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Effect of spacing on the growth and yield of 'Mukhikachu'

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Abstract: An experiment was conducted at the Crop Botany Farm of Bangladesh Agricultural University, Mymensingh, during the period from March to October, 2006 to find out the effect of plant spacing on the growth and yield of Mukhi Kachu. Nine plant spacings viz. 75x 45cm, 75x 35cm, 75x 25cm, 60x 45cm, 60x 35cm, 60x 25cm, 45x 45cm, 45x 35cm and 45x 25cm were used in the study. Plant spacing showed positive influence on the height of main plant, total number of leaves hill^{-1}, number of leaves of main plant, number of leaves of suckers hill^{-1}, fresh and dry weight of lamina and leaf sheath, number of suckers, number of corms and cormcls, fresh and dry weight of corm and cormels, yield of corms and cormels. Yields of corms and cormels were increased with the decrease in plant spacing up to 60x 25cm. However, the closest spacing of 45x 25cm produced lower yield probably due to inter plant competition. The highest yield of cormels (20.24 t\ha) was obtained from the spacing of 60x 25cm.
Key words: *Colocasia esculenta*, Cultivar, Spacing on the growth and Yield.

Introduction

Mukhi Kachu *(Colocasia esculenta* cultivar. Pancho Mukhi.) belongs to the family Araceae, is well known as taro in Western countries and Dasheen in tropical America (Coursey and Hayness, 1970). As a food crop it compares favourably in nutritional value with other root crops such as cassava, yam, sweet potato and other edible aroids having 25% carbohydrate (Rashid and Daunicht, 1979). Mukhi Kachu is a popular indigenous vegetable in Bangladesh. There is enough, supply of vegetables in winter. However its availability becomes very limited in summer especially late summer in Bangladesh. Aroids occupy an important position as vegetable in that scarce period (Basak and Maleque, 1992). The edible aroids which include Mukhi Kachu *(Colocasia),* Pani Kachu *(Colocasia),,* Maan Kachu *(Alocasia)* and Dud Kachu *(Xanthosoma)* were grown in about 23887 hectares of land in Bangladesh with an annual production of 182000 metric tons during 2004-2005 (BBS, 2006). The insufficient production of edible aroids can be increased by proper management practices, using improved technologies, high yielding genotypes, using plant growth regulators etc. Plant spacing is an important aspect among the crop production :systems. The growers choose plant spacing of Mukhi Kachu according to their own choice as there is no standard production spacing. The present study was undertaken to investigate the effect of plant spacing on the production of Mukhi Kachu.

Materials and Methods

The present research work was carried out at Crop Botany Farm of Bangladesh Agricultural University, Mymensingh during the period from March to October, 2006. The cormels of Mukhi Kachu cultivar. Pancho Mukhi used in the experiment were obtained from previous cropping year (2005) from the Kapasia thana under the Gazipur district. The average weight of seed cormel was (20±2) g. The cormels were kept in a room temperature (26±2^{0}C) for 15 days before planting. The land for the experiment was opened on 20 February, 2006. The experimental plot was then thoroughly prepared by ploughing and cross ploughing with power tiller followed by laddering to obtain a good tilth. The experiment was laid out in the Randomized Complete Block Design (RCBD) with three replications. The size of each unit plot was 2m x 1.5m. The treatments included different spacing such as 75x 45cm, 75x 35cm, 75x 25cm, 60x 45cm, 60x 35cm, 60x 25cm, 45x 45cm, 45x 35cm and 45x 25cm. The whole experimental plot was first divided into three blocks, each of which was then divided into 9 unit plots. The nine treatment combinations were then assigned randomly to nine unit plots of each block. The whole amount of cowdung was applied at the time of general land preparation and the entire quantity of triple super phosphate was applied during the final land preparation. Urea and muriate of potash were applied as side dressing in two equal installments on 40 and 90 days after final land preparation. Cormels were planted in different spacings as per treatments at 5 to 6cm soil depth on 11th March, 2006. Weeding was done periodically whenever necessary. Two earthing-up were done throughout the entire growing period. The first earthing-up was done when 1-2 leaves were unfolded and the second earthing-up was done after 60 days from the date of first earthing-up.

The height of the main plant, the number of leaves, the number of suckers per hill, the weight of leaf sheath per hill, the fresh and dry weight of lamina per hill, number of corms per hill, number of coromels per hill, weight of the main corms and the secondary corms, fresh and dry weight of cormels per hill was measured at harvest. Yields of corm and cormel were recorded as fresh weight basis. Fresh weight of all parameters were taken immediately after harvest whereas dry weight were taken after sun dried for 48 hours and thereafter oven dried for 72 hours at 80° C. The data for different characters under study were analyzed statistically to find out the significance of treatment effects. Analysis of variance was done by the`F' (Variance ratio) test. The significance of the differences between means was evaluated by the least significant difference (LSD) (Gomez and Gomez, 1984).

