

The Research of Four Sugarcane Variety (*Saccharum officinarum*) as The Raw Materials of Bioethanol Production in Negara Bumi Ilir Lampung

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Abstract — This research was conducted in order to find out which sugarcane is better between Kidang Kencana, GMP1, GMP2 and PSBM as the raw material for bioethanol production by the application of chemical fertilizer. Four treatment with 3 repetition was done that V1 was Kidang Kencana, V2 was GMP 1, V3 GMP2 and V4 was PSBM 901. The application of chemical fertilizer got better plant growth, total sugar and juice volume for GMP 2 and Kidang Kencana rather than GMP 1 and PSBM as the raw material for bioethanol production.

Key words— GMP 1, Kidang Kencana, Green manure, Chemical fertilizer, Total sugar.

I. INTRODUCTION

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. Which sugarcane is the best one for bioethanol in Negara Bumi Ilir Lampung Tengah? This research would answer this question.

In the first year of research of sugarcane in 2010 was carried out 4 variety of sugarcane that is GMP 1, GMP 2, Kidang Kencana and PSBM 901. The result of this research will select the first and the second grade of sugarcane as the raw materials of bioethanol in Negara Bumi Ilir.

The objection of this research were to find out the scale of priority of sugarcane as raw materials of bioethanol between GMP1 GMP 2, PSBM 901 and Kidang Kencana by the application of chemical fertilizer.

II. MATERIALS AND METHOD

Randomized block design with 2 repetition, 4 treatment that is V1 was Kidang Kencana, V2 was GMP 1, V3 was GMP 2 and V4 was PSBM 901 respectively.

Total Area = 0,5 ha.

Planting date : May 2010

Data collected : Height of plant and diameter of stem every month since 1 month old until 11 month old, total weight biomass and total sugar of juice of sugarcane, volume of juice

in each stem and bagasse weight in 6 month old until 11 month old.

Harvesting date : Since November 2010 with 10 sample in each treatment with 2 repetition.

Acreage of a block = 0,125 hektar (85 meter x 14,5 meter), 14 row in a block. Basic of fertilizer in each block was applied as follow (Anonymous, 2001).

Urea 200 kg/ha (137 kg N/ha)

TSP 250 kg/ha (115 kg P2O5/ha)

KCl 150 kg/ha (90 kg K2O/ha)

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

Urea 100 kg/ha (46 kg N/ha)

KCl 150 kg/ha (90 kg K2O/ha)

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

III. RESULT AND DISCUSSION

The Data of plant growth in 1 month until 11 month old was showed in table 1 and fig1.

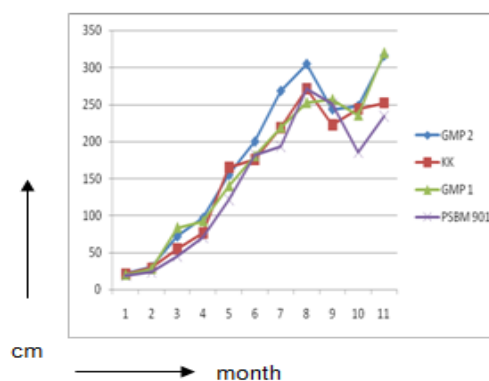


Fig 1. The Height of plant since 1 month old until 11 month old

According to the data in table 1 and fig.1. the height of plant was about 20 cm in 1 month old of plant and the maximum height of plant occurred since 8 month old until 11 month old that were 302 cm for GMP1, 316 cm for GMP 2, 272 cm for Kidang Kencana and 271 cm for PSBM 901 respectively.

The data of stem diameter presented in table 2 below.

TABLE 1

THE HEIGHT OF PLANT IN 1 MONTH UNTIL 11 MONTH OLD OF SUGARCANE PLANT.

