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INFLUENCE OF EGGSHELL WASTE AND LIQUID ORGANIC FERTILIZER ON PEANUT (Arachis Hypogaea L.) GROWTH

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Abstrak

Kacang tanah merupakan komoditi palawija yang patut dipertimbangkan mengingat kandungan protein 25-30%, lemak 40-50%, karbohidrat 12% dan vitamin B1. Namun hal ini tidak diimbangi oleh tingkat produksi yang baru mencapai 0,9 ton/Ha.

Pemanfaatan limbah dari sektor peternakan apabila tidak dikelola dengan baik maka limbah tersebut akan berpotensi menyebabkan pencemaran terhadap lingkungan. Limbah tersebut dapat berasal dari kotoran hewan maupun hasil samping ternak yang lainnya seperti cangkang telur sebagai alternatif sumber calsium.

Unsur Ca merupakan unsur hara yang paling menentukan tingkat kebernasan polong kacang tanah. Polong yang hampa sering dijumpai akibat unsur hara tanah dengan kalsium rendah. Selain itu Biourine sebagai salah satu asupan pupuk organik merupakan salah satu alternatif pupuk organik yang dapat meningkatkan ketersediaan dan efisiensi serapan unsur hara bagi tanaman serta dapat mengurangi ketergantungan pada pupuk anorganik dan meningkatkan hasil panen.

Pengkajian ini dilakukan di Lahan Praktek BBPP Batu dan Demplot petani binaan pada bulan Januari s.d. April 2017. Tujuan penelitian ini untuk mengetahui pengaruh konsentrasi pupuk biourine pada dua varietas kacang tanah pada hasil panen dan pengaruh pemberian calsium pada pemupukan. Penelitian ini menggunakan Rancangan Acak Kelompok Faktorial yang terdiri dari 3 faktor yaitu varietas, calsium dan biourine.

Parameter yang diamati adalah tinggi tanaman, jumlah cabang, jumlah polong, berat basah polong, berat biji kering, berat kering biji, produksi/Ha.

Kesimpulan pengkajian ialah kombinasi konsentrasi pupuk biourine memiliki pengaruh yang signifikan pada fase vegetatif dan generatif. Pada fase vegetatif interaksi antara varietas dan calsium dengan hasil tertinggi adalah varietas Hypoma dengan perlakuan pemberian Calsium dan konsentrasi 10 ml/liter biourine. Sedangkan pada fase generatif interaksi antara varietas dan calsium terhadap Jumlah Polong, Berat Basah Polong, Berat Kering Polong, Berat Kering Biji dan Produksi diperoleh hasil tertinggi dimana produktifitas tanaman mencapai 3,66 Ton per Ha pada perlakuan Hypoma Calsium. Dimana hasil Jumlah Polong yaitu 44,50 g, Berat Basah Polong 124 g, Berat Kering Polong 53,42 g, dan Berat Kering Biji sebesar 34,5g.

Kata Kunci : **Biourine, Calsium, Kacang Tanah.**

Abstract

Peanut is a commodity of palawija (other crops besides rice that is usually to be planted in a rice field) which is worth considering because it contains protein 25-30%, 40-50% fat, 12% carbohydrate and vitamin B1. However this is not commensurate with the level of production that just reached 0.9 tons per acre.

Utilization of waste from the livestock sector will potentially cause pollution to the environment if it is not managed properly. The waste can be derived from animal waste or other animal livestock such as eggshell as an alternative source of calcium.

Ca element is the most nutrient that determines the level of ground peanut pods. The empty pods are often found due to soil nutrients with low calcium. In addition biourine as one intake of organic fertilizer is one alternative organic fertilizer that can increase the availability and efficiency of nutrient uptake for plants and can reduce dependence on inorganic fertilizers and improve yields.

