



Flower Position on Main Stem and Branches Affect Fruit Set in Citrus Plant (Nobilis Var, Microcarpa L)



Ni Putu Anom Sulistiawati ^a

I Nyoman Rai ^b

I Gusti Ngurah Santosa ^c

Ida Ayu Astarini ^d

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Abstract

The aim of the research is to find out best citrus flower position (shot tips or axillary shoot) in relation to fruit formation 'Seam' citrus. The research was done on Citrus which belongs to the farmer at Catur village, district Kintamani, Bangli Regency, Bali. The research was conducted from May 2014 -April 2015. Ten years old Citrus plants were used in this study. Five Plants were chosen. Flower development and fruit formation were observed on six different positions on the plant, i.e. main stem: lower part, middle part and an upperpart, and branch which include lower axillary part of the branches, middle axillary branch and on the tips. Variable observed were a number of flowers developed, both in main stem and branches during on-season and off-season flowering time. Another observation was a number of fruits developed on each position. Results show that flower best on lower axillary branches, both during on-season (54,16%)the base and off-season (45,02%). Flower developed on the tips were much lower, bot on-season (6,90%) and off-season (12,50%). The highest number of fruits was also achieved at the lower axillary branch during on-season (52,23 %) and off-season (35,27 %).

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Author correspondence:

Ni Putu Anom Sulistiawati,

Faculty of Agriculture, Warmadewa University Bali, Indonesia

Email address : anomsulis@yahoo.co.id

^a Faculty of Agriculture, Warmadewa University, Bali, Indonesia

^b Faculty of Agriculture, Udayana University, Bali, Indonesia

^c Faculty of Agriculture, Udayana University, Bali, Indonesia

^d Biology Department, Faculty of Mathematics and Natural Science Udayana University, Bali, Indonesia

1. Introduction

Siam citrus fruit (*Citrus nobillis* var *macrocarpa*, L) is one of the tropical fruits in Indonesia are very likely to be developed. Judging from the level of consumption and the nutritional value of orange is a fruit that is much loved by the people because of the level of consumption of around 5,5 kg/capita/year at present Indonesia imports citrus fruit into two ASEAN after Malaysia state. This is due the price is much cheaper, the quality is good in terms of color because it attracts and continuity production [Poerwanto et al., \(2013\)](#) lack of fulfillment of citrus fruits is experienced by the people of Indonesia one reason is the fall of flower and fruit on fruit trees, given after fruit trees such as citrus undergoes a transition from the vegetative phase to reproductive phase, the large number of flower that formed and produced to survive can produce ripe fruit, this depends on two important factors that determine namely: 1) factor conditions endogenous from citrus plants, 2).

The influence of environmental factors where citrus plants are grown ([Poerwanto et al., 2013](#)). In most plants after experiencing flower pollination, ovary will grow and the fruit begins to develop, along with that usually occur instances where wilting and death of petal. Changes that mark transition interest into young fruit by [Rai \(2004\)](#) is the proportion of the amount of interest that persisted after petal fall reproductive depends on the ability of plants to induce flower ([Koshita et al., 1999](#)).

