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Study of Climate and its Correlation to the Flowering Period and Fruit Production on Two Cikrak and Jingga Cultivars of Durian (*Durio Zibethinus* Murr.)

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ABSTRACT

This research was aimed at finding the correlation of climate variables, flowering period, and fruit production on two durian cultivars, Cikrak and Jingga. The study employed observation method on durian (flowering period and fruit development). Meanwhile, climate variables (the average temperature, humidity and precipitation) were observed for 12 months, starting on August 2009 until August 2010. Climate variables data were correlated with observation data in the form of the flower and durian fruit number by using SPSS 17.0 for windows help on *frequencies* sub program. It can be drawn from the findings and the discussion that climate variables (temperature, humidity and precipitation) had a significant correlation with the flowering period and fruit production on Cikrak and Jingga cultivars durians. The emerging of flowering period on Cikrak and Jingga cultivars was triggered by the low condition of precipitation intensity. Precipitation variable happened to be the most influential variable in determining fruit production of Cikrak and Jingga durian cultivars.
KEYWORDS: Climate, flowering and durian fruit production.

INTRODUCTION

Durian (Durion spp.) is a kind of a tropical plantation which grows at the area reaching 1700 m of height above the sea level. Somehow, only the species of *zibethinus* that can grow well at the height of 300 until 650 above the sea level [12, 13, 8]. In it habitat, durian requires the minimum temperature of 22^0C and the maximum temperature of 33^0C, with 40-60% of sunlight intensity [5, 11]. The family of durian plantation requires wet climate in A or B type depending on the horizontal classification by *Schmidh-Ferguson*, with 2 to 3 months of dry temperature. Those dry months should have less than 60 mm of precipitation and above 100 mm of precipitation per month for the wet months [9, 6], or in other words this type of durian requires 1500 until 2500 of precipitation per year which is well distributed in each of the month. In that type of condition, durian will need water to grow, especially at the phases of flowering and fruit development. However, Indonesia has great potential to produce great quality of durians, which in turn can support the increase of the state income from the agriculture sector [10].

Up to now there has been some research especially on deciding the ripening level of durian fruit based on the analysis of Ethylene emission, by using electro statistic device, and by applying an analysis on the change of the physical condition of the fruit. However, there has not been a lot of research on the correlation of climate with flowering and the production stage yet. The research done has been so crucial to provide support for durian to grow in its appropriate habitat. Therefore, it is expected that durian can grow at its maximum level, both in terms of the quality and quantity of the fruit.

One of the most important factor in the breeding of local durian is the altitude which becomes the main cause of the weather change pattern and the climate. The climate differences cause various responses of durian plantation, especially in the case of the flowering and the fruit production stage. For commercial durian plantation, flowering stage general starts on early October and the harvest season end by the mid February. However, if there ia a special case when there is a second inflorescence stage during that period, the flowering phase starts on early June and the harvest season on June the following year [11]. Ashari and Wahyuni [3], state that it takes 6 to 7 weeks for the process of initiation to the blooming phases to happen, depending on the season. The flowers bloom at the night time and fall by the end of the night until morning time. Therefore, a research on the flowering and fruit production stages on local durian plantation is needed.

This study is designed to gather information on the correlation of several variables of climate and the flowering and fruit production stage on Cikrak and Jingga cultivars. The aim of study is gaining climate information which influence the flowering period and formed of the domestic cultivars durian Cikrak and Jingga at the different climate condition.

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MATERIALS AND METHODS

This study was conducted in 2 villages; Wonoagung and Pait, the district of Kasembon, Malang. It was conducted from August 2009 to August 2010. The locations of this study were chosen by design. Cikrak cultivar was found in Wonoagung which is located at 446 m above the sea level, while Jingga cultivar was found in Pait, which was located at 578 m above the sea level. Several devices used in this study were GPS (Global Positioning System), maximum-minimum thermometer, digital camera, and a hand counter. Meanwhile, the materials used were Cikrak and Jingga cultivars as local clons.

