Effect of Fertilizer on the Growth of Gigantochloa ssp. (buluh brang) in Peninsular Malaysia

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ABSTRACT

Bamboo is one of the most important non wood resources as their utilization varies and will reach maturity faster than other woody plants. Malaysia still depends on wild bamboo resources for this reason, commercial bamboo plantations need to be developed in order to fulfill future demand. *Gigantochloa spp.* is one of the species that can produce edible shoots and can also be used in the handicraft industry. The effect of organic and inorganic fertilizers was done on *Gigantochloa spp.* at Seremban, Negeri Sembilan, Peninsular Malaysia. This research was done to determine the best fertilizer type and rate to produce higher growth rate and quality bamboo shoot for *G. spp*. A simple randomized complete block design (RCBD) was used in the experiment. There were eight replicates in the trial plot where each replicate consisted of eight clumps treated with fertilizer. Two types of fertilizer were used in this study; chicken dung and NPK at four rates of fertilizer: 0, 0.5, 1 and 1.5 kg. The parameters measured were diameter at breast height (dbh), number of culms, number of shoot and height of shoot once a month for six months. The results showed significant differences in growth performance and bamboo production between types of fertilizer applied. However, when analyzed between different rates of fertilizer, only dbh and number of culms presented significant differences of 0.00 p-value for both at 0.5 significant level. NPK applied at 0.5kg produced the highest dbh mean number of 19.94 and culms mean number of 6.90.

Keywords: *Gigantochloa brang*, organic fertilizer, growth performance, bamboo shoot

Introduction

Bamboo grows in the tropical and subtropical regions of the world, mainly in Asia, Africa and South America. Bamboo is a tall tropical grass with hollow, woody stem and is the fastest growing botanical species, taking about four years to reach maturity (Anonymous 1991).

Bamboo shoots have been recognized as a delicious food and the culms are utilized widely in various forms, including traditional uses and commercial products. The main commercial

products are baskets, chopsticks, skewers, joss papers and handicraft items (Wong 1989, Azmy 1989).

Bamboo shoots for the local market in Malaysia still depend on wild sources. They are nutritious with low calories. However, because of the presence of cyanogens, which give a bitter taste to the shoots, only selected species of bamboo can produce edible shoots including buluh brang (*G.brang*) (Abd. Razak 1992).

The vegetation can be pure stand or mixed with other species in the forest. Bamboos require sites with good drainage and aeration. They do not favor waterlogged conditions, therefore are very seldom found in swampy areas. Bamboo growth is initiated when the young shoot sprouts from the soil especially after the onset of the rainy season. Rapid sprouting depends on the bamboo species and soil fertility (Azmy and Abd. Razak 1991).

Important factors that affect the survival and growth performance in the nursery and field are portion of the culm used, size and technique of preparing cutting, time of collection and planting, rooting technique and medium and environmental considerations like soil, temperature and moisture (Anonymous 1991).

Methods

Two hundred culms were planted in the 0.35 ha land, where the planting distance between clumps was 4 x 4 m. However, only 64 healthy culms were chosen randomly for observation. The data collection started in June 2009 when the average age of the bamboo clumps was one year.

Fertilizers being used were chicken dung and NPK applied at four different rates, i.e. 0, 0.5, 1 and 1.5 kg. Even though the data collection was started in June 2010, the application of fertilizer was done every six months (after three months of planting) using the broadcast technique around the seedlings.

The first data were collected two weeks after the third fertilizer application and then every month until six months. The parameters measured were diameter and number of culms, number of shoots and height of shoots. The observations on the of number of culms and diameter of culms included those already in the clumps before the study and the observation on number of shoots and shoot height only included those that appeared after the study began.

After six months, all the data were analyzed using ANOVA in SPSS statistical analysis. The results are presented in the following tables and charts.

Results and discussions

Table 1 gives the result of 2-way ANOVA test on bamboo growth. Significant difference was seen in every parameter in the fertilizer treatments where NPK gave higher readings. However, different rates of fertilizer were only significant for the dbh and culm number.

