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EFFECT OF PLANT GROWTH REGULATORS ON GROWTH AND YIELD OF MUKHI KACHU

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Abstract

An experiment was conducted with different concentrations of plant growth regulators to evaluate their effects on the growth and yield of late planted Mukhi Kachu *(CoIocsis esculenta).* Different treatments of uniconazole (growth retardant showed significant influence on plant height, petiole length, number of leases per plant, weight of leaf and weight of petioles per hill, number and weight of corms and cormels per hill and yield of cormel. GA_3, (growth promoter) enhanced foliage growth, flowering, and cormel development

Key Words: Growth regulators, Mukhi Kachu *(Colocusis esculenta)* and yield.

Introduction

Mukhi Kachu *(Colocasia esculenta)* is known as taro, cocoyam, eddoe, and dasheen in different places and used as an important vegetable in various parts of the tropics (Onwueme, 1978). In Bangladesh, it comes to market as an important summer vegetable when most of the vegetables are not available. But the yield of Mukhi Kachu is quite low (6.5 t/ha) BBS, 2001) as compared to that of other countries (Onwueme, 1978). The crop grown under rainfed condition and it is planted in late summer when rainfall occurs. As a result, the crop gets short duration to complete its life cycle due to late plantation, which is one of the main causes of low yield of Mukhi Kachu in Bangladesh. Onwueme (1978) stated that Mukhi Kachu is a warm weather crop requiring an average daily temperature of 21^0C. After plantation, the crop requires first six months for shoot growth. Then it declines and cormel growth starts and continues to grow about 2-3 months till maturity, in this condition 8-9 months are required for a crop growing season for Mukhi Kachu. In our country, the plantation depends on rainfall that leaves short time for its growth and development. As a result, shoot growth is fully achieved but cormel growth does not, so yield decreases. In such a situation, any means that could reduce shoot growing period and enhance the early initiation of underground parts (corm and cormel) would be a great help for late planted crop. In this case, application of growth retardant would play an important role, which showed effective results in other crops (Rahim, 1988; Rahim and Alamgir, 1995; Ud-Deen *et al.,* 2005). A growth promoter (GA_3) was also included in this study to confirm the effects of growth retardant.

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Materials and Method

The experiment was conducted in the experimentatal field of Rajshahi University, Rajshahi. The seed cormel of Mukhi Kachu variety Bilashi was used as experimental material. The land was medium high having sandy loam textured soil with pH 6.5 under the low Ganges river flood plain of agroecological zone AEZ 12. Two separate experiments were conducted. One with uniconazole (Sumiseven), a growth retardant comprising 3 (three) concentrations, such as 100, 150, 250 ppm and a control (0 ppm). Another with GA_3 (Gibbrerellic Acid). a growth promoter having same concentrations. Both the experiments were laid out in Randomized Complete Block Design (RCBD) with 3 replications. The unit plot size was 5m x 2.1rn and the plant spacing was 70cm x 50cm. The crop received 110 tons cowdung, 140 kg urea, l00 kg TSP, and 120 kg MP per hectare. Cowdung and TSP were applied before plantation and urea and MP were top dressed in two equal installments at 40 and 90 days after planting. Seed cormels were dipped in the respective concentrations of each growth regulators for 12 hours before planting. The crop was harvested at 90, 120, and 150 days after planting (DAP) to study their growth pattern and yield.

Results and Discussion

Effects of uniconazole

Uniconazole treated plants produced shorter plants with shorter petioles. A gradual decrease in plant height and petiole length for all the treatments was noticed as compared to that of control (Table 1). The tallest plant and petiole length were recorded in the control (T_0) plants, whereas the shortest one as found in plants treated with uniconazole of 250 ppm. Like plant height, a gradual decreasing trend in leaf number per plant, weight of leaves and petioles per hill were observed for all the treatments compared to that of control (Table 1). Higher concentration of uniconazole (250 ppm) treated plants produced minimum leaf number per plant, weight of leaves per hill, and weight of petioles per hill, whereas the control (T_0) plants produced the maximum leaf number per plant, weight of leaves per hill, and weight of petioles per hill. Several authors reported that uniconazole resulted in a significant decrease in plant height of different crops (Barrett and Nell, 1992; Starman, 1991; Wang and Blessington, 1990; Henry, 1985; Davis *et al.*, 1988; Deneke *et al.*,1992 and Keever and West, 1992). Frymire and Cole (1992), Henderson and Nichols (1991) and Norcini and Knox (1989) stated that uniconazole with medium drench applications reduced leaf area and leaf number, stem, and root dry weight. The above findings are in agreement with the present investigation.