Variety	Height of plant (cm) / month										
	1	2	3	4	5	6	7	8	9	10	11
KK	20,8	29,3	55,0	76,5	165,4	176	218,7	271,7	222,7	244,0	252,5
GMP 1	20,2	28,2	83,9	92,7	140,1	180,7	219,0	252,7	257,0	235,7	320,0
GMP 2	22,0	31,0	72,2	97,2	155,3	200,3	268,7	305,0	243,7	248,3	316,5
PSBM 901	18,9	24,1	45,0	71,0	121,4	181,7	193,3	271,3	251,0	185,7	234

TABLE 2

THE MEAN STEM DIAMETER 1 MONTH UNTIL 11 MONTH OLD OF PLANT

Variety	Diameter (mm) of stem /plant age (month)										
	1	2	3	4	5	6	7	8	9	10	11
KK	6.7	10.5	14.0	18.9	30.0	35.0	36.0	34.0	33.0	33.0	34.0
GMP 1	7.7	8.6	13.2	18.7	25.7	29.7	30.0	29.0	26.3	28.0	29.0
GMP 2	7.8	6.8	11.3	19.7	27.2	28.7	28.7	29.0	29.0	30.0	33.0
PSBM 901	6.3	7.5	11.8	17.9	27.0	31.7	32.0	32.0	32.0	32.0	30.0

The data in table 2 represent in fig 2 below.

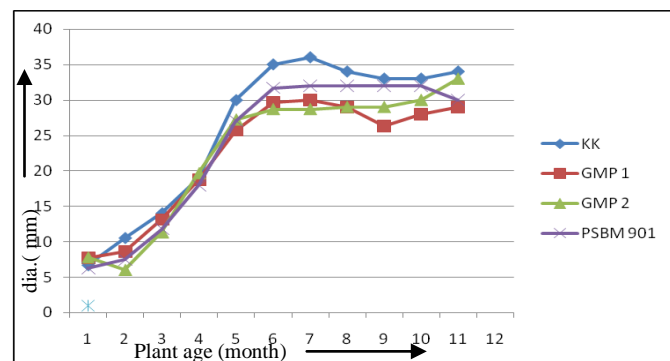


Fig 2. The curve of stem diameter 1 month old until 11 month old of plant.

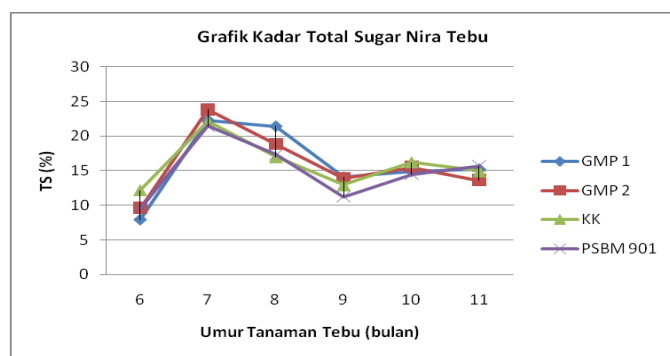


Fig 3. The curve of total sugar in juice since 6 month old until 11 month old of plant.

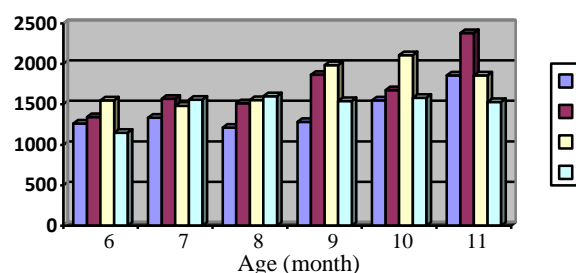
The curve of total sugar in juice since 6 month old until 11 month old of plant.

