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INTENSIFICATION IN BAMBOO (*Bambusa bambos* L.) TRAITS IN RESPONSE TO ORGANIC AND CHEMICAL NITROGEN ALONG THE COAST OF ARABIAN SEA

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ABSTRACT

Nitrogen is one of the most essential macronutrient which effects the plant growth and development. To check the influence of nitrogen sources on bamboo traits a field experiment was conducted during 2014-15. Experiment were carried out using randomized complete block design (RCBD) with square system of transplanting which was consist of 3 repetitions contained a net field size of 4.5m to 4.5m. Experimental sites were 20 km away from the Arabian Sea with an altitude of 2m. The bamboo (*Bambusa bambos* L.) plants were grown with four fertilizer sources i.e. S_0 = Control (0) kg N ha^{-1}, S_1 = urea (120 kg N ha^{-1}), S_2 = Farm Yard Manure (FYM 1% N), S_3 = Combination {50% N from urea (the recommended dose) + 50% N from Farm Yard Manure (FYM)}. A recommended dose of nitrogen was used as chemical source and applied at the rate of 120 kg N ha^{-1}. Significant differences were reported for studied traits in response to treatments. The results indicated that significant correlation was found among the traits such as plant height, number of culms per plant, stem diameter of culms and growth rate of newly emergence culms per day also showed higher vigour under the application of treatment combination {50% N from urea (the recommended dose) + 50% N from Farm Yard Manure (FYM)}. It was suggested that the growing of bamboo should be produced through the use of combination of chemical {50% N from urea and organic N (50% N from Farm Yard Manure).

Keywords: *Bambusa bambos* L., Farm yard manure, Urea, Correlation, Regression, Principal component analysis

1. INTRODUCTION

Bamboo belongs to the Poaceae family and is the tallest grass in the world. It is versatile in uses such as an in costly foundation of material for accommodation and edifice; poultry shed making, scaffolding, fixtures, handiwork, farming tools and farm cart, melodious tool, flesh and paper fabricate, game, engineering commodities such as bamboo strips and plywood, and countless things. Bamboo fixes by the side of river bank and watercourse to grasp the land against erosion. Immature shoot of some species of bamboo are consumed as foodstuff in different ways. Bamboo stems are mature within 3-5 years. Due to fast growth it is immensely industrial plants. Mostly bamboo is cultivated in Philippines, Bangladesh, China, India and some part of Pakistan (Roxas, 2010; Rivera, 2010 and Philippine Council for Agriculture, Forestry and Natural Resources Research and Development, 2003). Bamboo granted employment too many farmers on land. However significance and the pains depleted on bamboo research is at bottom in comparison to other agricultural crop equally in name of nutrients

management research. In my opinion fundamental research in bamboo is much significant for the bamboo cultivation. Scientist cannot answer the questions raised by the consumer: be acquainted by means of yields, Here we can say bamboo is a incredible plant, we can embroider its yield for the reason of keenness, previous research showed that some clone of bamboo are highly drought resistant. Query similar can be respond further simply for other agricultural crops. The major cause is that additional research labours and capital are used up in other plants, and too little in bamboo is needed (Gielis, 1998).

