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Application of Fertilization Time and Nitrogen Dosage on Peanut Plant (*Arachis hypogaea* L.)

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Abstract

This study aims to determine the effect of treatment of fertilization time and dosage of nitrogen to the growth and yield of peanut plants. This experiment is a two-factor experiment with incomplete randomized block design. The first factor is the time (S) of fertilizer consisting of three levels: During planting (S0), 15 days after planting (S1), 30 days after planting (S2), The second factor is the dosage of Nitrogen (N) fertilizer consisting of three levels: 25 kg/ha (N1), 50 kg/ha (N2). The results showed that treatment of fertilization time and a dose of nitrogen showed no significant effect on plant height, maximum leaf number, leaf area index, the total pod containing, total void pod, total pod number, oven dry weight of oven plants, and harvesting index. The interaction of nitrogen dose with a time of fertilization gave a very real effect to most observed variables except for maximum plant height, maximum leaf number, leaf area, harvest index that is not significant. The high dry weight of seed oven per plant was obtained at the fertilizer interaction treatment at 15 days after planting and the dose of nitrogen 25 kg/ha was 30.33 g and or increased by 152.75% and when compared with the control of 12.00 g. From a result of regression analysis got an optimum dose of nitrogen fertilizer that is 34.15 kg/ha with the dry weight of oven seeds per plant maximum 26.73 g.

Keywords: Fertilization time, nitrogen dosage, peanut result

1. Introduction

Peanut productivity is low when compared to the yield potential of peanut varieties that have been removed. The increase in peanut productivity in Indonesia is not followed by increased peanut production, national peanut production even decreased from 2008 to 2012. In 2008, peanut production was around 770,054 tons and in 2012 around 709,063 tons. The average production capability is only about 1 ton/ha of dry beans. One cause of peanut productivity is still low because the peanut pod filling process is not maximized, there are still many pods found half [1]. Peanut pod results are determined by photosynthesis accumulated into peanut and peanut shells [2].

Domestic peanut production is constrained due to the low knowledge of peanut cultivation techniques, if peanut cultivation is well understood, peanut cultivation has the certain uniqueness that is beneficial to agricultural land. Peanuts are known as soil fertility plants, with the presence of Rhizobium at its roots [3]. One of the improved techniques of peanut cultivation in order to obtain higher productivity is to fertilize. One of the fertilizers used is urea fertilizer. Urea fertilizer with high N formula $(NH_2)_2$ high N content is 46%, very easy to absorb water (hygroscopic) and the effect of this fertilizer reaction is towards the base [4] when given into humid soil immediately hydrolyzed to am-

monium carbonate, In the presence of water, fertilizers can seep down the root areas and easily experience volatilization or disappear in the form of ammonia gas [5].

The role of nitrogen for plants is to stimulate the growth of plants, especially roots, branches, and leaves. Nitrogen is also very important for the formation of proteins, fats, and various other organic compounds. Plants absorb nitrogen elements in the form of NH_4^+ or NO_3^- through mass flow processes that are affected by the osmotic pressure difference of the root trapping system [6]. The application of nitrogen fertilizer is very important because it is an essential nutrient [7]. Giving should also be given in accordance with the appropriate dosage to avoid nutrient deficiency and excess because the nutrient excess is as bad as the nutrient deficiency. According to [8] that the dose of nitrogen fertilization for peanuts is 20-25 kg/ha and the giving is done 1 day before planting or simultaneously at planting time.

The need for crops for various fertilizers during growth and development is not the same, takes different time (time) and not as much [9]. Furthermore, it is stated that the plants along the growth there are times when the plants require an intensive exchange of substances for good growth. Thus it is clear that fertilization should not be done at any time, should pay attention to the time required and the different nutrient deficiencies in the state of deficiency [9]. This study aims to determine the effect of time and dosage of nitrogen fertilizer and its interaction with growth and yields.

2. Material and Methods

This experiment is a field research conducted on plantation land of Technical Implementation Unit of Agriculture Department of Palawija and Hortikultura of Rendang Sub-district in Singarata Village, Rendang District, Karangasem Regency. Singarata Village has a cool climate with an altitude of about 650m above sea level. The study took place on April 8, 2014, until July 29, 2014.

