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The Influence and the Determination of the Doses of Fertilizers on the Growth of Cucumber in Greenhouses

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Abstract

The cucumber is the second most important plant cultivated in greenhouses in our country. The nutrition has great influence in the growth of this plant. This study aims to define the best doses of fertilizer at the "short fruit " type in the solar greenhouses, and to find out the best combination of the organic fertilizer with the crystalline chemical one as well which are actually in market. The evidence is a study with two factors, one of different doses of crystalline fertilizer combining with or without organic fertilizer. The Crystalline chemical fertilizer which are content by combinations of NPK, are used in additional fertilizing during all plant vegetation process through irrigating dripping system, while those organic fertilizing are thrown into basic fertilizing. The results of study show that the basic organic fertilizing by dose of 100 quintal/acres combined with the crystalline fertilizer by dose of 90-150 kg la NPK/acres ensures the highest productivity of the "short fruit" cucumber plant in the solar greenhouse.

Keywords: Cucumber, cultivation, vegetables, fertilizing, greenhouse.

1. Introduction

Application of modern intensive technologies for the growth and the development of plants in greenhouses require knowledge on nutrition. The study aims to determine the appropriate doses of the elements N: P: K in the form of crystalline fertilizers and combined with the organic manure for the plant of short fruit cucumber grown in solar greenhouse conditions. Undertaking this study sets/ determines the appropriate doses of plant food while eliminating the empirical usage, which lead to the increase of residues in the ground. The goal is inseparable from the economic and applicable aspect.

2. Material and Methods

The experiment was conducted in short fruit cucumber plant grown in the solar greenhouse of Agricultural Technology Transfer Center (ATTC) Lushnje, with hybrid Shekulli F1, in the period 2008 - 2010. Type of land was Ash-Brown Pasture land (ABP), with mechanical medium sub-clay composition (SAM /loam). First crop has been salad/spinach. Planting distances were 1m between the rows and 0.4 m between the plants. Watering was carried out through dripping irrigation system. The crystalline fertilizers were distributed through irrigation. The organic manure is used as basic manure before planting. The chemical fertilizers quantities were distributed during 100-day period of vegetation. In the study, there were 8 variants, trying different doses of the elements NPK, combined or not with the organic manure. The trial arose in 4 repetitions, according to the randomized block scheme. The variants in the study were as follows:

V_1 - 0 (Control)
V_2 - Organic manure 1000 kv/ha
V_3 - V2+ 360 kg l.a. /haN+225 kg/hal.a P_2O_5+315 Kgl.a/ha. K_20
V_4 - V2 + 480 kg l.a/haN+300kg l.a/ha P_2O_5+420 kg l.a/ha
V_5 - V2 + 600 kg l.a/ha N+375 kgl.a/ha P_2O_5 +525 kg l.a/ha K_2O
V_6 - 360 kg l.a. /haN+225 kgl.a/ha P_2O_5+315 Kgl.a/h K20

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V_7 - 480 kg l.a/haN+300kg l.a/ha P_2O_5+420 kg l.a/ha K_20
V_8 - 600 kg l.a/ha N+375 kgl.a/ha P2O5 +525 kg l.a/ha K_2O

Phenological data are kept; the number of female flowers nodes, the dynamics of plants growth in height, and the dynamics of leaves increasing number, the fruit biometric indicators, such as: the length and thickness of the fruit. It is observed in continuity the dynamics of production harvesting as well as it is counted the number of fruit for each harvest.

In conclusion, soil samples from 0 up to 30cm thick layer were taken and chemical analyzes were done for each variant.

3. Results and Discussion

The impact in plant production

The data of the three-year study indicate/show for the impact of the crystalline fertilization on the cucumber production (Table 1).

Table 1: The yield of plant per variants

Variants	Average yield quintal/ha	Addition to control	Addition in % to control
V_1 - 0 (Control)	586.2	-	100
V_2 - Organic manner 100kv/dn	1292.8	706.6	220
V_3 -V2 + 360 kg l.a. /haN+225 kg/hal.a P_2O_5+315Kgl.a/ha.	1579.6	993.4	269.5
V_4 - V2 + 480 kg l.a/haN+300kg l.a/ha P_2O_5+420 kg l.a/ha K_20	1571.3	985.1	268.0
V_5 - V2 + 600 kg l.a/ha N+375 kgl.a/ha P_2O_5 +525 kg l.a/ha K_2O	1626.5	1040.3	277.5
V_6 - 360 kg l.a. /haN+225 kgl.a/ha P_2O_5+315 Kgl.a/h K_20	1405.4	819.2	239.7
V_7 - 480 kg l.a/haN+300kg l.a/ha P_2O_5+420 kg l.a/ha K_20	1470.6	884.4	250.8
V_8 - 600 kg l.a/ha N+375 kgl.a/ha P_2O_5 +525 kg l.a/ha K_2O	1561.4	975.2	266.3
LSD 95%	71.426		
LSD 99%	101.234		

