RESPONCE OF SOYBEAN PLANT (*Glycine max* (L.) Mer) ON EFFICIENCY USE OF NPK FERTILIZER WITH ADDITION OF ORGANIC FERTILIZER

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Abstract

Soybean is one of multipurpose plant because soybean can be used as food, as feed ingredients, as well as for raw materials of various manufacturing and processed industries. In Indonesia the average requirement of soybean every year reaches 2-3 million tons, while the national production of Indonesia only reached 870,068 tons (37.85% of domestic needs). According to the Central Bureau of Statistics (BPS) (2015) recorded imports of soybeans reached 1,525,748 tons. To achieve the target soybean production can be done with non organic fertilization. But this agricultural technology is not environmentally friendly because of the deposition of heavy metal elements that can pollute the environment. To avoid deposition of heavy metal elements can be done addition of organic fertilizer. The purpose of this research is to know the responce of soybean plant to the efficiency of NPK fertilizer use with the addition of organic fertilizer.

The research method is a simple experiment using randomized block design with the addition of organic fertilizer that is P0: NPK 100% (Control), P1: NPK 75% + 30 ton/ha organic fertilizer, P2: NPK 50% + 30 ton/ha organic fertilizer, P3: NPK 25% + 30 ton/ha organic fertilizer, P4: organic fertilizer 30 ton/ha and repeated 3 times.

The result of observation of plant pod number, number of planting seeds, number of root nodule, dry weight of soybean tends, with high clay C-organic content to be more responce to the use of NPK 25% fertilizer showed higher tendency with production per hectare (= 2.17 ton/ha) higher than other treatment. It can be said also that with the use of NPK fertilizer 25% more efficiency.

Keywords: Tolerance, Glycine max, Efficiency, NPK Fertilizer, Organic Fertilizer

INTRODUCTION

Soybean is one of multipurpose plant because soybean can be used as food, as feed ingredients, as well as for raw materials of various manufacturing and processed industries. In Indonesia the average requirement of soybean every year reaches 2-3 million tons, while the national production of Indonesia only reached 870,068 tons or equivalent to 37.85% of the needs to be met in the country. To cover the shortage of the production raw materials can be met by way of soybean import from outside countries. The import value of soybean to meet domestic demand is very large, according to the head of the Central Bureau of Statistics (BPS) from January to August 2015 recorded soybean imports reached 1,525,748 tons. To achieve the target soybean production can be done with non organic fertilization.

In increasing production by using non-organic fertilizer to increase and maintain agricultural production, it turns out the technology is not environmentally friendly, due to the deposition of heavy metal elements in the soil and can be toxic to the human body. To avoid deposition of heavy metal elements can be done fertilization with the addition of organic fertilizer.

Organic fertilizers are fertilizers that are mostly or wholly composed of organic materials derived from plants and or animals in the form of solid or liquid which can be used to supply organic materials. Generally organic fertilizer contains macro and micro nutrients even in small amounts. Provision of organic fertilizer into the soil has a positive impact on

soil and plants, because the organic material content can improve the physical properties that stimulate granulation, improve soil aeration, and improve the ability to hold water, improve the chemical and biological properties of the soil.

The purpose of this research is to know the responce of soybean plant to the efficiency of NPK fertilizer use with the addition of organic fertilizer.

RESEARCH METHODS

The research was conducted in Balawi Main Seed of PalawijaLebak-sari Pasuruan with height of 100 mdpl, in January 2017 until April 2017. The research was experiment using randomized block design (RAK) and repeated three times. As a treat is NPK fertilizer and Organic Fertilizer:

P0: NPK = 100% (7.5 Kw / ha), Without PpkOrg;
P1: NPK = 75% (5.62 Kw / ha), PpkOrg 30 ton / ha;
P2: NPK = 50% (3.75 Kw / ha), PpkOrg = 30 ton / ha;
P3: NPK = 25% (1.87 Kw / ha), PpkOrg = 30 ton / ha;
P4: Without NPK = 0%, PpkOrg = 30 ton / ha

The variables observed were the number of trees per plant, the number of seeds per plant, the weight of 100 grains, the number of root nodules, the wet weight of the stalk, the dry weight of the stalk, the production of soybean and C-organic soil.

RESULTS AND DISCUSSION

Number of pods per plant, number of seeds per pod, weight of 100 grains, number of root nodules, wet weight of stover, dry weight of stover

Observation of number of pods per plant, number of seeds per pod, weight of 100 grains, number of root nodules, wet weight of sterilization, dry weight of stalk (Table 1) with some treatment of NPK fertilizer composition and organic fertilizer were not significantly different, but treatment P3: NPK = 25 % (1.87 Kw / ha), PpkOrg = 30 ton / ha shows higher yield compared to other.

