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Phosphate Fertilizer on Growth Response Time of Soybean Varieties Under Rubber Plant

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ABSTRACT

Research which aims to determine the response of several varieties of soybean plants to the time of application of phosphate fertilizer under stands of rubber plants has been carried out at the Sungai Putih Research Institute, Galang District, Deli Serdang Regency, North Sumatra Province. The method used was a Factorial Randomized Block Design method with two factors. The first factor was several soybean plant varieties (Anjasmoro, Dega 1, Dena 1, and Devon 2). The second factor was the time of administration of the phosphate fertilizer dose (111 g/plot giving phosphate fertilizer 1 week before planting, 111 g/plot giving phosphate fertilizer at planting time, and 111 g/plot giving phosphate fertilizer 1 week after planting). The parameters observed were plant height, amount of leaf chlorophyll, flowering time, number of filled pods, number of empty pods, seed weight and weight of 100 seeds. The research results showed that the treatment of several varieties had a significant effect on all observation parameters. The timing of phosphate fertilizer application had a significant effect on plant height, flowering age, number of filled pods, seed weight and 100 seed weight, but had no significant effect on the amount of leaf chlorophyll and the number of empty pods. The interaction between the two treatments had no significant effect.

Keywords: Application time; Leguminoceae; Macronutrient; Rubber stand; Varieties

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INTRODUCTION

The need for soybeans in Indonesia is increasing every year along with the increase in population and improvement in per capita income. Even though soybean plants can grow well on all types of soil, in reality this need cannot be met by domestic production (Adisarwanto, 2014). According to 2016-2017 data, national soybean production decreased by 10.75% and 37.33%. Apart from cultivation problems, the problem of decreasing land availability is also the cause of inadequate soybean production capacity. The government's efforts to increase planting area in 2018 from 355 thousand hectares to 680 thousand succeeded in increasing soybean production from 538 thousand tons to 967 thousand tons (PDSIP, 2019). One food crop commodity that requires intensive development and has important value is soybeans. Soybeans have an important role in meeting the needs of vegetable protein to improve people's nutritional levels (Rizwan, Rauf, Rahmawaty, Nyak Akub, 2018; Jufri, 2006).Agricultural experts have made a new breakthrough, namely creating seeds that can grow well which are planted under stands of annual plants while also carrying out plant cultivation activities under stands. Plants that can be developed and can be planted under stands include horticulture and secondary crops (Kadekoh, 2007).

Superior soybean varieties in Indonesia were created for various purposes. Until 2006, the government had released 83 superior varieties of soybeans. These varieties have a variety of advantages and characteristics, both morphological and agronomic characteristics. The superiority of a variety can be assessed based on yield potential, maturity, seed size, seed quality, resistance to biotic or abiotic stress, and environmental adaptation (Susanto et al., 2017).Variety selection should be adjusted to market demand (Asbur, 2020; Anonimus 2018).

From the technical aspect of cultivation, the effort to increase soybean production is proper and balanced fertilization, especially good application which should be adjusted to when the plant needs nutrient intake or at the right time. The time of fertilization is usually done before planting, during planting and after planting (Sinaga, 2007). This is because unbalanced fertilization can cause plants to grow not optimally, due to a lack or excess of fertilizer, which can ultimately lead to an imbalance of nutrients in the soil, damage to soil properties, and environmental pollution (Asbur and Purwaningrum, 2015). In an agricultural context, P deficiency or excess likely begins at seed germination and develops gradually over time. With increasing P levels in the soil, it will increase further. It is possible to create soil-based culture systems to simulate P deficiency or extra-optimum P fertility as occurs under field conditions (Crafts-Brandner, 1991). The nutrient P is really needed by plants which has the function of stimulating root growth, especially the roots of seeds and young plants. In addition, phosphate functions as a raw material for the formation of certain proteins, helping

assimilation and respiration and accelerating flowering, ripening of seeds and fruit (Setyamidjaja, 2000).

Soybean plants are C3 plants so they can be developed as intercrops under stands of rubber plants, industrial crops, or intercropping with other annual crops. Soybeans that experience light intensity stress can adapt by developing various changes (Kisman et al., 2008).One strategy for expanding soybean planting areas is to implement an agroforestry system Rizwan, Rauf, Rahmawaty and Nyak Akoeb, 2016.

