World Journal of Engineering Research and Technology
WJERT
www.wjert.org
SJIF Impact Factor: 5.924

GROWTH AND YIELD OF FORAGE *ASYSTASIA GANGETICA* AND *CLITORIA TERNATEA* IN AN INTEGRATION PATTERN IN *ALBIZIA SP*. PLANTATION

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Article Received on 20/11/2022 **Article Revised on 10/12/2022** **Article Accepted on 30/12/2022**

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ABSTRACT

Albizia sp is a leguminous tree that is being widely cultivated by farming communities in Bali. The less dense crown of *Albizia* plants provides an opportunity to be integrated with fodder crops under *Albizia* plantations. The study aimed to obtain the productivity of fodder crops in the integration pattern with *Albizia* plantation. The fodder crops used were *Asystasia gangetica* and *Clitoria ternatea* planted in an association pattern. The experiment used a 3 x 3 factorial complete randomized design with treatments consisting of *A. gangetica* monoculture, *C. ternatea* monoculture, and association of *A. gangetica* with *C. ternatea* as the first factor, while the second factor was chicken drum fertilizer consisting of 10 t ha-1, 20 t ha-1, and 30 t ha-1. Each treatment repeated 3 times so there are 27 experimental units. The variables observed were forage growth and yield. The results showed that different planting patterns and doses of chicken manure affected the growth and yield of forage. Fresh forage yield of plant association pattern increased with increasing application of chicken manure. Fresh forage yields of *A. gangetica*, *C. ternatea* and their associations were: 3.29 t ha-1, 3.96 t ha-1, and 2.70 t ha-1. Increasing the dose of manure from 10 t ha-1, 20 t ha-1, and 30 t ha-1 can increase the fresh forage yield of 2.29 t ha-1, respectively. 2.90 t ha-1, and 3.76 t ha-1. It is concluded that the pattern of crop association under *Albizia* plantation crops can be applied with the addition of chicken manure.

KEYWORDS: Growth, forage yield, chicken manure fertilizer, A. gangetika, C. ternatea.

INTRODUCTION

The Ministry of Agriculture continues to make strategic efforts in increasing food availability, one of which is integrated farming, namely integrated agricultural management in one stretch with many commodities. Related to this statement, the agricultural land area in Bali Province is 407,534 ha, including 328,908 ha of non-field land. The vast expanse of non-field land is a huge opportunity to develop integrated farming including the cultivation of fodder crops in an integrated pattern. These objective conditions make fodder crops increasingly strategic, with the support of various government programs that will ultimately demand the availability of sufficient and quality forage. Research on the integration of Asystasia gangetica (*A. genetica*) and *Clitoria ternatea* (*C. ternatea*) plants in the association pattern has not been widely carried out both on growth, green yields on *Albizia sp.* plantations. The crowns of *Albizia* sp. which are not tight are very likely to be integrated with fodder plants planted between *Albizia* plants.

The *A. gangetica* plant is not widely known as a feed crop. This plant grows like a shrub that grows creeping and in groups. This plant is often used as an ornamental plant because of its beautiful flowers, this plant also grows a lot on fallow land, which is land that is not used by farmers and ranchers. Looking at the growth characteristics of *A. gangetica*, it seems that the plant is very suitable to be associated or planted together with *C. ternatea*. To support the growth of this plant, it requires various growth elements that can be added from outside, one of which is by applying organic fertilizer.

RESEARCH METHOD

The research was conducted in *Albizia* sp. plantation owned by the community in Candi Kusuma Village, Jembrana Regency, for 6 months. The material used as fertilizer was self-mixed chicken manure at doses of 10, 20, and 30 tons ha-1. The experimental plots were 2 x 2 m in size, totaling 27 experimental plots. The height of the mounds/plot was 30 cm with a distance between plots of 100 cm. The research used instruments including: Nagata electric scales with a capacity of 1200 g and sensitivity of 0.1 g to weigh the fresh weight and dry weight of plant parts such as stems, leaves and flowers, Portable leaf area meter, Light meter, Chlorophyl Content Meter series 200 and so on.