This study was conducted on Practice Land of BBPP Batu and on farmers" field in January until in April 2017. The purpose of this study was to determine the effect of biorine fertilizer concentration on two varieties of peanuts on yield and the effect of calcium on fertilization. This research uses Factorial Random Block Design consisting of 3 factors, namely varieties, calcium and biourine.

The parameters observed were plant height, number of branches, number of pods, wet pod weight, dry seed weight, dry seed weight, and production per acre.

The conclusion of the assessment was the combination of biorine fertilizer concentration that had a significant effect on the vegetative and generative phases. In the vegetative phase, the interaction between varieties and calcium with the highest yield was hypoma varieties with the treatment of calcium and the concentration of 10 ml per liter of biourine. While in the generative phase of interaction between varieties and calcium on the number of pods, wet weight of pods, dry weight of pods, dry weight of seeds and production was obtained the highest yield of productivity which reached 3.66 ton per acre in the treatment of calcium hypoma. And the number of pods result is 44.50 g, wet weight pod 124 g, dry weight pod 53.42 g, and dry weight seeds of 34.5g.

Keywords: ***Biourine, Calcium, Peanut.***

INTRODUCTION

Background

Government efforts in increasing the productivity of agricultural products in order to realize the World Food Granary in 2040 need to be accompanied by intensification efforts and diversification agriculture. The current productivity of *palawija* is still far from expected, so efforts are needed to obtain high yields and seed quality so that market demand can be fulfilled.

Peanut (*Arachis hypogaea L*) is a crop *palawija* that will provide added value if it is produced optimally. In addition to having a source of protein and vegetable oil, peanut is a growing national food source. Efforts made to increase peanut productivity can not only rely on wetland, but this also can be developed on dry land as a peanut producer.

Efforts to increase peanut productivity can not only rely on the yield of peanuts grown in paddy fields, but dry or moor land has opportunities that can be developed as potential peanut producers (*Astanto*, 2010).

One of the utilization of eggshell powder as a source of organic fertilizer Ca is one of the most appropriate alternative to overcome the deficiency of Ca (lime) at the time of filling the pod so it is very useful support agriculture business of beans, especially peanut pods.

Ca nutrient element is the most determining nutrient level of peanut pod. It was found 3.64% Ca content and P content is lower 0.21% than Ca in peanut seeds. Ca seeds contains 69/100 g of material while P contains 4.01 g / 100 g of material, therefore the availability is needed (Adi Sarwanto, 2001). Hollow pods are often found on low calcium soils (Burkhat and Collins, 1942 in Goldsworthy and Fisher, 1992).

Although Ca ions are available at baseline with sufficient pH to cultivate during vegetative growth but lack of Ca during gin (*ginofor*) formation and seed removal may decrease yield. Decrease in yield can occur up to 60%.

Calcium is absorbed as Ca+2 bivalent cation. Ca can be the most immobile essential element, compared to other ions, there is only a little or no transport within the phloem. Peanuts require high enough Ca in the root zone for normal pod development and are directly absorbed by the roots and pods, Ca is used as a constituent of cell walls primarily as adhesive and essential substances for cell division and elongation. (Mc Kently, 1981 in Gardner et al., 1991). With the increase of Ca and Mg will stimulate cell turgor and chlorophyll formation so that the process of photosynthesis becomes more increased, the product of photosynthesis also increases. The results of photosynthesis can be used by root nodules for growth. N deficiency in the host during the lag phase between the time of infection and the beginning of N2 fixation will interfere with the process of leaf area formation which can provide for the provision of photosynthesis for the development of nodules (Sudaryono, 2002).

Growth and development of a plant is strongly influenced by genetic, climatic and soil factors. Genetic factors are derivative properties carried by each plant species. Plant productivity is determined by genetic factors and other factors, especially climate and weather. Rainfall and air temperature and crop activity, and soil factors are not static, with management and technology can be changed and improved in accordance with the location of the land that will be developed with the use of appropriate technology.