Results and Discussion

Height of plant: Different plant spacing showed wide variations in the plant height of Mukhi Kachli (Table 1). Spacing had significant effect on the height of plant hill^{-1}. Plant spacing of 75x 45cm produced the tallest plant at maximum growth stage. Even planting at the same spacing of 75x 45cm produced the tallest plants at all stages of growth which was statistically different from all other treatments and the shortest plant being produced by 45x 25cm plant spacing. The result indicated that the plant height increased with the increase in spacings and the results is agreed upon with Purewall and Daragan (1957).

Total number of leaves hill^{-1}: The total number of leaves hill^{-1} varied significantly among the treatments (Table 1). The maximum number of leaves was obtained from 75x 45cm spacing and the minimum from the spacing of 45x 25 cm in all stages of growth. The result indicated that the total number of leaves hill^{-1} increased with the increase in plant spacing.

Number of leaves plant^{-1}: Plant spacing had significant effect on the number of leaves in main plant hill^{-1} (Table 1). The highest number of leaves in main plant hill^{-1} was obtained from 75x 45cm spacing and the lowest number was noticed in 45x 25cm at all stages of growth. The number of leaves of main plants hill^{-1} increased with the increase in plant spacing. This might be due to plant at wider spacing avails more benefit of lights and nutrients thus better plant growth was observed.

Number of leaves of sucker: The number of leaves of sucker hill^{-1} was counted at different stages of growth and the data were presented in Table 2. The variation in the number of leaves of sucker hill^{-1}due to plant spacing was found to be significant. The maximum number of leaves of sucker hill^{-1}was obtained from 75x 45cm spacing and the lowest from 45x 25cm spacing inall stages of growth. The number of leaves of sucker's hill^{-1} increased with the increase in plant spacing.

Fresh weight of leaf sheath: There were significant variations in the fresh weight (g) of leaf sheath hill^{-1} due to plant spacing (Table 1). The highest fresh weight of leaf sheath hill^{-1} was obtained from 75x 45cm spacing and the lowest was obtained from 45x 25cm.

Dry weight of leaf sheath: The highest dry weight of leaf sheath hill^{-1} was obtained from 75x 45cm spacing and the lowest was found from 45x 25cm spacing. The dry weight of leaf sheath hill^{-1} increased with the increase of plant spacing.

Fresh weight of lamina: The different plant spacing showed wide variations in the fresh weight of lamina hill^{-1}.Planting at a 75x 45cm produced maximum weight of lamina hill^{-1} and spacing of 45x 25cm produced the lowest. The fresh weight of lamina hill^{-1} increased with the increase in plant spacing. This was probably for good plant growth due to ability of more spacing.

Number of suckers: The number of suckers increased significantly with the increase in plant spacing. The widest spacing i.e., 75x 45cm produced the maximum number of suckers hill^{-1} and the minimum number was obtained from the closest spacing of 45x 25cm.The increased number of suckers hill^{-1} produced at wider spacing was probably due to less competition among the plants for nutrients, water and space. This result was found in agreement with that of Dhar (1989).

Number of corms hill^{-1}: The variation in the number of corms hill^{-1} due to plant spacing was found to be significant (Table 2). There was a significant increase in the number of corms hill^{-1} with the increase in plant spacing. The plant spacing of 75x 45cm produced the maximum number of corms hill^{-1} and the minimum number of corms hill^{-1} was obtained from the plant spacing of 45x 25cm. The higher number of corms hill^{-1} produced at wider spacing was probably due to less competition among the plants for nutrients, water and space. The found in agrees with Dhar (1989).

Number of cormels hill^{-1}: The variation in the number of cormels hill^{-1} due to plant spacing was found to be significant (Table 3). There was a significant increase in the number of cormel hill^{-1} with the increase in plant spacing. The plant spacing of 75x 45cm produced the maximum number of cormels hill^{-1} and the minimum number was obtained from the plant spacing of 45x 25cm. The increase in number of cormel hill^{-1} with the increase of plant spacing was also reported by Ezumah (1973), Pena (1978), Mannan and Rashid (1986), Mannan *et al.* (1988) and Dhar (1989).

Fresh weight of corms hill^{-1}: The fresh weight of corms hill^{-1} was recorded at harvest. A significant variation in the weight of corms hill^{-1} due to plant spacing was observed (Table 2). As incase of number of corms hill^{-1}, the widest plant spacing of 75x 45cm resulted in the highest fresh weight of corms hill^{-1} and the lowest from the closest one. However, there was a trend of increase in the fresh weight of corms hill^{-1} with the increase in plant spacing. The increase in corm fresh weight hill^{-1} with increase in plant spacing was also reported by Pena (1978), Mannan and Rashid (1986) and Dhar (1989).

