



# The research of slow release nitrogen fertilizer applied in sugarcane (*saccharum officinarum*).

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**ABSTRACT:** The continuous application of chemical fertilizer mainly nitrogen has bad influence to soil. On the other hand the expensive price of fertilizer should be solved by maximized affect to plant productivity. The ordinary Nitrogen fertilizer has bad influence to soil water with high nitrogen content around the plantation mainly.. The Slow release Nitrogen Fertilizer has possibility to reduce the production cost of plant and more circumstance friendly. This Research was conducted in order to find out the influence of Slow Release Nitrogen Fertilizer and Nitrogen Fertilizer for sugarcane plant as the raw materials of green energy bioethanol. The Sugarcane plant needs fertilizer in order to improve plant productivity. The chemical fertilizer usually not circumstance friendly but the slow release chemical fertilizer may have something different. The application of slow release chemical fertilizer may be better for soil fertility. The application of slow release nitrogen fertilizer in GMP 2 and Kidang Kencana sugarcane plant seemed better rather than ordinary nitogen fertilizer in Yellow – Red Podzolic Soil in Negara Bumi Ilir, Center of Lampung, Indonesia.. Results of a field experiment with sugarcane showed that the treatment of urea with slow release nitrogen fertilizer (coated nitrogen fertilizer) increased its efficiency by preventing N losses, resulting in significantly higher cane yields. In one of the years, sulphur-coated urea at 300 kg N/ha gave higher total sugar content in the juice and significantly more commercial cane sugar (CCS) than uncoated urea.

**Keywords :** Kidang Kencana, GMP2, Sugarcane, Nitrogen Fertilizer, Slow release Fertilizer.

## Introduction

Use of slow release N fertilizer may be an effective management practice to improve crop performance while reducing environmental N losses under the different soil moisture conditions which may be experienced due to spatial variation in agricultural fields or because of annual variations in climate. However, the extra cost of this N source (approx. 10 percent more of ordinary N urea ) must first be evaluated relative to its potential benefits observed under field conditions before it can be recommended to farmers. An additional important outcome of this research will be information that can be used to improve N fertilizer recommendations based on predicted N loss due to annual or spatial variation in soil moisture conditions.

The location of this research with the mineral (sandy) soils typically have very low soil Organic Matter (OM) contents, so the soil-N supply from native soil OM can be expected to be very low, and crop availability of this N supply will likely be diminished by soil-N movement during rainfall events.

There is no fertilizer is recommended for sugarcane grown on muck soils. On organic soil , N deficiencies are rarely seen in sugarcane. A deficiency may appear if organic N cannot be mineralized under unfavourable conditions, such as flood.

It is also widely recognized that the sandy soils cropped to sugarcane are variable in terms of native soil OM contents, cation exchange capacities (CEC), and to some degree, soil pH. These factors affect native soil-N supply, and can vary considerably across adjacent 20-acre fields, and even within any given 20-acre field block. Regardless of this variability, the native soil OM and CEC for any of these sandy soils is considered low. Nitrate pollution in ground water has become a serious problem worldwide; one of its causes is known to be the excessive use of nitrogen fertilizers in agricultural production. Using water containing nitrate-nitrogen concentrations above the standards of the World Health Organization's (WHO)

(10 mg/L) leads to agricultural products becoming unsuitable for human consumption, particularly for infants ("blue baby disease").

One possibility to solve the nitrate-nitrogen pollution of subsurface it necessary to applied controlled-release N-fertilizer to sugarcane. Nowadays Indonesia is doing the research of some alternative of biofuel production which renewable of raw materials and circumstance kindly. There are many kind of excellence biomass as raw materials in Indonesia such as cassava, corn, sweet potato, sweet sorghum, sugarcane and etc. There are many kind of Sugarcane variety (*saccharum officinarum*) in Indonesia which suitable with the regional agroclimate.

The objective of this reserach were to find out the influence of slow release nitrogen fertilizer in sugarcane plant as raw materials of bioethanol for GMP 2 and Kidang Kencana variety respectively.