The role of Ca is essential for the formation of root nodules. Ca also raises soil pH. Bacteria that live on acid reacting soils are less able to form root nodules. The Ca effect spurs the root nodule even in low P ground levels is caused by the role of Ca raising soil pH and availability of P. Phosphate at low pH is not widely available in soil solution due to the

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presence of other ions such as Al and Fe that react with orthophosphate into additional forms which are not available.

In addition to plant genetic factors need to be considered the right and proper fertilization process. Excessive fertilization will lead to a decrease in soil fertility for subsequent cultivation resulting in subsequent growth. Application of liquid organic fertilizer is able to meet the nutrients needed for the plant because it is more evenly distributed and easily absorbed.

One of the alternative fertilization is *Biourine* which contains microorganisms that can increase the availability and efficiency of nutrient uptake for the plants so as to reduce the dependence of inorganic fertilizer (N, P, K) and able to increase the harvest. *Biorine* application by spraying is more effective because the absorption of nutrients is faster than the fertilization through the roots. Selection of good varieties of good seed is a requirement to meet the needs of national peanut seeds, but the application of good cultivation has not been applied in Indonesia.

Research purposes

This assessment aims to 1). Find out the best source of Ca that can improve peanut pod's livability, 2). Know which types of varieties are responsive to Ca source 3). Know the optimal dose of liquid organic fertilizer on peanut growth.

MATERIALS AND METHODS

Research methods

This research has been conducted for 4 months, starting from January 2017 until April 2017 on Practice Land Training Center in Batu.

The materials used in this research are: Groundnut seeds of several local varieties (groundnut Hypoma, Talam, Bima), eggshell powder, compost organic fertilizer and liquid organic fertilizer (rabbit urine), yarn, and a stick sample. The tools used are hoes, rakes, scales, knapsack, sprayer, meter, bucket, plastic bag, electric oven, knife, scissors and stationery.

This experiment uses Factorial Design (RAK) arranged in Group Random Design (RAK) 3 factors. The first factor is Ca source that is C0 (Normal), C1 (Shell Flour 150 gr), C2 (Lime 125 gr). The second factor is local peanut varieties consisting of: A (Hypoma 2

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Varieties), T (Talam Varieties), B (Bima Varieties). Then the third factor is liquid organic fertilizer with a dose of 10 ml / plant and 20 ml / plant.

To examine the effect of response treatment observed, the analysis of variance using Statistical Analysis System program. Furthermore, Duncan Multiple Range Test is done on the level of 5%.

Implementation Procedures

Processing of soil is done twice and silenced for 1 week. In this experiment is divided into 18 blocks with an area of 120 cm x 80 cm, 30 cm wide, with a distance between blocks 50 cm. Planting is done 2 seeds per hole, so the total population of plants in the experiment are 540 plants.

Watering is done by looking at the condition of the field. In the early phase of germination of peanut plants, they require enough water so watering can be done in the morning and in the afternoon, with the watering interval adjusted to soil conditions and crop needs.

Weeding is done twice during the growth period that begins when the 2-3 week old plant mechanically together with the soil to increase the soil so that is easier the entry of gin (*ginofora*) into the soil. The second weeding done at age 6-7 MST.

Basic fertilization is done at the beginning of planting when the formation of the final bed using organic fertilizer and liquid fertilizer. *Biourine* application is done after the plant grows. Initial fertilization is given biological fertilizer that describes ammonia on the soil. Then followed by biourine done 2 weeks after planting and ended 2 weeks before harvest. Fertilization sprayed a solution of biourine with concentrations according to the same treatment and water volume in the plants in each experimental plot. Pest and disease control is done by using insecticide and bactericide.

The dosage of lime is given at a dose of 400 kg / ha (150gr / plot), given at age 4 MST by sprinkling on a 10cm planting line from the base of the stem and directly dumping the land on the barrier to the base of the stem. Eggshell flour is given 400 kg / ha (150gr / plot). Eggshell flour is made by dried and then grinded into flour.