Dry weight of corms hill^{-1}: The highest dry weight of corms hill^{-1} was obtained from 75x 45cm spacing and the lowest dry weight of corms hill^{-1} was obtained from 45x 25cm spacing (Table 2). However,there was a trend of increase in the dry weight of corms hill^{-1} with the increase in plant spacing.

Fresh weight of cormels: The fresh weight of cormels hill^{-1} was recorded at harvest. A significant variation in the fresh weight of connels hill^{-1} due to plant spacing was observed (Table 2). As incase of number of connels hill^{-1} the widest plant spacing of 75x 45cm resulted in the highest weight of fresh cormels hill^{-1} and the closest spacing of 45x 25cm

resulted in lowest weight of fresh cormels hill^{-1}. The results obtained were in agreement with the results of Mannan *et al.* (1988) and Dhar (1989).

Dry weight of cormels: A significant variation in dry weight of cormels hill^{-1} due to plant spacing was observed (Table 2). The highest dry weight of cormels hill^{-1} was obtained from 75x 45cm spacing and the lowest was obtained from 45x 25cm spacing.

Yield of corms: The plant spacing resulted in significant variation in the yield of corns per hectare. The highest yield *of corms* was obtained from the plant spacing of 60x 25cm and the lowest yield of corms was recorded from the widest spacing of 75x 45cm (Table 2). The yield of corms was increased with the decrease in spacing up to 60x 25cm.

Yield of cormels: The plant spacing resulted in significant variation in the yield of cormels per hectare. The highest yield of cormels per hectare was obtained from the spacing of 25x 25cm and the lowest from the widest spacing of 75x 45cm (Table 4). The yield of cormels per hectare was increased with the decrease in spacing up to 60x 25cm. However, the closest spacing 45x 25cm showed lower yield probably due to maximum interplant competition. This finding agreed with the results of Plucknett *et al.,* (1970) and Mannan *et al.,* (1988).

Table 1. Effect of plant spacing on plant height, number of leaves plant^{-1}, number of leaves hill^{-1}, fresh and dry eight of leaf sheath hill^{-1} of Mukhi Kachu

Plant spacing	Plant height (cm)	No. of leaves plant^{-1}	No. of leaves hill^{-1}	No. of suckers hill^{-1}	Fresh wt. of leaf sheath hill^{-1}(g)	Dry wt. of leaf sheath hill^{-1}(g)
75×45cm	50.2 a	4.4a	14.9a	10.58a	184.1a	8.14a
75×35cm	47.3 b	3.9bc	14.1ab	10.15ab	183.7a	7.10b
75×25cm	43.6 cd	3.0e	11.9cd	8.85de	180.8b	4.48e
60×45cm	47.5 b	4.2ab	14.7ab	10.57a	183.8a	7.87ab
60×35cm	45.5 bc	3.6cd	13.7a-c	9.73bc	182.3ab	6.21 c
60×25cm	42.9 d	2.5f	10.4de	7.90f	174.3c	2.83 g
45×45cm	44.7 cd	3.4d	12.7bc	9.30cd	182.2ab	5.35 d
45×35cm	43.2 cd	2.8ef	11.1cd	8.30ef	179.7b	3.60 f
45×25cm	42.5 d	2.0g	8.9e	6.90g	172.1c	2.40 h
LSD(0.05)	2.2	0.3	20	0.581	2.612	0.273

In a Column figures followed by same letters do not differ significantly at 5% level of probability

Table 2. Effect of plant spacing on the number of cormels hill^{-1}, fresh weight of cormels hill^{-1}, dry weight of cormels hill^{-1} amd yield of Mukhi Kachu

Plant spacing	Number cormels hill-1	Fresh cormels hill-1 (g)	Dry weight of cormels hill-1 (g)	Yield of corms (t/ha)	Yield of cormels (t/ha)	Total yield of corm and cormels (t/ha)
75×45cm	24.59 a	263.5 a	67.04 a	11.52 e	12.20 g	23.72 f
75×35cm	23.82 ab	260.0 b	62.24 b	12.82 d	13.91 f	26.73 e
75×25cm	22.87abc	245.7 e	55.58 d	15.32 b	17.39 d	32.71 c
60×45cm	24.23 ab	262.12 a	65.37 a	12.66 d	13.83 f	26.49 e
60×35cm	23.11abc	255.5 c	61.53 b	14.57 c	16.22 e	30.79 d
60×25cm	21.87 c	242.3 f	52.16 e	17.68 a	20.24 a	37.92 a
45×45cm	23.05abc	247.8 d	58.73 e	14.63 c	16.57 e	31.20 d
45×35cm	22.47 bc	244.2 ef	54.01 d	17.33 a	19.59 b	36.92 ab
45×25cm	19.14d	214.3 g	44.56 f	17.24 a	18.92 c	36.16 b
LSD(0.05)	1.731	2.019	1.824	0.640	0.631	1.292

In a Column figures followed by same letters do not differ significantly at 5% level of probability

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