### Materials And Method

Randomized block design with 2 repetition, 8 treatment that is V1 was Kidang Kencana and V2 was GMP2 respectively. The application of Nitrogen fertilizer were P1 = 300 kg/ha urea, P2 = 300 kg/ha urea SRF, P3=200 kg urea SRF, and P4 = 100 kg/ha urea SRF. The treatment code are V1P1, V1P2,V1P3,V1P4,V2P1.V2P2.V2P3 and V2P4. The total acreage were 0.3 hectares. Planting date : April 30, 2012

Data collected : Height of plant and diameter of stem every month since 3 month old until 7 month old, total weight of biomass and total sugar of juice of sugarcane, volume of juice in each stem(Total sugar of juice by somogy's method) and bagasse weight in 6 month old until 7 month old.

Harvesting date : Since October 2012 with 10 sample in each treatment with 2 repetition.

Total acreage of experimental block = 0,30 hektar

Basic of ferilizer in each block was applied as follow (Anonymous, 2001).

Urea according to each treatment P1,P2,P3 and P4 (2/3 of each dosage respectively)

TSP ...250.....kg/ha..(115 kg P<sub>2</sub>O<sub>5</sub>/ha)

KCl...150.....kg/ha(90 kg K<sub>2</sub>O/ha)

In 2 month old of plant was applied second fertilizer that is (Anonymous, 2001).

Urea 1/3 of each dosage respectively.

KCl 150..... kg/ha (90 kg K<sub>2</sub>O/ha)

Plant spacing : Intra row = 1,0 meter( 14 row in a block). Spacing = 30 cm in row

### Result And Discussion

The Result of this research in 3 month old until 7 month old was showed in fig 1 until fig 8.

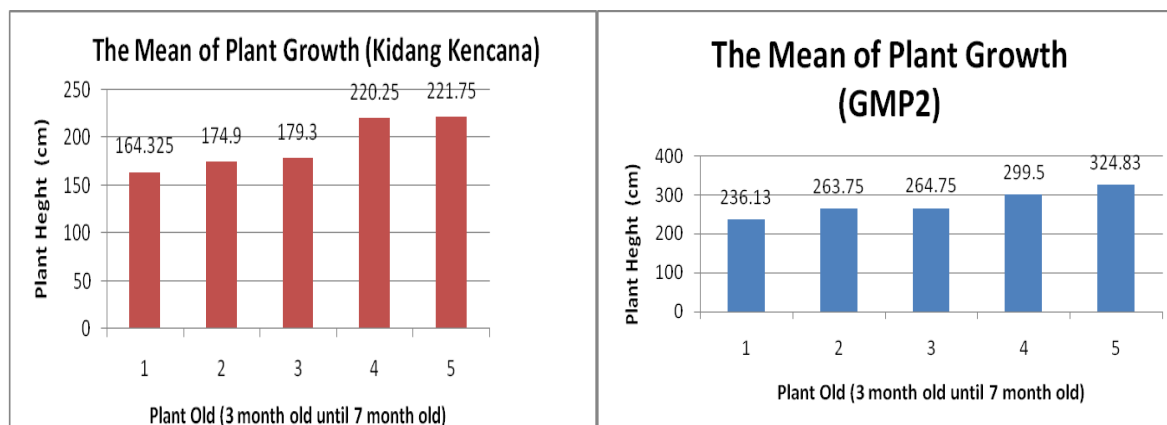


Figure 1. The Mean plant growth of Kidang Kencana (Left) and GMP2 (right)

The mean plant growth since 3 month until 7 month showed that GMP 2 was higher rather than Kidang Kencana as illustrated in Fig. 1. GMP 2 seemed more suitable rather than Kidang kencana by Slow release nitrogen fertilizer.