The technic of sampling collection employed for several climates factors was done proportionally because the population of the sample was designed to be in the same group (the age and the height of the durian plantation). By then, the device to measure the physical environment atmosphere was put by the classification of the age or the height. In the group of durian plantation with the same age or height, the device is put at the centre of the crown and on the ground. The observation was done in the morning (06.30 – 07.00) for the minimum temperature and in the afternoon (17.00 – 17.30) for the maximum temperature and precipitation, while the humidity was observed in the morning (06.30 – 07.00), at noon (12.00 – 12.30), and in the afternoon (17.00 – 17.30).

The observation on the flowers was done by counting the number of the flowers and the length of the flowering phase. The observation on the durian fruit was done by calculating the number of fruits harvested every month.

The data collected in the form of tables and then described in the forms of numbers and percentage. SPSS 17.0 program for windows at *frequencies* sub program was employed to analyse the data.

RESULTS AND DISCUSSION

1. The Correlation between Variables and the flower with the number of the fruits

The result of coefisien analysis between climate variables and flowering stage as well as the development of Cikrak and Jungga cultivars are put on tables 1 and 2. All of the correlation value (r) among those variables are real, except that between the number of the flowers and the numbre of the fruits of Jingga cultivar.

Table 1 Correlation matrix among flowers, fruits, temperature, humidity and precipitation on Cikrak durian in Wonoagung village.

Variables	Flower	Fruit	Temperature	Humidity	precipitation
Flower	1,0	0,84**	0,74**	-0,76**	-0,84**
fruit		1,0	0,51*	-0,56*	-0,73**
Temperature			1,0	-0,87**	-0,77**
Humidity				1,0	0, 93**
Precipitation					1,0

Table 2 Correlation Matrix among flowers, fruits, temperature, humidity, and precipitation on Jingga durian in Pait village.

Variables	Flower	Fruit	Temperature	Humidity	precipitation
Flower	1,0	-0,20	0,74**	-0,54*	-0,65**
Fruit		1,0	0,58*	0,48	-0,67**
Temperature			1,0	-0,76**	-0,71**
Humidity				1,0	0, 93**
Precipitation					1,0

The climate variables (temperature, humidity and monthly precipitation) have a real correlation with the flowering period and the fruit development in both cultivars.

2. The Correlation of temperture and the number of the floers and the fruit.

The increase of the monthly average temperature will in effect increase the number of the flowers and the fruits, except for the number of Jingga cultivar fruit (r = -0,58*). This can also be seen in in figure1 and 2. Cikrak cultivar begins to produce the fruits from June to January the following year, while Jingga starts its flowering phase in August and produces the fruits in December the same year (Figure3 and 4).

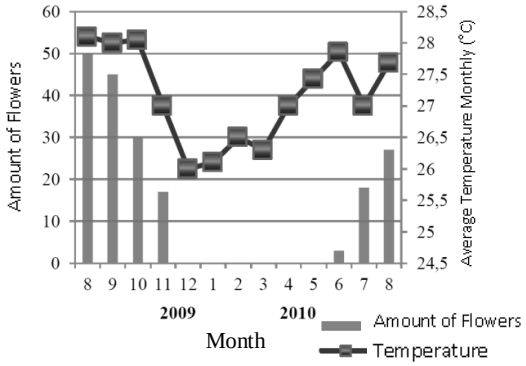

Figure 1. The temperature and the number of flowers in Cikrak cultivar

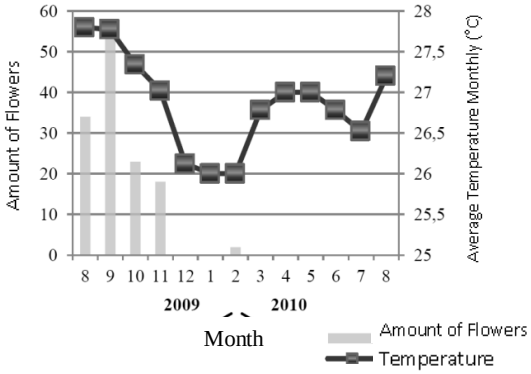

Figure 2. The temperature and the number of flowers in Jingga cultivar

It can be seen in the images 1 and 2 that the rise in the temperature is followed by the increase in the numbers of flowers in both Cikrak and Jingga cultivar.