Induction of flowering is a process in which the stimuli from the outside toward the growing point and these results induce primo, the leaves must be able to produce the substance of the driving flowering. An required by apical or stopper production inhibitor. So also the ability of the apex weeks to receive a response and received a stimulus flowering sufficient and stop receiving inhibitor from any part of the plant and then proceed to the formation of floral organs in the correct order on fruit trees outcomes on the formation of flowers and fruit is determined by the induction phase of flowering or the so-called transition phase that is the phase of vegetative to reproductive phase while also environmental factors are closely linked to the content of the activity of endogenous plant. naturally flowering in citrus siam plants seasonal flowering or bearing alternative ie flowering and fruiting much in a season (on-season) and bear slightly the following season (off-season), and therefore contributes to the sustainability of production. According to [Berier et al., \(1985\)](#) and [Kinnet et al., \(1985\)](#) flowering and fruiting on fruit crops is influenced by environmental factors, especially the microclimate and plant endogenous factors, such as carbohydrates and growth hormone. Growing environmental factors affect the physiological activity in plants that have an impact on the phases of plant growth and development. Climatic elements that could affect physiological processes, among others, air temperature, humidity, rainfall, rainy day, and light. According [Ogaya and Penuelas \(2007\)](#) and [Rai, et al., \(2010\)](#) the failure of the formation of fruit set caused by environmental factors is growing less supportive or because of less optimal process plant physiology for trying to insufficient nutrients, water and carbohydrate content. research results [Poerwanto et al., \(2013\)](#) Shows that, with the application paklobutrazol, prohezdion-ca and strangulation significant effect on the emergence of flower buds, flowers and the formation of the citrus fruits slightly mm / year with an average of 2-4 months of wet and 3-5 months dry, suitable to be planted in an area with an altitude of 300-1400 meters above sea level (asl) where the climate is relatively little dry, with a long dry period of about 3 months to process flowering ([Departemen Pertanian, 2010](#)). Flowers are a branch with leaves in a changed form, in which growth is limited, short segment ed, and its leaf has changed form. Section of interest by [Kowalska, \(2008\)](#) petals (Calyx) green, canopy (crown flowers/corolla, statements, pistil/pistil, flower/pedicel and receptaculum. The morphology of flowering is an event where the change to the formation of vegetative organs of interest, where the successful transition of plants from vegetative phase to phase fruit that is formed to be harvested is determined by the amount of interest be produced. percentage fertilization pollination of flowers that experience as well as the percentage of young fruit that can grow steadily become ripe fruit Citrus amount of interest earned is determined by the amount of shoots per plant because of the nature of the interest that the terminal which flowers grow and uncul only from the ends of the shoots. Furthermore intensity slightly or the amount of fruit that is formed to be harvested is determined by the amount of interest. Resulting percentage fertilization pollination of flowers that experience as well as the percentage of young fruit that can grow steadily become ripe fruit. Citrus amount of interest earned is determined by the number of shoots per plant because of the nature of the interest that the terminal which flowers grow and emerge only from the ends of the shoots. Furthermore intensity and [Bonghi et al., \(2000\)](#) pollination and fertilization not affect the amount of fruit so ripe to harvest, due to the nature of the citrus crop is determined by the number of flowering shoots and citrus plants ability mentioned.

2. Materials and Methods

Description of Location and Time Research:

Prior to the study carried out assessments in advance to determine the location to be chosen as a place to study. After that set the location of the center of citrus production in the village of Chess located 12 km northwest of the city Kintamani district, which is located amongst the middle between Mountains Writing, Batur, Chess, and Mountains Mangu that either side of the three districts in Bangli namely Badung, Buleleng and Bangli. Chess village location situated at an altitude 1450 meters above sea level (asl) with an area of 746 hectares of land which is divided into 630 fields, 25 hectares, an area of 320 ha people's plantation and forest area of 60 hectares. Namely the commencement of research activities from February to November 2014. Materials and Equipment observed citrus crop that is already 10 years old, as many as 5 plants of a broad expanse of the garden owned by farmers. Citrus crop has been maintained in accordance with the way the farmers farming, in accordance with actual conditions in the field. The way farmers are cultivating crops fertilized with organic fertilizers and irrigation only from rainfall Citrus crop has been maintained in accordance with the way the farmers farming, in accordance with actual conditions in the field. The way farmers are cultivating crops fertilized with organic fertilizers and irrigation only from rainfall. Routine maintenance is only a fungal disease eradication in the bark of citrus plants using Alika with a dose of 1-2 ml / liter of water and for the prevention of pests typically used Syngenta at a dose of 0.2 to 0.4 ml / liter of water, cleaning of weeds around the tree, and trimming branches dried, dried up twigs burned then buried in the ground, the materials used include: siam citrus plant). While the tools are used among other things Thermometer wet balls and dry balls, ribbons, books, rulers, polpen (note tool data), cameras, and computers.

Study the design used in this research is completely randomized design (CRD) due to environmental conditions and crop cultivation history and homogeneous and plant maintenance are also homogeneous. This research is an experimental one factor as the dependent variable with 10 replications. Factors as dependent variables connection seed Variable flowering and fruiting Observation on flowering includes: position of flowers, flowers are formed per plant, flowers fall per plant.