Based on the description above, it is necessary to carry out research to find out how several varieties of soybean plants respond to the shade of rubber plant stands and the appropriate timing of phosphate fertilizer application in order to obtain optimum growth and production of soybean plants. Research objectives were to determine the response to growth and production of several varieties of soybean plants, to determine the response of growth and production of soybean plants to the time of application of phosphate fertilizer, and to determine the response to growth and production of soybean plants under rubber plant stand.

MATERIAL AND METHOD

Place and Time of Research

This research was carried out at the Sungai Putih Research Institute, Galang District, Deli Serdang Regency, North Sumatra Province at an altitude of ± 25 meters above sea level. This research began in April to July 2019.

Research Materials and Tools

The materials used in this research were soybean seeds from the varieties Anjasmoro, Dega 1, Dena 1, Devon 2, phosphate fertilizer, water and other materials deemed necessary. Meanwhile, the tools used are hoes, measuring tape, scales, stationery, gembor, digital camera, chlorophyll meter (SPAD) and tools deemed necessary.

Research Methods

This research used a factorial randomized block design (RAK) with 2 factors studied and repeated 3 times with the first factor being several varieties of soybean plants (v) and the second factor being the time of application of phosphate fertilizer (w).

1. The first factor is several varieties of soybean plants (v) which consists of 4 levels, namely: v1 = Anjasmoro; v2 = Dega 1; v3 = Den 1; v4 = Devon 2
2. The second factor is the time of administration of the phosphate fertilizer dose (w) consisting of 3 levels, namely:
   - w1 : 100 kg/ ha (111 g/plot) fertilizer applicationphosphate1 week before planting
   - w2 : 100 kg/ha (111g/plot) fertilizer applicationphosphateat planting time
   - w3 : 100 kg/ha (111 g/plot) fertilizer applicationphosphate1 week after planting

Research Data Analysis

Ɛivw =Experimental error in the i-th block with treatment of several soybean plant varieties at the v-th level and the time of application of Phosphate fertilizer at the w-th level. If the treatment has a real effect then proceed with the Duncan mean difference test (DMRT) at the α = 5% level.

Research Implementation

Creation of Experiment Plots

Making plots using a hoe by loosening the soil and forming plots measuring 200 cm x 200 cm, with a distance between plots of 50 cm and a distance between repetitions of 300 cm. There were 36 experimental plots made with 3 replications.

Making Plant Spacing

In this study, a planting distance of 20 cm x 40 cm was used using a planting distance mold that had been made using a plate that had been tied with thread at a distance of 20 cm x 40 cm.

Fertilizer ApplicationPhosphate

FertilizerphosphateThis is applied to the plot at a dose of 111 grams/plot in sequence with the time of fertilizer applicationphosphateThis is with 3 application times, namely a week before planting, at planting time and a week after planting in the plot.

Planting Seeds

The seeds used are the Anjasmoro, Dega 1, Dena 1 and Devon 2 varieties. This planting uses a tugal system, namely by inserting two seeds per planting hole, with a planting distance of 20 cm x 40 cm at a depth of ± 1-2 cm. After the seeds are inserted into the planting hole, then the planting hole is covered again with soil.

Harvesting

Harvesting of soybeans is carried out when 70% of the leaves have turned yellow and fallen off and the pods are hard and have turned brownish in color. Soybeans are harvested simultaneously by cutting the main stem of the plant just above the soil surface. This harvesting method is better than pulling the plant straight away because the nitrogen-rich roots are left to decompose in the soil.

Observation Parameters

Plant Height (cm)

Observations were made by measuring plant height using a meter. Plant height observations can be made after the plants are 14 Day After Planting (DAP) (2 weeks). Further observations were made at the age of 18 DAP and 21 DAP.

Amount of Leaf Chlorophyll (Grains/mm^2)

Observations on leaf chlorophyll were carried out at 14 DAP (2 weeks), 18 DAP and 21 DAP using a chlorophyll meter (SPAD) to determine the level of greenness of the leaves by attaching a chlorophyll meter to the base of the leaf, middle of the leaf, tip of the leaf and averaging it. in millimeters which is carried out in the morning.

Flowering Time (DAP)

This observation was made by counting the days from when the soybean seeds were planted until the soybean plants started to flower. Calculation of flowering age was carried out on each sample plant.

