Agrotech Journal
ATJ
Url: http://usnsj.com/index.php/ATJ
Email: editor.atj@usnsj.com

Effect of Procal Lime on the Growth and Results of Cucumber (*Cucumis sativus* L.)

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ARTICLE INFO

e-ISSN: 2548-5148
p-ISSN: 2548-5121
Vol. 2, No. 1, June 2017
URL : http://dx.doi.org/10.31327/atj.v2i1.936

Abstract

The results showed that giving doses of procal lime 4,6875 Kg/swath (Ca3) shows the length of the longest plants i.e. 94,83 cm, the number of leaves by administering a dose of lime procal 4,6875 Kg/swath (Ca3) show the number of leaves that most namely 26,78 strands, the age of the plants start flowering by administering a doses of procal lime 4,6875 Kg/swath (Ca3) speed up the start of flowering plants age i.e. 26,78 (days after planting), the age of the plants begin to bear fruit by administering doses procal lime 4,6875 Kg/swath (Ca3) accelerating the age of the plants start fruiting i.e. 29,33 (days after planting), the amount of fruit plants by administering a doses of procal lime 4,6875 Kg/swath (Ca3) show the number of the most plant fruits namely 12,44 and the weight of the fruit plants by administering a doses of procal lime 4,6875 Kg/swath (Ca3) show the weight of the heaviest fruit i.e. 0,55 Kg

Keywords: fertilizer, lime procal, growth and yield of cucumber

A. Introduction

Cucumber (*Cucumis sativus* L.) is a plant of the tribe of pumpkin-labuan or Cucurbitaceae whose growth grows, the stems are round green and branched, the leaves are broad and hairy resembling pumpkin leaves. Cucumber is a type of vegetable plant that produces edible fruit. Benefits of Cucumber have diuretic properties, cooling effects, and cleansers that are beneficial to the skin. High water content; vitamins A, B, and C and minerals with values / 100 gr of cucumber (Sutarya, R., Grubben, G. & Sutarno Hadi, 1995).

Calcification is an act of giving lime ingredients to the soil layer to increase the pH of the soil to be neutral or near neutral so that the availability of macro and micro nutrients can be guaranteed. In addition, calcification in acid soils can reduce the micro-nutrient solubility of Al^{3+} and Mn^{2+} which generally poison aquaculture plants, spurring microbial activity in soil composers and improving physical soil sifaf (texture and structure) to be more stable. Calcification must at least pay attention to two things, namely the time of liming and the method of calcification. Calcification should be done at the beginning of the rainy season, ie 2-3 weeks before planting the seeds. With the right timing, lime can blend with the soil so that it effectively increases the pH of the soil (Sarpian, 2003).

Kelurahan 19 November is one of the centers for the development of vegetables and fruits in Wundulako District, Kolaka Regency. Biophysical conditions of land are generally dry land and paddy fields, the land is bumpy and flat which is classified into the type of soil Organosol. With air temperatures ranging from 25 ^{0}C to 30 ^{0}C. The average rainfall of 12,985 mm / year is divided into two seasons, namely the rainy season and the dry / dry season. In terms of altitude, Kelurahan 19 November is located at an altitude of 0-25 m above sea level, so it is categorized as a lowland which is generally suitable for cucumber cultivation.

Lime is a white and fine object made of sedimentary rock, forming rocks consisting of calcium minerals. Usually relatively limestone is formed in the deep sea with rock conditions containing calcium plates (coccoliths) formed by coccolithophores microorganisms. Lime (liming) is one of the actions to improve the soil so that the soil pH increases. Soils that are too acidic (low pH) cannot provide some important mineral nutrients for plants, such as phosphorus and calcium, and conversely increase the solubility of some minerals that can be toxic to plants such as Al and Mn. It is expected that calcification will increase pH to neutral, where at a neutral pH there are many nutrients that can be available to plants (Kuswandi, 2005).