This experiment is a two-factor experiment with incomplete Randomized Block Design (RBD). The first factor is the time (time) of fertilizer (S) consisting of three levels: S0 = During planting, S1 = 15 days after planting (DAP), S2 = 30 days after planting, The second factor is the dosage of Nitrogen (N) fertilizer consisting of three N2 = Nitrogen Fertilizer 25 kg/ha (54 kg Urea/ha), N2 = Nitrogen Fertilizer 50 kg/ha (108 kg Urea/ha). Thus there were 7 treatment combinations, each repeated three times so that 21 plots of experiments were required.

The variables observed were plant height, maximum leaf number, leaf area index 56, a number of pods containing, number of pods not contained, number of pods, fresh weight of seeds, fresh weight of stover, dry weight of oven seed, dry weight oven of stover, harvest index. The data of the research were analyzed by using statistical analysis of variance in accordance with the research design. For the different treatments, it was continued with the average difference test, Duncan for interaction effect, Least significant different for single factor effect with 5% real level.

3. Results and Discussion

The significance of the effect of treatment of fertilization time (S) with nitrogen dose (N) to the observed variables is presented in Table 1. From Table 1 it can be seen that the treatment of fertilization time showed no significant effect ($P \geq 0.05$) on some observed variables, except for fresh weight, fresh weight, and weight of the oven. The treatment of dose nitrogen (N) gave no significant effect ($P > 0.05$) on most observed variables except on the number of pods containing, the number of empty pods, fresh weight of tangibles significantly ($P < 0.05$) and oven dry weight very significant effect ($P < 0.01$).

From result of research, it is found that the treatment of fertilization time with nitrogen dose showed no significant effect (P≥0.05) on plant height, maximum leaf number, leaf area index, total pod containing, total pod void, total pod number, dry oven seed weight per plant, and harvest index (Table 1).

Table 1
Significance of Effect of Fertilization Time with Nitrogen Dosage on Observed Variables

No	Variable	Treatment			
		S	N	SxN	Control vs Treatment
1	Maximum plant height (cm)	ns	ns	ns	ns
2	Maximum number of leaves (strands)	ns	ns	ns	ns
3	Left area index 56 DAP	ns	ns	ns	ns
4	Number of pods per plant	ns	*	**	*
5	Number of empty pods per plant	ns	*	**	ns
6	Number of pods per plant	ns	ns	ns	**
7	The weight of fresh seeds per plant (g)	*	ns	**	**
8	Fresh weight trimmed per plant (g)	**	*	**	**
9	Dry weight of oven seeds per plant (g)	ns	ns	**	**
10	Dry weight of oven pods per plot (g)	*	ns	**	**
11	Dry oven dry weight (g)	**	**	**	**
12	Harvest index (%)	ns	ns	ns	*

**= highly significant effect (P<0.01); * = significantly effect (P<0.05); ns = not significant effect (P≥0.05)

The interaction of nitrogen dose with a time of fertilization gave very real effect (P<0.01) to most observed variables except for maximum plant height, maximum leaf number, leaf area, harvest index that is not significant (P> 0.05). The interaction between the 15 DAP fertilization time and the 25 kg/ ha (S1N1) nitrogen dose gave the highest dry weight of oven seeds per plant of 30.33 g. The high dry weight of oven seeds per plant is supported by plant height (r = 0.64**), leaf area index (r = 0,50*), number of pods per plant (r = 0.87**), number of pods per plant (r = 0.56*) fresh weight of seed per plant (r = 0.99**), fresh weight of crops per plant (r = 0.98**), dry weight of oven pods per plant (r = 0.96**), and harvest index (r = 0.72**). This is caused by nitrogen which is the main constituent of proteins or as the basic ingredients of protein and the formation of chlorophyll. With the increase of chlorophyll, the activity of photosynthesis is increased, the photosynthate produced will also increase. Furthermore, this photosintat will be transferred to the plant organs that actively conduct metabolism so that the growth of roots, stems and leaves of plants to be better and will further affect the crop. Fresh weight per plant is also an indicator of the growth and development of a vegetative plant, the N element is a very important role in the growth of leaves. This is in accordance with the statement of [10], that N fertilization is useful in growth and also the filling of seeds goes well. This is supported by the statement of [11], that dry matter for seed filling in peanuts is thought to be more obtained from photosynthesis.

