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GROWTH AND PRODUCTION RESPONSE OF THE PLANT OF TELANG PLANTS TO GIVING DOSES OF NPK FERTILIZER AND PLANTING MEDIUM IN ROB AREA WITH FLOATING SYSTEMS

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Abstract

The research to determine the application of NPK doses and types of planting media and their interactions on morphological characters and yield of Telang plant. The research was conducted in Denasri Wetan paddy field, Batang District, Batang Regency with an altitude of ± 3 m above sea level. The experimental design used Factorial Randomized Block Design (RBD) consisting of 2 factors with 3 repeats. The factors tried were the doses NPK (D) and planting media (M). The first factor was the doses NPK (D) consisting of a dose of 7,5 g/polybag (D1), a dose of 15 g/polybag (D2), and a dose of 22,5 g/polybag (D3). The second factor is the types of planting media (M) consisting of soil planting media (M0), soil + sand + rice musk (M1), soil + rice musk + manure (M2), and soil + sand + manure (M3). Data were analysed by the F test and continued with Least Significance Different (LSD) level 5%. Variable analysed were plant height (cm), leaf area (cm2), number of leaves (strands), number of branches (branches), longest root length (cm), root volume (ml), fresh flower weight (g), dry flower weight (g), number of flowers (piece), and time appearance of flowers (DAP). The results showed that the NPK doses were significant different and very significant different in the variable plant height, leaf area, longest root length, root volume, fresh flower weight, dry flower weight, and number of flowers whereas in other variables it was not significant different. The best NPK dose was achieved with a doses of 15 g/polybag (D2). The planting media had very significant different to all variables except the longest root length variable, which was not significant different. The best planting media is soil + rice husk + manure (M2). There was an interaction between the doses NPK and the planting media which was significant different for variable plant height and leave area and not significant different in other variable. The best interaction was achieved at a combination of dose NPK 15 g/polybag with planting media soil + rice husk + manure (D2M2).

***Keywords**: doses NPK, planting media, land suitability, Telang plant.*

INTRODUCTION

The telang plant (Clitoria ternatea L) is a leguminosae plant that originated in Tropical Asia and spread to South America, North America, Brazil, the North Pacific, and Africa. Telang plants can grow at altitudes between 1-1800 meters above sea level. Telang plants grow optimally at temperatures ranging from 19-28 ° C with average rainfall ranging from 700-1,500 mm / year. However, telang plants can tolerate low temperatures and drought up to 15 °C and rainfall ranging from 400-500 mm/year. The plant can grow on a variety of soils, including sandy soils and red soils with Ph ranging from 5.5-8.9 (Heuzé et al., 2016).

The part of the plant that is often used is the flower, this cannot be separated from the content in telang flowers such as triterpenoids, glycosides, flavonols, anthocyanins (Jeremy, 2019). Telang flowers are often used as a natural food coloring or traditional medicine to reduce inflammation, reduce the risk of hypertension, as a source of antioxidants

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and so on. Telang flowers are in great demand in the international market because of their many benefits, besides that the selling price is also quite high. Usually telang flowers sold in the market are dried flowers or in the form of tea.

The benefits and potential of telang plants are so great that they are not widely known by the wider community, which results in low production of telang flowers in Indonesia. Efforts to increase telang flower production are often faced with various challenges and obstacles such as land conversion, increasing marginal land, ineffective fertilizer doses, or inappropriate planting media. According to Prihatin (2015), the conversion of agricultural land to non-agricultural land is inevitable given the increase in activity and population as well as other developments. The definition of marginal land is land that is not suitable for development in agriculture due to low potential and has various limitations that result in plants not being able to grow optimally (Hasibuan, 2017). In coastal areas, especially the Pekalongan city area, there is a lot of agricultural land that has turned into residential and industrial areas or drowned due to tidal floods. As a result of this, it is necessary to make innovations to utilize land affected by rob so that it can still be used for agricultural crop cultivation. One way that can be used is to create floating land using a floating raft system.