Harvest is characterized by visual signs, ie leaves of yellowing plants, even dried and decay, more than 80% of old pods are marked with dark colors, visible textured clear, hard-skinned, pithy seeds and shiny seed shells. (Pitojo, 2005).

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Post-harvest handling is done by drying. The pods are spread over the floor and dried for 5 days until the water content becomes 9-12%, then sorting by separating the pod from the empty pods, wrinkles and non-pithy. Grouping is based on uniform pod size.

Observation Parameters

Parameters observed included: plant height, number of branches 30 HST, 45 HST and 60 HST, number of pods, wet pod weight, dry seed weight, dry pod / Ha yield.

Data Analysis

Data were analyzed by factorial *anova* analysis of 3 factors and if there were different data, then tested would be continued by using Tukey HSD.

RESULTS AND DISCUSSION

In technical cultivation is needed an appropriate effort to increase productivity in plants. This is also balanced with the use of balanced fertilizer to overcome the use of inorganic fertilizers in excess.

This assessment is expected by giving shell powder and *biorine* application to improve peanut seed production and productivity through several varieties observed.

Egg flour powder is expected to increase soil pH, if the saturation of base is less than 100% then increasing the soil pH can increase the amount of Ca and Mg in the soil, because Ca and Mg are dominantly exchangeable bases.

In the content of K in *Biourine*, this plays a role in the formation of pods. According to Buckman and Brady (1982), Potassium plays a balance not only on nitrogen but also on the phosphor so that potassium is important in a mixed fertilizer. Potassium is also very important in the development of chlorophyll.

Result of ANOVA Faktorial

Table 1. ANOVA Factorial Result of Vegetative Phase

Variety Sources	Plant Height		Brances Number	
	14 HST	28 HST	14 HST	28 HST
Varieties	33,38 **	363,73 **	58,16 **	354,92 **
Calcium	6,54 **	7,48 **	17,89 **	19,83 **

Liquid Fertilizer	30,65 **	34,00	**	61,15 **	65,53 **
Varietiess *Calsium	4,35 **	16,81	**	21,94 **	5,32 **
Varietas* Liquid Fertilizer	4,49 *	4,86	*	1,81 ns	2,86 ns
Calsium* Liquid Fertilizer	0,36 ns	0,46	ns	0,28 ns	3,21 ns
Varietas* Calsium* Liquid Fertilizer	0,45 ns	0,40	ns	0,63 ns	1,84 ns

Description: ns = non-significant, * significant at 5% level; ** significant at level 1%

The result of single variety analysis showed that varieties, calcium and liquid fertilizers had significant effect on plant height and number of branches at 14 HST and 28 HST. The interaction between varieties and calcium has a significant effect on plant height and number of branches at 14 HST and 28 HST. The interaction between varieties and liquid fertilizer gave significant effect to plant height 14 HST and 28 HST.

Table 2. Results of the Generative Phase Factor Generic Events

Sources of Diversity	Number of pods	BBP (g)	BKP (g)	BKB (g)	Produksi (ha)
Varieties	23,13 **	106,90**	114,36 **	31,46 **	2029,80**
Calcium	3,99 *	3,42*	7,88 **	6,28 **	4,84 *
Liquid Fertilizer	20,13 **	17,47**	27,10 **	43,17 **	35,59**
Varietas*Calsium	8,32 **	9,14**	23,08 **	6,25 **	11,78**
Varietas* Liquid Fertilizer	0,01 ns	0,15ns	0,81 ns	0,08 ns	0,03 ns
Calsium* Liquid Fertilizer	0,07 ns	0,07ns	0,10 ns	0,37 ns	0,72 ns
Varietas*Calsium* Liquid Fertilizer	1,22 ns	0,07ns	0,18 ns	0,31 ns	0,22 ns

Description: ns = non-significant, * significant at 5% level; ** significant at level 1%

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BBP = Wet Weight Pod (g); BKP = Dry Weight Pod (g); BKB = Dry Weight Seed (g)

Based on the analysis of variance indicated that singularly between varieties, calcium and liquid fertilizer gave significant effect to the number of pods, wet weight of pod, dry weight of pod, dry weight of seed and production. The interaction between varieties and calcium also has a significant effect on the number of pods, wet weight of pods, dry weight of pods, dry weight of seeds and production.

