THE EFFECT OF N, P, K MG AND TIME OF FERTILIZATION ON THE GROWTH AND PRODUCTION OF SWEET CORN (*ZEA MAYS SACCHARATA STURT*)

Reflianta Br Sinaga
Department of Agrotechnology, Agriculture Faculty,
Universitas Sumatera Utara
Jl. A. Sofyan No. 3 Kampus USU, Medan-20155
E-mail :reflianta@gmail.com

Erwin Masrul Harahap
Department of Agrotechnology, Agriculture Faculty,
Universitas Sumatera Utara
Jl. A. Sofyan No. 3 Kampus USU, Medan-20155

Yaya Hasanah
Department of Agrotechnology, Agriculture Faculty,
Universitas Sumatera Utara
Jl. A. Sofyan No. 3 Kampus USU, Medan-20155

ABSTRACT

Sweet corn production in Indonesia is only around 4-5 tons/ha, while the potential yield of sweet corn can reach 14 -18 tons/ha so there are still opportunities to increase sweet corn production through efforts to increase production. The problem that occurs in sweet corn cultivation in Indonesia is that the need for high corn nutrients has not been fulfilled optimally so that it has not yet achieved maximum productivity. Corn is a type of plant that is quite consumptive of nutrients, so the level of nutrient adequacy is a limiting factor for plant growth and yield. Therefore, the main purpose of determine the response of growth and production of sweet corn bonanza varieties to the dose and timing of N, P, K, Mg fertilizers to increase productivity. This research method used a 2 factorial randomized block design (RBD). Factor I The dosage of Urea, SP-36, KCl, and Dolomite fertilization is as follows: P0: Control, P1: Urea = 11.30 g; SP36 = 2.28 g; KCl = 7.27 g; Dolomite = 1.63 g, P2: Urea = 16.94 g; SP36 = 3.41 g; KCl = 10.90 g; Dolomite = 2.48 g, P3: Urea = 22.59 g; SP36 = 4.55 g; KCl = 14.53 g; Dolomite = 3.31 g. The second factor was the time of fertilizer application as follows: W1: 1 time of application of 0 DAS, W2: 2 times of application of 0 DAS and 15 DAS, W3: 3 times of giving 0 DAS, 15 and 30 DAS. The results showed that the fertilizer dose treatment had a significant effect on plant height, ear length and ear weight. The treatment time of application had a significant effect on the ear weight.

Keywords: sweet corn, fertilizer, application time.

INTRODUCTION

Sweet corn (Zea mays saccharata Sturt) is a very popular vegetable In Indonesia. Annual productivity of sweet corn until 2015 has increased by 3.17% year-1 with rate productivity of 5.18 tons ha-1 and production of 19.61 million tons in 2015. To fulfill lack of supply national production, Indonesia has imported sweet corn from other countries. The annual import rate increased 1.43% until 2015. Meanwhile, the export of sweet corn decreased by 17.25% [1]

Nowadays corn is not only used for food but is also a basic ingredient or processed material for cooking oil, cornstarch, ethanol, organic acids, snacks, and most of it is used for animal feed, especially poultry, so that corn imports must be carried out. Domestic maize needs to be continuously improved, both through intensification and extensification programs [3]

The problem that occurs in the cultivation of sweet corn is that the need for high corn nutrients has not been fulfilled optimally so that it has not yet achieved maximum productivity. In order for the growth and production of corn to be maximum, all essential elements must be in optimum quantities because corn is a type of plant that is quite consumptive of nutrients, so that in addition to the genetic potential of the varieties planted, the level of nutrient adequacy and soil fertility are limiting factors for growth and yields plant [8]

Corn plants to grow and produce optimally require sufficient nutrients, especially nitrogen (N), phosphate (P), potassium (K) and magnesium (Mg). Corn requires the most nitrogen fertilizer after rice. Several research results show that without balanced fertilizer application, corn plants will not get the expected results[2]

Increased production can be obtained by providing additional plant nutrients for optimal growth, both vegetative and generative growth through fertilization. Fertilization is carried out aiming to add nutrients needed by corn plants so that production reaches the potential yield. The state of the nutrient status of N, P, K, Mg varies from place to place, so that general fertilization of N, P, K, Mg in maize is not efficient because the dose of fertilizer given is not in accordance with the nutrient needs of the plant, therefore optimization of fertilization is needed. The applied N, P, K, Mg must be in accordance with the plant nutrient needs based on the nutrient status of the plant on the yield target to be achieved. The dose of Urea fertilizer was 24.3 g; SP36 15.2 g; KCl 13.4 g; Dolomite 11.3 g can increase production by 229.7 g/plant or 15.31 tons/ha for fodder maize [10]

The main purpose of determine the response of growth and production of sweet corn bonanza varieties to the dose and timing of N, P, K, Mg fertilizers to increase productivity.