In the cultivation of telang plants, there are several aspects that must be considered, namely fertilization and planting media because they will greatly affect plant yields. Appropriate fertilization will provide optimal cultivation results, otherwise improper fertilization will result in decreased plant productivity or even crop failure. Farmers in fertilizing generally use inorganic fertilizers because they are relatively easy to obtain and cheaper. The fertilizer that is often used is NPK fertilizer because it contains more than one type of nutrient, is more economical and practical in its application (Pangestu, 2021). Increased production of telang plants in addition to the use of fertilizers can also be influenced by environmental factors such as the planting media used. The use of appropriate planting media can have an influence on plant growth and yield (Hayati, et al., 2012). Planting media serves as a place to attach the roots and also as a provider of nutrients for plants. Good planting media must meet the requirements, namely not containing pest and disease seeds, free of weeds, able to hold water but also able to remove excess water, crumbly and porous so that roots can grow and develop through the planting media easily (Bui, et al., 2015).

The purpose of this study is to determine the dose of npk fertilizer affects the growth and production of telang plants, knowing the type of planting media affects the growth and production of telang plants, Knowing the interaction effect between the dose of npk fertilizer and the type of planting media on the growth and production of telang plants.

Based on this discussion, the following hypothesis can be formulated : The bestdose of NPK fertilizer is 400 kg/ha = 15 g/polybag, the best planting media composition is soil + sand + manure (1:1:1), There is an interaction between the dose of NPK fertilizer and the type of planting media for the growth and production of telang plants.

This research is expected to obtain information on the best dose of NPK fertilizer and the best planting media for the cultivation of telang plants.

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This research was conducted in a tidal area where the soil is inundated with water that has a salt content. The research began with making a floating frame from bamboo and plastic barrels to make the planting media floatable. The research continued by comparing 3 kinds of NPK doses and 4 kinds of planting media carried out with 3 replicates.

LITERATURE REVIEW

Telang is an herbal plant whose whole parts from roots to flowers are believed to have medicinal effects and strengthen organ performance (Mukherjee, et al., 2008). The efficacy of this plant is recognized in the traditional medicine of various civilizations, especially Asia and the Americas.

The application of manure to legumes greatly influences the productivity of cultivated legume plants. This is because the use of manure for the soil, chemically provides benefits, namely adding nutrients, especially N, P, and K and increasing CEC and biologically can increase the activity of soil microorganisms (Allison, 1973). Susetyo (1985) states that NPK contains several elements, including nitrogen elements that function in protein synthesis. Protein functions as a proto plasma builder to form plant organs.

METHOD

This research was conducted in a paddy field in Denasri Wetan, Batang District, Batang Regency with an altitude of 3 meters above sea level (above sea level). The experiment was conducted for approximately three months, from February to May 2022. The design used in this study was a Randomized Group Design (RAK).

This research is a factorial experiment consisting of 2 factors 3x4. The first factor is the dose of NPK consisting of 3 levels, including D1: dose of 7.5 g/polybag, D2: dose of 15 g/polybag, and D3: dose of 22.5 g/polybag and the second factor is planting media consisting of 4 levels, including M0: Soil, M1: Soil + sand + rice husk, M2: Soil + rice husk + manure and M3: Soil + sand + manure. Each treatment was repeated 3 times resulting in a total of 36 experimental units with 3 sample units resulting in a total of 108 experimental units.

Variables observed included: plant height, leaf area, number of leaves per plant, number of branches, longest root length, root volume, fresh flower weight, dry flower weight, number of flowers and flower emergence. The results were analyzed using the F test at 5% and 1%. If the effect is significant, it is continued with the 5% Least Sign ificant Difference (BNT) test.

RESULT AND DISCUSSION

NPK Doses

The results showed that the dose of NPK fertilizer was significantly different on the variables of plant height, leaf area, root length, root volume and dry flower weight and very significantly different on the variables of fresh flower weight and number of flowers. The results showed that the dose of 15 g/polybag gave the best results, this was because the use of a dose of NPK 15 g/polybag was able to increase cell elongation in telang plants so that it had an effect on plant height and root length of telang plants. The dose of NPK 15

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g/polybag is also able to increase cell enlargement and division which affects the leaf area and root volume of telang plants. The provision of inorganic fertilizers such as NPK pearl 16: 16: 16 can stimulate overall growth, especially branches, stems, leaves and plays an important role in the formation of green leaves, this is because the nature of inorganic fertilizers is an essential nutrient whose conditions are quickly absorbed by plants. Normal plant growth requires certain nutrients and must be in the optimum amount, as well as being in a certain balance in the soil (Nainggolan, 2011).