Number of Pods Contained (Seeds)

Observation of the number of filled pods per plant is carried out at harvest by counting all the number of filled pods on the soybean plant. The number of filled pods observed was the number of filled pods on each sample plant.

Number of Empty Pods (Seeds)

Observation of the number of empty pods per plant is carried out at harvest by counting all the number of empty pods on the soybean plants. The number of empty pods observed was the number of empty pods on each

sample plant.

Seed Weight (g)

Observation of the amount of seed production per plot is carried out at harvest by calculating the production of soybean seeds per plot. The number of seed production per plot observed is the number of seed production produced in the plot unit.

Weight of 100 Seeds (g)

Observation of the weight of 100 seeds (g) was carried out after the soybean seeds were dried. Drying was carried out by drying the seeds in the sun for 2-3 days, then seeds that had been randomly selected from a sample plant of 100 seeds were weighed using analytical scales.

RESULT AND DISCUSSION

Plant Height (cm)

The results of the analysis showed that the response of several soybean plant varieties to the time of application of phosphate fertilizer under rubber plant stands had a significant effect on soybean plant height at 28 DAP, while the interaction between the two treatments had no significant effect on soybean plant height at 28 DAP (Table 1).

Table 1. Response of Several Soybean Plant Varieties and Time of Application of Phosphate Fertilizer under Rubber Plant Stands (18% Shade) on Soybean Plant Height at 28 DAP (cm).

Treatment	Time to Apply FertilizerPhosphate(w)			Average
	w1	w2	w3	
Variety (v)				
v1	47.44	44.92	43.70	45.35 b
v2	38.54	36.60	35.29	36.81 a
v3	35.45	34.75	31.95	34.05 a
v4	49.04	45.93	44.45	46.48 b
Average	42.62 b	40.55 a	38.85 a	

Note: Numbers followed by letters that are not the same in the same treatment group are significantly different at the 5% level based on the DMRT test, while those without notations are not significantly different

In Table 1 it can be seen that the treatment of several soybean varieties had a significant effect on the height of soybean plants at 28 DAP. The highest yield of several soybean varieties was obtained in treatment v4 (Devon 2), namely 46.48 cm, while the lowest was in treatment v3 (Dena 1), namely 34.05 cm, followed by treatment v2 (Dega 1), namely 36.81 cm. and did not differ from the highest result in treatment v1 (Anjasmoro), namely 45.35 cm.

In the treatment, the time of application of phosphate fertilizer had a significant effect on the height of soybean plants at the age of 28 DAP. The highest yield was obtained in treatment w1 (111 g/plot phosphate given 1 week before planting) namely 42.62 cm, while the lowest was in treatment w3 (111 g/plot phosphate given 1 week after planting) namely 38.85 cm and treatment w2 (111 g/plot phosphate given at planting time) is 40.55 cm

Leaf Chlorophyll

The response of several soybean plant varieties to the amount of chlorophyll in soybean plant leaves had a significant effect at 28 DAP, but the time of application of phosphate fertilizer did not have a significant effect on the amount of chlorophyll in soybean plant leaves, nor did the interaction of the two treatment factors (Table 2).

Table 2. Response of Several Varieties of Soybean Plants and Time of Application of Phosphate Fertilizer under Stands of Rubber Plants (18% Shade) to the amount of chlorophyll in leaves of Soybean Plants Aged 28 DAP (mm^2).

Treatment	Time to Apply FertilizerPhosphate(w)			Average
	w1	w2	w3	
Variety (v)				
v1	36.03	36.03	36.26	36.11 ab
v2	36.82	36.62	36.33	36.59 b
v3	36.01	36.21	36.56	36.26 b
v4	35.97	35.01	35.83	35.60 a
Average	36.21	35.97	36.24	

Note: Numbers followed by letters that are not the same in the same treatment group are significantly different at the 5% level based on the DMRT test, while those without notations are not significantly different

In Table 2 it can be seen that the treatment of several soybean varieties had a significant effect on the amount of chlorophyll in soybean plant leaves at the age of 28 DAP.The highest number of leaf chlorophyll results for several soybean varieties was obtained in treatment v2 (Dega 1), namely 36.59 grains (mm^2),while the lowest is attreatment v4 (Devon 2) namely 35.60 Items (mm^2), and did not differ from the highest results in the treatmentv3 (Dena 1) is 36.26 grains (mm^2) and treatment v1 (Anjasmoro) is 36.11 grains (mm^2).

