Reprint **ISSN 1923-7766 (Web Version)**

International Journal of Experimental Agriculture

(Int. J. Expt. Agric.)

Volume: 4 **Issue: 4** **November 2014**

Int. J. Expt. Agric. 4(4): 14-18 (November 2014)

RESPONSE OF MUKHIKACHU (*Colocasia esculenta* L.) cv. Bilashi TO PLANT SPACING

R.K. SIKDER, M.I. ASIF, TOUHIDUZZAMAN, H. MEHRAJ AND A.F.M. JAMAL UDDIN

An International Scientific Research Publisher

Green Global Foundation©

Web address: http://ggfjournals.com/e-journals archive

E-mails: editor@ggfjournals.com and editor.int.correspondence@ggfjournals.com

ISSN-1923-7766 (Online)
Int. J. Expt. Agric. 4(4):14-18(November 2014)

RESPONSE OF MUKHIKACHU (*Colocasia esculenta* L.) cv. Bilashi TO PLANT SPACING

R.K. SIKDER[1], M.I. ASIF[2], TOUHIDUZZAMAN[3], H. MEHRAJ[4] AND A.F.M. JAMAL UDDIN[4]*

[1]Horticulture Development Division, BADC, Dhaka-1000, Bangladesh; [2]Department of Seed Technology, Sher-e-Bangla Agricultural University, Dhaka-1207, Bangladesh; [3]Fertizer Division, BADC, Dhaka-1000, Bangladesh; [4]Department of Horticulture, Sher-e-Bangla Agricultural University, Dhaka-1207, Bangladesh.

*Corresponding author & address: A.F.M. Jamal Uddin, E-mail: jamal4@yahoo.com
Accepted for publication on 15 October 2014

ABSTRACT

Sikder RK, Asif MI, Touhiduzzaman, Mehraj H, Jamal Uddin AFM (2014) Response of mukhikachu (*Colocasia esculenta* L.) cv. Bilashi to plant spacing. *Int. J. Expt. Agric.* 4(4), 14-18.

The study was conducted at the Horticultural Farm and Laboratory of Sher-e-Bangla Agricultural University, Bangladesh during the period from February 2012 to March 2013 to study the effect of spacing on growth, yield and storability of mukhikachu cv. Bilashi. The experiment consisted of four different plant spacing S_1 (60 cm × 20 cm); S_2 (60 cm × 30 cm); S_3 (60 cm × 40 cm) and S_4 (60 cm × 50 cm). Maximum individual corm weight was found from S_4 (90.3 g) which was statistically similar with S_3 (89.1 g) whereas minimum from S_1 (42.2 g). Maximum number of sucker per hill (7.9), yield of corm (5.6 ton) and cormel (26.2 ton) per hectare was found from S_3 whereas the lowest from S_1. 60 cm × 40 cm plant spacing was more suitable in consideration of yield contributing characters and yield but had no effect on the storability of cormels of mukhikachu.

Key words: *Colocasia esculenta, plant spacing, growth and yield*

INTRODUCTION

Mukhikachu (*Colocasia esculenta* L. Scott) belongs to Araceae family is an edible aroid, commonly grown throughout tropical and subtropical regions on the world (Ghosh *et al*. 1988). Corm and cormel are major economic part of taro. Occasionally, leaves and petioles also used as food. Main stored food in corm is carbohydrate (mostly starch). Yield of mukhikachu are very low in Bangladesh. Plant spacing is an important aspect of crop production for maximizing the yield. It helps to increase the number of leaves, branches and healthy foliage. Densely planted crop obstruct the proper growth and development. On the other hand, wider spacing ensures the basic requirements but decrease the total number of plants as well as total yield. Crop yield may be increased upto 25% by using optimum spacing. In Bangladesh like other management practices information about spacing to be used in mukhikachu cultivation is scanty. Different yield attributes response for different plant spacing. Many scientists earlier reported the wider spacing produced maximum plant height, functional leaves and leaf area index were, while the minimum of these parameters were produced at closer spacing. Greater number of suckers and cormels were also obtained at the wider spacing and lesser number at narrow spacing (Ira 2004; Sarma and Narzary, 2000; Sarma and Narzary, 1999). Generally in closer spacing plant compete for light than wider spacing which helps to elongation of plant with minimum number of leaves per plant than the wider spacing. There is a scope of increasing the yield as well as economic benefits of mukhikachu with the appropriate spacing. Considering the above mentioned facts present investigation was undertaken to find out the suitable spacing for production of mukhikachu.