Significant differences were observed among different concentrations of uniconazole in respect of number of corms and cormels per hill, weight of corms and cormels per hill and finally yield (Table 1 and Figure 1-2). The highest number of corms per hill, cormels per hill, weight of corms per hill, cormels per hill and higher yield (6.90 kg/plot and 7.53 t/ha) was found in the plants treated with 150 ppm uniconazole, whereas uniconazole of 250 ppm produced lowest number of corms per hill, cormels per hill, and weight of corms per hill, but control plants (T_0) produced the lowest weight of cormels per hill and lowest yield (3.75 kg/plant and 4.00 t/ha). Uniconazole produced higher yield possibly by enhancing the translocation of assimilates downward, this enhanced the cormels development in this case by determining the position of metabolic sink. It may revealed that the physiological role played by the growth retardant would be similar to that of abscisic acid in controlling tuberzation in *Dahlia* (Halvey and Biran, 1975). The same fact was also supported by Knypl (1979, 1990) in onion; Rahim (1988) in garlic and Rahim and Alamgir (1995) in Mukhi Kachu. By using different growth retardants and gibberellic acid, Knypl (1979) and Rahim (1988) found that the growth retardants significantly increased bulb growth relative to the both control and gibberellic acid treated plants. Similar type of action was observed in the present study.

Effects of GA_3

GA_3 treated plants produced longer plants with longer petiole as compared to that of control (Table 2). As the concentration of GA_3 increased the plant height, petiole length, number of leaves per plant and weight of leaves per hill and weight of petioles per hill also increased. Higher concentration of GA_3 (250 ppm) treated plants produced maximum plant height, petiole length, number of leaves per plant, weight of leaves per hill, and weight of petioles per hill, whereas control (T_0) plants produced the minimum plant height, petiole length, number of leaves per plant, weight of leaves per hill, and weight of petioles per hill. However, the present findings agreed well with the findings of different workers, Mishriky *et al.* (1990) observed that GA_3. significantly increased stem length and number of leavses per plant, while CCC (a growth retardant) reduced all these parameters of vegetative growth in pea. Ud-Deen *et al.* (2005) reported that number of leaves per plant, pseudostem length, leaf length, and plant height were increased with the increase of the duration of treatment of growth promoting hormone CA_3.

Table 1. Effects of uniconaoIe on the growth and yield of Mukhi Kachu *(Colocusia esculenta)*.

Treatment	Plant height (cm)	Petiole length (cm)	No. of leaves/ plant	Wt. of leaves/ hill (plant)	Wt. of petioles/ hill (g)	No. of corms/ hill	No. of cormels/ hill	Wt. of corms/ hill (g)	Wt. of cormels/ hill (g)	Yield of cormel	
										kg/plot	t/ha
T_0	45.20	37.50	18.33	19.62	60.72	2.12	18.99	60.94	150.60	3.75	4.00
T_{100}	41.86	35.10	16.90	12.53	53.60	1.85	23.33	75.33	190.66	6.03	6.76
T_{150}	40.63	37.85	12.22	12.23	50.41	2.98	25.36	100.26	200.36	6.90	7.75
T_{200}	36.15	30.52	9.36	8.36	40.12	1.20	18.89	60.60	195.55	4.96	5.68
LSD (5%)	3.06	2.12	1.09	4.36	4.89	0.66	4.85	8.69	7.55	2.36	1.36

Table 2. Effect of GA_3 on the growth and yiled of Mukhi Kachu (*Colocasia esculenta*).

Treatment	Plant height (cm)	Petiole length (cm)	No. of leaves/ plant	Wt. of leaves/ hill plant	Wt. of petioles/ hill (gm)	No. of corms/ hill	No. of cormels/ hill	Wt. of corms/ hill (gm)	Wt. of cormels/ hill (gm)	Yield of cormel	
										kg/plot	t/ha
T_0	43.55	34.23	11.12	9.36	35.22	4.12	25.30	90.63	150.36	5.36	5.10
T_{100}	46.33	37.54	12.99	11.23	49.66	3.65	23.10	81.23	189.55	6.56	6.12
T_{150}	46.93	38.10	15.36	14.11	55.23	3.10	22.36	79.31	173.33	6.49	6.00
T_{200}	48.66	40.93	19.23	15.47	65.36	2.35	14.23	65.33	135.35	4.98	4.35
LSD (5%)	5.36	2.03	5.61	3.10	7.56	2.02	4.03	9.36	5.36	1.03	2.36

A decreasing trend was observed with increasing concentration of GA_3 in relation to yield and yield contributing characters compared to that of control at different days after planting (Table 2 and Fig. 3-4). The control plants (T_0) produced the maximum number of corms per hill, cormels per hill, and weight of corms per hill, whereas GA_3 of 250 ppm treated plants produced the minimum number of corms per hill, cormels per lull, and weight of corms per hill. 100 ppm GA_3 treated plants produced the highest cormel weight per hill and yield, but higher concentration of GA_3 (250 ppm) produced the lowest cormel weight per hill and yield. It means GA_3 enhanced vegetable growth of plants and did affect yield. GA_3 enhanced flowering in *Colocasia esculenta.* Percent of flowers were increased with increase in concentration of GA_3 upto 150 ppm upto 90 days after planting (Fig. 5). It is supported by Miazaki *et al.* (1986). They stated that inflorescence contained flower and florets, but no pollen was formed from gibberellic acid induced inflorescence. Katsura *et al.* (1986) also reported that gibberellic acid induced flower in *Colocasia esculenta* rapidly. So, yields decreased due to application of gihberellic acid.

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