Flowering Age

The results of the analysis show that the response of several soybean plant varieties to the time of application of phosphate fertilizer under rubber plant stands has a significant effect on the flowering time of soybean plants (Table 3).

In Table 3 it can be seen that the treatment of several soybean varieties has a significant effect on the flowering time of soybean plants.

Table 3. Response of Several Varieties of Soybean Plants and Time of Application of Phosphate Fertilizer under Stands of Rubber Plants (18% Shade) to the flowering time of Soybean Plants.

Treatment	Time to Apply FertilizerPhosphate(w)			Average
	w1	w2	w3	
Variety (v)				
v1	30.00	31.00	31.00	30.67 c
v2	25.00	26.00	26.33	25.78 a
v3	30.33	31.00	31.67	31.00 c
v4	29.00	30.00	30.67	29.89 b
Average	28.58 a	29.50 b	29.92 b	

Note: Numbers followed by letters that are not the same in the same treatment group are significantly different at the 5% level based on the DMRT test, while those without notations are not significantly different

The fastest flowering time for several soybean varieties was obtained in treatment v2 (Dega 1), namely 25.78 DAP, while the longest was in treatment v3 (Dena 1), namely 31.00 DAP, and v1 (Anjasmoro), namely 30.67 HST and v4 (Devon 2) which is 29.89 DAP.

In the treatment, the time of application of phosphate fertilizer had a significant effect on the flowering time of soybean plants. The fastest results were obtained in treatment w1 (111 g/plot phosphate given 1 week before planting) namely 28.58 DAP, while the longest were in treatment w3 (111 g/plot phosphate given 1 week after planting) namely 29.92 DAP and treatment w2 (111 g/plot phosphate given at planting time) is 29.50 DAP.

From the description above, the response of several soybean plant varieties and the time of application of phosphate fertilizer under rubber plant stands to the growth of 18% shaded soybean plants can be discussed as follows: In testing several varieties carried out in this study, the highest plant height parameter was found in v4 (Devon 2), and the highest value of leaf chlorophyll is in v2 (Dega 1) and the fastest flowering time is in v2 (Dega 1). Several varieties tested showed variations in vegetative growth. There are soybean varieties that have faster vegetative growth and there are also soybean varieties that have high production. This depends on the genetic characteristics of the soybean plant. Soybean plants have root nodules which are capable of fixing N2 from the air, so that the plants are able to meet most of their N2 needs. Irwan (2006) stated that soybean plants can generally fix nitrogen from the air 10 to 12 days after planting, depending on environmental soil conditions and temperature. Where the nutrient N is good for increasing the vegetative growth of soybean plants.

In the treatment when phosphate fertilizer was applied (111 g/plot), the highest plant height parameter was in treatment w1 (111 g/plot phosphate given 1 week before planting) and the fastest flowering time parameter was found in treatment w1 (111 g/plot phosphate given 1 week before planting). This is because phosphate fertilizer given 1 week before planting can be available earlier than other treatments, so that newly growing soybean plants can immediately absorb the P element from the phosphate fertilizer which affects the growth of soybean plants. According to Hanafiah (2010) phosphate fertilizer is highly recommended as a basic fertilizer, namely used at planting time or before planting, this is because the P element is not quickly available and is also really needed at the initial growth stage. The advantage of applying fertilizer as early as possible in plant growth is that it encourages initial root growth so that the plant has good absorption capacity. The P element contained in phosphate fertilizer has a function for cell division, root development and flower formation. So that the treatment of giving phosphate fertilizer has a good or positive effect on the height growth of soybean plants because one of the functions of the P element is cell division which influences the growth of soybean plant height. According to Munawar (2011), the P element plays a role in dividing cell nuclei to form new cells and enlarge cells, so that plant growth and development can increase. According to Sutedjo (2008), in general the element P can accelerate flowering and ripening of fruit or seeds in plants.

Number of Pods Contained

The results of the analysis showed that the response of several soybean plant varieties and the time of application of phosphate fertilizer had a significant effect on the number of filled pods (Table 4).

