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Studies on growth and yield attributes of different kenaf genotypes influenced by various fertlizer levels

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Abstract
The experiment was conducted during *Kharif* 2016 at Tamil Nadu Rice Research Institute, Aduthurai, Thanjavur for studying the effect of different fertilizers levels on kenaf genotypes. The treatments comprises are such as a. Genotypes: JRK 2011-1 (V_1), JRK 2011-2 (V_2), AMC 108 5 (V_3) and HC 583 (V_4); Fertilizer levels: Control (F_1), 40:8.7:16.7 kg NPK /ha (F_2), 60:13:25 kg NPK /ha (F_3) and 80:17.5:33.3 kg NPK /ha (F_4). The results revealed that fertilizers levels significantly influenced on plant height, basal diameter and fibre yield of kenaf genotypes compared to control. Among the different genotypes, JRK 2011-2 recorded higher plant height (313 cm), basal diameter (1.42 cm) and fibre yield (22.14 q/ha) compared to other genotypes. In case of fertilizers levels, application of 80:17.5:33.3 kg NPK /ha recorded higher plant height (340.6 cm) and basal diameter (1.50 cm) and fibre yield (23.83 q/ha) which was at par with other levels. It concluded that application of 60:13:25 kg NPK /ha for JRK 2011-2 produced higher fibre yield.

Keywords: Kenaf genotypes, fertilizers levels, economics of kenaf

Introduction
Kenaf (*Hisbiscus cannabinus* L.) is one of the fibre crop among the various fibre crops which is fast growing annual crop belongs to malvaceae family, known for both its economic and horticultural importance (Mostofa *et al.* 2013) [7]. Africa is origin of kenaf and its various diversified forms of species are widely grown (Cheng *et al*. 2004) [4]. Kenaf is cultivated in both tropical and temperate climates of the world and thrives well under abundant solar radiation. Other the fibre production, its seed is also economically important because it has the potential of edible oil (Patil and Thombra, 2013) [8]. Kenaf oil contains fatty acids which are similar to cotton seed oil. The seeds can also be used for cooking, lubrication, soap manufacturing, cosmetics, linoleum paints and vanishes (Ten and Wang, 2006). The yield of kenaf depends on genotype (G), environmental (E) factors and G X E interactions (Agbaje *et al*. 2011) [1]. Yield can be improved by increasing the individual potential of each kenaf plant, or by increasing the yield per surface unit area through high population densities (Makinde, 2011) [6]. High yield stability usually refers to a genotypes ability to perform consistently, whether at high or low yield levels, across a wide range of environments and seasons (Robinson, 2008) [9]. Yield is defined as a measurement of the amount of crop that was harvested per unit of land area and the components of yield in the case of kenaf include number of seeds, weight of seed and quantity and quality of fibre. The yield components and the inherent physiological activities involved in their formation interact with the crop growth environment and management practices to affect yield (Charles *et al.* 2002) [3]. Plant breeding aims to improve crop production either within a given macro-environment or in a wide range of growing conditions. Fertilizer application is necessary for high yielding Kenaf. There are many reports published on fertilizer requirement for kenaf production (Patane and Sortino, 2010). Farmers are not well known of better kenaf production technology that hinders the expected production of Kenaf and fibre and seeds are grown conventionally (Banghoo *et al.* 2008) [2]. Poor fertilizer management practices also a cause for low yield of Kenaf. Therefore, the production of quality kenaf fibre in the country is very much essential to meet the increasing demand and expand this valuable crop. Taking into account all these essentials, upgrading of fiber yield and quality of Kenaf is the prime need of Bangladesh. In this aspect, research regarding development of new high yielding variety of Kenaf and determination of its

fertilizer requirement is very important. Therefore, the present study has been undertaken to observe the effects of N, P, K on different genotypes of kenaf and to find out the optimum requirement of nutrients combination to obtain highest fibre production.

Materials and Methods

a. Experimental site

The field experiment was carried out at Tamil Nadu Rice Research Institute, Aduthurai, Thanjavur during *Kharif* season 2016 under irrigated conditions. The experimental site was located at 11º North latitude and 79º East longitude at an altitude of 19.5 m above Mean Sea Level (MSL). The region is characterized by a sub-tropical climate with a hot dry summer (March-June), and extended wet period from September to February. Average annual rainfall is about 1078 mm, majority of which was received during North East Monsoon. The soil of the experimental site was clay in texture and moderately drained. The experimental soil was classified as alluvial clay and composed of 13.6% sand, 61.2% silt, and 25.3% clay, pH 7.5 (1:5 H2O) and EC 11.6 mS m^{-1} with medium in available nitrogen and phosphorus and high in potassium content.

b. Treatment details

The experiment was laid out in Factorial Randomized Block Design with three replications. The treatments comprises are such as a. Genotypes: JRK 2011-1 (V_1), JRK 2011-2 (V_2), AMC 108 5 (V_3) and HC 583 (V_4); Fertilizer levels: Control (F_1), 40:8.7:16.7 kg NPK /ha (F_2), 60:13:25 kg NPK /ha (F_3) and 80:17.5:33.3 kg NPK /ha (F_4). Four genotypes of kenaf (*Hibiscus cannabinus* L) used in this experiment and their seeds were obtained from National Research Institute for Jute and Allied Fibres, Indian Council Agricultural Research, Kolkata. The seeds of mesta was treated with Mancozeb @ 3 g/kg seed against foot and stem rot disease and sown with a spacing of 40 x10 cm. Farm yard manure @ 5 t ha^{-1} was applied during last ploughing. The crop was maintained by adopting the recommended package of practices. Need based plant protection measures were taken up during crop growth period. At harvest, five plants were selected from each plot in all the 4 genotypes and their replicates and data on plant height, basal diameter and fibre yield were recorded periodically and the data was analysed as per the standard statistical procedures described by Panse and Sukhatme (1985). The crop was harvested when 80% of the plants showed the sign of maturity. After shedding of leaves, the bundles were steeped plot-wise in pond water for 15-20 days for retting and fiber was extracted.