Gonzales *et al*. (2000) examined the special effects of 2 levels of fertilizer doses (whole fertilizer (120-90-90) and lacking fertilizer (0-0-0)); 3 yielding intensities (0%, 50%, and 100% yielding of three year old stem and older); and 2 stage of felling cycles (each year and every 2 years) on the development of different species. In Kenya farmers shifted from tobacco cultivation to bamboo cultivation for better livelihoods (IDRC, 2011; Kibwage *et al*., 2008 and Arori *et al*., 2011). Generally farmers are using nitrogen only and not pay attention to application of other macro -micro-nutrients, which are necessary for enhancing crop production and commodity quality. Organic material improves the micro-nutrient status in soil. According to the Liebig law of minimum, yield is increased to maximum with addition of any nutrients to a level then it tends to be decrease to minimum in spite of addition of that nutrients (Cheng, 1997) recommended that humic acid which are biotic in origin enhanced the growth of cell membranes, which results more absorption of water and essential nutrients .Organic manure improve the soil structure. Due to N-fixation and accessibility of macro- micro nutrients is enhanced. Humus improved the consumption of nutrients by increasing water uptake ability of soil (Gajri *et al*., 1994). Acidity in soil reduce the crop growth and production overall (Akinrinde *et al.,* 2005). In a field study macro and Ca nutrient improved the produce overall but Ca reduce indirectly (Ahmad, 1980). Hirzel *et al*. (2007) carried out a 2 year field study to check the impact of poultry litter. Consequence pertain that poultry litter react as alternative nutrient which enhance the maize yield. The remaining of nutrients effects in 2 year after doses improved 30-50% of cotton yield and 25-65% maize yield (Charles and Shuxin, 2005). The experiment was conducted with the objectives: To study the influence of organic and inorganic nutrients on the growth of bamboo at the ecology of arid climates.

2. MATERIALS AND METHODS

A field experiment was carried out for judging the intensification of Bamboo (*Bambusa bambos* L.) traits in response to organic and chemical nitrogen (N) applications at research area of Lasbela University of Agriculture Uthal, Lasbela, Pakistan during 2014-15.Composite soil samples were collect from the field within a 30 cm with soil sampler before planting. Collected soil taster was checked in laboratories for its nutrient value. Experimentation was carried out using (RCBD) design with square system having an area 4.5m x 4.5m with 3 repetitions each. Experiment comprised the bamboo (*Bambusa bambos* L.) with four fertilizer sources i.e. S_0 = Control (0) kg N ha^{-1}, S_1 = Urea (120 kg N ha^{-1}), S_2 = Farm Yard Manure (FYM), S_3 = Combination {50% N from urea (the recommended dose) + 50% N from Farm Yard Manure (FYM)}.Planting area was prepared before conducting experiment with deep tillage implements. Nutrient was applied accord-ing to the suggested dose. In experiment chemical urea were used as nitrogen @ (120 kg ha^{-1}) in divide doses. The entire farm yard manure was applied at the time of sowing. The entire nutrient added from organic sources was applied three weeks before sowing. The first irrigation was applied at transplanting of bamboo

plant. Plants were selected from one year old nursery. Remaining traditional practices were same for the experiment. The following parameters like plant height at maturity (cm), culm number, stem diameter of culm and growth rate of newly emergence culm per day were recorded and analyzed statistically for different comparisons means (Steel *et al.,* 1997).

3. RESULTS AND DISCUSSION

The results from table 1 indicated that there were important variations among the treatments. It was persuaded from the results (Table 2) that higher culm height, number of culm per plant, stem diameter of culm and growth rate of newly emergence culm per day was recorded for urea (50%) + farm yard manure (50%) as compared with alone use of both urea and farm yard manure. The results were also conformed from principal component biplot figure 1 that urea (50%) + farm yard manure (50%) contributed more to improve growth and yield of bamboo plant as compared with other treatments applied. Our results were similar as reported by Ayoola and Adeniyan (2006) from two experiments which were conducted to check the impact of macro nutrient and poultry manure on the biomass and other acquiesce related parts in cassava/maize/melon systems. The action was cropping system: cassava/maize/melon, only cassa -va, only maize, only melon. Finding showed cassava root yield not effected from intercropping but maize and melon seed yield reduced. In all treatment except control yield was same while in control yield is low. Similarly, Amujoyegbe *et al*. (2007) used following sources of nutrient in field trail: inorganic fertilizer (IF, mixtures of inorganic fertilizer + poultry manure (IFPM), Poultry manure (PM) and a control. The finding concluded more economical biomass in sorghum and maize in relation to remaining treatment. Leaf size and chlorophyll portion of maize was also improved through IFPM (Sekhon *et al.,* 1994) Consequence of PC on drizzling period was not well-known according to FYM and PM, but its left over result on biomass of wheat was as good as natural manures. The correlation analysis (Table 3) was performed to check the association among the traits studied and it was found that all the studied traits were significantly correlated with each other. Regression analysis showed (Table 4) the most contributing traits and performed to select genotypes of crop plant from large population and large number of traits studied (Ghosh *et al*., 2004 and Ali *et al*., 2016). In our present study, the studied traits showed positive relationship with each other and showed positive effect for culm height. The most contributing traits were number of culms per plant followed by growth rate of newly emergence culms per plant and stem diameter of culm (Table 4).