Table 4. Response of Several Soybean Plant Varieties and Time of Application of Phosphate Fertilizer under Stands of Rubber Plants (18% Shade) to the Number of Pods Containing Soybean Plants.

Treatment	Time to Apply FertilizerPhosphate(w)			Average
	w1	w2	w3	
Variety (v)				
V1	27.73	26.67	25.87	26.76 b
V2	27.40	24.00	24.13	25.18 ab
V3	24.60	24.27	23.67	24.18 a
V4	24.07	23.07	21.93	23.02 a
Average	25.95 b	24.50 a	23.90 a	

Note: Numbers followed by letters that are not the same in the same treatment group are significantly different at the 5% level based on the DMRT test, while those not marked are not significantly different.

In Table 4 it can be seen that the treatment of several soybean varieties has a significant effect on the number of filled pods. The highest yield of several soybean varieties was obtained in treatment v1 (Anjasmoro), namely 26.76 seeds, while the lowest was in treatment v4 (Devon 2), namely 23.04 seeds and treatment v3 (Dena 1), namely 24.18 seeds, and no different from the highest yield in treatment v2 (Dega 1), namely 25.18

seeds.

In the treatment, the time of application of phosphate fertilizer had a significant effect on the number of filled pods. The highest yield was obtained in treatment w1 (111 g/plot phosphate given 1 week before planting) namely 25.95 seeds, while the lowest was in treatment w3 (111 g/plot phosphate given 1 week after planting) namely 23.90 seeds and treatment w2 (111 g/plot phosphate given at planting time) is 24.50 seeds.

Number of Empty Pods

The results of the analysis showed that the response of several soybean plant varieties to the number of empty pods per plot had a significant effect, but the number of empty pods had no significant effect on the time of application of phosphate fertilizer (Table 5).

Table 5. Response of Several Soybean Plant Varieties and Time of Application of Phosphate Fertilizer under Stands of Rubber Plants (18% Shade) to the Number of Empty Pods in Soybean Plants

Treatment	Time to Apply FertilizerPhosphate(w)			Average
	w1	w2	w3	
Variety (v)				
V1	7.73	7.27	7.47	7.49 a
V2	7.27	7.33	7.67	7.42 a
V3	7.87	7.53	7.80	7.73 a
V4	9.47	9.73	10.27	9.82 b
Average	8.08	7.97	8.30	

Note: Numbers followed by letters that are not the same in the same treatment group are significantly different at the 5% level based on the DMRT test, while those not marked are not significantly different.

In Table 5 it can be seen that the treatment of several soybean varieties has a significant effect on the number of empty pods. The results of several soybean varieties, the highest number of empty pods was obtained in treatment v4 (Devon 2), namely 9.82 seeds, while the lowest was in treatment v2 (Dega 1), namely 7.42 seeds, treatment v1 (Anjasmoro), namely 7.49 seeds. and treatment v3 (Dena 1) namely 7.73 seeds.

Seed Weight (g)

The results of the analysis showed that the response of several soybean plant varieties and the time of application of phosphate fertilizer had a significant effect on seed weight (Table 6).

Table 6. Response of Several Soybean Plant Varieties and Time of Application of Phosphate Fertilizer under Rubber Plant Stands (18% Shade) on Soybean Plant Seed Weight.

Treatment	Time to Apply FertilizerPhosphate(w)			Average
	w1	w2	w3	
Variety (v)				
v1	199.39	178.43	159.05	178.95 a
v2	243.80	221.12	216.40	227.11 b
v3	196.12	173.34	147.25	172.24 a
v4	177.31	150.34	137.89	155.18 a
Average	204.16 b	180.81 a	165.15 a	

Note: Numbers followed by letters that are not the same in the same treatment group are significantly different at the 5% level based on the DMRT test, while those not marked are not significantly different.

In Table 6 it can be seen that the treatment of several soybean varieties has a significant effect on seed weight. The highest yield of several soybean varieties in Seed Weight was obtained in treatment v2 (Dega 1) namely 227.11 grams, while the lowest was in treatment v4 (Devon 2) namely 155.18 grams, treatment v3 (Dena 1) namely 172.24 grams and treatment v1 (Anjasmoro) namely 178.95 grams.

