Effects of Pruning and Fertilizing on Production and Quality of Mango Cultivar Gedong Gincu in West Nusa Tenggara Province - Indonesia

Muji Rahayu, Baiq Nurul Hidayah, Mujiono, Brian Thistleton, Sohail Qureshi, Ian Baker

Abstract**—**Mango is a type of tropical fruit which popular among the consumers and have high commercial value. Moreover, this fruit also good for human health as contain lots of vitamins, mineral, and fiber. The largest production area of mangoes in Indonesia is East Java Province, followed by Central Java, West Java and West Nusa Tenggara. In West Nusa Tenggara Province, mangoes mostly cultivated in yards and in mixed gardens with conventional technological approaches. However, low quality of mangoes from West Nusa Tenggara Province was indicated due to lack of Good Agricultural Practices (GAP). The one being developed is Cultivar Gedong Gincu which is native to Indonesia and acceptable for both local and export purposes. This study aims to observe the effects of pruning and fertilizing on the production of mangoes as well as its post harvest quality. The experiment was conducted at farmer's farm in the village of Mumbulsari, Sub District of Kayangan, North Lombok, West Nusa Tenggara Province of Indonesia, from January 2010 until January 2011. It consisted of seven treatments. Each treatment was repeated five times; therefore the experiment was using 35 test trees. Test trees were mangoes cultivar Gedong Gincu, average 12 years old trees and have uniform appearances. The parameters observed were varied but more focus on total number of fruits, total production, and malformation. Mango production management through a combination of 500 gram ZA fertilizer/tree + 1500 gram of SP36/tree + 1000 gram of KCl/tree + 80 gram B/tree + pruning could increase total number of fruits by 240.60% and increase total production by 269.80% compared to control treatment. In addition, use of Boron could significantly reduce the fruit sitting (malformation) from 7.22% (control) to 3.12 %.

***Keywords* —** pruning, fertilizing, mango, West Nusa Tenggara, Indonesia.

I. Introduction

MANGO is type of tropical fruit which popular among the consumers and have high commercial value. Moreover, this fruit also good for human health as contains lots of vitamins, mineral, and fiber. Horticultural commodity, especially mango, has a good prospect for development in intensive way in large agribusiness or agroindustry. Indonesia is the fourth ranking of mangoes producers in the world but not in the big five of export countries yet.

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The largest production area of mangoes in Indonesia is East Java Province, followed by Central Java Province, West Java Province and West Nusa Tenggara [*Indonesian = Nusa Tenggara Barat (NTB)*] Province. Mangoes farming systems in NTB for light skin cultivar (red, yellow, orange, etc.) such as Gedong Gincu, Kensington, etc. not popular yet in farmers level therefore NTB mangoes mostly dominated by green skin mangoes (green mangoes) such as Arumanis and other cultivars namely Manalagi, Madu, Golek, and some local cultivars. Mangoes market and trade situation more and more depend on consumer preferences. Domestic consumers more prefer to flavour, while international consumers more prefer high quality product (shape, size, and skin colour) both for fresh and processing fruits. In line with lots of promotion of green mangoes internationally, recently some countries accepted green mangoes. As the supplier of the national mangoes, NTB Province should continue to pursue increased production and better quality for the purpose of the local market as well as export markets.

In NTB, mangoes mostly cultivated in yard and in mixed garden with conventional technological approaches. Furthermore, low quality of mangoes due to lack of good agricultural practices. The one being developed is Gedong Gincu cultivar which is native to Indonesia and acceptable for both local and export purposes. Based on field observations, most of the mangoes trees will bloom after two flush, but there are some trees that bloom only once and then flush. The biggest factor causing irregularity of mango crop phenology is due to climate anomalies, while the factors causing low crop production is low fertility, lack of sunshine, unsuitable climate, dominant vegetative growth and excessive soil water conditions. According to Notodimedjo [3], lack of sunlight may affect the inhibition of flowering due to the growth of branches and twigs that are too tight. Therefore research on pruning of mangoes trees and combination of macro and micro nutrients is essential to be done. Moreover, by doing the adaptive research in collaboration with farmers and extension workers will encourage other farmers to do good agricultural practices in their farming activities.

II. Methodology

The study was conducted at farmers' farm in the village of Mumbulsari, Sub District of Kayangan, North Lombok, West Nusa Tenggara Province of Indonesia, from January 2010 until January 2011. The experiment consisted of seven treatments were tested as follows:

Treatment Codes	Fertilizer's Dose (gram/tree)				Pruning / No Pruning
	ZA	SP36	KCl	B	
A	500	500	500	40	Pruning
B	500	1000	750	60	Pruning
C	500	1500	1000	80	Pruning
D	500	500	500	40	No Pruning
E	500	1000	750	60	No Pruning
F	500	1500	1000	80	No Pruning
G (Control/ Farmers' Practices)	500	500	500	0	No Pruning

Each treatment was repeated 5 times; therefore the experiment consisted of 35 test trees. Test trees used were the cultivar of Gedong Gincu, aged 12 years old and the trees have uniform appearances. The parameters observed were varied but more focus on total number of fruits, total production, and malformation.

III. RESULTS AND DISCUSSION

Influence of pruning and fertilizing on the total fruits and total production of mango Gedong Gincu cultivar are shown in figure 1 and figure 2. Figure 1 indicated that pruning could increased total fruits in each treatment.

