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The study of soybean growth and yields as plant around the palm

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Key words: Adaptation, Anjasmoro, Dena 1, Grobongan, Kipas merah, Palm.

Abstract

The purpose of this study was to get better-quality from soybean varieties to support growth and yield. This research was conducted on smallholder palm plantations in New Peunaron Village, East Aceh District and started from March to July 2016. This study used a Randomized Block Design (RBD) with 4 treatments and 3 replications. The factors studied were various varieties consisting of 4 treatments such as Anjasmoro, Dena 1, Grobogan, and Kipas Merah. The parameters examined were growth and yield. The results showed that varieties affected the growth and yield of soybeans. The best varieties was found in Anjasmoro which were 2.10 tons ha^{-1}. While the lowest was found in the Kipas Merah variety 1.55 tons ha^{-1}.

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Introduction

Soybeans are used as one of the raw materials for food industry in Aceh. Besides that, soybeans are also one of the most important commodities in Aceh. Aceh has massive land, But the availabilty land is palm plantations. This land is a sleeping area. This land has a potential to economical prospect at the future if it's well managed. This land can be managed by planting soybeans as interrupted plants (BPS, 2015).

According to Asima *et al*., (2017) the progress of soybeans as interrupted plants among palm plants, it's can be provide a real contribution in supporting national food security. Van Noordwijk *et. al,* (2004) reported that planting soybeans among rows can also provide natural nitrogen which is bound by rhizobium. Maryani and Gusmawartati (2009) also added that erosion can be controlled by growing Soybeans.

The research of Arnold's, (2016) showed on soybean roots availability of macro nutrients such as nitrogen to support growth and yield.

According to Mangondidjoejo (2003) said not only in nutrients which were must to be considered, but the quality of soybeans varieties most important. That are to increase the maximum productivity.

It's also that can be produce growth and yield better. So the best varieties is the next alternative to increase soybean production. So, the aims of study was to identify the best varieties to support soybean growth and yield on palm plantations.

Materials and methodes

Place of study

The research was carried out on dry land in a 2-year old smallholder oil palm plantation area in Aceh Timur District Peunaron Subdistrict, New Peunaron Village. This research was carried out starting from March - July 2016.

Soybeans

Soybeans are used as interrupted plant around palm plantations. There are have 4 levels in various varieties such as Anjasmoro, Dena 1, Grobogan, and Kipas Merah.

Three varieties tested were from Balitkabi Malang and one variety of Kipas Merah originated from Aceh Assessment Institute for Agricultural Technology, Indonesia.

Fertilizer and pest

The fertilizers are used 50 kg ha^{-1} Urea, 100 kg ha^{-1} SP-36, 50 kg ha^{-1} KCl and dolomite 300 kg ha^{-1}. To control pests, diseases and weeds, insecticides Demacide, Diazinon and Glyphosate Herbicide are used. Fertilizer is given at the time of planting and at the age of 2 weeks after planting. Fertilizer is given by being stretched between rows of plants about 10 cm from the planting hole. Demacide insecticide 1/2 tsp / l water was used for pest control, while weed control was carried out using herbicide glyposhate 1.5 kg ha-1 and hand weeding. Weeding is done twice at the age of 20 days and at the age of 40 - 45 days.

Analyzed data

The collected data were analyzed statistically and to determine the effect of the treatment Duncan continued using the test at the level of 5%.

Experimental research

The collected data were analyzed statistically and to determine the effect of the treatment Duncan continued using the test at the level of 5%.

Parameters

Parameters observed included.

Plant height

Plant height measured from the soil surface to the highest shoot at the age of 30, 45 and 60 day after planting.

The number of branches

The number of branches counted at age 60 HST, the number of branches is calculated which is a branch that grows on the primary and secondary stems.

Age of flowering

Flowering age was observed after the vegetative period ended.

Number of empty pods on plant

The number of empty pods is calculated at the time of harvest. The way to get rid of that is by separating the empty pod first from the filled pod, then empty pods can be calculated.

Number of filled pods on plant

The number of empty pods is calculated at the time of harvest. The way to get rid of that is by separating the filled pod empty pod first from the empty pod, then filled pods can be calculated.

Weight of 100 seeds

The weight of 100 seeds is weighed after harvest. Weighing is done after the seeds are dried in the sun for 3 days, then the weight of 100 seeds can be obtained.

Seed weight on plant

The weight of seeds every plant is weighed after harvest. Weighing is done after the seeds are dried in the sun for 3 days, then the weight of seeds every plant can be obtained.

Yield potential (ton on hectare)

Yield potential (ton on hectare) was observed after harvest.

Result and discussion

The result

The results of the various analysis reveal that has significantly Plant height of several soybean varieties at the age of 30, 45, and 60 DAP; Number of branches on plant, flowering age, The number of empty pods, pods every plant, the heavy of 100 seeds, the heavy seeds and yields on hectare. it's can be seen in Table 1 and 2. Table 1 showed that the highest soybean plant height at 30 DAP was found in anjasmoro is 33.50 cm and the lowest was found in grobongan is 28.07 cm. The highest soybean height at the age of 45 DAP was found in anjasmoro is 47.37 cm and the lowest was found in grobongan variety which was 35.24 cm.

