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Profitability of Mukhi Kachu (*Colocasia esculenta*) Production as Influenced by Different Doses and Time of Application of Urea and Muriate of Potash

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Abstract: A field experiment was conducted to evaluate the relative costs and return in Mukhi kachu cv. Bilashi production as influenced by different levels of urea and MP fertilizers and their time of application. Four levels of urea and MP fertilizers viz., F_0, F_1, F_2 and F_3 and four times of application were used in this investigation. Different doses of urea and MP fertilizer and their time of application had significant influence on yield of Mukhi Kachu. The combination of the highest level of urea and MP fertilizer (300 kg each of urea and MP/ha) and application of $^1/_3$ dose each at 60, 100 and 140 DAP gave the highest yield of corms (7.20 t. ha^{-1}) and cormels (47.89 t. ha^{-1}). The highest gross return, net return and the best economic return (BCR) were Tk. 205820 ha^{-1}, Tk. 125905 ha^1 and 2.58, respectively obtained from the same treatment.

Key word: Profitability, Muhki kachu, urea and MP, CV. Bilashi, Best economic return

Introduction

Mukhi kachu (*Colocasia esculenta* L. Schott.), a member of the family Araceae is one of the important edible aroids in Bangladesh. It is grown as subsistence food crop throughout the tropical and subtropical regions of the world (Ghosh *et al*., 1988). Among the tuber crops, the corms and cormels of Mukhi kachu are rich source of Carbohydrate and also contain sufficient quantity of protein (Verma *et al.,* 1996). It is extensively grown in Bangladesh in kharif season and contributes a considerable part in the total supply of bulky vegetables are scarce in the market (Siddique *et al.,* 1988). The area and gross annual production of aroids in Bangladesh is increasing year after year, but its yield per unit area (7.25 mt ha^{-1}) is very low (BBS, 2000) as compared with China (17.05 mt ha^{-1}) and Japan (11.59 mt ha^{-1}) (FAO, 1999).

One of the main reasons for such a low yield is poor fertilizer management. Even through it has so much economic importance, information on the requirement of major nutrients in the production of this crop is very limited. Nitrogen and potash play a vital role in the yield of tuber crops (Verma *et al*., 1996, Rahman and Rashid, 1983). Mohankumar *et al.* (1990) reported that three split applications of nitrogen and potassium gave significantly higher cormel yield over two splits. Hossain and Rashid (1982) suggested that leaching out of applied fertilizer from Mukhi Kachu field could be avoided by a modified method of application preferably in splits commencing after the emergence of plants. But little is known about its production technologies and economic returns. Despite needs for improving yield, lack of information on Mukhi kachu cultivation and its potential economic return farmers can not get appropriate return and the policy makers also can not adopt appropriate polices regarding its extension and development.

Considering the above facts, the present study was undertaken to evaluate the relative cost and return in Mukhi kachu cv. Bilashi production as influenced by different levels of urea and MP fertilizers and their time of application.

Materials and Methods

The study was carried out at the Horticulture Farm, Bangladesh Agricultural University, Mymensingh during the period from March to October, 2000. The geographic position of the experimental site is in the sub-tropical zone, characterized by heavy rainfall during the months of April to September and scanty during the rest period of the year (Anonymous, 1960). The soil of the experimental plot was silty loam in texture belonging to the old Brahmaputra Flood Plain. The results of the chemical analysis of soil were soil P^H 6.5, organic matter (%) 1.49, total nitrogen (%) 0.08, available P (ppm) 17.42 and exchangeable K (me %) 0.13. There were 16 treatments comprising four urea and MP fertilizer dose viz., 0 kg ha^{-1} (F_0), 100 kg each of urea and MP ha^{-1} (F_1), 200 kg each of urea and MP ha^{-1} (F_2), 300 kg each of urea and MP ha^{-1} (F_3), and four time of application viz., full dose of urea and

MP at 60 DAP (T_1), ½ dose each at 60 and 100 DAP (T_2), $^1/_3$ dose each at 60 , 100 and 140 DAP (T_3) and 20% as basal, 40% at 40 DAP ad 40% at 90 DAP (T_4). The experiment was laid out following RCB (factorial) design. The unit plot size was 2.7 x 2.4 m^2. Two adjacent unit plots and blocks were separated by 50 cm and 1m space, respectively.