Lime Procal is a type of lime that can increase plant growth, increase leaf green (chlorophyll), and increase plant resistance from pests and diseases. Giving Nitrogen (N) to plants will encourage the growth of organs related to photosynthesis, namely leaves. Plants that have enough N supply will form wider strands with higher chlorophyll content, so that the plant is able to produce enough carbohydrates / assimilates to support vegetative growth. So that it can certainly affect the quality of the plants and the yield of cucumbers. Procal lime composition containing CaO + MgO> 53%, $CaCO_3$ + $MgCO_3$> 96%, Nitrogen ± 2%, K2O <1%, Micro Nutrient (Si, B, S), Organic Material (Humic Acid), Max. Moisture 3 %, Active Calcium (Ca) ± 16%, and Mesh Fineness 400> 50%.

B. Methodology

The research was designed using a Randomized Block Design (RBD) with a single factor, namely lime treatment. This lime treatment consists of 4 levels, namely:

- Ca0 (without lime) = control.
- Ca1 (2.5 tons / ha) or converted to 1.5625 kg / plot
- Ca2 (5 tons / ha) or converted to 3.125 kg / plot
- Ca3 (7.5 tons / ha) or converted to 4.6875 kg / plot

Each treatment was repeated 3 times so that there were 12 experimental units. Each experimental unit, measuring 2.5 m x 2.5 m, the distance between plots in 1 group = 25 cm and the distance between groups is 0.5 m. The total area of the experimental unit = 10.75 mx 8.5 m = 91.375 m2. Each experimental unit, both in groups and between groups, has a drainage channel 20 cm deep and 25 cm wide.

Implementation Method

1. Soil Processing

The soil is treated with a hoe as deep as a layer (25-30 cm) then smoothed to obtain a softer soil structure. After that, beds of size 2.5 m x 2.5 m are made with a height of 25-30 cm beds. When making beds, the surface of beds is flattened and cleaned from all tree roots, remnants of wood dikes and other dirt so that the land is ready for planting.

2. Seed Nursery

The cucumber seeds to be planted, soaked in ± 300 C warm water for 9 hours so that the seed skin becomes soft to prevent pathogens that might be carried by the seeds.

3. Planting

Planting is done directly after soaking cucumber seeds in warm water for 9 hours. Planting is done in the afternoon to avoid excessive transpiration in cucumber seeds. The desired spacing is 70 cm x 50 cm. Each planting hole is planted with 1 cucumber seedling.

4. Plant preservation

Preservation of cucumber plants includes planting, installation of stakes, giving water, weeding (sanitation), fertilizing, pruning, and controlling pests / diseases.

Embedding is done to replace plants that die, do not grow or are damaged by pests / diseases. Embedding is carried out about 4 weeks after planting the seeds by using reserve seeds that have been prepared in advance.

Mounting is done when the plant reaches ± 40 cm in height for the propagation site. Height of ± 1.5 m to rise and creep above the para-transverse along the beds.

Giving water needs to be done regularly to maintain soil moisture to remain high. Plants need a lot of water until the fruit is ripe, but should not be excessive because it will cause the roots to be prone to fusarium wilt. Watering needs to be done if there is no rainfall.

Weeding (sanitation) needs to be carried out periodically according to the conditions of growing weeds, using tools physically (manually). Weeding is avoided by spraying weeds by using herbicides (poisons) because they will endanger the ecology of the plantations and the environment.

Basic fertilization was carried out using 10 tons / ha of cow manure or converted to 6.25 kg / plot, which was carried out in conjunction with the provision of Cretaceous Procal, which was at 2 weeks before planting seeds. Manure and lime (according to the dosage) are mixed and stirred - stir in the top layer as deep as 20-25 cm evenly. When finished in lime, beds need to be watered so that the lime dissolves in the soil grains.

Crop trimming is done by removing buds - lateral buds or side buds that grow on the first leaf armpit until the eight armpit leaves. The shoots that grow from the ninth leaf armpit and so on are left (maintained) for the ovary. After the main stem grows 20 segments, the main stem shoots must be pruned frequently after reaching that height.

Disease control is done in an integrated manner (IPM) by combining healthy cultivation methods, physical and mechanical means if there is an attack of pests / diseases. How to avoid chemical pesticides wherever possible, except for other methods as above, unable to prevent pests / diseases. For example, if there are symptoms of wilt, it is controlled by the Benlate Fungicide.