3. Results and Discussions

The event of a change of leaf color from the leaves of young color transparent for the induction of flowering in citrus siam plants increased nitrogen content in the seeds conon in the amount of 2,09% was significantly higher when compared with the seed amounted to 1,62%. Positioning distribution pattern of flowers and fruit on trees and branches differ between seedling of connection and seed. In the seed interest positions on the tree are concentrated the middle section of the base is 37,16% in the base of the tree and 47,19% in the central part of the tree, while the flowers that grow on the top of a very slight 2,90%. Similar research results are reported by [Welch and Fieldman \(2000\)](#) of the percentage of fruit from plants set seed (93,97%) significantly higher than the connection of plant origin (85,38%). In the seed interest position relative to the upper base spread of shown by the number of flowers that grow on the top of the tree relatively much 20,15%. The distribution pattern of the position of interest in the armpit / buds-like plants in the connection. In the connection the dominant flower grow from the armpit / buds bottom (56,57%) while growing at the end of the discharge branch of the axillary flowers / buds amounted to 14,12% (Table 2). the event of a change of leaf color from the leaves of young color transparent for the induction of flowering in plants siam citur increased nitrogen content in the seeds connection in the amount of 2.09% was significantly higher when compared with the seed amounted to 1,62%. Positioning distribution pattern of flowers and fruit on trees and branches differ between seedling of connection and seed. In the seed interest positions on the tree are concentrated the middle section of the base is 37.16% in the base of the tree and 43,19% in the central part of the tree, while the flowers that grow on the top of a very slight 2,90%. Similar research results are reported [Bangert \(2000\)](#) that the vast majority ie 80% on the mangosteen fruit from seeds just beginning to bear fruit grow from branch nor 8-12, while growing from the top of the very few. In the seed interest position relative to the upper base spread of shown by the number of flowers that grow on the top of the tree relatively much 20,15%. The distribution pattern of the position of interest in the armpit / buds-like plants in the connection. In the connection the dominant flower grow from the armpit / buds bottom (56.57% while growing at the end of the discharge branch of the axillary flowers / buds amounted to 14,12% (Table 1). This is supported by [Rai \(2004\)](#) reported that the distribution pattern of the position of interest in plants from seeds mangosteen more dominant flowers grow from the bottom branches, while at the very low end of the branch. The percentage of fruit position on the base of the lower branch of porsentase position of

interest at the same place, while in the middle and upper branches of fruit porcentage amount higher than the amount of interest at the base of the distribution pattern of fruit on the branch position is identical to the distribution pattern of the position of the fruit on the tree. The position of the base of the flower that grows in place more sensitive branch suffered a miscarriage. Compared with a fruit body in the middle and upper branches. The death rate in this position due to the flowers and fruits that grow at the base of a branch of flowers and fruit that are supported by this shaded. It is associated leaves intensity of photosynthesis that are less influential on the low fotosintat generated is supported by the low total sugars in the leaves shoots that flower and fruit fall, supply fotosintat. In this regard stated that needs fotosintat "Sink" is mainly supplied by the "Source" nearby. This the leaves are experiencing the auspices of the leaf parasites, so its function as the "Source" to supply "Sink" to the development of flowers and fruits are low. Of the incident the plant did not have a balance between the needs and strengths asking "Sink" is high, on the other hand with the power quality of the "Source" is low (source activity, this impact low supply of photosynthate. This is supported by studies Luis *et al.*, (1995) that the proximity of the location of the "source" and "Sink" affect the ability of "Source".

Table 1
Percentage of fruit formation and differences in flower number,
Fruit number and yield of fruit per tree between seddling origin

Variable	Flowering period	
	On-season	off-season
Primary branches/tree	38,21	25,5**
Number of branches/tree	520	260 **
The number of flower are formed (florest)/tree	450	210 **
Fruit is formed (%)	92,5	68,9 **
The Percentage of fall flowers and fruit	6,5	31,1 **
Number of fruit/tree	425	126 **
Many autumn flowers (%)	20,55	32,80**
Long flower periode/day	5	4,5 tn
Fruit diameter(cm)	4,3	3,9 tn
Fruit weight (gram)	75,6	56,4 **
Weight fruit / tree/kg	7,5	5,0**

Description: on the same line numbers followed by tn mark
means not significantly different at T test
level 5 % and the number followed mark **
means significantly different at the
level of the T test level 1%.

The leaves are experiencing the auspices of the leaf parasites, so its function as the "Source" to supply "Sink" to the development of flowers and fruits are low. Of the incident the plant did not have a balance between the needs and strengths asking "Sink" is high, on the other hand with the power quality of the "Source" is low source activity this impact low supply of photosynthate. This is supported by studies Luis *et al.*, (1995) reported that citrus fruits are picked when young led to increased content of starch and sugars non -reduction in the leaves and branches. This is in line with the opinion of Bonghi *et al.*, (2000) and Monnerri (2011) that the proximity of the location of the "source" and "Sink" affects the ability of "Source".