Giving a dose of NPK pearl 16: 16: 16 as much as 15 g / polybag can increase the production of telang plants because of the content of nutrients N, P, and K in it which have their respective functions. N nutrients help telang plants in the formation of roots, stems and leaves, the formation of leaf chlorophyll and the formation of amino acids for the basic ingredients of protein. P nutrients can help form ATP in telang plants so as to increase energy in telang plants for generative formation such as flowers and seeds. K nutrients can accelerate the formation of enzymes and strengthen tissues in plants so that telang plants are not easily affected by pests and diseases and strengthen plants so that telang flowers do not fall easily. So that giving a dose of NPK 15 g / plant can increase the weight of fresh flowers, dry flower weight and the number of flowers. In line with the statement of Pangestu (2021), that NPK fertilizer affects the weight of flowers and the number of flowers.

The results showed that the dose of 22.5 g/polybag did not increase the growth or yield of telang plants, this is because the addition of doses to telang plants to 22.5 g/polybag resulted in plant physiological processes such as cell elongation and enlargement in telang plants stopping so that the growth and yield of telang plants did not increase. If the availability of nutrients N, P, and K for plants and nutrient absorption is better, it will provide better growth and produce higher production (Susilowati, 2021).

The results showed that the dose of NPK fertilizer treatment was not significantly different on the variable number of leaves per plant, the number of branches and when flowers appear. This is due to many factors including genetic factors of telang plants. The average telang plant has a number of compound leaves ranging from 100-200 leaves, 12-18 branches. Telang plants can flower at the age of 30-40 days after planting. In addition to the genetic factors of telang plants, environmental factors can also cause the provision of NPK to have no effect on the growth and yield of telang plants. Denasri wetan area is the north coast (north coast) of Batang district, has extreme climatic characteristics, such as hot air, high temperature, low humidity, strong winds and high evapotranspiration. This results in the evaporation of NPK fertilizers applied to the plants causing the growth of leaves, branches and flowers to be inhibited. Inadequate nutrient supply during plant growth will negatively affect the reproductive ability of plant growth and yield (Purba, 2020).

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Table 1. Mean numbers and statistical data analysis of research on the Effect of NPK Doses on the Growth and Production of Telang Plants (*Clitoria ternatea* L.)

Treatment	TT (cm)	LD (cm²)	JD (helai)	JC ((cabang)	PA (cm)	VA (ml)	BBS (g)	BBK (g)	JB (buah)	SMB (hst)
NPK Doses										
D1= 7,5 g/polybag	76,94 ab	6,32b	107,75	12,08	37,68 ab	27,96 ab	18,18 ab	2,41ab	59,50 ab	38,58
D2= 15 g/polybag	85,43 a	8,79a	133,25	14	41,74 a	37,71 a	19,81 a	2,60a	65,75 a	38,33
D3= 22,5 g/polybag	64,83 b	6,21b	95,25	10,17	24,36 b	22,72 b	13,23 b	1,85b	43,33 b	42,67
Uji BNT 5%	15,52	1,93	-	-	11,72	11,64	3,88	0,56	13,46	-

Notes:
Numbers in columns and treatments based on BNT test at 5% level. **= significantly different, *= significantly different, tn= not significantly different. TT (Plant Height), LD (Leaf Area), JD (Number of Leaves per Plant), JC (Number of Branches), PA (Longest Root Length), VA (Root Volume), BBS (Fresh Flower Weight), BBK (Dry Flower Weight), JB (Number of Flowers), SMB (Time to Flower Appearance).