5. Harvesting

Cucumber fruit can be harvested at the age of 49-64 days after the seeds are planted, depending on the variety (type) and local climate. Signs of cucumber fruit ready to harvest are: (1) fruit becomes hard, (2) dark green fruit skin color, (3) elongated fruit stalks and dividing lines connecting cucumber stalks and fruit are obvious, (4) fruit tip begins to color white and flower crown slowly disappear.

Observation variable
The variables observed in the study were:
1. Plant length (cm) at age 14; 21; 28; 35; 42 (days after planting).
2. Number of leaves (strands) at age 14; 21; 28; 35; 42 (days after planting).
3. Plant life begins to flower (days after planting).
4. Plant age begins to bear fruit (days after planting).
5. The average number of fruit plants.
6. Average fruit yield (Kg).

Data Processing Techniques

Data is processed by tabulation on each observation variable, according to the number of treatments in the number of replications used. Tabulations include the results of observations on each variable, the list of variance (ANOVA) and the average value of treatment along with the LSD (NP) comparison value.

Data analysis technique

Data from the observations of each observation variable were analyzed based on variance and F test. If F count> F tabe means the treatment tried significantly (ↄ = 0.05) or very significant effect (nyata = 0.01) so that it can followed by LSD test to see the difference between each treatment level tested.

C. Result and Discussion

Result

1. Plant Length

Table 1. The Smallest Significant Difference Test (LSD 0.05) The Average Length of Cucumber Plants on the First Second Week Measurement / 14 HST (cm)

Treatment	Average Plant Length (cm)	comparative value of $LSD_{0,05}$
Ca0	17,77	
Ca1	19,56	2,90
Ca2	21,67	
Ca3	23,71	

Description: The average number followed by letters that are not the same, is significantly different from the 95% confidence level.

Table 1 shows, treatment Ca3 gives the longest average yield of cucumber plants, although not significantly different from Ca2 treatment but significantly different from Ca1 and very significantly different from Ca0.

Table 2. The Smallest Significant Difference Test (LSD 0,05) The Average Length of Cucumber Plants on the Second Measurement of the Third Week / 21 days after planting (cm)

Treatment	Average Plant Length (cm)	comparative value of $LSD_{0,05}$
Ca0	23,69	
Ca1	26,39	4,03
Ca2	28,86	
Ca3	31,72	

Description: The average number followed by letters that are not the same, is significantly different from the 95% confidence level.

Table 2 shows, the treatment of Ca3 gives the longest average yield of cucumber plants, although not significantly different from Ca2 treatment but significantly different from Ca1 and very significantly different from Ca0.

Table 3. The Smallest Significant Difference Test (LSD 0.05) The Average Length of Cucumber Plants on the Third Measurement of Fourth Week / 28 days after planting (cm)

Treatment	Average Plant Length (cm)	comparative value of $LSD_{0,05}$
Ca0	35,54	
Ca1	39,13	5,58
Ca2	42,22	
Ca3	48,41	

Description: The average number followed by letters that are not the same, is significantly different from the 95% confidence level.

Table 3 shows, the treatment of Ca3 gave the longest average yield of cucumber plants, but it was significantly different from the Ca2 treatment and was very significantly different from the treatment of Ca1 and Ca0.

Table 4. The Smallest Significant Difference Test (LSD 0.05) The Length of the Cucumber Plant on the Fifth Four-Week Measurement / 35 days after planting (cm)

Treatment	Average Plant Length (cm)	comparative value of $LSD_{0,05}$
Ca0	55,54	
Ca1	59,13	7,53
Ca2	62,22	
Ca3	70,93	

Description: The average number followed by letters that are not the same, is significantly different from the 95% confidence level.

Table 4 shows, the treatment of Ca3 gave the longest average yield of cucumber plants, but was significantly different in the treatment of Ca2 and Ca1, and was significantly different from the treatment of Ca0.

Table 5. The Smallest Significant Difference Test (LSD 0.05) The Average Length of Cucumber Plants at the Sixth Week Sixth Measurement / 42 days after planting (cm)

Treatment	Average Plant Length (cm)	comparative value of $LSD_{0,05}$
Ca0	71,08	
Ca1	78,26	11,58
Ca2	86,70	
Ca3	94,83	

Description: The average number followed by letters that are not the same, is significantly different from the 95% confidence level.