Table 1. Effects of fertilizer and dosage on bamboo growth

Source	Df	DBH (mean)	No. of culm (mean)	Shoot Number (mean)	Shoot Height (mean)
Rate (R) *0 kg*		14.600[c]	5.494[c]	.385	5.917
0.5 kg		19.935[a]	6.899[a]	.542	6.837
1.0 kg		18.406[ab]	6.715[ab]	.670	7.108
1.5 kg		16.460[b]	6.194[b]	.420	6.199
Fertilizer (F) *Chicken Dung*		14.937	5.948	0.396	5.226
NPK		19.763	6.804	0.613	7.810
Rate x	3	*	*	ns	ns
Fertilizer	1	ns	ns	ns	ns
First-order interaction RFX Residual: Total:	1	ns	ns	ns	ns

*Significant different at 0.5

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The results were analyzed further using Duncan analysis; application of 0.5 kg of NPK was markedly the best to produce the highest mean dbh and number of culms.

To illustrate the results, Figure 1 was developed and clearly showed that the best growth given by the application of 0.5 kg NPK whereby in almost every month the highest value was displayed. The number of shoots and height were not significant in the dosage treatment may be due to a few factors such as number of replicates and sample size. More replicates and samples could have produced a different result. Another factor was probably the fact that the data were collected every month, instead of every week, because in one month, a shoot may change into a culm as not to be included in the shoot's data.

In addition, the figure indicates that the number of shoots increased when applied with fertilizer and the highest increase was the application of 0.5 kg of NPK, in the second month of application.

A longer period of study might give a better result because Malaysia has wet and dry seasons throughout the year and bamboo shoot growth is affected by the seasons. In areas of high rainfall, usually in the range of 1270 to 6350 mm, bamboos showed high growth rates. Growth rates were reduced under semi- dry conditions of 762 to 1016 mm precipitation (Tewari 1992).

Among the important factors that affect the survival and growth performance of bamboos were environmental considerations like soil, temperature and moisture (Anonymous 1991).

Data of climate in Table 2 were collected in year 2009 and the rainfall figure in Figure 2 was developed to show clearly amount of the rainfall. The total amount of rainfall in that year was 2728.8 mm, which is a suitable amount to produce good growth of bamboo. Based on Figure 1, November presented the highest increase in dbh and number of culms compared with other months, proving that high rainfall promotes growth. However, to explain why number of shoots was given in the highest the second month of fertilizer application, which is July, needs further study.

Conclusion

From the research, significant differences in bamboo growth and shoot were seen between using chicken dung and NPK. In the number of culms at the end of the experiment, every rate of NPK application achieved more than 230 culms, while for chicken dung only about 200 culms were obtained. Also in dbh, every dosage of NPK produced an average per culm of more than 90 cm, while chicken dung only produced only 70 cm. However, the significance differences between rates of fertilizer applied only appeared in dbh and number

of culms and not for shoot number and height. The best rate of fertilizer to be applied for *G. brang* was 0.5 kg of NPK because it gave the highest growth performance of culms compared to chicken dung. NPK is thus recommended to farmers as a suitable fertilizer to increase the growth performance of the bamboo.

Recommendations

Based on the research, we suggest that the results obtained be confirmed by another study with a bigger sample size and a longer period of observation on the growth performance of the bamboo shoots. Also the data must be collected more frequently every week to avoid missing measuring the bamboo shoots as they develop.