MATERIAL AND METODS

Location of the experimental site

This research was conducted from June to August 2020 at Jalan Sei Beras Sekat Kec. Pancur Batu, Deli Serdang Regency, with a height of ± 30 meters above sea level.

Material and tool

The tools used in this study were hoes, knives, gauges, analytical scales, and other writing tools to support this research. The materials used in this study were corn seeds, urea, SP-36, KCl, and dolomite

Research methods

This research method used a randomized block design (RBD), 2 factorials, namely:
Factor I The dosage of Urea, SP-36, KCl, Dolomite and application time is as follows:

P0 = Kontrol
P1 = Urea = 11,30 g; SP36 = 2,28 g; KCl = 7,27 g; Dolomit = 1,63 g
P2 = Urea = 16,94 g; SP36 = 3,41 g; KCl = 10,90 g; Dolomit = 2,48 g
P3 = Urea = 22,59 g; SP36 = 4,55 g; KCl = 14,53 g; Dolomit = 3,31 g

Factor II when fertilizer application is as follows:

Treatment	Time Of Fertilization		
	0 DAS	15 DAS	30 DAS
W1	N 100 % P 100% K 100% Mg 100%		
W2	N 70% P 100% K 50% Mg 100%	N 30% K 50%	
W3	N 34% P 100% K 50% Mg 100%	N 33% K 50%	N 33%

Number of repetitions: 3 repetitions, number of plots : 36 plots, plot area : 2.65 m x 1.5 m, distance between tests: 50 cm, distance between plots : 50 cm, planting distance: 75 cm x 20 cm, number of plants per plot : 28 plants, total number of plants: 1,008 plants, number of sample plants : 5 plants/plot, total number of samples: 180 plants

Observed Parameters

a. Plant Height (cm)

Observation of plant height was carried out by measuring the plant from above the soil surface to the tip of the youngest leaf using a meter. Calculation of plant height from 2 MST to 5 MST with an interval of 1 week.

b. Cob Length

The length of the cob was measured after the corn was harvested and the husks were peeled from the base of the cob to the tip of the cob using a tape measure.

c. Cob Weight With Kelobot

The weight of the husky cobs was calculated by weighing the weight of the cob harvested using an analytical balance

RESULT AND DISSCUSSION

Plant Heigh

The list of variance shows that the dose of fertilizer has a significant effect on plant height at the observation age of 3, 4, 5 and 6 WAP but has no significant effect at 2 WAP. The treatment time of application had no significant effect on plant height at all observation ages.

Table 1. Different Test for Average Height of Sweet Corn Plants (cm) due to Fertilizer Dose Treatment and Application Time at 2, 3, 4, 5 and 6 WAP.

Treatment	Plant Height(cm)				
	2 WAP	3 WAP	4 WAP	5 WAP	6 WAP
Dosage of fertilizer					
P0	26,11	48,92 c	81,24 c	115,49 c	164,24 c
P1	26,32	52,43 b	92,33 b	137,47 b	192,38 b
P2	27,48	54,29 ab	94,53 ab	140,89 ab	197,24 ab
P3	28,42	56,69 a	98,44 a	144,93 a	203,44 a
Time Of Fertilization					
W1	27,49	51,52	89,08	130,85	185,72
W2	27,25	53,21	92,10	134,82	189,62
W3	26,51	54,53	93,73	138,42	192,65
Combination					
P0W1	25,00	46,87	77,80	111,73	160,40
P0W2	26,43	49,63	81,60	115,73	165,33
P0W3	26,90	50,27	84,33	119,00	167,00
P1W1	26,97	50,93	90,47	133,87	190,27
P1W2	26,47	51,90	92,33	136,47	192,60
P1W3	25,53	54,47	94,20	142,07	194,27
P2W1	28,53	52,37	91,00	134,67	193,87
P2W2	27,37	54,37	95,73	142,53	195,27
P2W3	26,53	56,13	96,87	145,47	202,60
P3W1	29,47	55,90	97,07	143,13	198,33
P3W2	28,73	56,93	98,73	144,53	205,27
P3W3	27,07	57,23	99,53	147,13	206,73

Note: The numbers followed by the same letter in the same column are not significantly different at the level of $\alpha = 0.05$ based on the Duncan distance test

Table 1 shows that at the age of 6 WAP due to the effect of fertilizer dose treatment on plant height, the highest average was obtained at P3 (203.44 cm), which was significantly different from P0 (164.24 cm) and P1 (192.38 cm) but not significantly different from P2 (197.24 cm). This was presumably because at the beginning of the 2 WAP growth period there was no competition between plants, after the plants were 3, 4, 5 and 6 WAT the roots of corn plants had developed and were active in absorbing nutrients available in the soil and were able to meet the need for nutrients needed. required for plant height growth. Absorption of nutrients during the growth period is not as much, so it needs to be given gradually with an amount that suits the needs of the plant. There are certain times when growth is very vigorous and fast so that it absorbs a lot of nutrients.