Tukey Advanced Test For Factors That Influence Significant Influence On Vegetative And Generative Variables

Vegetative Phase of Plants

Table 3. Meaning of Plant Height and Number of Branches by Variety

Varietas	Plant Height		Brances Number	
	14 HST	28 HST	14 HST	28 HST
Hypoma	22,40 a	38,29 a	6,83 a	12,67 a
Talam	19,16 b	30,48 b	5,10 b	9,61 b
Bima	18,03 b	21,23 c	4,94 b	6,06 c

Description: the numbers followed by different letters in the same column show a real difference according to the Tukey HSD test 5%

Varieties have a significant effect on plant height and number of branches at 14 HST and 28 HST. The table above shows that the *Hypoma* variety has the highest average plant height and number of branches than the *Talam* and *Bima* varieties. Where the height of plants and number of branches age 28 HST on *Hypoma* varieties reached 38.29 cm and 12.67 *catang*. While the varieties reached 30.48 cm *Talam* and 9.61 stems. The lowest varieties of *Bima* are 21,23 cm and 6,06 stems.

This is thought to be influenced by the genetic properties of the *Hypoma* plant where the height can reach 50 cm. *Lingga* (1992) adds that the height of the plant is influenced by the genetic properties and environmental conditions of growing plants. While in the highest number of branches are *Hypoma* varieties are 6.83 at 14 HST and 12.67 at 28 HST. *Hypoma* varieties provide a number of branches that are superior to varieties of *Talam* and *Bima*. Establishment of branches and plant height including vegetative growth. Nutrients generally required are nitrogen (N) at the time of vegetative growth, besides requiring Magnesium (Mg) for main stem growth. Hormonal competition arises due to the growth of the main stem, so the growth of the stem more driven than the formation of new shoots on the main stem. The number of branches produced is affected by the growth of the main stem, because the branch grows on the main stem, so the difference is also different (Semiawan, 2010).

Table 4. Average Plant Height and Number of Branches based on Calcium

Calcium	Plant Height		Brances Number	
	14 HST	28 HST	14 HST	28 HST
Ca	21,22 a	31,02 a	5,96 a	10,32 a
Lime	19,42 b	30,34 a	5,96 a	9,19 b
Normal	18,95 b	28,64 b	4,95 b	8,82 b

Description: the numbers followed by different letters in the same column show a real difference according to the Tukey HSD test 5%

Type of calcium giving a significant effect on plant height and number of branches at the age of 14 HST and 28 HST. The table above shows that Ca has the highest average plant height and number of branches than Lime and Normal.

Table 4 shows that Calcium has the highest average plant height and number of branches compared to Lime and Normal that is 21.22 cm at 14 HST and 31.02cm at 28 HST likewise with the number of branches of calcium is higher at 14 and 28 HST of 5.96 and 10.32 stems. This indicates the availability of the calcium element which is indispensable for peanut plants in the formation of pods and seed filling. The element of calcium is absorbed by young roots and pod skin. Therefore, the administration of calcium in the soil around the pods is very helpful in the provision of Ca in plants.

Table 5. Meaning of Generative Phase Based on Liquid Fertilizer

Liquid Fertilizer	Plant Height		Number of Brances	
	14 HST	28 HST	14 HST	28 HST
10 ml	21,36 a	31,51 a	6,25 a	10,27 a
20 ml	18,37 b	28,49 b	5,00 b	8,62 b

Description: the numbers followed by different letters in the same column show a real difference according to the Tukey HSD test 5%

The amount of Liquid Fertilizer gave a significant effect on plant height and number of branches at 14 HST and 28 HST where the highest average was found in the application of 10 ml of liquid fertilizer. Suspected concentration of 10ml / liter is able to provide adequate nutrition for branch growth and plant height. High concentration does not necessarily spur

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better growth, this is in accordance with the opinion of Dartius (1990) that the availability of the necessary elements of plants that are in sufficient condition, the protein, enzymes, hormones and carbohydrates will be formed in sufficient quantities also the result of metabolism process, so that the enlargement, extension and formation of cells will take place quickly.