MATERIALS AND METHODS

The study was conducted at the Horticultural Farm and Laboratory of Sher-e-Bangla Agricultural University (SAU), Dhaka, Bangladesh during the period from February 2012 to March 2013 to study the effect of plant spacing on the growth, yield and storability of mukhikachu. The experiment consisted of four different plant spacing *viz.* S_1 (60 cm × 20 cm); S_2 (60 cm × 30 cm); S_3 (60 cm × 40 cm) and S_4 (60 cm × 50 cm) followed by Randomized Complete Block Design with three replications. The size of the each plot was 2.0 m × 1.8 m. The distance maintained between two blocks and two plots were 1.0 m and 0.5 m, respectively. Corms were sown in the plot with maintaining distance as per treatment. Cormels were planted at a depth of 7-8 cm. Cowdung (15 t ha^{-1}), urea (150 kg ha^{-1}), Triple Super Phosphate (150 kg ha^{-1}), MP (175 kg ha^{-1}), gypsum (30 kg ha^{-1}), zinc sulphate (15 kg ha^{-1}) and boric acid (5 kg ha^{-1}) were applied. The entire cowdung, TSP, gypsum, zinc sulphate, boric acid, ½ urea, ½ MP were applied during final land preparation. Rest of the urea and MP were applied in two installments, firstly at 45 DAP (Days after planting) and secondly at 100 DAP (BARI 2008). Earthing up was done at 60 and 120 days after planting followed by weeding on both sides of rows by taking the soil from the space between the rows by a small spade. Treatment wise 250 g cormels were stored in room temperature after harvesting. In the storage room a polythene sheet was spread and 1 inch thickness sand was applied on the polythene sheet. Treatment wise cormel was placed on the sand and again 1 inch thickness sand was applied above the cormel. Weight loss and number of rotten cormel was counted from the storage cormel at 120 days. Data were collected on plant height, number of leaves/plant, foliar coverage, number of suckers/hill, weight of individual corm, number of cormels/plant, yield of corms/plot, yield of corms/ha, yield of cormels/plot, yield of cormels/ha, weight loss (%), rotten cormel (%). Collected data were statistically analyzed using MSTAT-C Computer Package Program. The significance of difference among treatments means was estimated by LSD test at 1% level of probability (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Plant height

Significant variation was found on plant height of mukhikachu to different levels of plant spacing at different DAP (days after planting) and harvest. Tallest plant was found from S_3 (54.0 cm) which was statistically similar with S_4 (53.2 cm) and S_2 (52.6 cm) whereas shortest was found from S_1 (49.0 cm) at harvest (Fig. 1a). It was revealed that with the increases of spacing, plant height showed increasing trend upto certain level then decreases. In case of closer spacing plant compete for light and other macro and micro nutrients which greatly effect plant growth that produced comparatively shorter plant than wider spacing. On the other way excess wider spacing did not create and compete within the species and produce comparatively shorter plant than the suitable spacing. Intra-row spacing interaction had a significant effect on vegetative growth parameters as well as plant height (Abd-Ellatif *et al*. 2010). Maximum plant height were produced at 60 × 45 cm while the minimum were produced at 60 × 35 cm and plant height increased up to 120 days after planting and thereafter declined until maturity (Ira 2004).

Number of leaves per plant

Number of leaves per plant of mukhikachu showed significant variation for different plant spacing at different DAP and harvest. Maximum number of leaves per plant was observed in S_3 (4.7) treatment which was statistically similar with S_4 (4.6) and S_2 (4.4), minimum was found from S_1 (3.7) at harvest (Fig. 1b). Plant spacing 45 × 30 cm resulted in the highest number of leaves per plant (8.1) (Gill *et al*. 2005). Maximum leaves were produced at 60 × 45 cm and leaves increased up to 120 DAP and thereafter declined until maturity (Ira 2004).

