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Response of Guinea Grass Varieties to Shade and Potash

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Field experiment was conducted at the College of Agriculture, Vellayani, Thiruvananthapuram, Kerala to find out the potash requirements for guinea grass varieties under varying shade levels. Results of the experiment revealed that lower levels of shade as well as higher levels of potassium had significant positive influence in improving the fodder production of guinea grass. Among the varieties, Hamil registered higher yield compared to Haritha. Lower levels of shade and higher doses of potassium significantly increased growth parameters viz., height, number of tillers, leaf : stem ratio, leaf area index and green fodder yield. Lower levels of shade with higher dose of potassium registered the highest net returns and benefit cost ratio. But, economic yield was obtained in shade intensity up to 50 per cent.

Key words : Shade intensity, fodder yield, leaf area index, tiller

The significance of livestock in Indian agriculture sector is well recognised. However, the Indian livestock have very low productivity and fail to express their full genetic potential mainly due to the non availability of good quality fodder and feed resources. Currently the forages and feeds available in our country is sufficient to meet only 46.6 percent of the requirement and the shortage is mainly due to the very limited area available for fodder cultivation. Hence the only way to bridge the wide gap between demand and supply is to increase productivity from unit area and so a possible measure in Kerala is to raise fodder as intercrop in the partial shade of coconut trees in home steads.

Grass speces suitable for the coconut understorey are relatively short, sod forming and shade tolerant. They should provide a moderate carrying capacity, easy to establish from cuttings, compete well with aggressive weeds and do not compete excessively with coconuts (Reynolds, 1988). Shading has both direct and indirect effects on forage production in that it can alter morphological development and yield (Kephart and Buxton, 1996).

Optimum quantity of potash is required for the efficient utitisation of nitrogen and phosphorus for herbage production, Based on this study the suitability of guinea grass varieties for the different shade intensities and requirement of potash for different shade levels can be standardised. Keeping this in view, the present investigation was conducted to study the shade response of guinea grass varieites and to assess the optimum potash requirement for maximum fodder yield under different shade intensities.

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Materials and Methods

Field experiment was conducted in the upland area of the Instructional Farm of College of Agriculture, Vellayani, Trivandrum in split-split plot design with 3 replications. Three levels of shade (0,25,50%), three levels of potassium (50,100,150 kg ha^{-1}) and two varieties of guinea grass (Hamil and Haritha) were combined to form eighteen treatment combinations. Shade levels were maintained by using shade nets. FYM @ 10 t ha^{-1} was applied uniformly to all the plots at the time of final preparation of land. Entire dose of phosphorus was given as basal @ 50 Kg ha^{-1}. Nitrogen @ 200 kg ha^{-1} was given in two equal splits one as basal and one after the second harvest. Healthy slips of guinea grass varieties as per treatments were planted at 40x20cm spacing @ 2 slips $hill^{-1}$. Harvesting of the crop was done at a height of 15cm from the base. Six cuts were taken, starting with the initial cut at 60 days after planting. Subsequent harvests were done at 45 days interval. Six observational plants were selected from each plot and observations were taken on plant height, number of tillers per hill, leaf : stem ratio and green fodder yield. The economics was also worked out based on cost of cultivation and prevailing market price of the fodder. Data relating to each character was analysed by applying the analysis of variance technique (ANOVA) as suggested by Panse and sukhatme (1967).

Results and Discussion

Growth characters

The results of the study revealed that the plant height increased as the shade intensity increased.

Table 1. Effect of varieties shade and potassium levels on growth parameters

Treatments	Plant height (cm)	No.of tillers hill^{-1}	Leaf : stem ratio	Green fodder yield (t/ha)
Shade levels				
S_0	167.96	29.08	1.24	100.31
S_1	174.29	27.34	1.24	95.47
S_2	180.90	21.66	1.21	67.21
S.Ed	0.07	0.02	0.03	0.05
CD	0.28	0.08	0.010	0.21
Varieties				
V_1	174.67	26.59	1.23	89.56
V_2	174.10	25.46	1.23	85.76
SED	0.06	0.03	0.01	0.05
CD	0.21	0.12	NS	0.17
Potash levels				
K_1	171.75	23.14	1.23	79.97
K_2	175.67	23.47	1.23	90.13
K_3	175.73	25.01	1.23	92.88
S.Ed	0.07	0.10	0.01	0.06
CD	0.21	0.31	NS	0.19