Table 6. Interaction of Varieties and Calcium to Plant Height and Number of Branches

Interaction of varieties * Calcium	Plant Height		Number of Branches	
	14 HST	28 HST	14 HST	28 HST
Hypoma Ca	23,92 a	42,29 a	8,31 a	14,33 a
Hypoma Lime	21,73 ab	39,57 a	6,63 b	12,03 b
Hypoma Normal	21,55 abc	33,02 b	5,55 bc	11,66 bc
Talam Ca	18,84 bcd	29,05 c	4,04 d	10,53 cd
Talam Lime	18,67 bcd	31,01 bc	6,17 bc	9,44 de
Talam Normal	19,98 bc	31,39 bc	5,09 cd	8,84 e
Bima Ca	20,90 abc	21,72 d	5,53 bc	6,11 f
Bima Lime	17,86 cd	20,44 d	5,08 cd	6,11 f
Bima Normal	15,33 d	21,52 d	4,21 d	5,95 f

Description: the numbers followed by different letters in the same column show a real difference according to the Tukey HSD test 5%

The interaction between varieties and calcium has a significant effect on plant height and number of branches at 14 HST and 28 HST. The highest average of plant height 14 HST, plant height 28 HST and number of branches at 14 HST found in Hypoma + Ca treatment. At plant height with the highest value of 23.92cm at 14 HST and 42.29cm at 28 HST. While on the highest average branch number found in Hypoma + Ca treatment is 8.31 at 14 HST and 14.33 at 28 HST. The highest average plant height on Bima + Normal varieties is 15.33 at 14 HST and 21.52 at 28 HST. For the lowest number of branches at 14 HST there is at Talam + Ca at 4.04 and at 28 HST found in the Bima + Normal treatment of 5.95.

Table 7. Interaction of Varieties and Liquid Fertilizer to Plant Height 14 HST, Plant Hight 28 HST and Number of Branches Age 28 HST

Interaction of varieties * liquid fertilizer	Plant Height	
	14 HST	28 HST
Hypoma 10 ml	24,88 a	40,79 a
Hypoma 20 ml	19,92 bc	35,79 b
Talam 10 ml	20,69 b	31,98 c
Talam 20 ml	17,64 c	28,98 d
Bima 10 ml	18,52 bc	21,75 e
Bima 20 ml	17,54 c	20,70 e

Description: the numbers followed by different letters in the same column show a real difference according to the Tukey HSD test 5%

The interaction between varieties and liquid fertilizer gave significant effect to plant height at 14 HST and 28 HST and number of branch 28 HST. The highest average was in the treatment of Hypoma + 10 ml liquid fertilizer with a value of 24.88cm at 14 HST and 40.79cm at 28 HST. The lowest average is in the treatment of Bima + 20 ml liquid fertilizer with a value of 17.54 cm at plant height 14 HST and 20.70cm on the number of branches 28 HST.

Generative Phase of Plants

Table 8. Evaluate the Generative Phase by Variety

Varieties	Pods Number	Wet Pods Weight	Dry Pods Weight	Dry Seeds Weight	Production (ha)
Hypoma	41,39 a	119,39 a	51,44 a	32,47 a	3,29 a
Talam	38,11 b	108,39 b	42,90 b	27,56 b	2,26 b
Bima	37,39 b	88,11 c	40,07 c	27,38 b	2,04 b

Description: the numbers followed by different letters in the same column show a real difference according to the Tukey HSD test 5%