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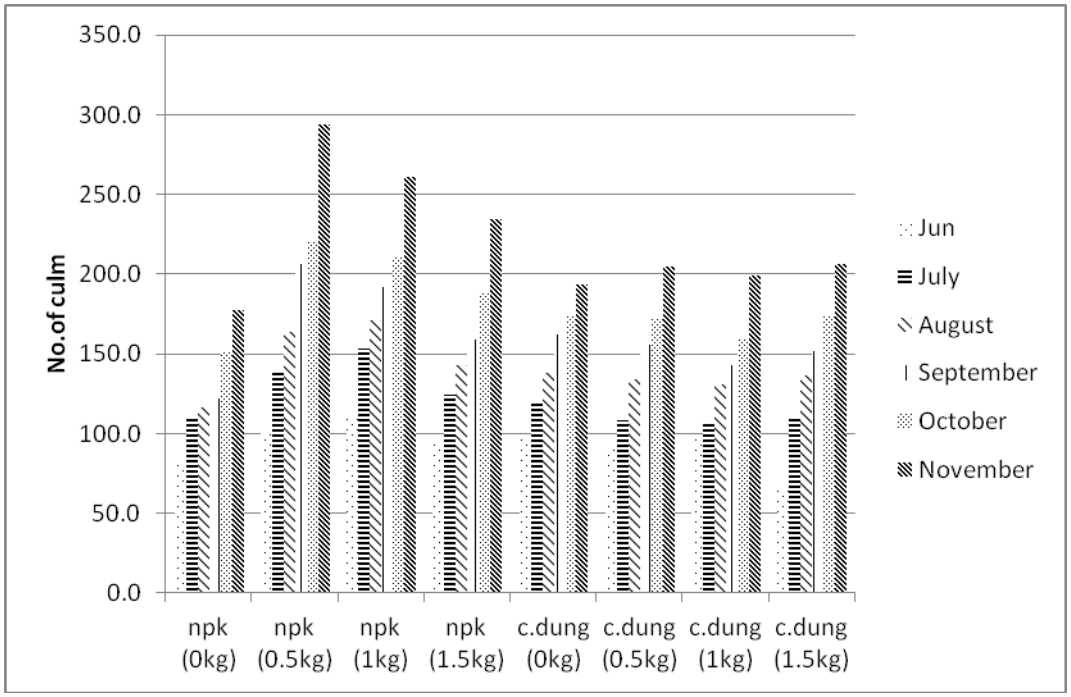