Judging from the total sugar content when associated with the distribution pattern of the position of interest occurs a difference on the flower buds survive and fall on the citrus siam plant. Statistically seen from the total sugar content distribution position of interest that is of interest that arise in the trees and flowers that appear on branch total sugar content in the leaves and shoots which survived the fall does not happen a real difference in the level of 5% (Figures 1).

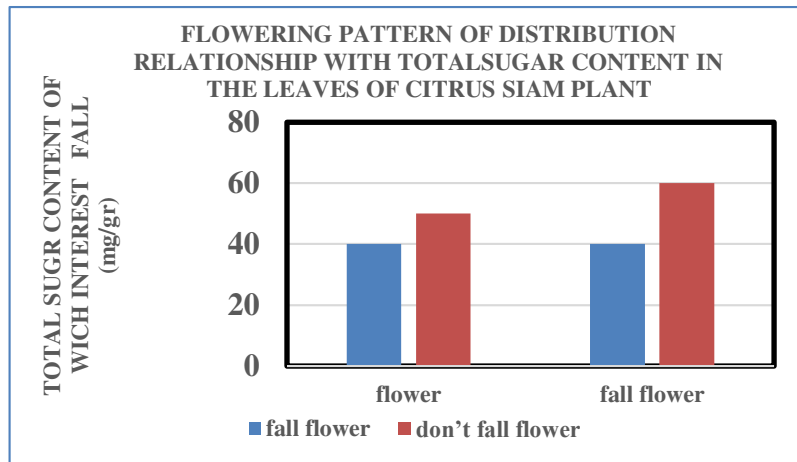


Figure 1. xxxxxxxxxxxxxxxxxxxx

Table 2

Difference position of grow in interest and the fruit on the trees and branches among the plant from seedlings

Variable	Flowering period	
	On-season	off-season
Interest position on the tree (%)		
The base	43,19 a	37,16 a
The middle	50,02 a	32,35 ab
Top	2,90 a	20,15 bc
Flower on branch position (%)		
The base	54,16 a	45,02 b
The middle	25,12 cd	22,21 c
Top	3,21 c	13,25 de
The position of the fruit on the tree (%)		
The base	23,25 b	26,08 b
The middle	53,04 a	26,53 b
Top	5,65 c	24,09 bc
The position of the fruit on the branch		
The base	52,23 a	35,27 b
The middle	25,35 bc	32,05 b
Top	3,13 d	21,34 c

Description: on each variable, the numbers followed by the same letter are not significantly different mean at the level of 5 % Duncan test

Total sugar content lower leaves on the flower buds that support demonstrates the ability of the leaf is supporting the development of flowers is less than optimal, causing flowers on the top of the fall. This means that interest occurs because of the nearest source. The closest is less able to meet the needs of sink [Ogaya and Penuelas \(2007\)](#) reported that the limited assimilate production generated on the flower buds fall and is caused by limited or assimilate production and allocation assimilate to the very low interest. However, also the opinion [Luis et al., \(1995\)](#) which states that the formation of interest is also determined by the level of competition between the source itself, because the thick leaves of the plant tangerine seen from the number of leaves it assimilates used for forming the lower the interest, because the usage percentage assimilates required for the utilization of the leaves. According to [Ogaya and Penuelas \(2007\)](#) stated that insufficient assimilates not directly determine the flower abscission because it is also determined by the level of competition between the source and between flowers or flowers with buds as well as the

proximity of the location of the source with the flow.