Growing Medium

The results showed that the type of planting media soil + rice husk + manure (M2) was significantly different from the variables of plant height, number of leaves per plant, root volume, fresh flower weight, dry flower weight, number of flowers and the time of flower emergence and the type of planting media soil + sand + manure (M3) was significantly different from the variables of leaf area and number of branches. The best results were obtained in the treatment of soil + rice husk + manure (M2). This is because the planting media in M2 uses more organic matter than other planting media such as rice husk and manure. The addition of rice husk as a planting medium aims to make the planting medium more porous and the role of organic matter as a nutrient enhancer for plants that will be absorbed by the roots. Rice husk has a high water storage capacity and is easily decomposed, not overgrown with mold, and the price is relatively cheaper and can function for soil fertility and softness. Rice husk has contents such as moisture content 32.40 - 11.35%, crude protein 1.70 - 7.26%, fat 0.38 - 2.89%, free nitrogen extract 24.70 - 38.79%, fiber 31.37 - 49.92%, ash 13.16 - 29.04%, pentose 16.94 -21.95%, cellulose 34.34 - 43.80%, and lignin 21.40 -46.97% which can be utilized (Sauli, 2022).

The addition of manure to the planting medium produces the best growth and production of telang plants, the manure used in this study is cow manure. Cow manure has the ability to provide suitable conditions for plant root penetration because manure provides nutrients, improves soil macro and micro pores and increases the ability of soil to maintain moisture. Cow manure contains nutrients such as N 2.33%, P2O5 0.61%. K2O 1.58%, Ca 1.04%, Mg 0.33%, Mn 179 ppm and Zn 70.5 ppm. Cow manure can increase the soil's ability to store water which later serves to mineralize organic matter into nutrients that can be used directly by plants during their growth period (Prasetyo, 2008).

Good planting media such as soil, rice husks, manure and sand. Telang plants can grow on a variety of planting media, but the planting media that are suitable for telang plants are alluvial soil types. Lack of nutrients can cause less optimal plant growth (Nugraha et al., 2012). Soil is a planting medium that has small dimensional pores, so the soil can absorb

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relatively large amounts of water. However, soil lacks nutrients so it needs to be combined with other planting media when it is used. Telang plants in the M0 treatment (soil) experienced obstacles in the formation of leaves, branches, roots and flowers. This is due to not fulfilling the needs of nutrients, especially N, which plays a role in the vegetative growth of plants.

Sand is often used as an alternative growing medium to replace the function of soil. Sand-textured planting media is very easy to process, this type of soil has the availability of air voids, good aeration and drainage, but the ability to store water is very low or the soil dries out faster. Sand contains phosphorus, potassium, calcium, Fe2O3 and MgO nutrients. According to Magfiranur (2019), the cohesion and consistency of sand is so small that it is easily eroded or carried away by air or wind.

Table 2. Mean numbers and statistical data analysis of research on the Effect of Planting Media on Growth and Production of Telang Plants (*Clitoria Ternatea* L.)

Treatment	TT (cm)	LD (cm²)	JD (helai)	JC (cabang)	PA (cm)	VA (ml)	BBS (g)	BBK (g)	JB (buah)	SMB (hst)
types of growing medium										
M0= soil	40,23 c	4,05b	26,11c	4,33 b	26,52	11,17b	1,53c	0,17 c	4,78c	52,56 c
M1= soil + sand + rice husk	73,61 b	6,49 ab	93,67 bc	10,78 ab	33,73	27,51a b	12,86b	1,51 b	40,67 b	43,89 b
M2= soil + rice husk + manure	97,70 a	8,62a	181,44 a	16,56 a	37,62	40,00a	29,27a	4,15 a	95,56 a	32,78 a
M3= soil + sand + manure	91,39 ab	9,26a	147,11 ab	16,67 a	40,50	39,17a	24,62a	3,33 a	83,78 a	30,22 a
Uji BNT 5%	17,61	2,22	47,31	3,95	-	13,44	4,48	0,64	15,54	4,72

Notes:
Numbers in columns and treatments based on BNT test at 5% level. **= significantly different, *= significantly different, tn= not significantly different. TT (Plant Height), LD (Leaf Area), JD (Number of Leaves per Plant), JC (Number of Branches), PA (Longest Root Length), VA (Root Volume), BBS (Fresh Flower Weight), BBK (Dry Flower Weight), JB (Number of Flowers), SMB (Time to Flower Appearance).

