Growth With of Alfalfa Mutant in Different Nitrogen Fertilizer and Defoliation Intensity

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***Abstract*— The research was conducted to evaluate growth of alfalfa mutan (plant height increment, number of leaves and dry matter production) in different Nitrogen Fertilizer and defoliation intensity. The design used was randomized block design 4x2 factorial with 3 replications. The first was dosage of Nitrogen fertilizerNitrogen (0, 30, 60 and 90 kg N / ha), the second factor was defoliation intensity (5 and 10 cm). Variables observed alfalfa growth (plant height increment, number of leaves, the production of dry matter (DM) forage). The results showed that different N fertilization did not affect the growth of alfalfa mutants. Defoliation intensity affected number of leaves and DM production of alfalfa mutant. Fertilization to 90 kg N / ha has not affected the growth and defoliation intensity 10 cm gave better growth on alfalfa mutant.**

Keywords: alfalfa mutant, Nitrogen fertilizer, defoliation, growth

I. INTRODUCTION

Legume forage was the mainstay for most of the plants have a high protein content. Alfalfa can also be used as biofuel feedstock (Lamb *et al*., 2003). Excellence of alfalfa in nutritional quality, makes it widely used as a major part in the ration of most farm animals such as dairy cows, horses, beef cattle, sheep and dairy goats (Orloff. 1997). Production and quality alfalfa enable for feed to all types of livestock. Alfalfa crop was a legume commonly grown in temperate areas (Hoy *et al.,* 2002). Alfalfa growth requires sunlight and adequate levels of lime, high temperature resistant but can not grown in high humidity. Alfalfa requires good drainage, and soil in pH 6.5 or more with good fertility (Agricultural Experiment Station and Cooperative Extension Service, 1998). The high nitrogen level enhanced the growth of alfalfa and compensated for reduction of its yield under high saline conditions (Helalia *et al.*, 1995). Alfalfa mutant is more able to adapt to the long irradiation (Widyati *et al*., 2012). Stage of growth and development of alfalfa harvested as a major factor in determining forage quality and production (Smith *et al*., 2006).

Mutations are genetic changes in the organism as reflected in changes in expression. Posed genetic variability can be used as material selection population. Mutation induction was one of the breakthroughs in the improvement of plant traits that are difficult mainly repaired conventionally. (Soertini, 2003). and can be done with a chemical mutagen ethyl methyl sulfonate (EMS).

Fertilization was intend to complement the lack of available nutrients in the soil, so the optimal growth of plants can be achieved. Nitrogen fertilizer was essential for all plants because it is a protein constituent of all compounds. Nitrogen deficiency in plants that often of defoliation affects the formation food reserves for regrowth. Nitrogen functions to enhanced plant growth which was necessary for vegetative growth. Optimize production, quality and sustainability of alfalfa production were needed defoliation management of plant developmental stage, defoliation intensity and interval (Bagg, 2003).

II. MATERIALS AND METHODS

Research material used was the result of mutations of alfalfa seed. A land area of 300m2, consisting of 24 plots with 2x2m size, distance between plots 0.5 m, compost, urea (45% N), SP-36 (36% P2O5), KCl (52% K2O), and insecticides. Research carried out in the garden in the village Kenteng, Bandungan, Semarang located at an altitude ± 800 m dpl. Variables observed alfalfa growth (plant height increment, number of leaves, the production of dry matter (DM) forage). The design used was randomized block design 4x2 factorial with 3 replications. The first was dosage of Nitrogen fertilizer (0, 30, 60 and 90 kg N / ha), the second fact was defoliation intensity (5 and 10 cm). Fertilization treatment after the first defoliation (8 weeks). The data was processed according to the analysis range to see the effect of treatment of the observed variables and if there is a significant effect followed by Duncan Multiple Test Area (Steel and Torrie, 1980).

III. RESULT AND DISCUSSION

Plant height increment

The results of various analyzes indicate that there is no interaction effect ($p > 0.05$) between different N fertilizer and defoliation intensity, different N fertilizer and defoliation intensity had no effect ($p > 0.05$) on plant height increment. Alfalfa plant height increment on different N fertilization and defoliation intensity were shown in Table 1.

Tabel 1. Plant Height Increment Alfalfa on Different N Fertilizer and Defoliation Intensity.

N Fertilizer	Plant Height Increment		Mean
	D_1 (5cm)	D_2 (10 cm)	
	---------- cm ----------		
N_1 (0 kg N/ha)	57,08	58,50	57.79
N_2 (30 kg N/ha)	56,83	54,08	55.46
N_3 (60 kg N/ha)	50,25	56,42	53.34
N_4 (90 kg N/ha)	51,92	57,58	54.75
Mean	54,02	56,65	

Different N fertilizer had no effect on plant height increment, it was because reasearch area contains nutrients N total 0.215% is sufficient for N is required for the growth of alfalfa. Levels of N available for growth ranged from 0.02 to 0.50% . Fertilizing compost as fertilizer on the basis of all the plots can enhance plant growth, the physical content of the soil and improving soil nutrient available (Mbarki *et al*., 2008). The higher the level of compost in growing media to increase

production and forage quality of alfalfa (Widyati-Slamet *et al*., 2009). Forage uniformity results (8 weeks after planting) returned to the soil as green manure will increase soil nutrients, thus re-growth after the first cutting had no effect on plant height increment, because the nutrients that sustain the life of alfalfa derived from the decomposition of organic fertilizer that alfalfa forage returned to the ground.