TABLE 3

THE STEM WEIGHT,(PERCENT OF JUICE) AND JUICE VOLUME SINCE 6 MONTH UNTIL 11 MONTH OLD

N ^o	Variety	6	7	8	9	10	11
1.	GMP 1	1264 (50,3)= 635,80	1336,67 (44,9)= 600,31	1213,3 (48,7)= 590,73	1283,3 (40,7)= 522,18	1548 (45,2)= 699,70	1860 (32,3)= 600,78
2.	GMP 2	1345 (52,1)= 700,75	1570 (45,7)= 717,49	1513,3 (48,5)= 733,81	1866,7 (44,8)= 836,42	1675 (57,3)= 959,78	2380 (44,1)= 1049,58
3.	Kidang Kencana	1550 (48,1)= 745,55	1480 (42,8)= 633,44	1553,3 (48,5)= 753,21	1983,3 (48,4)= 959,77	2106,6 7 (59,1)= 1245,24	1857,5 (48,5)= 901,13
4.	PSBM 901	1150 (47,8)= 549,70	1556,67 (38,8)= 604,12	1600 (40,8)= 652,80	1540 (43,5)= 669,90	1580 (48,4)= 764,72	1530 (32,7)= 500,31

weight(gr)



Blue = GMP1, Red= GMP2, Yellow= Kidang Kencana, Light Blue=PSBM 901

Fig.4. The graph of stem weight since 6 month old until 11 month old of plant Table 4. Volume of juice and total sugar (percent) since 6 month until 11 month old

According to the data in table 4. the production of bioethanol in 7 month old of plant the best is Kidang Kencana and GMP 2 about 770 ml of juice in a plant with total sugar 22% for Kidang Kencana and 717 ml with total sugar 23,9% for GMP 2 respectively. In one hectare there are 70.000 plant of sugarcane so the total of bioethanol per hectare about 7900 litre. The bioethanol in Brazil is about 9000 litre/ hectare in 10 until 12 month old of sugarcane plant. In 10 month old of plant juice volume of Kidang Kencana increase until 1245 ml/plant but total sugar only 16% so bioethanol produced only $16/15 \times 1245 \times 70.000 \times 0,1 = 7276$ litre. There are Kidang Kencana and GMP 2 better to be used in 7 month old of plant as raw material of bioethanol. According to juice volume and total sugar it predicts the scale of priority as bioethanol raw material as follows: first is Kidang Kencana, second is GMP 2, third is GMP1 and fourth is PSBM 901

The highest total sugar about 23 percent in 7 month old plant. The lowest total sugar about 10 percent in 6 month old of plant. In 11 month old of plant the total sugar about 15 percent. These data predict that in 7 month old of plant will produce the highest ethanol production every 1 ton of sugarcane. The juice volume with 15 percent total sugar will produce bioethanol (95% v/v) about 10 percent of juice volume. By knowing the amount and concentration of juice

will be able to predict the total bioethanol every 1 hectare of sugarcane plant,

N0	Variety	6	7	8	9	10	11
1.	GMP 1	635,7 (7,92)= 50,37	600,0 (22,32)= 133,92	590,0 (21,45)= 126,56	521,7 (14,06)= 74,24	700,0 (14,92)= 104,44	600,0 (15,21)= 91,26
2.	GMP 2	700,0 (9,56)= 66,92	716,7 (23,87)= 171,15	733,3 (18,84)= 138,10	836,7 (13,91)= 116,43	960,0 (15,54)= 149,18	1050,0 (13,62)= 143,01
3.	Kidang Kencana	745,0 (12,17)= 90,67	776,7 (22,12)= 171,87	753,3 (16,95)= 127,64	960,0 (12,90)= 123,84	1245,0 (16,23)= 202,06	900,0 (14,92)= 134,28
4.	PSBM 901	550,0 (9,56)= 52,58	603,3 (21,44)= 129,28	653,3 (17,29)= 112,90	670,0 (11,20)= 75,04	765,0 (14,47)= 110,70	500,0 (15,65)= 78,25

IV. CONCLUSION

The scale of priority as raw material for bioethanol is Kidang Kencana as the first priority. The second priority is GMP2. The third priority is GMP 1 and the fourth priority is PSBM 901.

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