THE EFFECT OF SHADE AND ADDITIONAL OF UREA FERTILIZER ON GROWTH AND PRODUCTION OF JONTANG KUDA (*SYNEDRELLA NODIFLORA*)

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ABSTRACT

The research aimed to determine the effect of shade and additional urea fertilizer on growth and production of "Jontang Kuda" or "Legetan" (Synedrella nodiflora) as forage. The research was carried out in the Forage and Pasture Science Laboratory, Faculty of Animal Science, Universitas Gadjah Mada, Yogyakarta. The research was arranged by Completely Randomized Design (CRD) factorial design 2x3. The shading treatment was used shade with light intensity 478x10 lux and open space plantation with light intensity 477x100 lux. The fertilizer treatment was used 0 kg/ha, 100 kg/ha, and 200 kg/ha. Variables observed in the research included plant height, number of branch, number of leaf, and biomass production. The statistical analysis used variance based on CRD factorial and result of significant followed by Duncan's multiple range test (DMRT). The results showed that the effect of shade and level of urea fertilizer had a significant effect (P <0.05) on the growth and production of Synedrella nodiflora. Shade decreases the value of biomass production, plant height, number of leaves and number of branches, while the urea fertilizer level of 200 kg/ha increases the value of biomass production and plant growth. The results showed that there was no interaction between shade and level of urea fertilizer on growth and fresh production of Synedrella nodiflora.

Key words: Biomass, Shade, *Synedrella nodiflora*, Urea fertilizer

INTRODUCTION

Feed has an important role in livestock production system to fulfil, the nutritional requirements for basic living, animal growth and development, as well as for production and reproduction. To meet those nutrient needs ruminant usually was fed of rations which consisting of concentrate and forage, with forage as the main feed resource. Provision of forages is facing a constrain in Indonesia, due to uncertain availability caused by the seasons. Alternate resource is needed to get the balance of forage supply and demand. Many non commercial ruminants breeders in Indonesia utilise weeds which growth at the a agricultural land as feed to resolve forage limitations. But, Asih (2004) reported that the farmers or small breeders commonly make use grasses, agricultural waste and other forage products for feed resources and these practices was passed from generation to generation.

Weeds was defined as all undesirable plants that grow in an certain area so that their presence is unvanorable for other nearby or main plants. The use of weeds as forage sources should be manage to get the optimum benefit for animal feed without adversed effect to the main crops. Mentioned by Ali (2010) that the growing weeds is potential to be used as feed for livestock animal. One of the weeds that has a potency to be used as forage for livestock is *Synedrella nodiflora*.

Synedrella nodiflora is a flowering plant belongs to the *Asteraceae* familiy. It is known locally as legetan or jontang kuda (Suwignyo, 2020$_a$). The *Asteraceae* family has a broad-leaf and considered as seasonal weed that has a preference for slightly moist soil for their growth (Tjitrosoepomo *et a.l,* 1987). The availability of land for forage plantation is increasingly limited due to the density of human settlements, industrial areas and plantations. As a consequence, is the decreasing of availability of forage stock. Intercroping system by planting of forages under the shade of main plant stands, such as teak trees, with 63% of average light could be the right solution to increase forage production of limited land. Weeds are one of the plants that can grow easily under the shade.

Environmental factors that affect plant growth are temperature, humidity, solar radiation, soil, soil reactions, biotic factors and nutrient supply (Purbajanti, 2013). Shading, certainly, is a great influence to the adequacy of light received by under shade plants for photosynthesis. In general, plants will grow well if they get enough of sunlight. Harsono (2011) state that weeds generally be able to grow under the shade. *Synedrella nodiflora* can be found under the shade of main plants in plantations with less sunlight compare to in open land. Plant production can also be boosted through fertilization. Nitrogen is needed for plant growth and it is an essential component of plant protein (Hancock *et al.*, 2011). Until now, there has not been much research on *Synedrella nodiflora*

as animal feed. Therefore, this research needs to be done to get information about the production and growth of *Synedrella nodiflora* under the shade treatment with urea fertilizer.

MATERIALS AND METHODS

Time And Place

This research was conducted from August to September 2020, started from preparation for planting to harvesting. Field research was conducted in a greenhouse and continued with sample analysis at the Laboratory of Forage and Pasture Science Laboratory, Faculty of Animal Science, Universitas Gadjah Mada, Yogyakarta.