Results of Soil Analysis of the Research site C-Organic: 2.51%, Total N: 0.180%: P-available: 335.49 ppm, K-available: 225.65 ppm. The soil texture is classified as dusty clay

loam. The analysis results of chicken drum fertilizer used are: C-Organic: 40.73%, total N: 0.62%, available P: 699.34 ppm, and K-available: 525.58 ppm.

The study used a completely randomized design (CRD) factorial pattern with two factors. The first factor was plant association (*A. gangetica* monoculture, *C. ternatea* monoculture, and association of *A. gangetica* with *C. ternatea*) and the second factor was the dose of chicken manure, namely: fertilizer dose of 10 t ha-1 (B1), fertilizer dose of 20 t ha-1 (B2), fertilizer dose of 30 t ha-1 (B3). The experiment was repeated three (3) times so that there were 27 experimental units. Before the research began, several preparations were made, among others, the soil to be used in the research was first processed so that the structure was evenly distributed or homogenous, then made plots with a size of 2 x 2 meters.

The data obtained will be analyzed by variance analysis (Steel and Torrie, 1991). If the mean value of the treatment in the variance analysis shows a significant difference, the analysis will be continued by using the Least Significant Difference Test (LSD) at a real level of 5% (Steel and Torrie, 1991).

RESULTS AND DISCUSSION

The field experiment was conducted in May and started with land clearing and processing. After the plant plots were completed, planting was carried out using plant seeds that had grown in polybags. Interception of solar radiation in *A. gangetica* monoculture was highest when 30 t ha-1 chicken manure was applied, while in *C. ternatea* monoculture it was highest when 10 t ha-1 chicken manure was applied. When *A. gangetica* and *C. ternatea* were planted in an association pattern, the highest interception of solar radiation occurred at a dose of chicken manure of 20 t ha-1. This shows that the planting pattern and the dose of chicken manure affect each other so that there is an interaction on solar radiation interception (Table 1). The same pattern of influence also occurred on soil temperature variables (Table 2) but did not show an interaction, as well as the simple effect of the two treatment factors did not give a significantly different effect ($P>0.05$).

In Table 1 and Table 2, it can be seen that the increased interception of solar radiation under the shade of *A.gangetica* and *C. ternatea* showed a sparser density of plant cover area, but both plants either in monoculture or association had a larger stem diameter. The higher interception of solar radiation will increase soil temperature, soil conditions become better with increasing aerobic microbial activity so that in addition to the addition of manure as a

nutrient provider, nutrients will be more quickly available with increasing soil microbial activity.

Table 1: Radiation interception in monoculture and association cropping patterns

Fertilizer	Plant Association			Average
	A	C	AC	
10 t ha^{-1}	17.77 bB	41.83 aA	16.53 bB	25.38 B
20 t ha^{-1}	34.80 aB	33.60 aA	39.40 aA	35.93 A
30 t ha^{-1}	47.90 aA	28.17 bA	34.60 bA	36.89 A
Average	33.49 a	34.53 a	30.18 a	

Notes: Mean values of treatments followed by the same small letter in a row and the same capital letter in a column are not significantly different at the 5% test level, based on Duncan's Multiple Range Test (Steel and Torrie, 1981).

Table 2: Soil Temperature in monoculture and association cropping pattern.

Fertilizer	Plant Association			Average
	A	C	AC	
10 t ha^{-1}	31.10	38.50	23.20	28.71 A
20 t ha^{-1}	34.80	30.27	39.40	34.82 A
30 t ha^{-1}	41.23	28.17	34.60	34.67 A
Average	35.71 a	32.31 a	30.18 a	

Notes: Mean values of treatments followed by the same small letter in a row and the same capital letter in a column are not significantly different at the 5% test level, based on Duncan's Multiple Range Test (Steel and Torrie, 1981).