Fertilization of N, P, K, Mg can increase plant vegetative growth. This upgrade due to the nutrients and nutrients needed by plants are in sufficient quantity to absorbed by plants and can support the needs vegetative [7]

Nutrients N, P, K, Mg function in plant growth, as components of enzyme molecules and chlorophyll molecules, which play a role in the energy transfer process in cells and in the process of reshuffling photosynthate into simple molecules that are rearranged into molecules of other desired materials in the process. plant cell metabolism [2]

Ear length

The list of variance shows that the fertilizer dosage treatment had a significant effect on ear length, while the treatment application time and the interaction between the two treatments had no significant effect on ear length.

Table 2. Tests for Average Difference of Ear to Fertilizer Dose Treatment and Application Time

Treatment	Dosage of fertilizer				Average
Time Of Fertilization	P0	P1	P2	P3	
		.....cm.....			
W1	17,82	19,99	21,03	21,33	20,04
W2	18,30	20,53	21,17	21,73	20,43
W3	18,89	21,13	21,47	23,07	21,14

Average	18,34 c	20,55 b	21,22 ab	22,04 a

Note: The numbers followed by the same letter in the same column are not significantly different at the level of α = 0.05 based on the Duncan distance test

From Table 2 it can be seen that the dose of fertilizer to the longest ear length found at P3 (22.04 cm) is significantly different from P0 (18.34 cm) and P1 (20.55 cm), but is not significantly different from P2 (21, 22 cm). The increase in the length of sweet corn cobs allows more seeds to form on the cobs of sweet corn. In this case, the energy requirement for the formation of sweet corn kernels is increasing. The element N is very influential because it is an important element for cell division which will support plant growth both in increasing size and volume [4]

A plant will grow and thrive if the nutrients provided can be absorbed by a plant and in a form suitable for root absorption and in sufficient conditions. Nutrients available for plant growth will cause nutrient absorption and photosynthesis activities to run well so that the accumulated photosynthate also increases and will have an impact on the length of the cob. The formation of cobs requires macro nutrients, namely P and K elements in optimum amounts [6]

Weight cobs with husk

From the list of variance, it shows that the fertilizer dosage treatment and application time have a significant effect on the weight cob with the husk.

Table 3. Tests for the Difference of Average Weight cobs with husk to Fertilizer Dose Treatment and Application Time

Perlakuan	**Dosage of fertilizer**				
Time Of Fertilization	P0	P1	P2	P3	**Average**
		.....g.....			
W1	226,87	346,80	365,07	378,40	329,28 b
W2	238,13	348,67	376,60	386,87	337,57 b
W3	293,80	365,53	379,80	399,13	359,57 a
Average	252,93 c	353,67 b	373,82 ab	388,13 a	

Note: The numbers followed by the same letter in the same column are not significantly different at the level of α = 0.05 based on the Duncan distance test

From Table 7 it can be seen that the production target for weight cob with the husk weight found at P3 (388.13 g) is significantly different from P0 (252.93 g) and P1 (353.67 g), but is not significantly different from P2 (373.82 g). The more nutrients available can increase nutrient uptake by the sweet corn plant, which in turn can provide better cobs yield. Plants will thrive if the elements (nutrients) they need are available and these nutrients are available in a form that can be absorbed by plants [9]

In the treatment time of ear weight application with the heaviest weight found in the W3 treatment (359.57 g) was significantly different from W1 (329.28 g) and W2 (337.57 g). The application of fertilizer to plants must pay attention to the right time of application, because the application carried out in the right time interval of application will greatly help plant growth. The application of fertilizer in one dose in one dose will result in luxurious consumption or waste of fertilizer at that time where not all of the fertilizer given will be absorbed by the plant and consequently there will be an insufficient amount of fertilizer in the future [5]

CONCLUSIONS

The dose of fertilizer had a significant effect on plant height, cob length, and corn cob weight. The best dose of fertilizer was found in the P3 treatment (Urea = 22.59 g; SP36 = 4.55 g; KCl = 14.53 g; Dolomite = 3.31 g) this indicates that the addition of fertilizer can increase the productivity of sweet corn plants. . The time of application of fertilization had a significant effect on the weight of the cobs but did not significantly affect the plant height and the length of the cobs. The best application time was found in the W3 treatment (3 times of giving 0 DAS, 15 and 30 DAS) this indicates that the application of fertilizer gradually can increase the productivity of sweet corn plants.

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