Table 5 shows, the treatment of Ca3 gives the longest average yield of the length of cucumber plants, although not significantly different from the treatment of Ca2 but significantly different from Ca1 and very significantly different from Ca0.

2. Number of Leaves

Table 6 shows, the treatment of Ca3 gave the most results on the average number of leaves of cucumber plants, but it was significantly different from the treatment of Ca2 and Ca1, and was significantly different from Ca0.

Table 6. The Smallest Significant Difference Test (LSD 0.05) Average Number of Cucumber Plant Leaves in the Second Week First Calculation / 14 days after planting (strands)

Treatment	Average Number of Leaves (strands)	comparative value of $LSD_{0,05}$
Ca0	6,44	
Ca1	8,11	3,15
Ca2	7,67	
Ca3	12,33	

Description: The average number followed by letters that are not the same, is significantly different from the 95% confidence level.

Table 7. The Smallest Significant Difference Test (LSD 0.05) Average Number of Cucumber Plant Leaves in the Third Week Second Calculation / 21 days after planting (strands)

Treatment	Average Number of Leaves (strands)	comparative value of $LSD_{0,05}$
Ca0	8,22	
Ca1	11,22	3,64
Ca2	11,44	
Ca3	17,33	

Description: The average number followed by letters that are not the same, is significantly different from the 95% confidence level.

Table 7 shows, the treatment of Ca3 gives the most results on the average number of leaves of cucumber plants, and is very significantly different from the treatment of Ca2, Ca1, and Ca0.

Table 8. The Smallest Significant Difference Test (LSD 0.05) The Average Number of Cucumber Plant Leaves in the Fourth / 28 days after planting (strands)

Treatment	Average Number of Leaves (strands)	comparative value of $LSD_{0,05}$
Ca0	10,00	
Ca1	13,22	3,76
Ca2	13,44	
Ca3	19,33	

Description: The average number followed by letters that are not the same, is significantly different from the 95% confidence level.

In table 8 shows, the treatment of Ca3 gives the most results on the average number of leaves of cucumber plants, and is very significantly different from the treatment of Ca2, Ca1, and Ca0.

Table 9 shows, the treatment of Ca3 gave the most results on the average number of leaves of cucumber plants, although it was significantly different in the treatment of Ca2, Ca1 and very significantly different from Ca0.

Table 10 shows, the treatment of Ca3 gives the most results on the average number of leaves of cucumber plants, and is very significantly different from the treatment of Ca2, Ca1 and Ca0.

Table 9. The Smallest Significant Difference Test (LSD 0.05) The Average Number of Leaves of Cucumber Plants in the Fifth Fourth Week Calculation / 35 days after planting (strands)

Treatment	Average Number of Leaves (strands)	comparative value of LSD$_{0,05}$
Ca0	13.11	
Ca1	16.22	4.45
Ca2	16.33	
Ca3	22.22	

Description: The average number followed by letters that are not the same, is significantly different from the 95% confidence level.

Table 10. The Smallest Significant Difference Test (LSD 0.05) Average Number of Leaves of Cucumber Plants in the Sixth Week / 42 days after planting (strands)

Treatment	Average Number of Leaves (strands)	comparative value of LSD$_{0,05}$
Ca0	17,00	
Ca1	20,22	3,44
Ca2	20,44	
Ca3	26,78	

Description: The average number followed by letters that are not the same, is significantly different from the 95% confidence level.

3. Age begins to flower

Table 11. The Smallest Significant Difference Test (LSD0.05) Age of the Cucumber Plant When Starting Flowering on the Fourth Week (days after planting)

Treatment	Average Age of Plants Starts Flowering	comparative value of LSD$_{0,05}$
Ca0	33,33	
Ca1	31,00	2,48
Ca2	29,78	
Ca3	26,78	

Description: The average number followed by letters that are not the same, is significantly different from the 95% confidence level.

Table 11 shows, the treatment of Ca3 gave the fastest average yield for the age of cucumber plants at flowering, although it was significantly different from the Ca2 treatment and was very significantly different from the treatment Ca1, Ca0.