Interaction between NPK Dosage and Type of Planting Media

The results showed that the interaction between the dose of NPK fertilizer and the type of planting media was significantly different on plant height and leaf area. The best interaction on the variable of plant height was obtained by the dose of NPK fertilizer 15 g/polybag with the type of planting media soil + rice husk + manure (D2M2) with the best interaction on the variable leaf area of the dose of NPK fertilizer 15 g/polybag with the type of planting media soil + sand + manure (D2M3). This is because the use of NPK doses and planting media interact with each other so that they can have an effect on the height and leaf area of telang plants. The fertilizer dose of 15 g/polybag gives a good effect on the variable plant height and leaf area of telang plants because the NPK dose of 15 g/polybag is able to increase cell elongation and cell division so as to increase the height and leaf area of telang plants. In line with the opinion of Haryadi et al., (2015), which states that one of the factors

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causing the growth of plant height and leaf area is the presence of N, P, and K nutrients contained in fertilizers using 16:16:16 pearl NPK fertilizer.

Giving a mixture of rice husk or sand planting media can improve soil composition so that the aeration and drainage system becomes better. Syakur (2016) stated that good planting media such as crumbly physical characteristics, good aeration and drainage will make it easier for roots to grow. The advantages of rice husk are not easily weathered and easily bind water, another advantage is that rice husk is a source of potassium (K) needed by plants, and is not easy to solidify so that plant roots can grow well. The addition of manure as a planting medium serves to improve soil structure, increase soil absorption of water, increase microorganisms in the soil and as a source of substances for plants (Suparanti et al., 2021).

The results showed that the interaction between the dose of NPK fertilizer and the type of planting media had no significant effect on the variable number of leaves per plant, number of branches, root length, root volume, fresh flower weight, dry flower weight, number of flowers, and time of flower appearance. This is because each treatment, namely the dose of NPK and planting media, does not affect each other and the process runs separately (Rahmi and Jumiati, 2007).

Table 3. The average number of interactions of NPK Dosage and Planting Media on the growth and production of telang plants (*Clitoria Ternatea* L).

Treatment	Plant height (cm)	Extensive Leaves (cm^2)
D1M0	22,37d	2,30b
D1M1	92,70ab	8,30a
D1M2	100,73a	6,79a
D1M3	91,97ab	7,92a
D2M0	62,73bc	7,31a
D2M1	87,13ab	8,94a
D2M2	101,70a	9,66a
D2M3	90,17ab	9,24a
D3M0	35,60cd	2,54b
D3M1	41,00cd	2,25b
D3M2	90,67ab	9,41a
D3M3	92,03ab	10,64a
BNT 5%	30,51	3,85

Note: Numbers in columns and treatments followed by the same letter show no significant difference based on BNT test at 5% level. **= significantly different, *= significantly different, tn= not significantly different.

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CLOSING

Conclusion

Based on the results of the research and discussion, the following conclusions can be drawn: 1). The dose of NPK fertilizer was significantly different on fresh flower weight and number of flowers, significantly different on plant height, leaf area, longest root length, root volume, and dry flower weight, and not significantly different on other variables. The optimum dose of NPK fertilizer was achieved at a dose of 15 g/polybag (D2). 2). The types of planting media differed significantly on all variables observed except for the longest root length variable, which was not significantly different. The best planting media is soil + rice husk + manure (M2). 3). There is an interaction between the dose of NPK fertilizer and planting media that is significantly different on plant height and leaf area. The best interaction was obtained at a dose of NPK fertilizer of 15 g/polybag with a planting medium of soil + rice husk + manure (D2M2)

Sugession and Recommendation

Based on the results obtained, some suggestions can be given as follows 1). Further research needs to be done regarding other doses of NPK fertilizer, 2). Further research needs to be done regarding different types of planting media. 3). Further research needs to be carried out regarding the dosage of NPK fertilizer and types of planting media for other commodities.

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