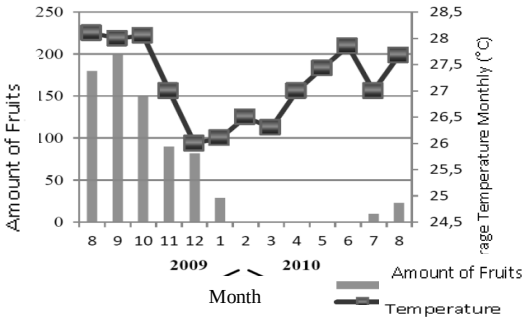

Figure 3. The temperature and the number of the harvested fruits in Cikrak cultivar

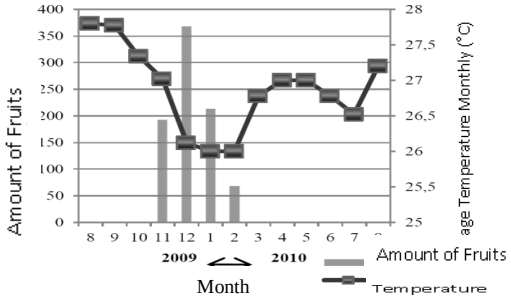

Figure 4.The temperature and the number of the harvested fruits in Jingga cultivar

For Cikrak cultivar, the harvest season is on from July to January in the following year, while the harvest season for Jingga cultivar starts from November to February (Figure 3 and 4).

The temperature has a significant correlation with the number of durian harvested for both cultivars. However, the increase in temperature will decrease the number of the harvested fruits for Jingga cultivar, with r = -0.58*. The increase and decrease in cardinal temperature will affect the pollen fertility of some fruit plantation [7, 5]. Ashari [1] states that durian *fruit set* is low due to two things; the imperfect pollination or because of the incompatibility symptom (*self-incompatibility)* caused by the physiological defect and diseases.

3. The Correlation of the humidity and the number of durian flower and fruits

Humidity has a direct correlation with the flowers formed, both in Cikrak and Jingga cultivars. (Figures 5 and 6).