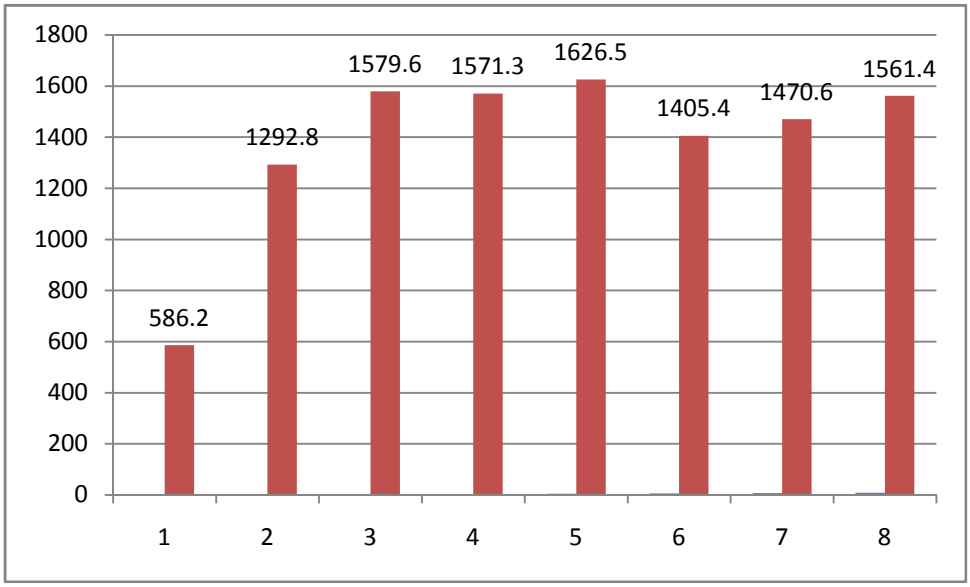

Figure 1. Yield of plants under different options

Parameters statement clearly shows the impact of using manure production crystalline indicators.

From the data obtained in Table No. 1 shows that the use of crystalline fertilization of cucumber culture is profitable in quantity: V3 - V2 + 360 kg left / Han + 225 kg / hal.a kg l.a P2O5 + 315 / ha. K20, V4, V5 and V8.

From the results it appears that production yield obtained in different limits from 586.2 quintals / ha, which variant to not use any kind of manure, using

version control for all other variants, 1579.6 quintals/ha, variant (V3 - V2 + 360 kg left / inn + 225 kg / hal.a kg l.a P2O5 + 315 / ha. K20, 1571.3 quintals / ha and the V4 version 1626.5 quintals / ha variant v5, while (V8 - 600 kg left / ha kg l.a n + 375 / ha P2O5 left +525 kg / ha K2O, only fertilizers) studying all indicators were 1561.4 quintals / ha. Quantity kg / getter / ha that was spent more in V4 does not justify expenditure incurred.

Impact on Energy released by combustion of additional production

From Table 2, note that with increasing doses of chemical fertilizers and increase productivity, but unproved. Assessing the Impact of chemical fertilizers should be seen not only in increasing production per unit of land, but also in terms of energy analysis. By composting combinations analyzed in terms of power, noted that option 3 has a positive energy balance with that variant 4 and 5. In general, the energy spent for fertilizer production constitutes about 55-60% of all energy is spent for the implementation of crop production.

From Table 3, note that with increasing doses of chemical fertilizers and increase productivity, but unproved. Assessing the Impact of chemical fertilizers should be seen not only in increasing production per unit of land, but also in terms of energy analysis. By composting combinations analyzed in terms of power, noted that option 3 has a positive energy balance with that variant 4 and 5. In general, the energy spent for fertilizer production constitutes about 55-60% of all energy is spent for the implementation of crop production.

Effectiveness on soil chemical qualities

In terms of the effect of crystalline fertilization on soil indicators, it is observed that the nutrition has not brought any significant changes on the indicators presented in Table 4.

To notice the effectiveness of the doses utilization, we have taken into consideration the income obtained from the sale of the production and the current prices. From the economic analysis, it results that the third variant provides higher net income compared to other variants. In the study mentioned above, the evaluation in terms of economic and energetic aspect proved that the best variant is variant 3, where the best combination of production and positive energetic balance is.

