiting [4].

Citrus Siam plant flowers appear from top/armpits previously dormancy [1]. During the flowering period was not all armpit or shoots on citrus plants can bloom, this result is not all armpit or shoots may be induced and phase transition from vegetative to reproductive phase so it is not the whole armpit/buds produce flowers in other words at the plant at the same time there is the armpit/shoots are flowering and no underarm/shoots are not flowering. [11] In fact, often it does armpit/shoots that have fruitful during the fruiting season before, there may bloom again in the next season so that the productivity of trees is not optimal in every season fruit. The phenomenon of the behavioral differences citrus crop is not yet known. The transition from a relatively simple leaf structure becomes more complex rate structure

The incident was preceded by the cessation of the candidate leaves and meristem forming organs begin to produce flowers [5]. The ability of plants to reproductive phase transition depends on its ability to induce flower [10]. Shoots or armpits can be induced or not induced flowering on most fruit crops closely related to differences in the content of growth hormone,

differences in the balance of carbohydrates and nitrogen as well as the conditions of optimal nutrient along with changes in the shoot tips or axillary [7].

Much evidence implying that flower initiation is controlled or heavily influenced by hormones [12], driving one or more substances that are positive and one or more blocks that are negative, where the compound is still to be identified. Citrus identifying development of flower organs and the content of endogenous contained in shoots induced flowering and not induced flowering is still scarce, therefore, identify and study phases of development of flower organs and some endogenous substance that allegedly affect interest induced or not induced highly relevant done The process begins flowering dormant buds on the shoots or leaves the armpit are often induced to flowering occurred on the armpit/shoots that exist in citrus. In the flowering season, often shoots or axillary already bear abundant fruit in season cannot be flowering the following season. The important problems faced by farmers citrus siam plants, thus not ensuring the continuity of production and high production fluctuations between the harvest season. In the harvest season or during a period of many fruit production, on the contrary during this period the number of fruit is very limited and almost no fruit harvest when the price is expensive. The situation is causing the low income of farmers so as lackluster cultivate crops intensively. Given the nature of which is owned by the plants of tropical fruits in general are alternate bearing, is due at the time of flowering is not all armpit or shoots on citrus plants can bloom, this result is not all armpit or shoots may be induced and the transition from the vegetative phase to reproductive phase so not the whole armpit/buds generate interest, in other words at the plant at the same time there is the armpit/shoots are flowering and no underarm/shoots are not flowering. In fact, often it does armpit/shoots that have fruitful during the fruiting season before, there may bloom again in the next season so that the productivity of trees is not optimal in every season fruit. Based on these problems then: Is it the same content of endogenous plant between buds / axillary flowering and bud/armpit do not bloom on the citrus siam plants?. Is there a difference in the content of endogenous effect on plants could determine interest developments that affect the flowering?.

Based on the problems faced by citrus growers in the village of Kintamani chess, then the purpose of this research is: find the cause of the shoot can bloom and flowering will not find a model of the formation process of flowering citrus crops in order to develop the production of citrus fruit quality and sustainable.

2. Research Method

The place is done initial research, namely in citrus production center, the Village Chess, Kintamani, Bangli Regency Chess 2015. The village is located 12 km northwest of the city district of Kintamani, located at an altitude of 1250 meters above sea level with an area of 746 hectares of land divided into moor 630.25 Ha, smallholder forest area of 320 Ha and 60 Ha. Citrus plants studied are already aged 10 years, as many as 10 plants of extensive plots owned by farmers. The Orange crop has been maintained in accordance with the farmers' way of cultivation, which according to the actual conditions in the field. How are farmers cultivating crops fertilized with organic fertilizers and irrigation only from rainfall? Just a routine maintenance, disease control fungus on the bark of citrus with Alika taking a dose of 1-2 ml / liter of water and for the prevention of pests Syngenta is typically used at a dose of from 0.2 to 0.4 ml / liter of water, cleaning of weeds around the tree and trimming branches that have been dried, twigs burned and then buried. Implementation is carried out in the field and in the laboratory of citrus as many as 10 plants were taken at random from 70 plants were used as, research. The study was conducted in two stages early studies (first year), the research is done in 2 stages:

a) The collection of samples and direct observations of morphological aspects of flowering shoots and buds are not blooming.
b) Research Laboratory for observation of changes in the content of endogenous in flowering shoots and buds are not blooming through the analysis of the content of endogenous contained.