Materials

The equipment used for the research were a 65% paranet for shading simulations, scales, pots, and rulers used to measure growth in weeds. The *Synedrella nodiflora* weed seeds were obtained from the Laboratory forage and Pasture, and urea was used as fertilizer.

Method

This study used a completely randomized design with a 2 x 3 factorial pattern.The first factor was the type of shade, namely under the shade (N1) with the light intensity was 478x10 lux and without shade (N2) with the light intensity was 477x100 lux. The second factor was the level of urea fertilizer which consisting of (P0) 0 kg / ha, (P1) 100 kg / ha, (P2) 200 kg / ha. Each treatment was carried out 3 unit as replications, so that there were 18 experimental units.

The research was began by prepared the plant growing medium which then be placed in the greenhouse. Plants under the shade were grown below the shading of 65% paranet, while plants without shade were grown without parane over the plants. Wild *Synedrella nodiflora* plant that grows on the yard of the Laboratory of Forage and Pasture collection were collected and be used as seeds and then replanted on soil media that has been prepared according to the treatment. Fertilization was applied at a week after plants been transfered into the pots. Fertilizer was put in the holes that been made around the plants. Plants was mainained for 30 days.

Plant growth was observed every week until harvested by measuring plant height, number of leaves and number of branches. Plant height was obtained by measuring the height of the plant from the soil surface to the tip of the highest plant leaves. The number of leaves data was obtained by counting the leaves that are perfectly open. The number of branches was obtained by counting each branch that appears on the plant. Plant maintenance activities during the study included watering every day at the morning and the evening. At the end of growing periode, plant were harvested and data for fresh feed production of the plant was recorded.

Data Analysis

Obtained data were statisticaly analyzed by analysis of variance to determine the differences in plant responses between shade treatment and fertilizer application and the interaction between treatments. If there were a significant differences, then continued with the Duncan's New Multiple Range Test (Steel and Torrie, 1995). The calculation was done using SPSS software (*Statistical Product and Service Solution*) version 23.

RESULTS AND DISCUSSION

Plant Height

The results in the Table 1. Showed that the height of *Synedrella nodiflora* grown without shade was 44,28 cm, higher than the plants under shade 33,53 cm (P<05). Lack of light access causes metabolism in plants do not run properly. The disruption of this metabolic process lead to decreasing of the tissue formation and development so that plants become shorter. The level of shade is related to the amount of light intensity for plant photosynthesis. The higher level of shade, the lower of light intensity received by plant. Hanafi *et al.* (2006) explained that the growth of pasture plant species was significantly dependent on environmental light.

Table 1. Plants height (cm) with different shade treatments and urea fertilizer levels

Treatment	Urea Fertilizer Levels(kg/ha)			Average
	0	100	200	
Under the shade	30,01±4,60	33,42±2,78	37,17±3,63	33,53±4,49^{x}
Without shade	40,87±1,22	44,82±3,26	47,16±6,58	44,28±4,63^{y}
Average	35,44±6,67^{a}	39,12±6,81^{ab}	42,16 ±7,25^{b}	

The height of *Synedrella nodiflora* with urea fertilizer of 200 kg/ha was highest amongs the treatments (P<0.05), while plant with 100 kg/ha fertilizer did not showed significant different compared to control (P>0.05). Application of urea fertilizer at optimum dosage can provide N in the soil to support optimum plant growth. The availability of nitrogen in the soil induce the cell division process to occur faster. This is in accordance with the opinion of Afifi *et al.* (2011) stated that the application of urea fertilizer to plants increase plant growth.

Number of Leaves

Tabel 2. The number of leaves with different shade treatments and urea fertilizer levels

Treatment	Urea Fertilizer levels (kg/ha)			Average
	0	100	200	
Under the shade	106,67±29,02	127,00±22,72	172,33±58,96	135,33±45,35^{x}
Without shade	232,33±2,52	241,00±7,94	269,67±26,08	247,67±21,77^{y}
Average	169,50±71,25^{a}	184,00±64,27^{ab}	221,00±67,12^{b}	

Type of shade factor in Table 2 showed a significant effect (P<0.05) 0n the number of leaves of *Synedrella nodiflora*. *Synedrella nodiflora* planted on open area (without shade) had more number of leaves out of shaded plant (P<0.05). According to Salibury and Ross (1995) shade on plants reduce the amount of incoming light received by the plants which has further effect on slowing down of the photosynthesis process. So that, the formation of plant organs was also inhibited, including the formation of leaves and stolons.