Table 2. The energy released by the combustion of additional production.

Variants	Average yield Quintal/ha	Addition to organic fertilization Quintal/ha	Increased production in Kg dried material (10% humidity) (Quintal/ha)	Energy released from burning of increased production (MJ) (1kg=17MJ)
V_1 - 0 (Control)	586.2	-		
V_2 - Organic manure 1000kv/ha	1292.8			
V_3 - V2 + 360 kg l.a. /haN+225 kg/hal.a P_2O_5+315 Kgl.a/ha. K_20	1579.6	276.4	27,64	46988
V_4 - V2 + 480 kg l.a/haN+300kg l.a/ha P_2O_5+420 kg l.a/ha K_20	1571.3	278.5	27.85	47345
V_5 - V2 + 600 kg l.a/ha N+375 kgl.a/ha P_2O_5 +525 kg l.a/ha K_2O	1626.5	333.7	33.37	56729
V_6 - 360 kg l.a. /haN+225 kgl.a/ha P_2O_5+315 Kgl.a/h K_20	1405.4	112.6	11.26	19042
V_7 - 480 kg l.a/haN+300kg l.a/ha P_2O_5+420 kg l.a/ha K_20	1470.6	172.8	17.28	34376
V_8 - 600 kg l.a/ha N+375 kgl.a/ha P_2O_5 +525 kg l.a/ha K_2O	1561.4	268.6	26.86	45660
LSD 95%	71.426			
LSD 99%	101.234			

Table 3. Energy balance for the addition of cucumber production in plants

Variants	Energy for the production of nitrogenous fertilizer (MJ)	Energy for the production of phosphoric fertilizer (MJ)	Energy for the production of potassium fertilizer (MJ)	Total energy for the production of chemical fertilizers (MJ)	Energy generated from the increased production (MJ)	Energetic balance of the in-creased production (MJ)
V_1 - 0 (Control)						
V_2 - Organic manure 1000kv/ha						
V_3 - V2 + 360 kg l.a. /ha N+225 kg l.a/ha P_2O_5+315 Kg l.a/ha K_20	24200	2895	3150	30245	46988	15743
V_4 - V2 + 480 kg l.a /ha N+300kg l.a/haP+420 kg l.a/ha K_20	33600	3900	4200	41700	47345	- 130
V_5 - V2 + 600 kg l.a/ha N+375 kgl.a/ha P_2O_5 +525 kg l.a/ha K_2O	42000	4875	5250	46875	56729	9854
V_6 - 360 kg l.a. /haN+225 kgl.a/ha P_2O_5+315 Kgl.a/h K_20	24200	2895	3150	30245	19042	-11203
V_7 480 kg l.a N/ha+300kg l.a/ha P_2O_5+420 kg l.a/ha K_20	33600	3900	4200	41700	34376	-7324
V_8 - 600 kg l.a/ha N+375 kgl.a/ha P_2O_5 +525 kg l.a/ha K_2O	42000	4875	5250	46875	45660	-1215

Table 4. Effectiveness of crystalline fertilization on soil indicators in the third year

	Soil composition					
Variant	Humus %	Nitrogen %	P_2O_5 mg/ 100gr soil	Dry residues %	Chloride %	Ca %
Variant 1	8,5	0,364	1,1	0,556	0,121	0,084
Variant 2	7.0	0,420	1,12	0,404	0,082	0,052
Variant 3	7,0	0,420	1,3	0,698	0,117	0,062
Variant 4	6,5	0,342	1,6	0,564	0,131	0,074
Variant6	6,5	0,448	1,1	0,384	0,078	0,059
Variant 6	6,5	0,392	1,12	0,524	0,138	0,082
Variant 7	6,5	0,420	1,3	0,610	0,159	0,078
Variant 8	6,5	0,308	1,6	0,374	0,071	0,058
Qualities of soil before the establishment of the experiment	7,0	0.420	1,0	0,103	0,014	0,015

4. Conclusions

Based on the results of the study, it can be concluded as follows:

Combined usage of mineral and organic fertilizers increases the effectiveness of their use. The maximum production is secured by variant: V_3 – 1000Quintal/ ha + 360 Kg 1.a./ha N+225 Kg 1.a./ha P_2O_5+315 Kg 1.a./ha K_2O. The usage of organic fertilizers creates opportunities for a balanced food in the form of nutritive elements of macro-elements. Usage of optimal doses of nutritive elements in combination with the organic fertilizers increases the effectiveness of their utilization.

The impact on soil qualities: Generally, feeding with crystalline fertilizers has not lead to the changes of soil indicators proving the level of nutrients utilization.

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