Research Design

This study uses the draft environmental completely randomized design with one dependent variable factor of each 15 replicates (10 plants). Factors such as variables are not free flowering period consists of two levels ie: not flowering shoots and flowering shoots. This initial study did not use a specific treatment, only focused on identifying the content of endogenous and floral organ development on citrus plants and the role of the environment in flowering.

Variables Observed

Analysis of the content of the endogenous plant, a sample was taken begins when shoots are at the end of the dormancy period (light green leaves transparent) which is when it is expected rates will induce. Content analysis of endogenous substances plants flowering shoots, shoots example set of branches examples of 50% of the middle vertical headers. Sampling every 2 days during the induction phase and differentiation and 3 days during the maturation phase and the flowers bloom. Shoots/armpit is taken as an example consist of shoots before induction and shoots from four stadia flower development, namely: 1) shoots / armpit on stage induction, 2) shoots on a stage of differentiation, 3) shoots on stadium maturation flower parts and shoots at the stage of flowers bloom. Example for analysis of total sugar content comprising: terminal leaves and bark of twigs under the last segment. The content of N, P, K terminal. Example is the leaves that have been observed morphology is then separated into leaves terminal for content analysis of endogenous plant

3. Results and Analysis

The first occurrence of visually observed flowering phase in citrus siam flowering is a complex incident, the morphological changes of the vegetative phase to the reproductive phase. Morphologically most of the interest of citrus began with the emergence marked with a color change from deep green leaves become light green color transparent, but there is also emerging orange flowers as plant leaves are dark green (Figure 1). So that the citrus crop leaf discoloration is largely *penciri* but not as an absolute identifier because there are some shoots are dark green leaves to the flower induction.

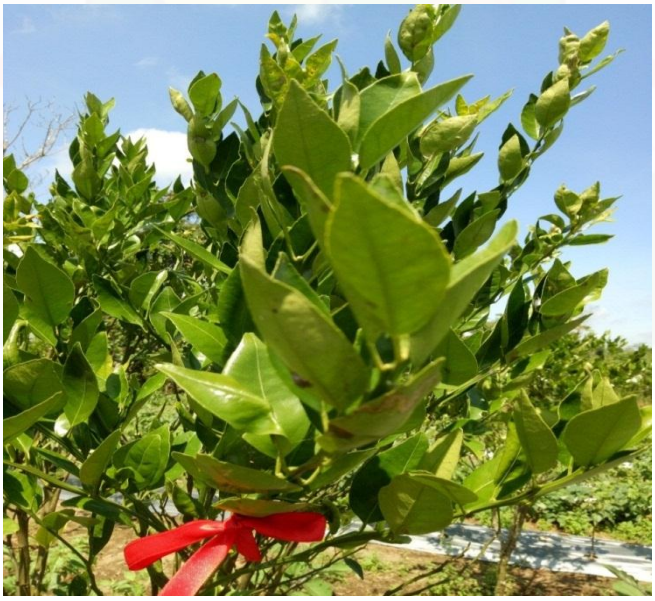

Fig 1. The phase of dormancy in citrus siam plants
Doc. Anom.S. 2015

Fig 2. Induction occurrence in citrus siam
Doc. Anom. S 2015

Observation from the base of the shoots are visually morphology base of shoots with enlargement and swelling at the base of shoots that will flower, this is the beginning of the beginning of the final stage differentiation or induction stage, the difference in flowering shoots are not visually induced new shoots that grow lengthwise. Most fruit trees, flowering shoots can be induced or not induced closely related to the differences and the balance of endogenous plant. Differences in carbohydrate and nitrogen balance and optimum nutritional conditions change along with changes in the shoot tips [7].