Table 1. Average Number of pods per plant, number of seeds per plant, weight of 100 grains, number of root nodules, wet weight of the stalk, dry weight of the stalk some fertilizer treatment.

Treatment	Number of pods per plant	number of seeds per plant(seed)	weight of 100 grains (gr)	number of root nodules (nodule)	wet weight of the stalk (gr)	dry weight of the stalk (gr)
P0	178,64	266,74	12,29	27,62	475,00	253,22
P1	175,19	304,80	12,65	28,76	460,56	254,01
P2	167,86	248,13	12,28	29,84	428,89	249,39
P3	183,19	260,09	12,10	33,11	445,00	274,51
P4	163,58	253,17	12,05	26,18	408,89	267,78
BNT 5%	ns	ns	ns	ns	ns	ns

Description: ns = not significantly different (p = 0.5)

The addition of organic fertilizer tends to give positive impact to the number of pods per plant, the number of seeds per plant, the weight of 100 grains, the number of root nodules, the wet weight and the dry weight of the stalk. The results of Farida and Hamdani (2002) research have positive interactions due to the use of organic fertilizers and inorganic fertilizers. The combination of treatment of dosage of chicken manure and NPK fertilizer had significant effect on all growth parameters.

Sitompul (1995) that one of the factors in plant growth that determines plant weight is the production of biomass used to form plant parts or as food reserves roughly derived from photosynthesis. The dry weight of the plant is the weight of the material after it has been heating for some time so the weight remains constant. In dry weight of stover can also be influenced from growth factor, plant morphology factor and also can be seen from parameter of wet weight of plant. Supported by opinion Damanik et al, (2011) which states that plant growth is influenced by two important factors namely genetic factors and environmental factors.

Production and C - organic on soil

Table 2 shows that crop production has a significant effect on the composition of NPK fertilizer with the addition of organic fertilizer. The highest production of soybean crops was in the use of NPK 25% (1.87 Kw / ha) + organic fertilizer 30 Ton / ha (P3) with the value of 2.17 ton / ha and not significantly different with (P4). Figure 1is a regression equation between the composition of fertilizer and production: Y = -0.016X2 + 0.1502X + 0.3326, with correlation R^2 = 0.9042.

The highest C-Organic soil content is present in use only with organic fertilizer 30 Ton / ha (P4) with value 12,09. Figure 2 is a regression equation between the composition of the fertilizer with C-Organic soil: Y = -0.014X2 + 0.711X + 0.79, with the correlation R^2 = 0.9896.

Table 2. Average Production of Soya and C-Organic Soil PlantsEffect of NPK Fertilizer Composition and Organic Fertilizer

Treatment	Production (ton/ha)		C-Organic Land	
P0	1,43	a	1,42	a
P1	1,69	ab	2,31	b
P2	1,83	bc	2,71	c
P3	2,17	d	3,37	d
P4	1,99	cd	4,03	e
BNT 5%	0,29		0,04	

Description: The numbers followed by the same letter in one column are not shows a marked difference (p = 0.5)

The highest production in the treatment of NPK 25% fertilizer and organic fertilizer 30 ton / ha can be said that the fertilization with this composition can generally be recommended given on soybean crop, because with the addition of organic fertilizer 30 ton / ha then the use of NPK fertilizer can be more efficient. The addition of organic fertilizer to the soybean soil can improve the level of soil keseburuan with the activity of microorganisms in the soil that can increase the availability of nutrients, so that the need of inorganic fertilizers added can be reduced. This is in accordance with the opinion Handayanto and Hairiah (2007) explains the provision of organic fertilizer can increase the soil organic matter content and increase the presence of soil microorganisms. The addition of soil organic matter can improve and improve soil fertility, so that the addition of inorganic fertilizers can be reduced