Figure 1 shows the interaction between the treatment time of 15 DAP with the dose of nitrogen 25 kg/ha (S1N1) gives the highest yield on the dry weight of oven seeds per plant that is 30.33 g, and at the time of fertilization when planting on the dosage of nitrogen 50 kg / Ha (S0N2) yields the highest dry weight of oven seeds per plant of 25.67 g. However, interaction treatment between 15 DAP fertilizer and 25 kg/ha (S1N1) of urea fertilizer still gives the highest dry weight of oven seeds compared to fertilizer treatment at planting time and 50 kg/ha (S0N2) urea fertilizer. This is thought to be a good nitrogen absorption occurring at the time of a 15 DAP in peanut plants. In line with his opinion [12] which states that one that limits the production per plant is the nutrients needed by plants and the right time in the application of such fertilizers, so as to achieve maximum production. Described by [13], giving urea containing elements of N can increase the absorption of P and K by plants, so as to give effect to the balance of the soil, the amount of these elements will determine the

growth and development of the plant.

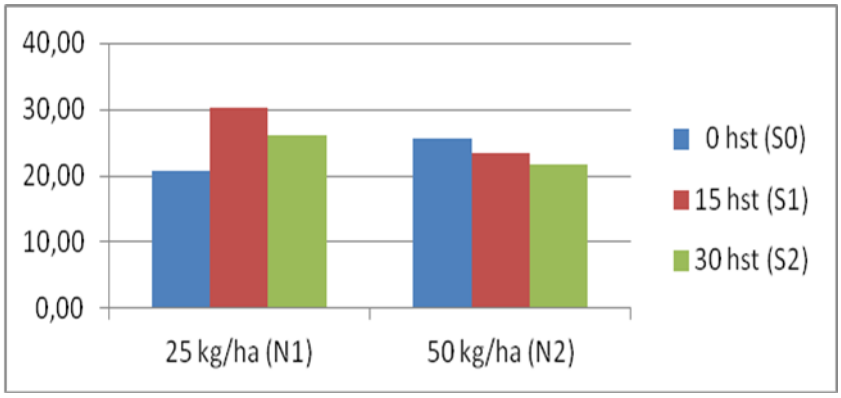

Figure 1
Dry Seed Oven Weight on The Interaction of Fertilizer Time with Nitrogen Dosage