The mean of plant diameter (Kidang Kencana)

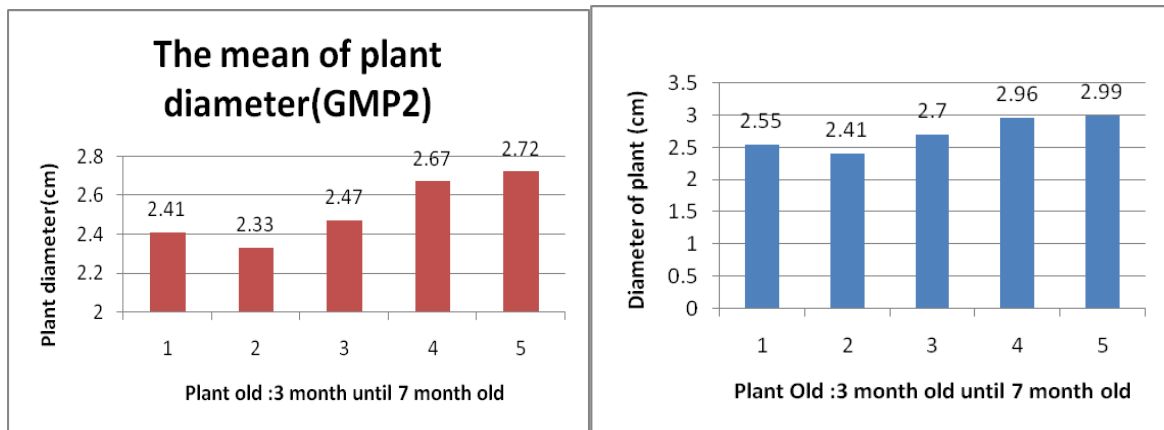


Figure 2. The Mean of plant diameter of GMP2 (Left) and Kidang Kencana (right).

Kidang Kencana seemed had better diameter size of stem rather than GMP 2 in the application of Slow Release Nitrogen Fertilizer. In 4 month old of plant ,the hot weather and no rainfall decreased the diameter of plant (fig 2.)

The total sugar V1P1 in 6 month old is the biggest indicated that Kidang Kencana suitable with uncoated nitrogen fertilizer. V1P2 showed lower total sugar than V1P1 and indicated that coated nitrogen fertilizer 300 kg/hectar seemed suitable for Kidang Kencana. GMP 2 seemed suitable with 200 kg/ha and 100 kg/ha coated nitrogen fertilizer.

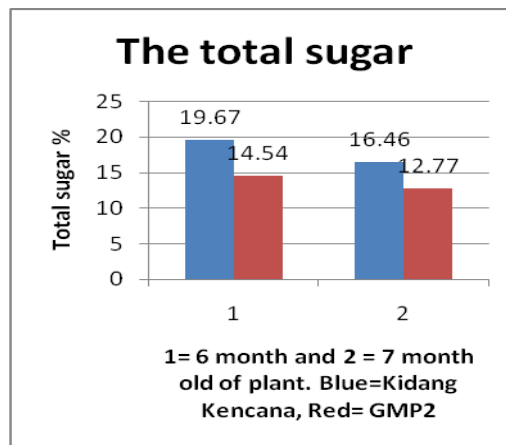


Figure 3. The mean Total sugar of Kidang Kencana and GMP 2 in 6 month and 7 month old. Kidang Kencana seemed had better total sugar rather than GM2 in the application of Slow Release Nitrogen Fertilizer. Kidang Kencana more suitable rather than GMP2 by the application of slow release Nitrogen fertilizer.(fig3, fig 4 and fig 5).

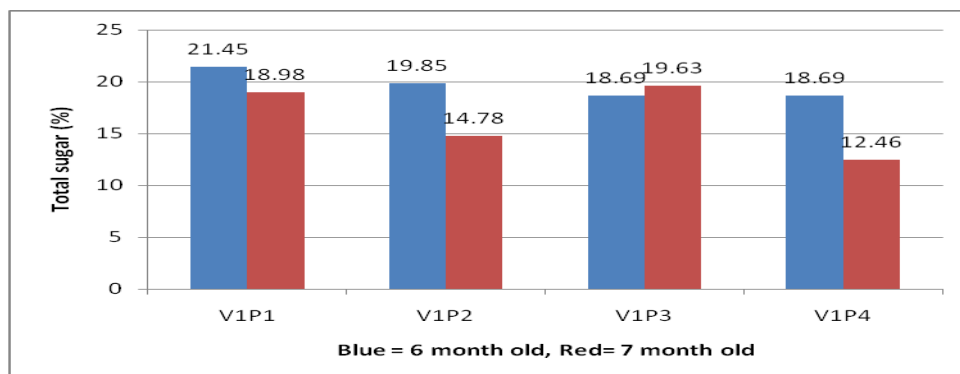


Figure 4. The Total Sugar of Kidang Kencana in 6 month and 7 month old

The total sugar of Kidang Kencana and GMP 2 is better in six month old of plant rather in 7 month old of plant. The highest total sugar was obtain by 300 kg/ha nitrogen fertilizer and 300 kg /ha slow release nitrogen fertilizer respectively (fig 4).