In the variable number of chlorophyll leaves of *A. gangetica* and *C. ternatea* did not show an interaction between the planting pattern and the dose of chicken manure. The average value of the treatment of the two treatment factors independently also did not shows significant differences.

The number of branches of *A. gangetica* and *C. ternatea* in the association pattern is more than the number of branches of each monoculture. Similarly, the amount of chlorophyll in *A. gangetica* with the association pattern is more than its monoculture, but on the contrary in *Cltoria* in the association pattern the amount of chlorophyll is less than its monoculture although it has not shown a significant difference (Table 3). This is possible *because A. gangetica*, which is known as a weed, can grow well with other plants and is more tolerant of shade than *C. ternatea*. However, because the differences in the number of branches and the

amount of chlorophyll were not significant, the association pattern also did not have a significant effect on fresh greenery production.

Table 3: Total leaf chlorophyll (Chlorophyll Content Index).

Fertilizer	Plant Association			Average
	A	C	AC	
10 t ha^{-1}	32.13	27.13	39.17	32.81A
20 t ha^{-1}	29.53	30.53	29.32	29.79 A
30 t ha^{-1}	35.57	41.17	28.78	35.17 A
Average	32.41 a	32.94 a	32.42 a	

Notes: Mean values of treatments followed by the same small letter in a row and the same capital letter in a column are not significantly different at the 5% test level, based on Duncan's Multiple Range Test (Steel and Torrie, 1981).

The increasing dose of chicken manure applied will increase the fresh weight of forage, the highest forage yield was obtained at the highest chicken manure application of 30 t ha-1. The association pattern of *A. gangetica* with *C. ternatea* did not give different forage yields with each monoculture. The difference in forage yield was solely due to differences in the dose of chicken drum fertilizer so that the interaction between fertilizer dose and planting pattern also did not occur (Table 4). This is supported by the stem diameter of *A. gangetica* and *C. ternatea* plants which increased with higher doses of chicken manure although it did not show a significant difference in stem diameter.

Table 4: Plant fresh weight (t ha-1).

Fertilizer	Plant Association			Average
	A	C	AC	
10 t ha^{-1}	2.13	2.35	2.40	2.29 B
20 t ha^{-1}	3.47	2.67	2.57	2.90 A
30 t ha^{-1}	4.27	3.87	3.15	3.76 A
Average	3.29a	2.96a	2.70a	

Notes: Mean values of treatments followed by the same small letter in a row and the same capital letter in a column are not significantly different at the 5% test level, based on Duncan's Multiple Range Test (Steel and Torrie, 1981).

Based on data analysis on the various response variables above, it appears that the growth of *A. gangetica* and *C. ternatea* plants grown in monoculture and in association patterns under the shade of Albezia plantations does not show significant differences, shading by *Albezia*

plants does not put more pressure on competition between *A. gangetica* and *C. ternatea* plants grown in association patterns. The variables of number of branches, amount of chlorophyll, and stem diameter were not influenced by the planting pattern and different doses of manure fertilizer ($P > 0.05$), but numerically increasing the dose of manure fertilizer will increase the magnitude of these variables. Consequently, there was a significant increase in plant fresh weight ($P < 0.05$) at higher doses of manure fertilizer.

CONCLUSIONS AND SUGGESTIONS

Conclusion

The association of *A. gangetica* with *C. ternatia* and the dose of organic chicken manure fertilizer planted between *Albizia* plants increased the growth and forage yield, and the highest yield was obtained when the dose of chicken manure fertilizer was 30 t ha-1. There was no interaction effect between the pattern of plant association and the dose of chicken manure fertilizer on the growth and forage yield of forage planted between *Albizia* plantations.

Suggestion

Based on the data obtained and looking at the tendency of the association and integration patterns, it is recommended to continue research on the provision of feed in the pattern of integration with plantation crops including *Albizia* preceded by the selection of crop varieties suitable for planting under the shade of *Albizia* canopy.

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