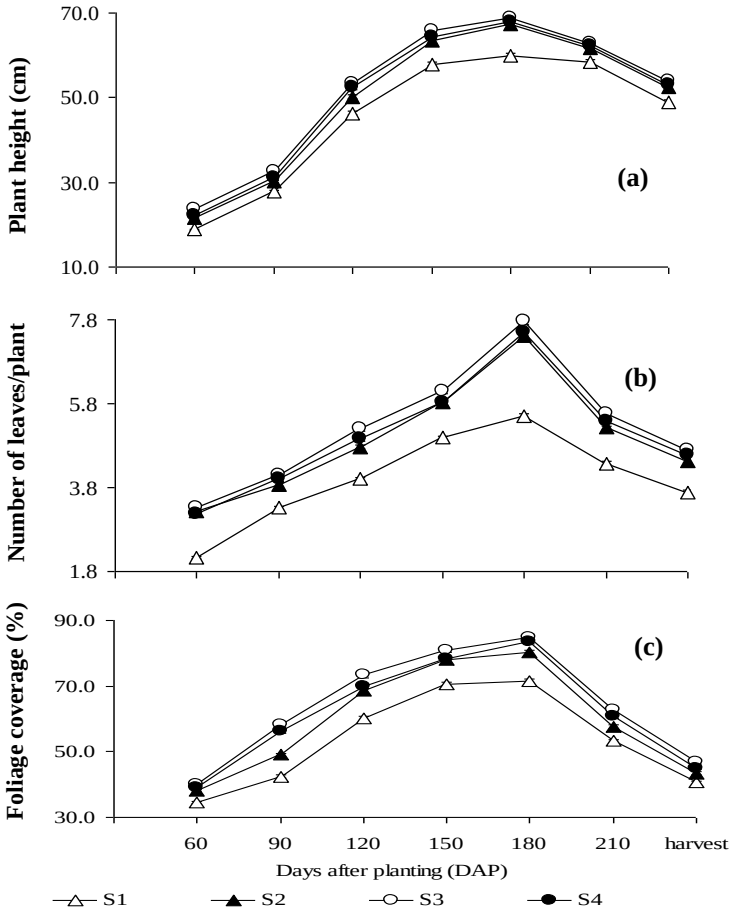

Fig. 1. Response of mukhikachu (*Colocasia esculenta*) to different levels of plant spacing on (a) plant height (b) number of leaves/plant and (c) foliage coverage

Here, S_1 = 60 cm × 20 cm; S_2 = 60 cm × 30 cm; S_3 = 60 cm × 40 cm and S_4 = 60 cm × 50 cm

Foliage coverage

Different plant spacing varied significantly for foliage coverage of mukhikachu at different days after planting and harvest. Maximum foliage coverage was observed in S_3 (46.8%) treatment which was similar to S_4 (45.0%) and S_2 (43.4%) and minimum was found from S_1 (40.6%) treatment. It was revealed that with the increases of

spacing foliage coverage showed increasing trend but there after a certain period it decreases with the increases of spacing and optimum spacing produced the highest foliage coverage than wider spacing. In case of closer spacing plant compete for light and with the time being leaf length decreases.

Number of suckers per hill

Significant variation was observed for number of suckers per hill of mukhikachu by different levels of plant spacing at different days after planting. Maximum number of suckers per hill was counted from S_3 (7.9) which was statistically similar with S_4 (7.7) and S_2 (7.5) while minimum from S_1 (6.11) (Fig. 2). Greater number of suckers was obtained at the wider spacing i.e. 60 × 65 cm and lesser number of suckers at narrow spacing i.e. 60 × 35 cm (Ira 2004). In case of optimum spacing plant have enough space for vertical and horizontal expansion that leads for production of maximum number of suckers per plant than the closer spacing. 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 (Dhar 1989).

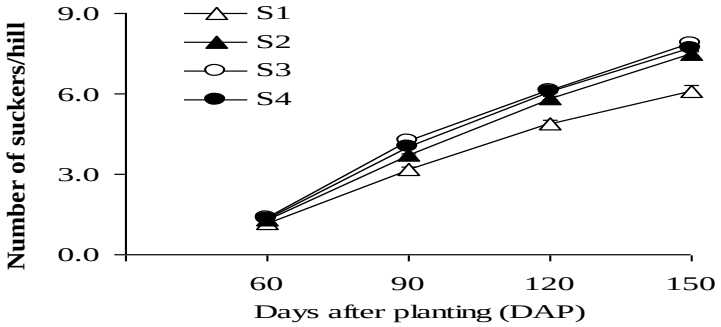

Fig. 2. Response of mukhikachu (*Colocasia esculenta*) to different levels of plant spacing on number of suckers/hill

Here, S_1 = 60 cm × 20 cm; S_2 = 60 cm × 30 cm; S_3 = 60 cm × 40 cm and S_4 = 60 cm × 50 cm

Weight of individual corm

Statistically significant variation was found for individual corm weight of mukhikachu to different plant spacing. Maximum individual corm weight was found from S_4 (90.3 g) treatment which was statistically similar with S_3 (89.1 g) while minimum from S_1 (49.2 g) treatment was obtained (Table 1). Wider plant spacing ensure higher vegetative growth and the ultimate results would be the highest weight of individual corm. Plant spacing 45 × 30 cm resulted in the highest corm weight (29 g) which support the present result (Gill *et al*. 2005).