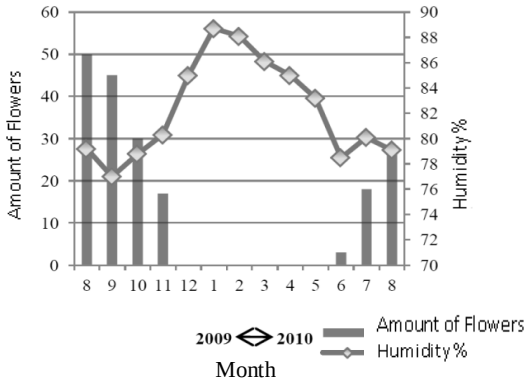

Figure 5. The humidity and the number of flowers formed in Cikrak cultivar

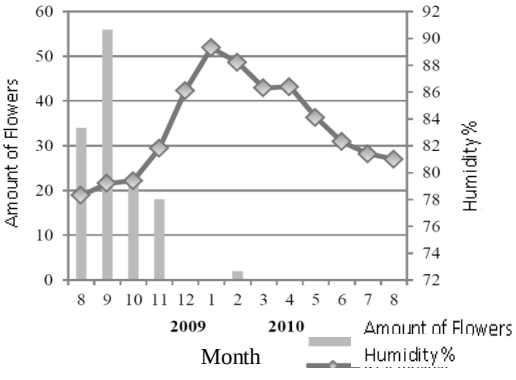

Figure 6. The humidity and the number of flowers formed in Jingga cultivar

The monthly average humidity during the experiment has a positive correlation towards precipitation, and has a negative correlation towards the temperature (table 1 and 2). For Cikrak cultivar, humidity is very influential towards the flowers formation ($r = -0.76^{**}$). Figure 5 show that the increase in humidity will decrease the number of the flowers significantly in Cikrak cultivar than that in Jingga. Somehow it suggests that Cikrak cultivar is more sensitive towards the humidity than the Jingga cultivar (Figure 6). With the same level of humidity, Jingga cultivar is able to survive with more number of flowers than that of Cikrak. Humidity affects the pollination processes. The intense humidity damages the pollen and the pistil which in turn causes the failure in the pollination processes [2]. It will indirectly affect the number of fruits produced and harvested each month. For CIkrak cultivar, humidity has a negative correlation ($r = -0.56^{*}$) with the numbers of fruits harvested each month while it is positive in that of Jingga. It shows that the flowers development is relatively resistant towards the increase and decrease of humidity level (Figures 7 and 8).

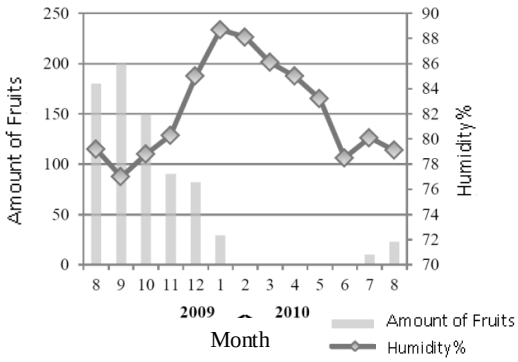

Figure 7. Humidity and the numbers of fruits harvested in Cikrak cultivar

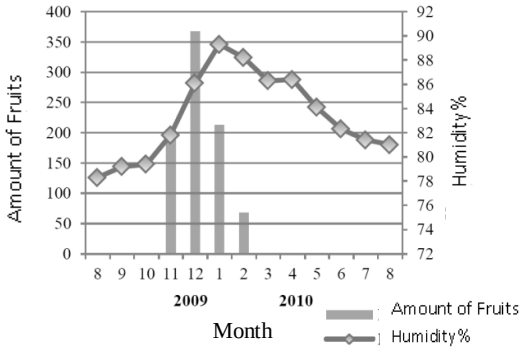

Figure 8. Humidity and the numbers of fruits harvested in Jingga cultivar

4. The correlation of precipitation and the numbers of flowers and the fruits harvested

Precipitation level has a negative correlation with the numbers of the flowers and fruits harvested, both in Cikrak and Jingga cultivars (Figures 9 and 10). For Cikrak cultivar, the increase in the number of the flowers happens when the precipitation level is relatively lower than that of the Jingga cultivar. The decrease of the precipitation level in May will trigger the flowers to come in June up to November for Cikrak cultivar while it happens during August to November in Jingga cultivar. That difference shows the sensitivity of Cikrak cultivar towards the decrease of precipitation level compared with that of Jingga cultivar ($r = -0.65^{**}$); it triggers the flowers to grow in Cikrak cultivar ($r = -0.84^{**}$).