This increase in plant height with increase in shade intensity was observed in all the five cuts. Production of auxins are more under shaded conditions which results in strong apical growth, preventing side shoot sprouting. A similar result was also reported by Mullakoya (1982) in guinea grass cv. Mackueni. There was significant difference in plant height between the varieties only at the second harvest. Hamil recorded more plant height compared to Haritha. Application of potash had shown linear increase in the height of plant with increasing levels (Table 1). Potash is essential for vaious metabolic activities of living cells. This function of potash in the plant might have stimulated grasses to grow taller under higher doses of potash applications. It is well known fact that potassium promotes the growth of merstematic tissues (Tisdale *et al.,*1995)

The study revealed that shade has dominating influence on inhibition of tiller production. Tiller number declined with shading in first, second and fifth cuts. Maximum number of tillers were recorded at zero per cent shade. The increase in number of tillers may be due to the higher leaf area index which might have resulted in more carbohydrate assimilation. These findings are also in agreement with the observations made by Buxton (2001) in forages and by Wong (1993) in two tropical grasses *Paspalum malacophyllum* and *paspalum wettsteinii.* Tiller number was also significantly influenced by the varieties in all cuts except in fourth cut. Among the varieties, highest tiller number was recorded by Hamil compared to Haritha. Significant response for potash application was recorded in all cuts. Higher doses of pottassium recorded the maximum tiller numbers. Among various plant hormones, cytokinins, have been known to play important role in the growth of buds and tillers (Bruins, 1979). Therefore better potassium nutrition in fertilized plots resulted in significant increase in the number of tillers, probably through the increased chlorophyll content of leaves observed in this study.

Result on leaf : stem ratio showed that shade levels had significant influence in all harvests except in third cut. Leaf : stem ratio was higher in the open condition. The greater availability of sunlight in the open has greatly enhanced vigorous growth and higher tillering in grasses resulting in the higher production of larger leaves as evidenced by the high leaf area index under open.

Green fodder yield

Regarding the total green fodder yield, there was an yield reduction of 4.8 and 33.0 percent in 25 and 50 percent shade, respectively. The increased number of tillers, high root volume and high leaf area index in open may have contributed to the increased yield in open condition. In general yield of forages is linearly related to the amount of light available, and in a coconut plantation with 50 percent light transmission, the yield of highly productive grass like Panicum maximum will be approximately 50 percent of the yield achieved in full sunlight (Reynolds, 1995). Among the varieties, Hamil recorded 4.43 percent increase in green fodder yield compared to Haritha. This may be due to the higher number of tillers produced by Hamil and better uptake of nutrients. The highest dose of potassium (150 kgha^{-1}) recorded significantly higher green fodder yield in first, second and fifth harvest.An yield increase of 16.1 percent and 12.7 percent was obtained due to the application of 150 and 100kg K_2O ha^{-1} over 50Kg K_2Oha^{-1}.Potassium increases the plant height, number of tillers, leaf area, number of stomata and its apertures, net photosynthesis and efficiency of carbon dioxide assimilation owing to its role in many of the biochemical processes such as protein synthesis and carbohydrate metabolism and better potassium nourished plants grow vigorously (Jacob *et al,* 1973).

Economic analysis

Highest net returns and benefit : cost ratio was obtained under zero percent shade and higher dose of potassic fertilizer. Guinea grass can be economically cultivated in shade intensities unto 50 percent where the B:C ratio is 1.70 compared to 2.23 under open conditions. This is mainly due to the higher green fodder and dry fodder yield realized from the said treatments. Among the varieties, Hamil registered highest net returns and benefit: cost ratio compared to Haritha which is also due to the high fodder yield of the variety.

From this experiment it could be concluded that lower levels of shade and higher doses of

potassium registered maximum green fodder yield, highest net returns and benefit cost ratio. Among the varieties, Hamil registered higher green fodder yield in all harvests.

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