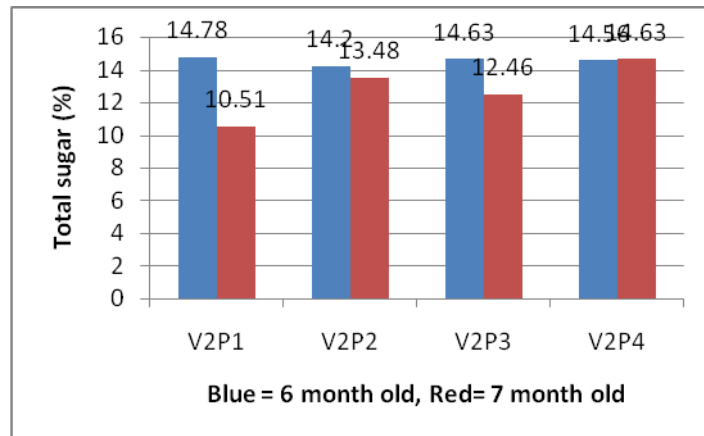


Figure 5. The Total Sugar of GMP2 in 6 month and 7 month old

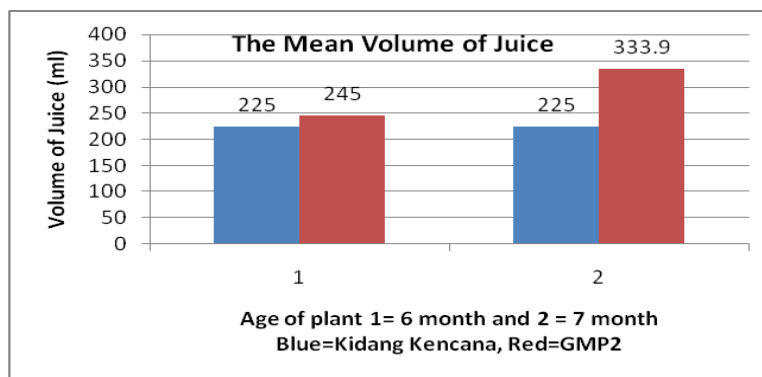


Figure 6. The Mean volume of juice of Kidang Kencana (Blue) and GMP2 (red)

GMP2 seemed had better volume of stem juice rather than Kidang kencana in the application of Slow Release Nitrogen Fertilizer

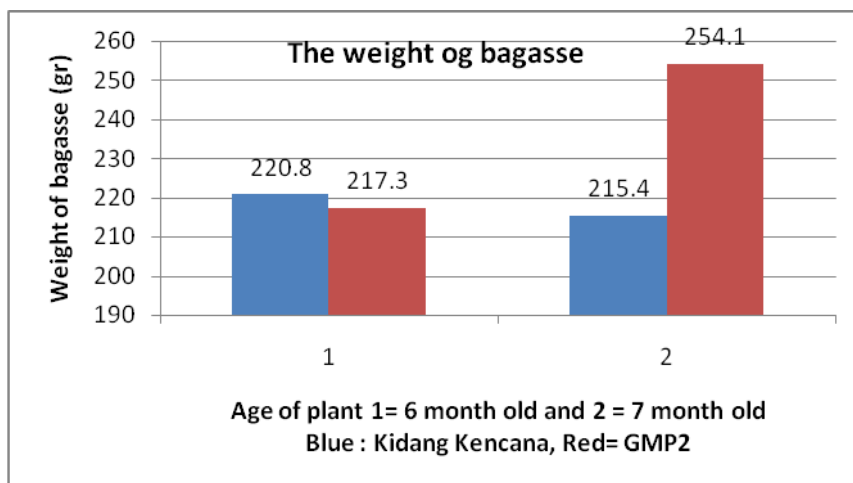


Figure 7. The Weight of bagasse of Kidang Kencana (Blue) and GMP2 (red)

GMP2 seemed had better weight of baggase rather than Kidang Kencana in the application of Slow Release Nitrogen Fertilizer in 6 month and 7 month old of plant respectively. But Kidang kencana seemed had better weight of baggase rather than GMP 2 without the application of Slow Release Nitrogen Fertilizer.