In this regard stated that the need Potosi NTA T "Sink" is mainly supplied by the "Source" nearby. This is supported by Rai (2004) states that "Sink" in normal circumstances produce a certain hormone, then translocated to the leaves. The inside led to photosynthesis in the leaves is increased. If there is interference on "Sink" the amount of translocated hormone decreased to affect the rate of photosynthesis also decreases distribution pattern position of interest on different branches of trees and plants in the period between the on-season and off-season In the period of on-season and off-season flowers Monnerri (2011) on trees positions are concentrated at the base and the middle is equal to more and showed significant differences in the level of 5%, respectively 43.19 and 50.20 at the time, flowering in the period on-season and off-season position of interest is concentrated at the base and middle of the tree (Table 2) more than at the top is much less, namely the on-season period. This is in accordance with the results of the study (Singh, *et al.*, 2014), that 80% of fruit on fruit trees flower growing from a tree branch No. 8-12 while growing from the tree top was very little. The difference in the distribution pattern of the growing interest in the position of trees and branches affect the amount of interest that is formed on plants. The observation of the position of interest determines the percentage of interest fall and formed in plants, while the flowers are so located at the base of the tree are lower than the percentage of interest in the same position. The distribution pattern of the fruit on the branch position is identical to the distribution pattern of fruit position in the tree. Percentage fruit position on the base of the branch is lower than the percentage position of interest at the same place, while at the top of the branch middle and the percentage of fruit higher than the amount of interest these data indicate that the flowers that appear in the base of the tree and the base of the branch is more sensitive than the fall experienced a growing interest on the part of middle and top of the tree or branch. This is because the flowers that grow on the tree trunk and branches are supported by the flower leaves shaded. The leaves are shaded so that the parasite leaves its function as a source to supply the needs of low-interest sink. In such a condition occurs imbalance between needs and strengths request sink (sink strength) is high on the one hand with the quality of the source (source activity) is low on the other hand, so its ability to supply Potosi NTA T limited.

Growing interest position on the base or the base of the branch tree could have supplied the needs of growth and development by the leaves of the canopy top, but the distance sink much interest to source supplies Potosi NTA T cause their ability to supply low. This is consistent with the opinion Albrigo *et al.*, (2007) the proximity of the location between the leaves sink or source to affect the ability of the source to supply Potosi NTA T, is related to the environment, especially the micro-climate that is a failure by the optimal light intensity in the branch.

It is appropriate with the opinion Bonghi *et al.*, (2000) that the proximity of the location between the source and sink affects the ability of the source to supply Potosi NTA T. In this regard stated that the need Potosi NTA T sink mainly supplied by a nearby source-sink in normal circumstances produce amount of certain hormones then translocated 4th leaf and leaf photosynthesis there causes the rate to increase. When the sink is disturbed then translocated decreasing a number of hormones so that the rate of photosynthesis is also down.

There is a difference of total sugar content in the two periods between on-season and off-season orange Siam, the total content of plant leaf sugar in the period of on-season and off-season in the position of the most middle and last branch showed an unreal difference at the level of 5%. The more aged leaves change the total leaf sugar content in the plant Siam orange. This proves that the more down to the increasing age of the leaves the total sugar content decreases

4. Conclusion

Flower and fruit -growing located at the base of the tree and butt branch more sensitive miscarried Branch more sensitive miscarried, closeness lies between the source to sink affect the ability of the source to fotosintat supply, differences in the distribution pattern of flowers growing position in the tree and branches affect the number of flowers and fruits of autumn, and The difference in the distribution pattern of growth position flowers on trees and branches affect number of flowers and fruits fall on plant.

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Statement of authorship

The author(s) have a responsibility for the conception and design of the study. The author(s) have approved the final article.

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Biography of Authors

	<p>Ir. Ni Putu Anom Sulistiawati, M.Si, Institution: Warmadewa University, Faculty of Agriculture Concentration: Agrotechnology Position: Lecturer seconded Warmadewa University Areas of Expertise: Horticulture Rank/Class: IV b/Assistant Professor, Lecturer PNS seconded Email: anomsulis@yahoo.co.id</p>
	<p>Prof. Dr. Ir. I Nyoman Rai, M.S. Institution: Udayana University, Faculty of Agriculture, Agro echo technology Study Program, Laboratory of Agronomy and Horticulture. Position: Dean Area of Expertise: Horticulture Rank/Class: Professor/IV d/Lectures on government university</p>
	<p>Prof. Dr. Ir. I Gusti Ngurah Santosa, M.S. Institution: Udayana University, Faculty of Agriculture, Agro echo technology Study Program, Laboratory of Ecophysiology Position: Lecturer Area of Expertise: Management of Water Resources, Soil, and Plant Rank/Class: Professor/IV e/Lecturer on Government University</p>
	<p>Dr. Ir. Ida Ayu Astarini Institution: Udayana University, Faculty of Mathematics and Natural Sciences. Position: Head, Master Agree Program in Biology Area of Expertise : Horticulture Biotechnology Rank/Class: Associate Professor/Iva/Lecture of Government University.</p>