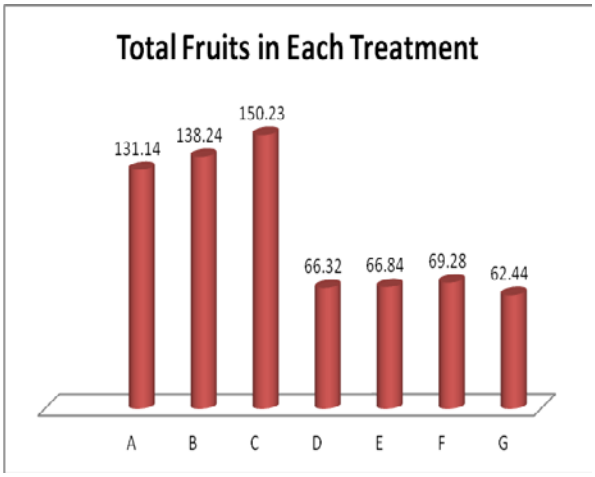

Figure 1. Total fruits in each treatment of the experiment (number of fruits/treatment)

Figure 1 shows that pruning treatments (A, B and C) may increase total fruits in each treatment. It was supposed to cut right to the book stimulates the growth of new shoots around the book. In the books there are a lot of the mango shoot buds are ready to form a bud wood, in the presence of branch cuts in the area more open and facilitate the formation of leaf buds. With the number of leaf buds were formed enables the formation of flower buds more if other needs (climate, which promote flowering hormones and nutrients) were met. While the cuts, combined with the use of fertilizer with a higher dose there was a tendency to increase the growth of leaves and buds flower.

Pruning could increase the interception of light therefore the rate of net photosynthesis and production of broad unity maximum occurs. Net assimilate photosynthesis is a measure of production which is then manifested as a nutrient with added weight to total dry matter or absolute growth rate (AGR), relative growth rate (RGR) and net assimilation rate or NAR [1]. Light interception in addition to important terms of total assimilates addition to the sink. Theoretically by Ryugo [2] makes light interception dry matter partitioning into branches is relatively high because the morning sun's infrared encourage rich synthesis of cytokines and inhibit translocation of carbohydrates from the branch to the trunk as the branches of woody tissue therefore the branch is stretched a stronger sink than rod. At the time productive branch is a good source.

Pruning by cutting mangoes branches stimulate the formation of vegetative-generative shoots therefore a wider field of branching and allows for the formation of more flower buds. In principle, the pruning done for the purpose of increasing the ratio C/N, so the trees ready for flowering. While fertilizer is important to influence plant growth and gain maximum results. Nutrients required for mango trees are not only macro nutrients (N, P, and K) but also micro nutrients such as Boron (B) and Zink (Zn). Fulfillment of micro nutrients with the addition of B and Zn facilitate physiological processes in order to support fruit formation. Micro nutrients role, such as Boron, in plant growth and development of mango is as a regulator of carbohydrate metabolism, particularly in glycolysis. Boron deficiency in plants led to the development of leaf segments shortened, the leaves become smaller, reducing flowering and cause damage to fruit shape.

Furthermore, figure 2 indicated that total production of mangoes also increased due to pruning and fertilizing treatments. Mango production management through a combination of ZA fertilizer 500 gram + 1500 gram of SP36 + 1000 gram of KCl + 80 gram B + pruning could increase total production of the trees in each treatment.

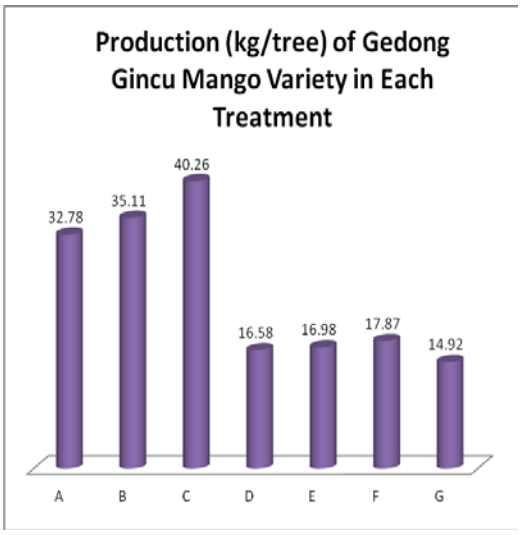

Figure 2. Total production in each treatment of the experiment

The highest input of fertilizers (500 gram ZA + 1000 gram SP36 + 1500 gram KCl) gave the highest results of all parameters were observed. It was alleged at a dose of fertilizer is a proper balance of hormones that support the initial formation of flowers (gibberellins and auxins) and utilization of nutrients. While the farmers' practices (control) showed that the dose of fertilizer use is less effective in promoting the production and fruit quality. Furthermore, the use of Boron significantly reducing the percentage of fruit sitting (malformation) of 7.22% (control) decreased to 3.82% - 3.12%.

IV. Conclusion

Mango production management, especially Gedong Gincu cultivar, through a combination of 500 gram ZA fertilizer/tree + 1500 gram of SP36/tree + 1000 gram of KCl/tree + 80 gram B/tree + pruning could increase total number of fruits by 240.60% and increase total production by 269.80% compared to control treatment. In addition, use of Boron could significantly reduce the fruit sitting (malformation) from 7.22% (control) to 3.12 %.

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