Varieties have a significant effect on the number of pods, wet weight of pods, dry weight of pods, dry weight of seeds and production where the highest average is found in Hypoma varieties. Where the number of pods worth 41.39 with a wet weight of pod 119.39g; Dry Weight The pod weighs 51.44; Dry Weight of Seeds of 32.47g and Production of 3.29 tons per Ha

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Table 9. Average Generative Phase Based on Calcium

Calcium	Pods Number	Wet Pods Weight	Dry Pods Weight	Dry Seeds Weight	Production (ha)
Ca	39,94 a	102,39 b	46,58 a	29,01 ab	3,28 a
Lime	38,72 ab	108,06 a	44,09 b	30,48 a	3,18 ab
Normal	38,22 b	105,44 ab	43,73 b	27,91 b	3,11 b

Description: the numbers followed by different letters in the same column show a real difference according to the Tukey HSD test 5%

The type of calcium has a significant effect on the number of pods, wet weight of pods, dry weight of pods and dry weight of seeds where the highest average is found in Ca with a value of 39.94 for Number of Pods; 102.39 g for Wet Weight Pod; 46.58g for Dry Weight Pod and 29.01g for Dry Weight Seeds and 3.28 tons for production per Ha. This is also due to the fact that Ca ions are available at the beginning of planting with sufficient pH at the time of vegetative growth but lack of Ca during gin (ginofor) formation and seed filling can decrease yield. Decrease in yield can reach 60%.

Table 10. Meaning of Generative Phase Based on Liquid Fertilizer

Liquid Fertilizer	Pods Number	Wet Pods Weight	Dry Pods Weight	Dry Seeds Weight	Productio (ha)
10 ml	40,11a	109,00a	46,47 a	31,09 a	3,33 a
20 ml	37,81b	101,59 b	43,14 b	27,18 b	3,06 b

Description: the numbers followed by different letters in the same column show a real difference according to the Tukey HSD test 5%

The amount of Liquid Fertilizer giving significant influence to the number of pods, wet weight of pod, dry weight of pod, dry weight of seed and production where the highest average is found in the application of 10 ml of liquid fertilizer with the value of 40.11 for the number of pods; 109g for wet weight of pod; 46,47g for Dry Weight pod; 31.09 for Dry Weight Seeds; and 3.33 tons per Ha for crop productivity.

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Table 11. Interaction of Varieties and Calcium on Number of Pods, Weight of Wet Pods, Heavy Dried Pods, Dry Weight Seeds and Production

Interaction varieties * calcium	Pods Number	Wet Pods Weight	Dry Pods Weight	Dry Seeds Weight	Production (ha)
Hypoma Ca	44,50 a	124,00 a	53,42 a	34,50 a	3,66 a
Lime Hypoma	40,33 b	121,17 a	51,31 a	32,30 ab	3,24 b
Normal Hypoma	39,33 bc	113,00 ab	49,59 a	30,60 abc	2,99 b
Talam Ca	39,67 bc	105,17 bc	40,24 bc	24,65 d	2,31 c
Lime Talam	38,00 bcd	114,17 ab	49,65 a	30,69 abc	2,29 c
NormalTalam	36,67 cd	105,83 bc	38,80 c	27,33 cd	2,17 cd
Bima Ca	35,67 d	78,00 e	37,52 c	27,89 cd	1,90 d
Lime Bima	37,83 bcd	88,83 de	38,80 c	28,46 bcd	2,04 cd
Normal Bima	38,67 bcd	97,50 cd	43,88 b	25,81 d	2,17 cd

Description: the numbers followed by different letters in the same column show a real difference according to the Tukey HSD test 5%

The interaction between varieties with calcium, has a significant effect on the number of pods, wet weight of pods and dry weight of pods, dry weight of seeds and production. The highest average was in Hypoma + Ca treatment with a value of 44.50 for Number of Pods; 124g for Wet Weight Pod; 53.42g for Dry Pods Weight; 34.5g for Dry Weight Seeds and 3.66 tons on plant productivity per Ha. While the lowest average is in the treatment of Bima + Ca with a value of 35.67 for the number of pods; 78g for Wet Weight Pod; 37.52g for Dried Weight Pod; 27.89g for Dry Weight Seeds and 1.9 tons on plant productivity per hectare.