Table 1
Contents Nitrogen, Phosphate and Potash Elements Leaves on Floral Organ Development Phase at Flowering and Flowering Shoots

stadia floral organ development	**Types of shoots**	
	Flowering shoots	**Not flowering shoots**
	N content of leaves (%)	
before induction	1,10 b	1,25 a
Induction	1,06 b	1,27 a
Differentiation	1,05 b	1,26 a
Blossom	1,04 b	1,06 b
	P content of leaves (%)	
before induction	0,04 a	0,05 c
Induction	0,04 b	0,05 c
Differentiation	0,03 b	0,05 c
Blossom	0.02 b	0,03 d
	K content of leaves (%)	
before induction	1,35 b	2,02 a
Induction	1,13 c	1,45 b
Differentiation	1,12 c	1,12 c
Blossom	1,04 c	1,19 c

Description: The numbers followed by the same letter for each type of nutrient showed no real influence at 5% level by Duncan test.

The influence of endogenous plant to the formation of shoots flowering and flowering Results of the statistical analysis showed that the tendency of decrease in N element content at the

induction stage of flowering as compared to before the induction. The decrease in element content of N occurs in shoots of plants were flowering occurs both in the period offseason and in the period on the season while the buds are not blooming of the nutrient content of N her in the induction phase of flowering higher than before induction, where the sampling is done while before stage induction on shoots, not flowering (Table 1). Even if visits are not statistically significant happens to the difference in the level of 5%.

Fic 2. The induction in citrus siam plants
Doc. Anom. S. 2015

Fig 3. The differentiation in citrus siam plants
Doc. Anom. S. 2015

Table 1. Judging that the growth activity all directions, vegetative big more on flowering shoots not more many seen from the content of nitrogen, phosphate, and potassium needed in no flowering shoots. Judging from the development stage flowers before induction, induction, differentiation, and flowers bloom nutrient content of N is greater at the top do not bloom when compared flowering shoots. Likewise, the content of N is not any conflict between stadia floral organ development before induction, induction, and differentiation but there is a difference

significant at 5% level on organ development stage at the time of blooming flowers. The flowering process, because the condition of the flowering process is the achievement of the generative phase. Plants with C / N ratio is high will be more easily stimulated to immediately enter the generative phase, so that the flowering process may soon occur. If the value is too high C without offset by a sufficient amount of nitrogen will cause no flowering the following season [9].

Figure 4. The flowers in full bloom in citrus siam plants
Doc. Anom. S. 2015

The high content of N, P and K on flowering shoots were not induced in the picture shows the activity of vegetative growth on flowering shoots not higher [6]. The flowering process is influenced by the total sugar content of leaf, ratio C: N. at the induction stage an increase in tangible results of statistical analysis showed that the shoots do not bloom on the plant citrus in the village chess was found that starting from the phase before induction of a higher amount of nitrogen or C / N ratio of the small citrus crop remains in the vegetative phase [2]. At the induction stage of the real increase in total leaf sugar and C / N ratio of leaves compared with before induction. This is in line with the results of the study [9], on mango and plant sugar bark, that the balance of C / N ratio will determine the balance of the process and the vegetative phase generative phase. The nitrogen content in the plant is abundant, as well as carbon in plants are also redundant, meaning that when the ratio of C and N are comparable (same lot) has an impact on crops is difficult to flowering. On the condition of vegetative organs will flourish, so that C only discharged used for vegetative growth, this impact is not usually stored carbohydrate.

Citrus siam the flowering process is the accumulation of carbohydrates stored photosynthesis, the citrus crop in touch with the ratio of carbon (C) and nitrogen (N) in the canopy, carbon is essential for plants because it is the raw material to create more energy, while nitrogen where if the value of N is abundant in plants and so is the value of carbohydrate are equally abundant, the plant will lead to the vegetative growth From observations of plants for 10-year-old to remain in the vegetative phase, marked by the production branches or twigs branch more dominant course will run into problems in.

Besides the C, N ratio, and potassium nutrients required by plants in large enough quantities is phosphorus. Phosphorus is an essential nutrient that plays an important role, therefore, determine the availability of growth and yield. Phosphorus-deficient plants affect the expansion of the leaves more hampered than the formation of chlorophyll per unit leaf area very much, but the efficiency of photosynthesis per unit leaf area very much, but the efficiency of photosynthesis per unit clorofil very low.