In the treatment, the time of application of phosphate fertilizer had a significant effect on seed weight. The highest yield was obtained in treatment w1 (111 g/plot phosphate given 1 week before planting) namely 204.14 grams, while the lowest was in treatment w3 (111 g/plot phosphate given 1 week after planting) namely 165.15 grams and treatment w2 (111 g/plot of phosphate given at planting time) is 180.81 grams.

Weight of 100 Items (g)

The results of the analysis showed that the response of several soybean plant varieties and the time of application of phosphate fertilizer had a significant effect on the weight of 100 grains (Table 7).

In Table 7 it can be seen that the treatment of several soybean varieties has a significant effect on the weight of 100 grains. The highest yield of several 100-grain soybean varieties was obtained in treatment v2 (Dega 1), namely 18.81 grams, while the lowest was in treatment v4 (Devon 2), namely 13.09 grams, treatment v1 (Anjasmoro) namely 13.28 grams. and treatment v3 (Dena 1) namely 13.67 grams.

In the treatment, the time of application of phosphate fertilizer had a significant effect on the weight of 100 grains. The highest yield was obtained in treatment w1 (111 g/plot phosphate given 1 week before planting) namely 14.99 grams, while the lowest was in treatment w3 (111 g/plot phosphate given 1 week after planting) namely 14.39 grams and no different from the highest yield in the w2 treatment (111 g/plot of phosphate given at planting time) namely 14.77 grams.

Table 7. Response of Several Soybean Plant Varieties and Time of Application of Phosphate Fertilizer under Rubber Plant Stands (18% Shade) on the Weight of 100 Soybean Plant Seeds.

Treatment	Time to Apply Fertilizer Phosphate(w)			Average
	w1	w2	w3	
Variety (v)				
v1	13.37	13.40	13.09	13.28 a
v2	18.88	19.12	18.44	18.81 b
v3	13.88	13.78	13.37	13.67 a
v4	13.85	12.77	12.67	13.09 a
Average	14.99 b	14.77 b	14.39 a	

Note: Numbers followed by letters that are not the same in the same treatment group are significantly different at the 5% level based on the DMRT test, while those not marked are not significantly different

From the description above, the response of several varieties of soybean plants and the time of application of phosphate fertilizer under stands of rubber plants to the production of 18% shaded soybean plants can be discussed as follows: In testing several varieties carried out in this study, the parameter for the number of filled pods was the highest in the treatment v1 (Anjasmoro) is 26.76 seeds, followed by v2 (Dega 1) which is 25.18 seeds, v3 (Dena 1) which is 24.18 seeds, and v4 (Devon 2) which is 23.04 seeds. In terms of parameters, the highest number of empty pods was found in treatment v4 (Devon 2), namely 9.82 seeds, followed by v3 (Dena 1), namely 7.73 seeds, v1 (Anjasmoro) namely 7.49 seeds and v2 (Dega 1).) which is 7.42. The highest seed weight parameter was obtained in treatment v2 (Dega 1) namely 227.11 grams, followed by treatment v1 (Anjasmoro) namely 178.95 grams, treatment v3 (Dena 1) namely 172.24 grams and v4 (Devon 2) namely 155.18 grams. The highest weight parameter for 100 grains was obtained in treatment v2 (Dega 1), namely 18.81 grams, followed by treatment v3 (Dena 1), namely 13.67 grams, treatment v1 (Anjasmoro) was 13.28 grams and treatment v4 (Devon 2) was 13.09 grams. This shows that the characteristics of soybean plants vary greatly in their generative growth which we can see in terms of the number of pods, pod formation, seed production and seed weight of each variety. Some of the variations produced in generative growth are caused by the genetic characteristics of each variety and the growing environment of several varieties. Wirnas et al. (2006) stated that the development of high-yielding varieties that are adaptive to stressful environments is expected to increase soybean productivity. However, to obtain soybean plants that have high production, it is necessary to know which soybean varieties are suitable for the existing environmental stress conditions. Varieties play an important role in soybean production because achieving high yields is largely determined by their genetic potential and growing environment (Hartman et al. 2011). If growing environmental management is not carried out well, the high potential of superior varieties will not be realized.

Differences in production results between varieties are the result of genetic differences. Anjasmoro is the resultMass selection from a population of pure Mansuria strains. Dega is the result of a single cross between Grobogan and Malabar. Dena 1 is the result of a cross between IAC 100 and Agromulyo. Devon 2 is the result of a cross selection between kawi and the IAC 100 line. According to Mangoendidjojo (2003), in a cross between parents it can be found that the appearance of the F1 offspring can be the average of the two parents, some are even tougher than the two parents. The varieties tested also had genetic contributions from both parents.