Results and discussion

The experimental results revealed that combined fertilizer doses focused the significant positive effect on the yield contributing parameters like plant height, base diameter and fibre yield with different genotypes (Table 1). The yield and yield components i.e. plant height, base diameter, yield of fibre and stick were significantly increased over control by different rates of fertilizer levels. Among the different genotypes, JRK 2011-2 recorded higher plant height (313 cm), basal diameter (1.42 cm) and fibre yield (22.14 q/ha) compared to other genotypes such as 304.6, 295.9 and 288.4 cm; 1.34, 1.34 and 1.29 cm and 19.67, 19.0 and 19.09 q/ha of plant height, basal diameter and fibre yield in JRK 2011-1 (V_1), AMC 108 5 (V_3) and HC 583 (V_4) respectively. With respect fertilizer levels, application of 80:17.5:33.3 kg NPK /ha recorded higher plant height (340.6 cm) and basal diameter (1.50 cm) and fibre yield (23.83 q/ha) compared to other fertilizer levels such as 314, 332.8 and 214.4 cm; 1.29, 1.42 and 1.17 cm and 21.08, 22.82 and 11.42 q/ha of plant height, basal diameter and fibre yield in 40:8.7:16.7 kg NPK /ha (F_2), 60:13:25 kg NPK /ha (F_3) and control (F_4) respectively. The increased fibre yield due to enhancing application of fertilizers may be because of the climatic conditions and nutrient available in the soil more over kenaf also nutrient demanding crop. Similar findings reported by Hossain *et al.* 2011 [5].

The interaction of genotypes and fertilizer on fibre yield was found significant. Fibre yield of JRK 2011-2 at 60:13:25 kg NPK /ha (25.06 q/ha) was statistically at par with fibre yield of both JRK 2011-1 (25.66q/ha) and JRK 2011-2 (25.58 q/ha) and significantly higher than fibre yield of check varieties at both the fertilizer levels. The results were also conformity with the findings of Zainul and Mansur (2001) [10] and Daud (2006).

Similarly, maximum net return (Rs.35362/ha) was recorded with 80:17.5:33.3 kg NPK /ha however maximum benefit cost ratio of 1.83 recorded in 40:8.7:16.7 kg NPK /ha.

Table 1: Growth and yield attributes of kenaf influenced by different levels of fertilizers

Treatments	Plant height (cm)	Basal diameter (cm)	Fibre yield (q/ha)	Net return (Rs.ha^{-1})	B:C
Genotypes					
V_1 - JRK 2011-1	304.6	1.34	19.67	27231	1.63
V_2 - JRK 2011-2	313.0	1.42	22.14	35456	1.83
V_3- AMC 108 5	295.9	1.34	19.00	24402	1.55
V_4- HC 583	288.4	1.29	19.09	24609	1.55
SEm±	2.5	0.01	0.27	-	-
CD (p=0.05)	7.2	0.02	0.77	-	-
Fertilizer levels:					
F_1- Control	214.4	1.17	11.42	8264	1.26
F_2- 40:8.7:16.7 kg NPK /ha	314.0	1.29	21.08	33567	1.83
F_3- 60:13:25 kg NPK /ha	332.8	1.42	22.82	34506	1.76
F_4- 80:17.5:33.3 kg NPK /ha	340.6	1.50	23.83	35362	1.70
SEm±	2.8	0.02	0.29	-	-
CD (p=0.05)	8.1	0.05	0.88	-	-

Conclusion

The results of study on effect of genotypes under different fertilizer levels revealed that the growth and yield attributes were significantly influenced by factors studied. Thus, it may be concluded that application of 60:13:25 kg NPK /ha for JRK 2011-2 produced higher fibre yield which also gave higher net return. Therefore, it is recommended to farmers for adopt the fertilizer level of 60:13:25 kg NPK /ha in kenaf for better yield and income.

Table 2: Growth and yield attributes of kenaf influenced by different levels of fertilizers

Treatments	Fibre yield (q/ha)			
	Fertilizer levels			
	F_1- Control	F_2- 40:8.7:16.7 kg NPK /ha	F_3- 60:13:25 kg NPK /ha	F_4- 80:17.5:33.3 kg NPK /ha
Genotypes				
V_1 - JRK 2011-1	11.66	19.66	21.66	25.66
V_2 - JRK 2011-2	13.23	24.66	25.06	25.58
V_3- AMC 108 5	10.41	20.16	22.36	23.06
V_4- HC 583	10..35	19.83	22.16	24.00
SEm±	0.55			
CD (p=0.05)	1.58			

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