Number of cormels per plant

Significant variation was found in number of cormels per plant of mukhikachu. Maximum number of cormels per plant was found from S_3 (26.0) treatment while minimum from S_1 (12.7) (Table 1). It was revealed that highest plant spacing ensured highest vegetative growth and the ultimate results was the highest number of cormels per plant. The spacing with 60 × 45 cm was the best with respect to total cormel production (Sarma and Narzary, 1999). Greater number of cormels was obtained at the wider spacing i.e. 60 × 65 cm and lesser number at narrow spacing i.e. 60 × 35 cm (Ira 2004). 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).

Table 1. Response of mukhikachu (*Colocasia esculenta*) to different levels of plant spacing on yield and storability

Plant spacing levels	Weight of individual corm (g)	Number of cormel/ plant	Yield of corm (kg/plot)	Yield of corm (t/ha)	Yield of cormel (kg/plot)	Yield of cormel (t/ha)	At 120 days after storage	
							Weight loss (%)	Rotten cormel (%)
S_1	49.2 c	12.7 d	1.6 c	4.5 c	6.0 d	16.6 d	16.9 a	14.0 a
S_2	72.7 b	19.7 c	1.8 b	5.1 b	8.2 c	22.8 c	16.9 a	13.8 a
S_3	89.1 a	26.0 a	2.0 a	5.6 a	9.4 a	26.2 a	16.7 a	13.5 a
S_4	90.3 a	24.9 b	2.0 a	5.4 a	9.1 b	25.2 b	16.5 a	13.2 a
LSD(0.01)	1.3	1.0	0.1	0.3	0.3	0.7	0.5	1.1
CV (%)	8.7	4.3	6.3	6.3	5.3	5.3	1.2	1.0

In a column means having similar letter(s) are statistically similar and those having dissimilar letter(s) differ significantly at 0.05 level of probability

Here, S_1 = 60 cm × 20 cm; S_2 = 60 cm × 30 cm; S_3 = 60 cm × 40 cm and S_4 = 60 cm × 50 cm

Yield of corms per plot

Yield of corms per plot of mukhikachu showed significant variation among different levels of plant spacing. Maximum yield of corms per plot was found from S_3 (2.0 kg) and S_4 (2.0 kg) treatment while minimum from S_1 (1.6 kg) treatment (Table 1). Cormel yield per unit area decreased with increase in spacing (Soumik and Sen, 2005). Proper plant spacing caused optimum plant density which might have resulted in reduced competition leading to increased shoot and root parameters, and enhanced photosynthesis efficiency besides better source–sink relationships (Choudhary and Suri, 2013). The decline of crop yields in the traditional farming systems has been attributed largely to soil-related constraints (Aihou *et al.* 1988; Juo *et al.* 1995) and highly variable plant densities including inappropriate cropping practices.

Yield of corms per hectare

Significant variation was found for yield of corm per hectare of mukhikachu to different plant spacing. Maximum yield of corm per hectare was found from S_3 (5.6 ton) treatment which was statistically similar with S_4 (5.4 ton) followed by S_2 (5.1 ton) whereas minimum from S_1 (4.45 ton) treatment (Table 1).

Yield of cormels per plot

Significant variation was found in yield of cormels per plot of mukhikachu among different levels of plant spacing. Maximum yield of cormels per plot was found from S_3 (9.4 kg) treatment followed by S_4 (9.1 kg) while minimum from S_1 (6.0 kg) (Table 1) treatment.

Yield of cormels per hectare

Significant variation was found in yield of cormels per hectare of mukhikachu among different levels of plant spacing. Maximum yield of cormels per hectare was found from S_3 (26.2 ton) treatment followed by S_4 (25.2 ton) treatment and minimum from S_1 (16.6 ton) treatment (Table 1). Yields per plant were significantly higher in wider spacing but total yields were higher in the closer spacing (Basak *et al*. 1999). Moderately wide spacing of 0.75 m × 0.75 m produced an acceptable yield (Tumuhimbise *et al*. 2009).

Weight loss

Statistically non significant variation was found in weight loss of mukhikachu at 120 DAS (days after storage) that produced from different plant spacing. Maximum weight loss was found from S_1 (16.9%) while minimum S_4 (16.7%) (Table 1).