Defoliation intensity treatments did not affect plant height increment, not least due to the cut alfalfa plants will regrowth from the base of the woody and branched at the base and climbed as high as 30-120cm (Mannetje and Jones, 2000). Defoliation intensity 5 and 10 cm did not affect the regrowth of alfalfa because of the new shoots out from the base of the plant.

Number of Alfalfa Leaves.

The results of various analyzes indicate that there is no interaction effect (p> 0.05) between different N fertilizer and defoliation intensity, Different N fertilizer was no effect (p> 0.05), but the effect of defoliation intensity (p <0.05) against the number of leaves alfalfa. Number of leaves alfalfa in different N fertilizer and defoliation intensity were shown in Table 2.

Tabel 2. Number of Alfalfa Leaves on Different N Fertilizer and Defoliation Intensity

N Fertilizer	Number of Leaves Alfalfa		Mean
	D_1 (5cm)	D_2 (10 cm)	
	helai/m^2		
N_1 (0 kg N/ha)	2123	2570	2347
N_2 (30 kg N/ha)	2157	2733	2445
N_3 (60 kg N/ha)	2362	2629	2495
N_4 (90 kg N/ha)	2453	2703	2578
Mean	2274*	2659*	

* Significant (p<0,05)

Different N fertilizer did not affect number of leaves alfalfa l , N content of this field of research due to be sufficient for the regrowth of alfalfa. Fertilizing compost that is "slow release" as a base fertilizer will provide sufficient nutrients contribute to the regrowth of plants (Mbarki *et al*., 2008), in addition to the return of the uniformity of forage (8 mg) into the soil will improve soil fertility, so the number of leaves which is not affected by different N fertilization.

The number of leaves at high defoliation 10 cm higher than the number of leaves at high defoliation 5. The success of "regrowth" influenced the number of reserve carbohydrates in plant organs, the ability to perform photosynthesis leaf, root mass and activity, and environmental conditions, especially temperature factors (Person and Ison, 1987). Defoliation intensity 10 cm treatment on alfalfa will be left with reserves of more carbohydrates, the leaves are left on defoliation will continue to perform photosynthesis, so regrowth of alfalfa would be better than defoliation intensity 5 cm.

Alfalfa Forage Production (dry matter/DM)

The results of various analyzes indicate that there is no interaction effect (p> 0.05) between different N fertilizer and defoliation intensity, different N fertilizer had no effect (p> 0.05) and defoliation intensity effect (p <0.05) against BK production of alfalfa forage. Alfalfa forage production on different N fertilizer and defoliation intensity were shown in Table 3.

Tabel 3. Alfalfa Forage Production on Different N Fertilizer and Defoliation Intensity

N Fertilizer	Alfalfa Forage Production (DM)		Mean
	D_1 (5cm)	D_2 (10 cm)	
	g/m^2		
N_1 (0 kg N/ha)	99.55	127,93	113,74
N_2 (30 kg N/ha)	94,94	110,80	102,87
N_3 (60 kg N/ha)	91,43	134,37	112,90
N_4 (90 kg N/ha)	102,76	148,56	125,66
Mean	97,17*	130,42*	

* Significant (p<0,05)

Different N fertilizer did not affect the production of alfalfa forage, content of N was due to land there to be sufficient for the growth of alfalfa. The addition of compost on the land before planting as basal fertilizer that is slow release will add organic matter on land. Fertilization treatment after defoliation for the uniform (8 weeks) and forage results were returned to the soil as green manure. Green manure and compost will improve soil fertility are available on the land sufficient for regrowth of alfalfa (Mbarki *et al.*, 2008). This is supported by previous studies that the higher the ratio of compost and soil resulting higher production and quality alfalfa (Widyati-Slamet *et al*., 2009).

Production of alfalfa forage at defoliation intensity 10 cm higher than the production at defoliation intensity 5 cm, not least due to the defoliation intensity 10 cm on carbohydrate reserves more and more of the remaining length of the stem and leaves were left still do photosynthesis so that growth will return better than defoliation intensity 5 cm. Dry matter at defoliation intensity 10 cm higher than at defoliation intensity 5 cm and number of leaves too much. This was supported by the alfalfa mutant was more responsive to the long irradiation (Widyati *et al*., 2012), so that by the number of leaves a lot more then the process of photosynthesis is also better so that production will also be higher.

To optimize production, quality and sustainability of alfalfa production are needed on the defoliation management were depending of plant growth stage, intensity and interval defoliation (Bagg, 2003). Growth phase was the biggest factor in determining the production of quality forage when harvested, the DM alfalfa increased continuously from early growth until at some plants start flowering. When defoliation for production and quality evaluation, more than 50% of alfalfa plants will already be flowering (flower buds form).

IV. CONSLUSION

In could be conclused that fertilization to 90 kg N / ha do not affect the growth of alfalfa mutants, while defoliation intensity 10 cm gave better growth on alfalfa mutant.

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