4. Age starts to bear fruit

Table 12. The Smallest Significant Difference Test (LSD 0.05) The Age of the Cucumber Plant When Starting Fruiting on the Fifth Sunday (days after planting).

Treatment	Average Age of Plants Starts Fruiting	comparative value of LSD$_{0,05}$
Ca0	36,56	
Ca1	34,00	2,74
Ca2	32,67	
Ca3	29,33	

Description: The average number followed by letters that are not the same, is significantly different from the 95% confidence level.

Table 12 shows, the treatment of Ca3 gives the fastest average yield for the age of cucumber plants at the time of fruiting, although it is significantly different from the treatment of Ca2 and is very significantly different from the treatment of Ca1, Ca0.5.

5. Amount of Fruit Planting

Table 13. The Smallest Significant Difference Test (LSD 0.05) The Average Amount of Fruit Per-Plant Cucumber in the First to Third Harvest.

Treatment	Average Number of Fruits / Plants	comparative value of $LSD_{0,05}$
Ca0	11,11	
Ca1	11,55	0,70
Ca2	11,89	
Ca3	12,44	

Description: The average number followed by letters that are not the same, is significantly different from the 95% confidence level.

Table 13 shows, the treatment of Ca3 gives the most results on the average number of cucumber fruit plants, although not significantly different from the Ca2 treatment, significantly different from the treatment of Ca1 and very significantly different from Ca0.

6. Plant Fruit Weight

Table 14. Smallest Significant Difference Test (LSD 0.05) Average Fruit Weight of Cucumber Plants in First to Third Harvest (Kg)

Treatment	Average Fruit Weight (Kg)	comparative value of $LSD_{0,05}$
Ca0	0,26	
Ca1	0,27	0,09
Ca2	0,42	
Ca3	0,55	

Description: The average number followed by letters that are not the same, is significantly different from the 95% confidence level.

Table 14 shows, the treatment of Ca3 gives the heaviest results on the average weight of the fruit of the cucumber plant, although it was significantly different from the Ca2 treatment and was very significantly different in the treatment of Ca1, Ca0.

Discussion

In soil conditions that are too acidic or low in soil pH, agricultural lime containing nutrients (Calcium (CaO) and Magnesium (MgO) needs to be added to the soil, so that it becomes neutral and the pH of the soil is stable according to the needs of the plants to be planted. The pH level of the soil needed by plants varies, depending on the type of plants to be planted (Setiadi & Parimin, 2002).

Soil calcification aims to increase soil pH if the acidity of the soil is below neutral, and is also useful for improving soil structure, increasing soil microorganism activity so that it can improve the nitrification process and decomposition of soil organic matter (humus), eliminate toxic substances without removing substances other important substances, adding nutrients to Posphat (P), molybdenum (Mo), calcium (Ca), and Magnesium (Mg), increasing plant growth and plant productivity (Cahyono, 2003).

The results showed that the treatment of Ca3 (7.5 tons / ha dose) gave better results on the variables of growth and production observed compared to Ca0 (control), Ca2 (dose of

5 tons / ha), and Ca1 (dose 2.5 ton / ha). The average height generated in the treatment of Ca3 (4.6875 kg / plot) compared to Ca0 (Control) on the observation of yield components is due to the main function of Cretaceous Procal which is able to influence the increase in acidic soil pH, to pH which leads to neutral and ultimately reduce poisoning (Al, Fe, Mn) and nutrients that are needed by plants such as N (nitrogen), P (phosphorus), K (potassium), S (sulfur), Mg (magnesium), Mo (molybdenum) available to plants so that they absorb food well. Which can increase plant growth, increase the color of leaf green (chlorophyll), and increase the resistance of plants from pests and diseases. So that it can function double, besides increasing soil pH, it also fulfills plant nutrients which are easily absorbed by roots as plant food nutrients in its growth (Aliuddin A, A Ashandi, dan B Jaya. 1990).

D. Conclusion

The results of this study indicate that giving Lime Procal with a dose of 4.6875 Kg / plot (Ca3) still showing the best growth and fruit production of cucumber plants.

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