Figure 1. Number of culms based on dosage of fertilizer

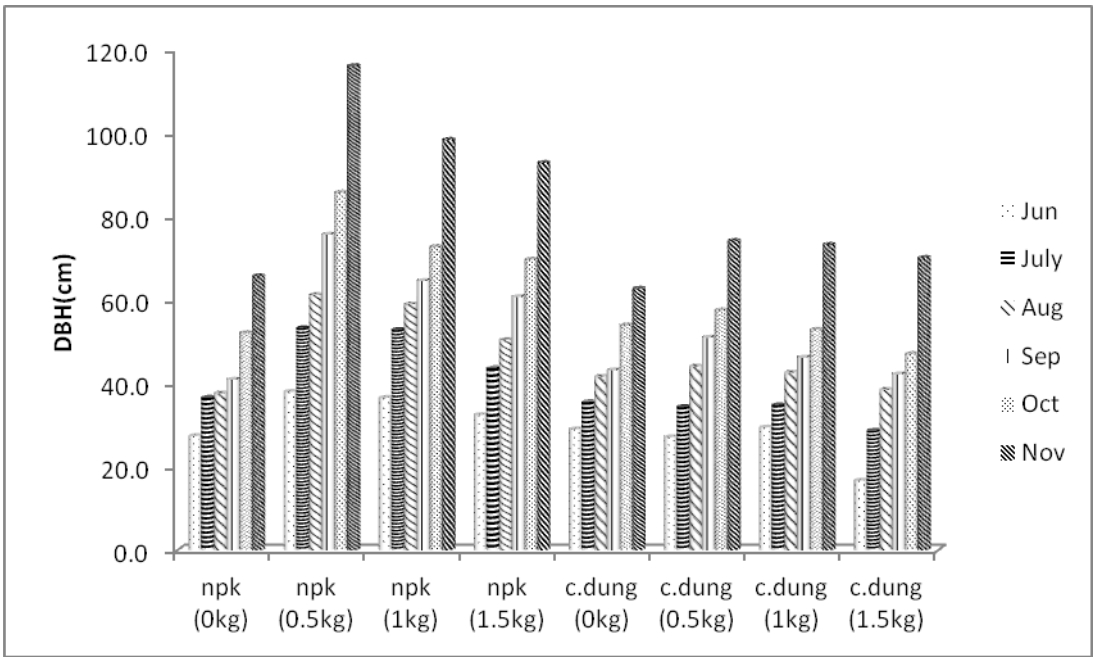

Figure 2. Dbh of bamboo based on dosage of fertilizer

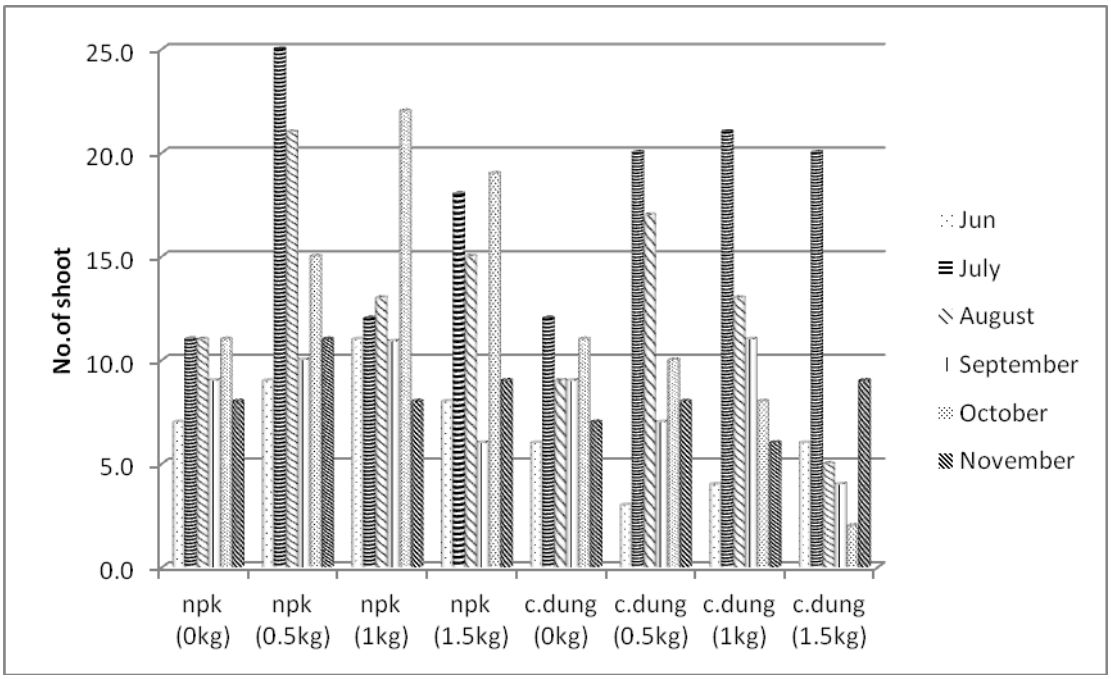

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Figure 3. Number of shoot based on dosage of fertilizer

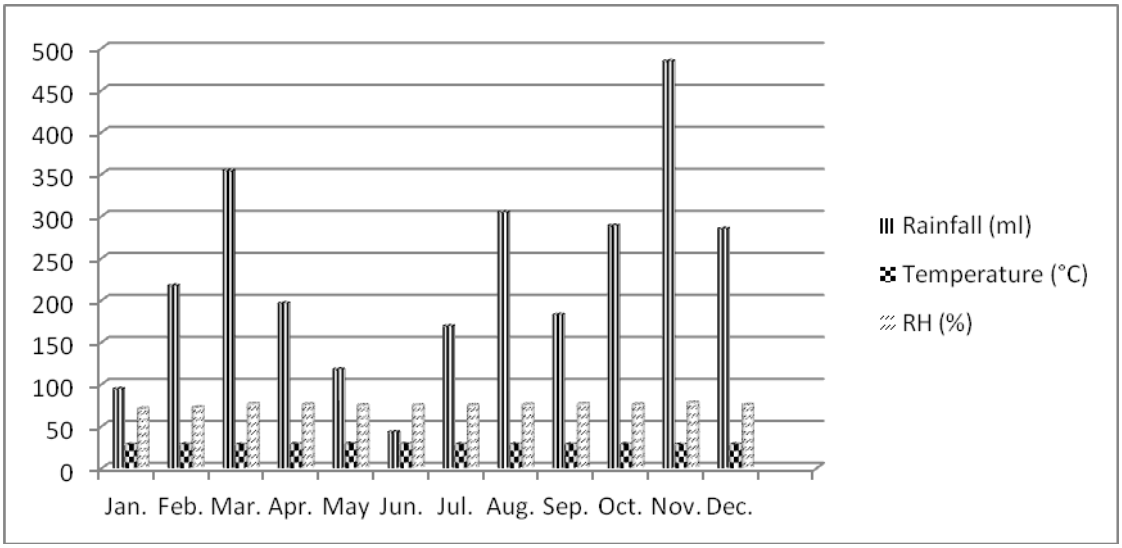

Figure 4. Climate based on month