In the treatment, the time of application of phosphate fertilizer (111 g/plot) on the parameters of the highest number of filled pods was in treatment w1 (111 g/plot phosphate given 1 week before planting) namely 25.95 seeds, followed by w2 (111 g/plot phosphate given at planting time) namely 24.50 seeds and w3 (111 g/plot phosphate given 1 week after planting) namely 23.90 seeds. This is because treatment w1 (111 g/plot phosphate given 1 week before planting) was given earlier and was available compared to treatments w2 (111 g/plot phosphate given at planting time) and w3 (111 g/plot phosphate given 1 week after planting), then in treatment w1 (111 g/plot phosphate given 1 week before planting) the number of pods contained a higher yield compared to treatment w2 (111 g/plot phosphate given at planting time) and w3 (111 g/plot phosphate given 1 weeks after planting).Sutedjo (2002) stated that the nutrient P plays a role in increasing the seed filling of soybean plants so that giving high levels of P will increase the fresh seed weight of soybean plants.In the treatment of the time of application of phosphate fertilizer (111 g/plot) the highest seed weight parameter was in treatment w1 (111 g/plot phosphate given 1 week before planting) namely 204.14 grams, followed by treatment w2 (111 g/plot phosphate given at planting time) namely 180.81 grams and w3 treatment (111 g/plot phosphate given 1 week after planting) namely 165.15 grams. This is because treatment w1 (111 g/plot phosphate given 1 week before planting) was available first so that the seed weight from treatment w1 (111 g/plot phosphate given 1 week before planting) was higher than treatment w2 (111 g/plot phosphate plot given at planting time) and w3 (111 g/plot phosphate given 1 week after planting) this is because in the w1 treatment (111 g/plot phosphate given 1 week before planting) the number of pods, seeds containing more and the formation of seeds more mature and perfect because they get the available P elements first compared to treatments w2 (111 g/plot phosphate given at planting time) and w3 (111 g/plot phosphate given 1 week after planting).According to Novizan (2005), P elements can stimulate the growth of flowers, fruit and seeds and can speed up fruit ripening and make the seeds more nutritious.In the treatment, the time of application of phosphate fertilizer (111 g/plot) on the weight parameter of 100 seeds was highest in the w1 treatment (111 g/plot of phosphate given 1 week before

planting), namely 14.99 grams, followed by the w2 treatment (111 g/ phosphate plot given at planting time) namely 14.77 grams and w3 treatment (111 g/plot phosphate given 1 week after planting) namely 14.39 grams. This is because in the w1 treatment (111 g/plot phosphate given 1 week before planting), the P element is given first and is available so that the weight of 100 seeds from w1 (111 g/plot phosphate given 1 week before planting) is higher compared to the treatment w2 (111 g/plot phosphate given at planting time) and w3 (111 g/plot phosphate given 1 week after planting), this is because in the w1 treatment (111 g/plot phosphate given 1 week before planting) the seed formation is more mature and perfect because it gets the available P elements first compared to treatments w2 (111 g/plot phosphate given at planting time) and w3 (111 g/plot phosphate given 1 week after planting).Taufiq et al. (2006) stated that the P element absorbed by soybean plants can increase the total number of pods, the number of fruity pods and the weight of 100 seeds.

CONCLUSION

The treatment of several soybean varieties had a significant effect on the height of the soybean plants with the highest yield was found in Devon 2. Testing several varieties had a significant effect on the amount of leaf chlorophyll and flowering time was found in Dega 1,Testing several soybean varieties had a significant effect on the number of filled pods was found in Anjasmoro, testing several soybean varieties had a significant effect on the number of empty pods was found in Devon 2, testing several soybean varieties had a significant effect on seed weight and weight of 100 grains with results highest was found in Dega 1. The timing of phosphate fertilizer application had a significant effect on soybean plant height, flowering age, number of filled pods, seed weight, weight of 100 grains with the highest achievement was found in 111 g/plot of phosphate given 1 week before planting) andpThe timing of phosphate fertilizer application did not have a significant effect on the number of leaf chlorophyll and number of empty pods.

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