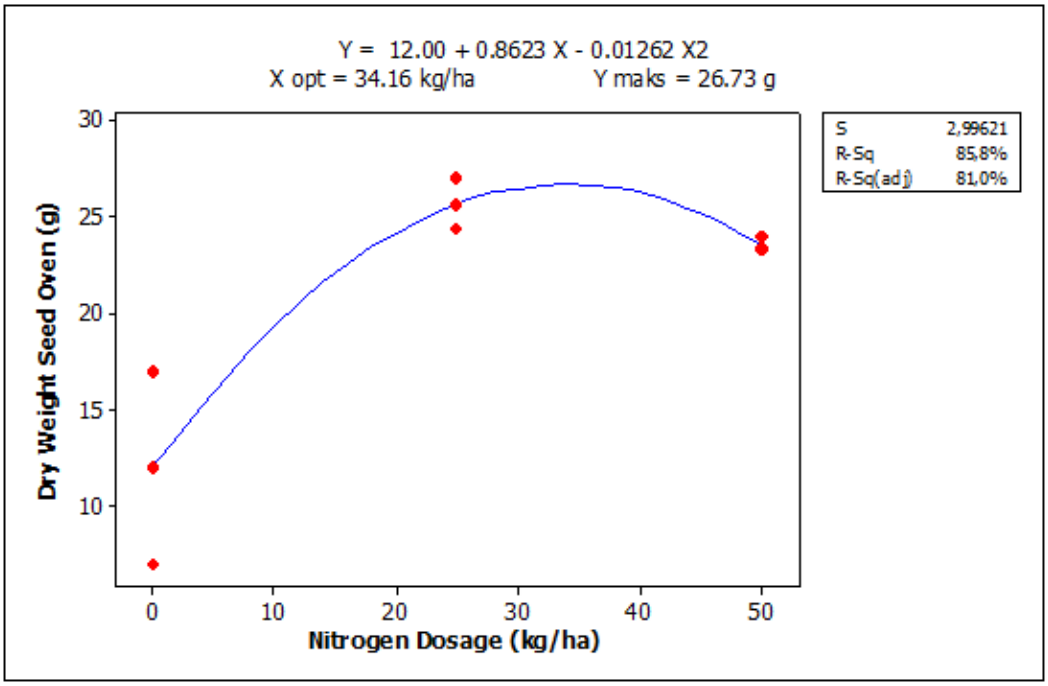

Figure 2.
The Relationship Between The Dose Of Nitrogen and Dry Weight of Oven Seeds per Plant at The Time of Fertilization 15 DAP

From the above explanation can be seen that the effect of interaction between 15 DAP fertilization time with the dose of nitrogen 25 kg/ha (S1N1), gives the highest value to dry weight of oven seed. The exact time of fertilization and the dosage of fertilizer given greatly affects the peanut plant yield, it is proved by the high dry weight of oven seeds per plant obtained on the treatment of fertilizer interaction at 15 DAP and the dose of nitrogen 25 kg/ha (S1N1) amounted to 30.33 G or increased by 152.75% when compared with the control treatment ie 12.00 g.

The result of regression analysis between nitrogen dose and dry weight of seed oven per plant showed a quadratic relationship with regression line equation: $\hat{Y} = 12.00 + 0.8632X - 0.01262X^2$ with the determination coefficient (R^2) equal to 85.80% (Figure 2). From a result of regression analysis got the optimum dose of nitrogen fertilizer that is 34.16 kg/ha with the dry weight of oven seeds per plant maximum 26.73 g. Based on the results of regression analysis showed that dry weight of oven

seeds per plant maximum 26.73 g. Based on the results of regression analysis showed that dry weight of oven seeds per plant is higher with increasing dose of nitrogen to an optimum limit, then decreasing when exceeding optimum dose. The availability of nutrients is one of the factors that affect the dry weight of oven seeds per plant, such as N elements that are very influential on leaf physical, which indirectly affect the rate of photosynthesis. Giving of N element at 25 kg/ha gives the highest yield of dry oven seed, but with increasing the dosage to 50 kg/ha it gives low result compared with 25 kg/ha dosage, this is supposed to have enough nutritional requirement in the plant.

4. Conclusion

Treatment of fertilization time showed no significant effect on most observed variables, except for variables of fresh weight of seed per plant, fresh weight of fruits, dry weight of pod oven, and dry weight of the shredded oven. Treatment of nitrogen dose 25 kg/ha gave the highest result that was 30,33 g and not significant influence to most of the variable observed except an amount of pod containing, an amount of empty pod, and fresh weight of fruits. Treatment of interaction between fertilization time and nitrogen dose gave a very real effect to some observed variables, except maximum plant height, maximum leaf number, leaf area index 56 day after plant, the number of a pod, and harvest index.

The highest dry weight of oven seeds per plant was obtained in the interaction treatment between 15 day after plant fertilization time and 25.30 g of nitrogen dosage or increased by 152.75% when compared with the control treatment of 12.00 g.The result of regression analysis between nitrogen dose and dry weight of seed oven per plant showed a quadratic relationship with regression line equation: $\hat{Y} = 12.00 + 0.8632X - 0.01262X^2$ with the determination coefficient (R^2) of 85.80%. From a result of regression analysis got the optimum dose of nitrogen fertilizer that is 34.16 kg/ha with the dry weight of oven seeds per plant maximum 26.73 g. In order to obtain higher peanut yields, it can be suggested 15 day after plant fertilization time with nitrogen dose 25 kg/ha.

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