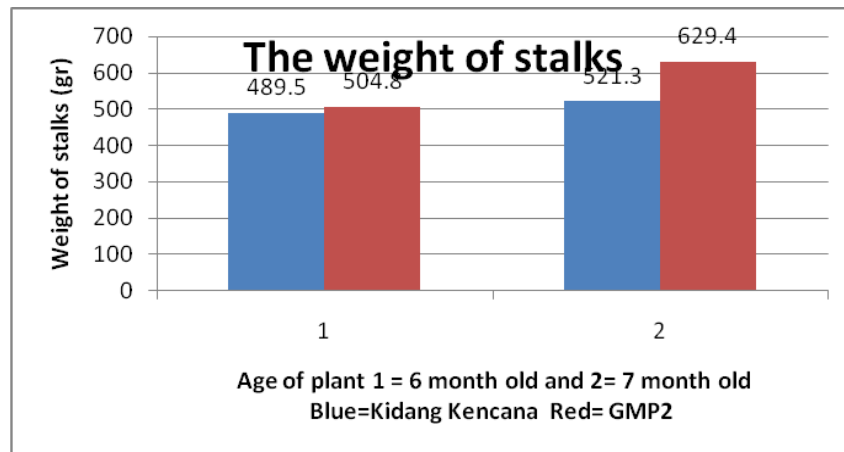


Figure 8. The Mean Weight of stalks of Kidang Kencana (Blue) and GMP2 (right)

GMP2 seemed had better weight of stalks rather than Kidang kencana in the application of Slow Release Nitrogen Fertilizer in 6 month and 7 month old of plant respectively. But Kidang kencana seemed had better weight of stalks rather than GMP 2 without the application of Slow Release Nitrogen Fertilizer.

The stalks weight in 6 month old of plant for Kidang Kencana more than 600 gram per plant equal to 120 ton per hectare by application of 300 kg/ha Nitrogen fertilizer. By the data of stalks weight, GMP2 seemed more suitable with the application of slow release nitrogen fertilizer mainly in 7 month old of plant.

The total sugar of Kidang Kencana and GMP 2 is better in six month old of plant rather in 7 month old of plant. The highest total sugar of Kidang Kencana was obtain by 300 kg/ha nitrogen fertilizer and 300 kg /ha slow release nitrogen fertilizer respectively.

N deficiencies can readily occur in sugarcane grown on sandy soils such like Yellow Red Podzolic Soil in Negara Bumi Ilir. Multiple applications of N fertilizer are often required during the growing season to sustain adequate sugarcane production on mineral (sandy) soils, which lack the high organic N contents of muck soils. Failing to supply adequate N during critical growth periods can result in stunted plants, premature ripening, and reduced biomass and sugar yields. Nitrogen has the greatest influence on cane ripening of all the nutrient elements. Cane will store a higher percent of sucrose when N is limited 6 to 8 weeks prior to harvest. Although a late-season N deficiency can actually promote improved sugarcane ripening, this scenario is unlikely to be achievable on organic soils.

Since N is a mobile nutrient, N-deficiency symptoms are first observed on older leaves (since N is mobilized from older tissues in favor of supporting growth in new tissue), although deficiency symptoms can eventually be seen over the entire plant. Leaf blades become uniformly pale-green to yellow, stalks become short and slende.

## Conclusion

The conclusion of a field experiment showed that the treatment of urea with slow release nitrogen fertilizer (coated nitrogen fertilizer) increased its efficiency by preventing N losses, resulting in significantly higher cane yields. In one of the years, slow release nitrogen fertilizer or sulphur-coated urea at 300 kg N/ha gave higher total sugar content in the juice and significantly more commercial cane sugar (CCS) than uncoated urea or ordinary urea.

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