In addition to the fertilizers under treatment, 15 tones of cowdung and 125 kg of triple super phosphate (TSP) per hectare were applied in the experimental plot. The entire amount of cowdung was applied at the time of general land preparation and the entire quantity of TSP was applied during the final land preparation. Medium size (28±1g) seed cormels of Mukhi kachu cv. Bilashi were planted at a depth of 7-8 cm on 1 March, 2000 maintaining a row to row distance of 60 cm and plant to plant distance of 45 cm . Weedings were done as and when necessary. In case of control plot two earthingups were done. The first earthing up was carried out after 60 days of planting and the second was done after 90 days after planting. Other plots were earthing up as per top dressing schedules. The crop was grown under rainfed condition. Some plants were infested by red mite (*Tetrangchus bicalatus*) which was controlled by spraying neuron (1 ml L^{-1}). The crop was harvested after 230 days of planting, when the leaves of all the main plants were dead. Data were collected on yield at harvest. From the middle rows eight plants were selected from each plot to recorded data and analyzed statistically and means were compared by the least significant difference (LSD) test at 1% level of probability. Information relative input use as well as collected on plot basis, than converted into per hectare. Interest on input cost was calculated on the basis of commercial bank rate. The rental value of land was calculated on the basis of existing annual rate.

Results and Discussion

Mukhi Kachu is a labour intensive crop which required, on an average 580 man days per hectare from sowing to harvesting expect top dressing and earthing up (Table 1). In this study all the labours were hired. The highest non-material cost (Tk. 3750) was for lease of land for the season. Here labour cost excluding top dress and earthing up and power tiller costs were 29,000 and 3,000 Tk ha^{-1} ,respectively. Here seed rate was 629 kg per hectare which cost was 9435 Tk. (Table 2). But farmers are use higher seed rate (Saha *et al.,* 1991). That is why input cost increases. The highest total input cost (73542 Tk ha^{-1}) was recorded from the combination of the highest level of urea and MP fertilizer (300 kg each of urea and MP ha^{-1}) and application of $^1/_3$ dose each at 60, 100 and 140 days after planting (DAP) following by

Table 1: Per hectare labour requirement for various operations to produce Mukhi kachu cv. Bilashi

Heads of use of labour	Number of labours
Bed preparation	116
Planting and covering	70
Weeding (5 times)	232
Insecticide application	23
Harvesting	93
Carrying and bagging	46
Total	580

Table 2: Per hectare non-material and material cost in Mukhi kachu cv. Bilashi production

Cost items	Amount	Rate	Total
Labour	580 man days	Tk.50/man day	29000
Power tiller	3 times	Tk.1000/ploughing	3000
Lease of land	For the season	Tk.3750	3750
Seed cormel	629 kg	Tk.15/kg	9435
Cowdung	15 ton	Tk.350/metric ton*	5250
TSP	125 kg	Tk.15/kg*	1625
Urea and MP, labour for top dress, soil mixture and earthingup	Details shown in Table 3	-------------	--------
Insecticides	23 Bottle	Tk.70/50ml Bottle	1630

* Including carrying cost

(71862 Tk ha^{-1}) 200 kg each of urea and MP fertilizers and application $^1/_3$ dose each at 60, 100 and 140 DAP. This might be due to availing maximum dose, split application and earthing up. The minimum (64459 Tk. ha^{-1}) input cost was recorded from the crop receiving no urea and MP fertilizers i.e. control.

The over head cost was highest (6373 Tk. ha^{-1}) when 300 kg each of urea and MP fertilizers were applied at 60, 100 and 140 DAP into three equal installment and the lowest (5586 Tk. ha^{-1}) from control (Table 3).

The variation in cost of production was noticed due to different treatment combinations comprising different levels of urea and MP fertilizer and time of application. The production cost was the highest (Tk. 79915 ha^{-1}) when urea and MP fertilizer (300 kg each of urea and MP ha^{-1}) and three split ($^1/_3$ dose each at 60, 100 and 140 DAP) were applied. It might be due to use of higher level of urea and MP fertilizers, more split application and earthingup. The lowest cost of production (Tk. 70045 ha^{-1}) was found when no urea and MP fertilizer was applied.

The treatment combinations significantly influenced yield of corm and cormel. The highest yield of corm and cormel per hectare 7.20 ton and 47.86 ton, respectively were obtained from the combination of the highest level of urea and MP fertilizers (300 kg each of urea and MP ha^{-1}) and three split application ($^1/_3$ dose each at 60, 100 and 140 DAP) and the lowest (3.09 ton and 14.76 ton respectively) obtained from the crop no receiving urea and MP fertilizer(Table 4). It might be due to higher nitrogen encouraged higher nitrogen uptake, vegetative growth,