The number of plant leaves with urea fertilizer at level of 200 kg/ha was more than the number of leavesof plant without fertilization (P<0.05) (Table 2), while leaves number of plant with urea fertilization at 100 kg/ha did not showed significant differences from plant with 200 kg/ha fertilizer as well as from plat without fertilization. This was in accordance with the opinion of Hartadi *et al.* (1997), leaf pigmentation is influenced by fertilization, which in turn affects the amount of energy received by plants for the accelerated process of adding leaves.

Number of Branches

The shade factor has significant effect on branches number of the *Synedrella nodiflora* plant as shown in Table 3 (P<0.05). The number of branches of plant without shade had a higher value, almost twice (P<0.05) than the plant under the shaded (29,89). Plants under the shade have lower light intensity than those without shade. The level of sunlight intensity correlates with the rate of plant photosynthesis, while photosynthetic process affect the plant growth including formation of plant branches. The increasing of light intensity, increase the rate of photosynthesis due to the production of ATP and NADPH which quite high. The increasing of photosynthasis rate causes the production of photosynthate increase which ultimately increases the number of leaves, trunk circumference, number of branches, and plant weight (Salisbury and Ross, 1995).

Table 3. The number of branches with different shade treatments and urea fertilizer levels

Treatment	Urea Fertilizer levels (kg/ha)			Average
	0	100	200	
Under the shade	21,33±4,04	34,00±13,86	34,33±11,15	29,89±11,15^{x}
Without shade	40,67±6,66	60,33±16,65	57,67±5,13	52,89±13,13^{y}
Average	31,00±11,67^{a}	47,17±19,89^{b}	46,00±14,95^{b}	

The number of branches of *Synedrella nodiflora* plants with different levels of fertilizer showed significant differences (P <0.05). The branches number of plant with urea fertilizer at level 100 and 200 kg/ha was higher (P<0.05) than the number of branches of plant without fertilization, but branches number of both fertilized plants did not showed a significant differences. Hidayat (2003) reported that the use of fertilizers in cultivation activities is intended to increase the availability of nutrients in the soil for plant growth. The essential nutrients needed by plants include nitrogen (N), phosphorus (P), and potassium (K). The main role of nitrogen for plants is to stimulate overall plant growth, especially stems, branches and leaves.

Fresh Production

Fresh production of the *Synedrella nodiflora* plant with different shade treatments and urea fertilizer levels can be seen in Table 4.

Tabel 4. Fresh production with different shade treatments and urea fertilizer levels

Treatment	Urea Fertilizer Levels (kg/ha)			Average
	0	100	200	
Under the shade	5,60±0,80	6,84±1,05	7,28±1,12	6,58±1,15^{x}
Without shade	14,94±1,43	15,00±2,86	15,64±4,08	15,20±2,61^{y}
Average	10,27±5,22	10,93±4,87	11,46±5,30	

The fresh production of *Synedrella nodiflora* showed significantly different (P <0.05) in both shade type treatments and levels of fertilizer. *Synedrella nodiflora* planted without shade showed higher fresh production (15,20 kg/ha) compared to under the shade teratment (6,58 kg/ha). This was consistent with Sirait (2005) which said that the presence of shade causes a significant decrease in fresh production.

Fertilizeration at both levels, 100 and 200 kg/ha did not showed significant differences in fresh production of *Synedrella nodiflora*. It could be seen from the average value of fresh production (Table 4), they were able to compete with superior feed forages such as alfalfa (*Medicago sativa* L.) and indigofera (*Indigofera zollingeriana*) in the form of a tree. Suwignyo *et al.* (2020$_b$) reported that *S. nodiflora* with 350 kg/ha urea has fresh production 17,4 ton/ha. This was consistent with Sirait *et al.* (2010) which reported that production of alfalfa with fertilizers produce 13.26 tonnes / ha of fresh weight, while indigofera had a high production of 33-51 tonnes of DM/ha/year with a defoliation interval of 60 days (Tarigan *et al.*,(2010) ; Abdullah and Suherlina (2010). Forage production could be achieved optimally when the kinds and amounts of nutrients were provided in sufficient quantities and in balance to meet requirement of the plant (Hakim *et al.*, 1986).

CONCLUSION

Based on the result of the study, it can be concluded that there did not showed interaction between different shade and level of fertilizer application to the growth and fresh production of *Synedrella nodiflora*. . Shade decreases the value of biomass production, plant height, number of leaves and number of branches, while the urea fertilizer level of 200 kg/ha increases the value of biomass production and plant growth.

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