Rotten cormel

Rotten cormel of mukhikachu that produced from different plant spacing showed non significant variation at 120 DAS. Maximum rotten cormel was found from S_1 (14.0%) minimum from S_4 (13.2%) (Table 1). Spacing had no effect on quality attributes in *C. esculenta* cultivars (Sarma and Narzary, 2000).

CONCLUSION

Considering the findings of the present experiment, it may be concluded that S_3 (60 cm × 40 cm plant spacing) showed significantly better performance in most of the parameter under study. By maintaining this plant spacing growth and yield of mukhikachu can be increased but storability of cormels might not be significantly affected by plant spacing.

REFERENCES

Abd-Ellatif AA, Shehata AEE, Youssef SM (2010) Effect of planting date and intra-row spacing on growth, yield and quality of taro. *Research J. Agric. Biol. Sci*. 6(6), 806-814.

Aihou K, Buckles K, Carsky I, Dagbenonbakin G, Eleka A, Fagbohoun F, Fassassai R, Galiba M, Gokai G, Osiname O, Versteeg M, Vissoh P (1988) Cover Crops in West Africa: Contributing to Sustainable Agriculture. International Development and Research Center, Canada.

BARI (2008) Mukhikachu Unnato Utpadan Koushal. Tuber Crop Research Centre (TCRC), BARI. Joydevpur, Gazipur. p. 6.

Basak NC, Khan MMR, Sarker AH (1999) Effects of spacings and fertilizers on the agro-economic performance of Panikachu. *Bangladesh J. Train. Dev*. 12(1/2), 155-160.

Choudhary AK, Suri VK (2013) On-Farm participatory technology development on resource conservation technologies in rainfed upland paddy in Himachal Pradesh, India. Communications in Soil Science and Plant Analysis 44.

Dhar M (1989) Effect of plant spacing and system of planting on the growth and yield of Mukhi Kachu (*Colocasia esculenta*). M.Sc. (Ag.) Thesis. Dept. Hort., Bangladesh Agric. Univ., Mymensingh, pp. 65-72.

Ezumah HC (1973) The growth and development of taro (*Colocasia esculenta* Schott). in relation to selected cultural practices. Dissertation Abstract International (B), 34(1), 24.

Ghosh SP, Ramanujam T, Jos JS, Moorthy SN, Nair RG (1988) Tuber Crops. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, India. pp. 403.

Gill BS, Randhawa GS, Saini SS (2005) Optimizing the agronomic requirements of taro (*Colocasia esculenta*) for Punjab. *Indian J. Agron*. 50(2), 170-172.

Gomez KA, Gomez AA (1984) Statistical Procedures for Agricultural Research. Jhons Wiley and Sons, New York. p. 67.

Ira S (2004) Studies on some growth parameters in *Colocasia* at different spacings. *Ann. Agril. Res*. 25(2), 316-319.

Juo ASR, Franziuebbers, Dabiri A, Ikhile B (1995) Changes in soil properties in long term fallow and continuous cultivation after forest clearing in Nigeria. Agriculture. *Ecosystem and Environment*. 56, 9-18.

Mannan MA, Rashid MM (1986) Effect of seed size and spacing on the growth, yield and profitability of Mukhi Kachu (*Colocasia esculenta*). *Bangladesh J. Agric. Res.* 11(2), 11-18.

Mannan MA, Sarkar AK, Rashid MM (1988) Effect of spacing in single and double row systems on the yield and profitability of Mukhi Kachu. *Bangladesh J. Agric. Res.* 13(2), 89-96.

Pena RSD (1978) Yield of upland and low land taro at varying plant densities. *Field Crop Res.* 1(2), 183-190.

Sarma I, Narzary BD (1999) Effect of cultivar and spacing on the yield and profitability of Colocasia. *J. Agril. Sci. Soc.* 12(1), 131-135.

Sarma I, Narzary BD (2000) Evaluation of some quality traits in Colocasia cultivars. *J. Agril. Sci. Soc. North East India*. 13(1), 44-47.

Soumik M, Sen H (2005) Growth and productivity of eddoe taro (*Colocasia esculenta* var. antiquorum) as influenced by fertilizer levels and spacings. *J. Root Crops*, 31(1), 50-53.

Tumuhimbise R, Talwana HL, Osiru DSO, Serem AK, Ndabikunze BK, Nandi JOM, Palapala V (2009) Growth and development of wetland-grown taro under different plant populations and seedbed types in Uganda. *African Crop Sci. J.* 17(1), 49-60.