Table 3: Per hectare total input cost of production of Mukhi kachu cv. Bilashi

Treatments	Cost of urea and MP fertilizer (Tk.)[a]	Cost of labour for top dressing soil mixture and ear thing up @ Tk. 50 No. of labour	(Tk.)	Total cost of urea and labour (Tk.)	Total input cost (Tk.)[b]	Over head cost (Tk.)[c]
F_0 x T_1	-	154	7700	7700	64459	5586
T_2	-	154	7700	7700	“	”
T_3	-	154	7700	7700	“	”
T_4	-	154	7700	7700	“	”
F_1 x T_1	1630	154	7700	9330	66171	5734
T_2	1630	154	7700	9330	“	”
T_3	1630	231	11550	13180	70213	6085
T_4	1630	154	7700	9330	66171	5734
F_2 x T_1	3200	154	7700	10933	67819	5877
T_2	3200	154	7700	10933	“	”
T_3	3200	231	11550	14750	71862	6228
T_4	3200	154	7700	10900	67819	5877
F_3 x T_1	4800	154	7700	12500	69499	6023
T_2	4800	154	7700	12500	“	”
T_3	4800	231	11550	16350	733542	6373
T_4	4800	154	7700	12500	69499	6023

Calculated on the bans of March 2000 market price
Urea = Tk 6 per kg including carrying cost
MP = Tk 10 per kg including carrying cost
Labour for 2 times ear thins up.
b.Total input cost= Total non-material and material cost +5% of the total non-material and material cost
c. 13% interest of the total input cost for 8 months

Table 4: Per hectare cost and returns from Mukhi kachu production at different levels of urea and MP fertilizers and time of application

Treatments	Total cost of production (Tk ha^{-1})[a]	Yield (t ha^{-1}) Corms	Cormels	Gross return (Tk ha^{-1})[b]	Net return (Tk ha^{-1})	BCR
F_0 x T_1	70045	3.24	14.76	65520	-4525	0.94
T_2	“	3.09	14.81	65420	-4625	0.93
T_3	“	3.40	15.20	67600	-2445	0.97
T_4	“	3.32	15.32	67920	-2125	0.97
F_1 x T_1	71905	4.63	19.86	88700	16795	1.23
T_2	“	5.35	26.83	118020	45115	1.64
T_3	76298	6.28	28.83	127880	51582	1.68
T_4	71905	5.29	27.14	119140	47235	1.66
F_2 x T_1	73696	5.29	23.86	106020	32324	1.44
T_2	“	6.48	27.59	123320	49624	1.67
T_3	78090	6.74	33.14	1146000	67910	1.87
T_4	73696	6.38	27.91	124400	50704	1.69
F_3 x T_1	75522	6.43	26.49	118820	43298	1.57
T_2	“	6.69	33.85	148780	73258	1.97
T_3	79915	7.19	47.86	205820	125905	2.58
T_4	75522	6.78	33.75	148560	73038	1.97

Total input cost + over head cost
Considering farmgate price of corm and cormels at harvest @ Tk. 2000 and Tk,. 4000 per ton, respectively.

photosynthesis and then translocation of photosynthates to the cormels. Potassium is known to be essential for the synthesis and translocation of carbohydrate, considered as one of the most important physiological activities of root crops. Mohankumar *et al.* (1990) reported that 80 kg N and 100 kg K_2O ha^{-1} was beneficial for higher yield of cormels in taro with three split applications. The beneficial effects of nitrogen and potassium nutrition in enhancing the cormel yield in taro was reported by Hossain and Rashid (1982).

The gross return obtained through sale of freshly harvested corm and cormel at farmgate price was found to be the lowest (Tk. 65420 ha^{-1}) under the treatment combination of F_0 (no urea and MP fertilizers) and T_2 ($\frac{1}{2}$ dose each at 60 and 100 DAP). The highest gross return of Tk. 20582 ha^{-1} was obtained from the combination of the highest level of urea and MP fertilizer (300 kg each of urea and MP ha^{-1}) and three split application ($^1/_3$ dose each at 60, 100 and 140 DAP). When the treatment combinations were compared in respective of economic aspects, it was evident that the highest net return (Tk. 125905 ha^{-1}) and three split ($^1/_3$ dose each at 60, 100 and 140 DAP) application (Table 4). The best economic return (2.58) was also obtained from the same treatment combination. The treatment combinations, which received no urea and MP fertilizer showed negative net return. It might be due to the crop receiving no urea and MP fertilizers, as a result the growth and development of the plant was hampered. As there was deficiency of nitrogen and potassium in the soil, the plant could not use other inputs properly which was stated by Grewal *et al*. (1992). Considering the economic point of view, it can be concluded that the highest level of urea and MP fertilizers (300 kg each of urea and MP ha^{-1}) with three split ($^{1}/_{3}$ dose each at 60, 100 and 140 DAP) application would be optimum for the best economic return of Mukhi Kachu cv. Bilashi production under Bangladesh Agricultural University farm condition.

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