Table 1. The average plant height of several soybean varieties at the age of 30, 45, and 60 DAP; Number of branches on plant and flowering age.

Varieties	Plant height (cm)			Number of branch on 60 DAP	Age of flowering
	30 DAP	45 DAP	60 DAP		
Anjasmoro	33.50 ^{d}	47.37 ^{d}	67.50 ^{c}	3.10 ^{b}	36,49 ^{c}
Dena 1	30.35 ^{b}	41.55 ^{c}	58.30 ^{a}	3.00 ^{b}	33,30 ^{b}
Grobogan	28.07 ^{a}	35.24 ^{b}	60.15 ^{b}	2.10 ^{a}	29,50 ^{a}
Kipas Merah	32.98 ^{c}	44.19 ^{a}	69.10 ^{d}	4.25 ^{c}	40,72 ^{d}

Description: The numbers followed by the same letter show not significantly different (Duncan test 0.05).

The highest soybean height at 60 DAP was found in anjasmoro variety, which was 67.50 cm and the lowest was found in dena 1 variety which was 58.30 cm. The highest number of branches was found in Kipas merah varieties is 4.25 and the least number of branches was found in grobongan varieties is 2.10. The fastest flowering age was found in grobongan is 29.50 and the longest flowering age was found in the kipas merah is 40.72.

Table 2 illustred The highes of the number of without beans was found in grobongan is 12, 30 and the lowest was found on dena 1 is 7,50.

The heighest of the number heavy beans was found on heavy Anjasmoro is 105,2 and the lowest was found on kipas merah is 76,79. The best 100 weight of beans was found on grobongan is 16,20 g and the lowest was found on kipas merah is 11,50 g. The best weight of beans was found on anjasmoro is 127,00 g and the lowest was found on kipas merah is 92,99 g.

The best yield on hectar was found on anjasmoro is 2,10 ton ha^{-1} and the lowest was found on kipas merah is 1,55 ton ha^{-1}.

Discussion

This is due to the genetic factors of each different variety, so that growth in the field also gives different heights. The research of Adeniyan and Ayoola (2006) said that quality of varieties have the role of technology which are gave the greatest contribution to increasing soybean production. The study of Cho *et al.*, (2006); Han *et al.*, (2006) and Mursito (2003) suggested that the role of varieties greatly determines the age of flowering. Nilahayati and Putri (2015) added that the faster entering the flowering phase, the more opportunities to appearance more pods.

Table 2. The number of without of pod and the total packed pod on plant; Weight of 100 seeds, planting seed weight and yield on hectare in various varieties of soybeans.

Varieties	Without beans	The number of heavy beans	100 Weight of beans (g)	Weight of beans	Yield on hectar
Anjasmoro	8,20[b]	105,2[d]	15,08[c]	127,00[b]	2.10[b]
Dena 1	7,50[a]	85,30[b]	14,26[b]	95,00[a]	1,60[a]
Grobogan	12,30[d]	96,20[c]	16,20[d]	103,20[a]	1,72[a]
Kipas Merah	11,50[c]	76,79[a]	11,50[a]	92,99[a]	1,55[a]

Description: The numbers followed by the same letter show not significantly different (Duncan test 0.05).

In addition to factors caused by varieties, environmental factors such as sunlight can also affect vegetative growth which during this growth plant will carry out photosynthesis. The research of Machikowa *et al.*, (2011), Jessikuty (2003) and Jiang *et al.*, (2011) suggest that sunlight is one of the supporting factors in photosynthesis. Malik, *et al.*, (2007) added that besides being influenced by genetics, environmental factors can also affect the number of pods that are formed so that it has something to do with the formation of the number of flowers in each branch of the plant.

The table above can be seen that the filling of seeds is based on the amount of starch (assimilate) accumulated in the spikelet, which can determine the filling phase of the seed. The research of Maldinovic *et al.*, (2006) and Heru *et al.*, (2014) suggested that during the seed filling process, photosynthate production produced by plant organs, translocation system from source to limb, and photosynthate accumulation on the sink.

The research of Marwoto *et al.*, (2012), Sihar (2004) and Mejaya *et al.*, (2010) stated that the best varieties are one of the technological components that have a real role to increasing the production and quality of soybean yields around palm.

Conclusion

The highest soybean plant height at 30 DAP was found in anjasmoro is 33.50 cm and the lowest was found in grobongan is 28.07 cm. The highest soybean height at the age of 45 DAP was found in anjasmoro is 47.37 cm and the lowest was found in grobongan variety which was 35.24 cm. The highest soybean height at 60 DAP was found in anjasmoro variety, which was 67.50 cm and the lowest was found in dena 1 variety which was 58.30 cm. The highest number of branches was found in kipas merah varieties is 4.25 and the least number of branches was found in grobongan varieties is 2.10. The fastest flowering age was found in grobongan is 29.50 and the longest flowering age was found in the kipas merah is 40.72.

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