The phenomenon of flowering citrus Siam plants is an event that is very complex. To be understood, it relates to environmental and endogenous plant that is very influential on the shoot can bloom and bloom. This happens the real difference that the total sugar content in the flowering shoots and flowering shoots are not this mean that the flowering shoots of photosynthesis produced for induction of flowering higher total sugar content [8], as compared to the period of differentiation and during the bloom period. While the flowering shoots are not the total sugar content not experience a noticeable difference and have not experienced a sharp increase, from the example of flowering shoots are not adjusted as in the time of flowering shoots at the stadium before the induction, induction, differentiation, and stadia flowers bloom. This is because it is not used to support the process of floral organ development because of *fotosintat*.

Table 2
The Content of Sugar, Total Sugar, and Sucrose on Flowering Shoots and Flowering on the Leaves of Citrus Siam Plants (%)

stadia floral organ development	**Types of shoots**	
	Flowering shoots	**Not flowering shoots**
	Reducing sugar (%)	
before induction	3,75 a	3,25 a
Induction	5,66 b	3,27 a
Differentiation	5,29 c	3,28 a
Blossom	5,29 c	3,29 a
	Total sugar (%)	
before induction	3,67 a	2,25 a
Induction	2,65 b	2,28 a
Differentiation	2,45 c	2,28 a
Blossom	2,45 c	2,29 a
	Sucrose (%)	
before induction	0,08 a	1,23 a
Induction	2,84 b	1,00 b
Differentiation	2,84 b	1,00 b
Blossom	3,01 c	0,99 c

Description: the numbers followed by the same letter for each type of reducing sugar content, total sugar and sucrose showed no real influence at 5% level by Duncan test.

Utilized so that kept part storage organs including this leaves. This matter shoots accordance with the opinion of [9], says that is a phenomenon of early flowering in fruit crops where is the first step of reproduction that determines the formation and subsequent fruit development one of the determining factors is the endogenous plant.

4. Conclusion

From the results of observations conducted both in the field and doing observations in the laboratory may be summarized as follows:

The observations made in the field by viewing Visually, the morphology of flower development plant citrus in Kintamani consists of four phase development, namely: (a) Induction here there is a change of leaf color from dark green to green light transparent, but not all shoots discoloration is the absolute will appear prospective interest, (b) Early or late differentiation induction, here began swelling and extends into the shoots that will flower out nodule candidate, (c), foci of flowers began to appear and floral organ development occurs here

over a period of 2-3 weeks will be (d) interest blooms and long flowering of approximately 3 days and one after another into a fall flower jewelry.

Flowering is the first step of sexual reproduction citrus crops, vegetative and reproductive phases of an event that will determine the formation of fruit and fruit-set on the plant. Induction of flowering occurs is determined by the content of endogenous differences in plant tissues include nutrient phosphate, potassium and total sugar content in the flowering buds, especially in the period prior to induction with an induction period, although not significantly different from the phase differentiation and blossom. The formation of flowering citrus Siam plants greatly determined by reducing sugar content, total sugar, and sucrose in plants.