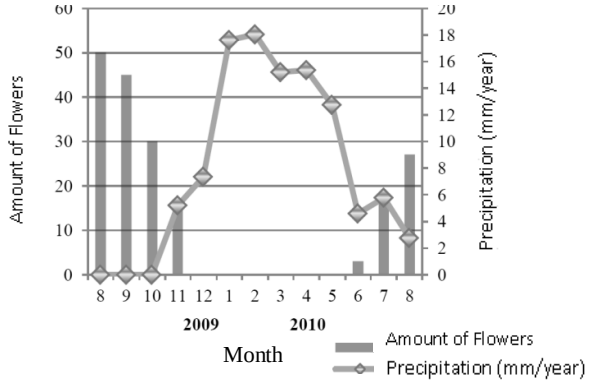

Figure 9. Precipitation and the number of flowers formed in Cikrak cultivar

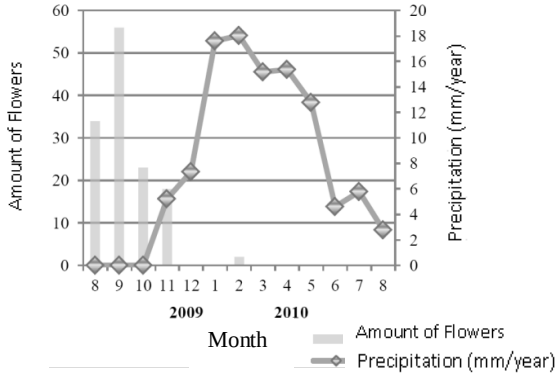

Figure 10. Precipitation and the number of flowers formed in Jingga cultivar

Mechanically, the high precipitation intensity causes the damage of the pistil and the rupture of pollen which leads to the pollination and flower formation failure. High precipitation intensity is needed at the period after the fruit set is formed when the fruits grow until almost ripe. It can be seen in figures 11 and 12 which show that both cultivars do not need high intensity of precipitation during harvest time, especially in Cikrak cultivar.

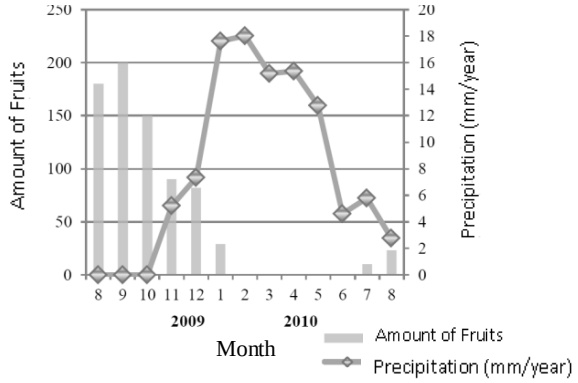

Figure 11. Precipitation and the number of fruits harvested in Cikrak cultivar

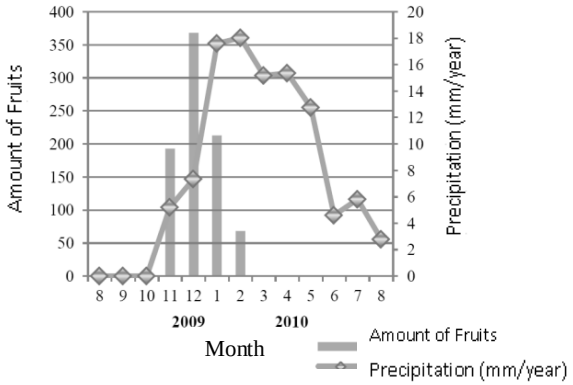

Figure 12. Precipitation and the number of fruits harvested in Jingga cultivar

In the same level of precipitation, both cultivars show different responses in the length of the harvest period and the number of fruits harvested. Cikrak cultivar shows to have longer harvest period than that of Jingga, but it works the opposite for the number of fruits harvested.

5. The most influential climate variable for the fruits production

The result of the double regression shows that of several climate variables tested (temperature (X_1), humidity (X_2) and precipitation (X_3) towards the fruits harvested (Y), precipitation is the most deceive variable in the fruits production of durian. For Cikrak cultivar: $y = -1.744\ X_3$ with $(R) = 0.82^{**}$ of determination coefficient, and in Jingga cultivar $Y = -1.829\ X_3$ with $(R) = 0.88^{**}$ determination coefficient.

CONCLUSION

1. Cimate variables (temperature, humidity , and precipitation) are correlated with the Flowering period and the number of fruits harvested in both Jingga and Cikrak cultivar.
2. The durian fruits production is mostly determined by the precipitation variable.

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