The respected regression equation was: $Y = 0.98 + (0.701X_1) + (0.815X_2) + (0.605X_3)$

Principal component analysis was performed to access the variation among the traits (Table 5) to make selection on the basis of studied traits. There were two principal components PC1 and PC2 obtained which 94.15% and 3.86% variation respectively (Fig 1). All the studied traits showed nearly equal contribution in total variation under different traits applied. The traits showed higher variation may be used to select higher plant growth and yield (Ali *et al*., 2016).

CONCLUSION

The results designated that significant correlation was originate among the bamboo traits of plant stature, culms , stem diameter of culm & growth rate of newly emergence culms per day also illustrate higher intensification under the appliance of treatment combination {50% N from urea (the recommended dose) + 50% N from Farm Yard Manure (FYM)}. It was suggested that the growing of bamboo should be ensue through the use of combination {50% N from urea (the recommended dose) + 50% N from Farm Yard Manure (FYM)} applications.

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Table 1: Analysis of variance for studied traits of bamboo

Treatments	Culm height (m)	Number of culm per plant	Stem diameter of culm (cm)	Growth rate of newly emergence culm per day (cm)
Control (0) kg N ha^{-1}	4.101*	2.900*	3.021*	7.001*
Urea (120 kg N ha^{-1})	35.091*	39.099*	78.023*	67.982*
Farm Yard Manure (FYM)	27.017*	48.022*	77.991*	62.128*
Combination {50% N from urea (the recommended dose) + 50% N from Farm Yard Manure (FYM)}	56.246*	98.001*	84.920*	102.093*

Table 2: Comparison of chemical and organic nitrogen sources for different traits of bamboo

Treatments	Culm height (m)	Number of culm per plant	Stem diameter of culm (cm)	Growth rate of newly emergence culm per day (cm)
Control (0) kg N ha^{-1}	2.6^{d}	4.1^{d}	05.39^{d}	06.5^{d}
Urea (120 kg N ha^{-1})	8.5^{b}	8.5^{b}	10.62^{c}	10.52^{c}
Farm Yard Manure (FYM)	7.73^{c}	8.2^{b}	13.96^{b}	13.66^{b}
Combination {50% N from urea (the recommended dose) + 50% N from Farm Yard Manure (FYM)}	9.4^{a}	12.5^{a}	15.73^{a}	15.17^{a}

Table 3: Correlation among studied traits of bamboo

Treatments	Culm height	Number of culm per plant	Stem diameter of culm
Number of culm per plant	0.361*		
Stem diameter of culm	0.472*	0.627*	
Growth rate of newly emergence culm per plant	0.562*	0.724*	0.582*

***** = Significant at 5% probability level

Table 4: Stepwise linear regression analysis for culm height of bamboo

Parameter	estimate	S.E.	T	P	Partial R^2 %
Growth rate of newly emergence culm(X_1)	0.701	0.265	2.64	0.118	11.80
Number of culmsperplant(X_2)	0.815	0.251	3.25	0.083	8.30
Stem diameter of culm(X_3)	0.605	0.204	2.96	0.098	9.80

Intercept = -0.98, R^2 = 66.7, Standard error = 1.76.