Dry weight of pods is the result of weight representation of wet pods without moisture content as same as wet weight of pods in plants is strongly influenced by the process of photosynthesis.

Hypoma + Ca + 10ml varieties are able to produce more number of pods, highest wet pod weight and highest dry pod weight, so this also affects the dry weight of the seeds. The number of more pods was able to produce seeds with a higher weight as well. It shows this variety response to fertilization in increasing production.

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Ca granting had a significant effect on the production of dry beans per hectare. The highest production was found in Hypoma Herooma 3.66 ton / Ha, followed by Hypoma Kapur 3,24 Ton / Ha and Normal Hypoma 2.99 Ton / Ha varieties.

CONCLUSION

In the Vegetative phase observations and analyzes obtained that between varieties, calcium and liquid fertilizer have a significant effect on plant height and number of branches at 14 HST and 28 HST. Interaction on varieties and calcium significantly influence on plant height and the number of branches of 14 HST and 28 HST. The interaction of varieties and liquid fertilizer only significant effect on plant height 14 and 28 HST.

In the Vegetative vase, the interaction of varieties had a significant effect on plant height and number of branches where Hypoma Ca varieties reached the highest values at 14 HST and 28 HST. The interactions on calcium seen in Hypoma + Ca varieties had the highest yields with 42.29 cm and 14.33 sticks at 28 HST. Then the lowest treatment is Bima + Normal treatment with a value of 21.52 cm and 5.95 stems. Giving Liquid Fertilizer Biourine 10 ml / liter on Hypoma Variety, gave significant effect to plant height and number of branches at 14 HST and 28 HST.

In Vase Generative plants have a significant effect on the number of pods, wet weight of pods, dry weight of pods and dry weight of seed production. Where interaction between varieties and calcium in Hypoma + Ca treatment gave the highest result compared to other treatments that was 44.50 for the number of pods; 124g for wet pod weight; 53.42g for pod dry weight; 34.5g for dry weight of seed and 5.66 tons per Ha for productivity. Treatment with the lowest yield on treatment Bima + Ca with a value of 35.67 for the number of pods; 78g for wet pod weight; 37.52g for pod dry weight; 27,89g for dry weight of seed and 1.9 ton per Ha for productivity.

From the result of the analysis, it can be seen that the influence of good growing environment will support the growth and development as well as the better root distribution so that the plant can absorb more N, P, K (Afa Laode, 1998) elements. Murtado and Sutedjo (1988) reported that total N, P, K and Mg uptake by peanuts at harvest increased with increasing doses of P and Ca fertilizers. Phosphorus (P) plays a key role and efficiently controls the most utilization of nutrients in plants and improves vegetative growth for the better (Prasad et al. 1982), regulates the formation and trans location of substances or materials such as sugar and starch, important in the process of maturation and fruit and seed formation (Bennett, 1989). Thus, high dry matter can be produced and good photosynthetic translocation to the reproductive part causes increased yield components and pod results.

In addition, the increasing number of pods, wet weight of pods, dry weight of pods, Dry Seeds of Seeds and Production also occurs due to Ca administration, presumably because it has to do with the role of Ca that encourages the development of peanut pods. The availability of Ca in soil with sufficient quantity causes better pod

and seed development and consequently the yield of pods and seeds will increase. Ca element for peanut has an important role as a certain activator in enzymatic reaction in pod formation. Calcium is useful in preventing seed loss and increasing the formation of two bear pods (Ainurrasjid, 1986). It is also reported that Ca administration in the glandophoral region can significantly increase the number and weight of pods because Ca is essential for normal root growth (Hasenstein and Evans, 1986).

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