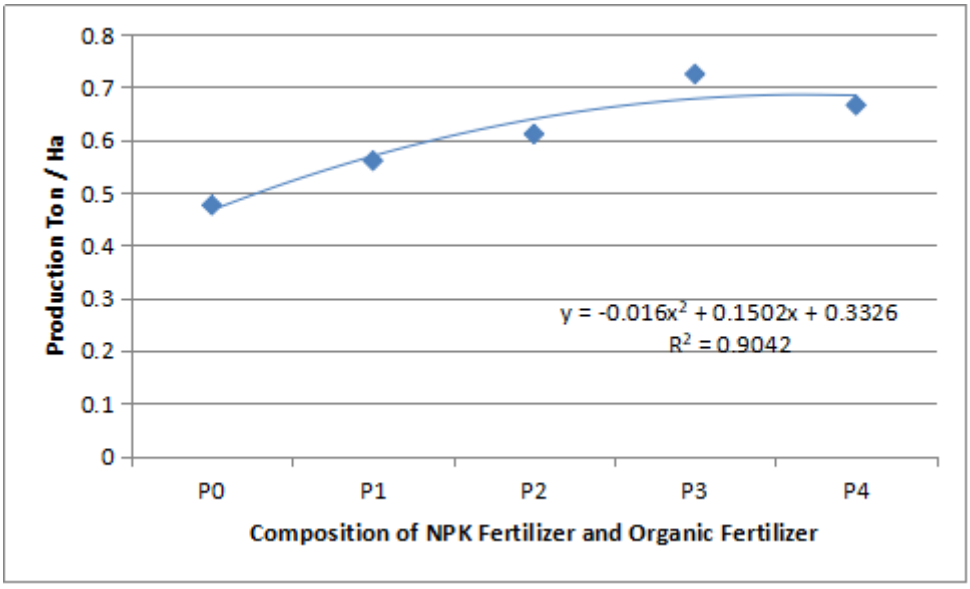

Figure 1. Regression / Correlation of NPK Fertilizer Composition and Organic Fertilizer Of Soybean Crop Production

Figure 1 shows that the reduced amount of NPK fertilizer use with the addition of organic fertilizer 30 tons / ha increased production. Hulopi (2008) states that the use of chicken manure 5 tons / ha can reduce the use of inorganic fertilizers (NPK) with a dose of 25%, meaning that the application of chicken manure with a low dose can improve soil fertility, thus increasing the efficiency of fertilizer use Inorganic for nutrient needs for crops.

Excessive use of chemical fertilizers will break the soil nutrient cycle and can kill soil organisms. Other effects of using chemical fertilizers can also reduce and suppress populations of soil organisms that are very beneficial to soil and plants (Erianto, 2009). Manshuri (2010) reported that up to a certain level of yield, the optimal nutrient requirements of N, P and K of soybean plants are linearly correlated with outcomes.

The result of C-Organic analysis on soil prior to fertilizer treatment was 1.29 that is low, after the use of fertilizer obtained by C-Organic increase (Table 2). Figure 2 shows that with the composition of NPK fertilizer and organic fertilizer reduced the use of NPK fertilizer increasing the C-Organic content in the soil.

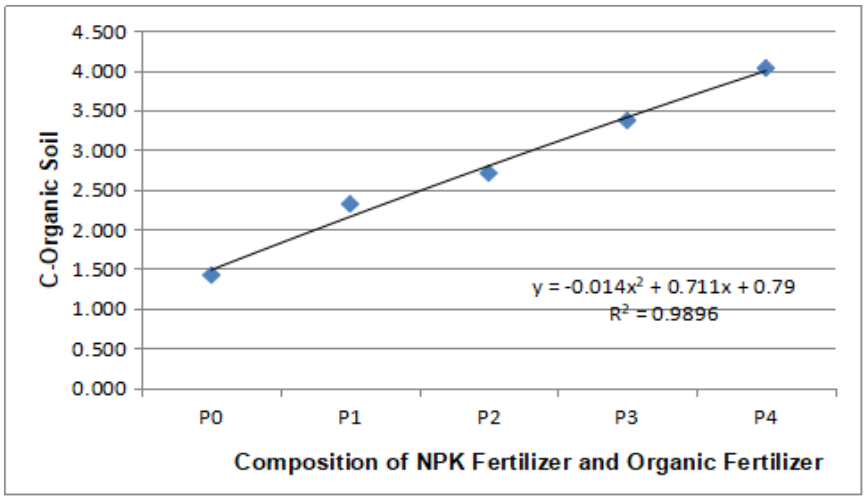

Figure 2. Regression / Correlation of NPK Fertilizer Composition and Organic Fertilizer To the C-Organic Content in the Soil

Organic materials play a role in contributing to soil chemical conditions such as cation exchange capacity. Soils with high CEC (Cation exchange capacity)are able to absorb and provide better nutrients than those with low CEC (Hardjowigeno, 2002). The content of CEC is low according to the soil analysis results is expected to be higher with the provision of organic matter, this has an effect on the observed variables due to the increase of CEC supplementary soil ability to hold the nutrient element so it is not easily lost and can be utilized by the plant (Weil and Magdoff, 2004). According to Mowidu (2001), 20-30 tonnes / ha of organic matter has a significant effect on increasing total porosity, useful pore count, moisture storage pores and aggregate stability and decreasing of particle density, buckle density and permeability. Sönmez et al. (2013) stated that manure can reduce the use of fossil energy and NPK fertilizers such as phosphorus and potassium

CONCLUSION

The use of NPK fertilizer composition = 25% (1,875 kw / ha) + 30 ton / ha organic fertilizer gives the highest average yield, and it can be said that the use of NPK fertilizer is more efficient. It is recommended to recommend fertilizer compositions in general can be used for fertilization in soybean crops.

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