Table 5: Principal component analysis for studied traits of bamboo

Percentage variation	94.15	3.86
Variables	**PC1**	**PC2**
Culm height	0.49106	0.65409
Growth rate of newly emergence culm	0.50387	-0.52984
Number of culm per plant	0.49751	0.32817
Stem diameter of culm	0.5074	-0.42864

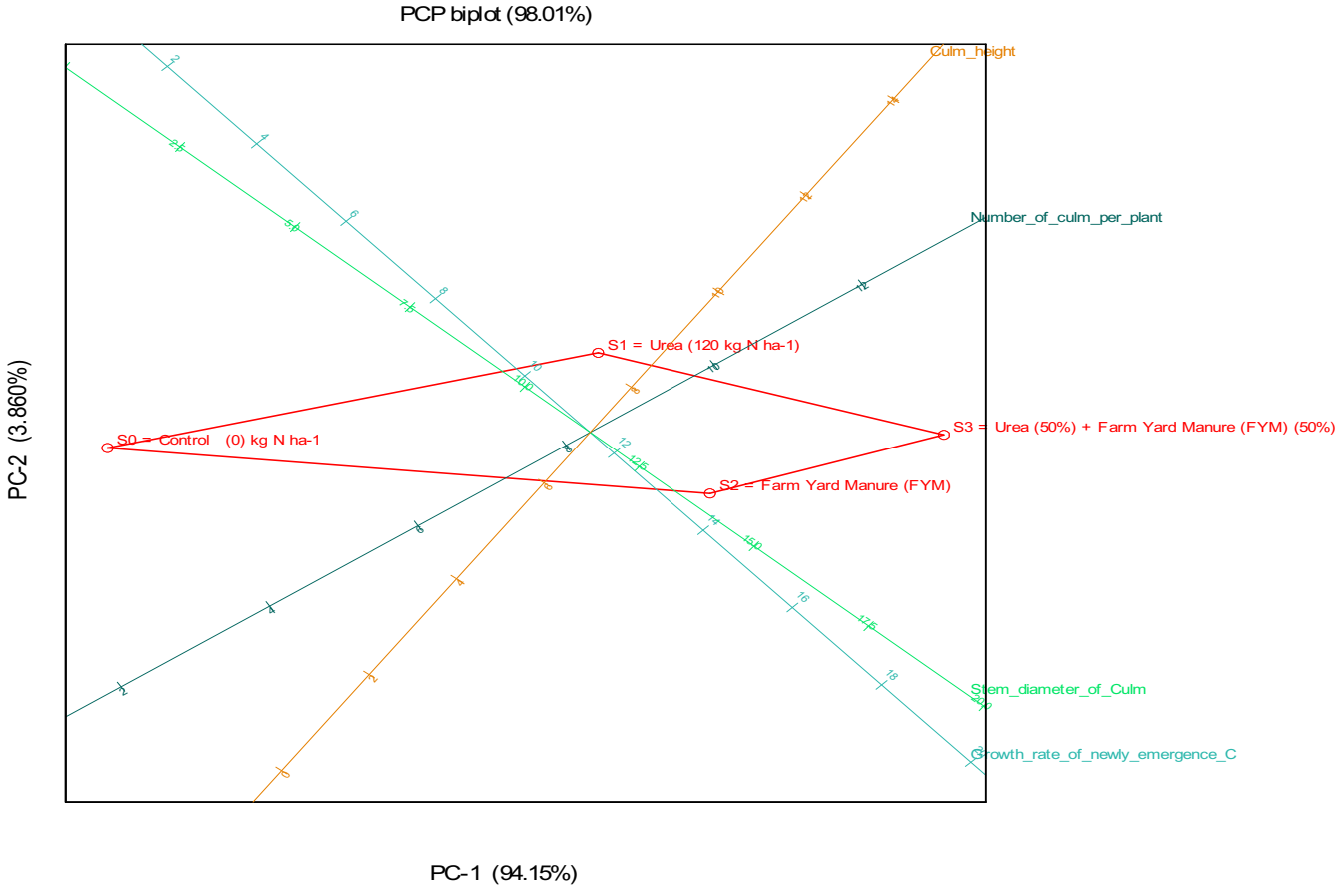

Figure1: Principal component biplot for different treatments and traits of bamboo