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References

1. A, D Huchche and M.S Ladaniya (2014). Flowering and Fruiting-Recent Research Advances, National Seminar-Cum-Workshop 24 – 26 May 2014
2. Arcentales, G. A. T., Lucas, M. A. P., Guerrero, J. A. C., & Gordín, R. G. (2017). Evaluation for the Reduction of NH3 Contamination Risks. International Journal of Life Sciences (IJLS), 1(2), 10-17.
3. Arnawa, I. K., Sukerta, I. M., Martiningsih, N. G. A. E., & Astuti, P. S. (2017). Minapolitan Area Development Strategy: An Effort to Increase Fisherman Income, Gianyar Regency, Bali Indonesia. International Journal of Life Sciences (IJLS), 1(2), 39-47.
4. Gene Albrigo. L and Juan I, Valiente, 2007. Flower Bud Induction of Sweet Orange Trees (Citrus sinensis (L) Osbeck Effect of low temperatures, Croop Load Bud age. Horticultural science university of Florida FAS citrus Research and Education Center 700 Experiment Station Road Coke Apt
5. Jain, P., Jain, A., Singhai, R., & Jain, S. (2017). Effect of Biodegradation and Non Degradable Substances in Environment. International Journal of Life Sciences (IJLS), 1(1), 58-64.
6. Jurado, W. C. C., Pérez, A. V. P., Quiroz, A. M. V., & Gámez, M. R. (2017). Environmental Impact On Electrical Networks Near The Manabita Litoral. International Journal of Life Sciences (IJLS), 1(2), 18-27.
7. Kowalski, G. 2008. Flowering Biology of Eggplant and Procedures Intensifying Fruit-set. Acta Scientiarum Polonorum, Hortorum Cultus 7(4):63-76
8. Monnerri L. Fortunato-Almeida A, Molina R. V Neubauer, S. G and Garcia-Luis A. 2011. Relation of Carbohydrate Reserves With the for Incoming Crop, Flower Formation, and Photosynthetic Rate in Alternate Bearing Salustiana Sweet Orange (Citrus Sinensis L) Science Horticulture. 129: 71 – 78.
9. Nazer Ahmed, Dinesh Kumar, Javid iq Bal Mir and Apel. Physiology of Flowering in Perennial Temperate Fruit Crops. Central Institute of Temperate Horticulture old Air Field Rangreth, Srinagar 007, J & K.
10. Ogaya, R., J. Penuelas. 2007. Drought Effects on flower and fruit Production in a Mediterranean Oak Forest. An International Journal of Forest Research 80(3):351-357.
11. Ogu, G. I., & Orjiakor, P. I. (2017). Microbiological and Nutritional Qualities of Fermented Melon Seed Shells. International Journal of Life Sciences (IJLS), 1(2), 1-9.
12. Parvanti M. Sreekumar, Mahesh Salimath, Ranu. S.V and Udayakumar. 2014. The current of Flowering Control Will it Provide Options for Chemical Regulation of Flowering. Nasional Seminar-Cum-Workshop on Physiology of Flowering in Parenial Fruit Crops. The Sosiey for Development of Subtropical Horticulture (SDSH) Central Institute for Subtropical Horticulture (ICAR) Rehman Khera, Lucknow- 226 101, Uttar Pradesh.
13. Poerwanto R, Ani S, Dadang R, Endang E. 2013. Development of Indonesia's flagship Citrus To meet the nutritional needs of the community.
14. Raddy Y.N and om Veer Sigh. 2010. Induction of Flowering in Mango, Some Alternate Approaches Using Phosphatic Chemicals, Rhizosphere Ethylene and Defoliation or Base Pruning of Young Flush 4 the Indian Horticulture Congres 2010 New Delhi. Book of Abstracts pp 216-217.
15. Reddy Y.N. 2013.Physiological Implications of High-Density Planting and Canopy Management in Fruit Crops Lead Paper Presented in National Seminar on High Density Planting in Fruit Crops at Cimbaton T N U.
16. Shailendra Rajan, V. K Singh, Y. T. N Reddy K. K. Upretil, Pooja Saxena, Sakkthi subramaniyam and S. R. Shivu Prasad. 2014. Environment Determines Success of Natural and Induced off-Season Flowering in Mango. National Seminar-Cum-Worksop 24 – 26.
17. Sivu Prasad. S. E. Reddy Y T N Upret K K and Rajeswara A.N. 2014. Studies on Changes in Carbohydrate Metabolism in Regular Bearing and off-Season Bearing Cultivars of Mango (Mangifera indicia. L) During Flowering International j Fruit Science (in press).

18. Ogunsiji, A. S., & Ladanu, W. K. (2017). A Theoretical Study of Performance Measures in the Strategic and Corporate Entrepreneurship of Firms. International Journal of Life Sciences (IJLS), 1(1), 49-57.
19. Omer, A. M. (2017). Identifying, Developing, and Moving Sustainable Communities through Application of Bioenergy for Energy or Materials: Future Perspective through Energy Efficiency. International Journal of Life Sciences (IJLS), 1(1), 9-39.
20. Saxena, A. (2017). The Impact of Nutrition on the Overall Quality of Life Adolescent Girls are Living Across the City of Kota. International Journal of Life Sciences (IJLS), 1(1), 40-48.
21. Singh, D. (2017). Leaf Phenology of Cassia Sieberiana L. in KSUSTA Campus of Kebbi State, Nigeria. International Journal of Life Sciences (IJLS), 1(1), 1-8.
22. Sulistiawati, N. P. A., Kartini, L., & Yuliartini, M. S. (2017). Identification of Development Phases and Changes Shoots Flowering Orange Siam Plants. International Journal of Life Sciences (IJLS), 1(2), 28-38.

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