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Effect of growth regulators on days taken to physiological maturity, number of marketable and unmarketable tuber per plant in sweet potato (*Ipomoea batatas* (L.) Lam.)

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Abstract
A field experiment was carried out during *kharif*2016-17 at Kittur Rani Channamma College of Horticulture, Arabhavi (Karnataka) to study the effect of growth regulators yield of sweet potato [*Ipomoea batatas* (L.) Lam.]. The minimum days taken for physiological maturity (101.67) were found in treatment combination of GA_3 @ 100 ppm and CCC @ 250 ppm (T_{10}), followed by (102.33) treatment combination of GA_3 @ 50 ppm and IBA @ 200 ppm (T_9), while the maximum days taken for physiological maturity (119.33) were observed in control (T_{11}) treatment. The (number of marketable tubers significantly ranged from 3.78 to 7.61 with different concentration of growth regulators. Maximum number of marketable tubers (7.61) was found in combination of GA_3 @ 100 ppm and CCC @ 250 ppm T_{10}), followed by single treatment (T_6) of CCC @ 300 ppm (6.50). Whereas, the minimum number of marketable tubers (3.78) was observed in control (T_{11}).

Keywords: Sweet potato, plant growth regulators and physiological maturity

Introduction

Sweet potato [*Ipomoea batatas* (L.) Lam.] is an important tuber crop belonging to the family Convolvulaceae. It is an important starchy vegetable crop in tropics and sub tropics. It is mainly grown as oneof the supplementary food crops to meet the requirements of carbohydrates and also to provide raw materials for manufacture of starch, alcohol, lactic acid, vinegar etc. The nutrition of sweet potato in human diet is quite appreciable since, it provides high quantity of starch, substantial amount of vitamins (A, B and C) (Hung *et al.* 1999) [6], minerals and trace elements compared to cereals. It would be a good substitute for rice and wheat (Thakur, 1975) [17]. It also contains considerable amount of beta-carotene (5.40 to 20.00 mg/100g) and sugar content.

Sweet potato tubers are consumed usually after boiling, baking and frying and may also be candied as 'Puree'. Tubers are utilized for canning, dehydration and flour manufacturing and also as an important source of starch, glucose, pectin and sugar hence used in syrup and industrial alcohol preparation. Sweet potato 'vine tips' are used as leafy vegetable in China, Japan and Korea (Dhankhar, 2001) [5].

The role of plant growth substances in the physiology of plant is one of the most interesting chapters in the science. The plant growth substances are organic compounds, other than nutrients which in small concentration influence the physiological processes of plants. They have been used for various beneficial effects such as promoting plant growth, increasing number of flowers, fruit size and inducing early and uniform fruit ripening.

The gibberellins a large family of closely related tetracyclic diterpenoid compounds have been applied to enhance the productivity of crops. GA_3 has a major effect on growth and development activating the entire metabolic activities of many crops. GA_3 is one of the important growth regulators that stimulate vegetative growth (Singh and Rajodia, 2001) [16], yield (Khan *et al.,* 2002) [7] and sugar content (Babu, 2000) [2]. With this background, the studies on effect of growth regulators on yield of Sweet potato was undertaken during *Kharif* 2016 at Dept. of vegetable science, Kittur Rani Channamma College of Horticulture, Arabhavi.

Material and Methods

The field experiment was conducted at the Kittur Rani Channamma College of Horticulture, Arabhavi, Gokak Taluk, Belgaum district of Karnataka state during the *Kharif* -2016.

Arabhavi is situated in northern dry zone of Karnataka state at 16^0 13' 39.6" north latitude, 74^0 50' 13.5" east longitude and at an altitude of 612.03 m above the mean sea level. Arabhavi, which lies in Zone-3 of Region-2 of agro-climatic zones of Karnataka, is considered to have the benefit of both South-West and North-East monsoons. The average rainfall of this area is about 530 mm, distributed over a period of five to six months (May-October) with peak (226.10 mm) during September. The area receives water from Ghataprabha Left Bank Canal from mid-July to mid-March. During the experimental period, the mean minimum temperature varied from 11.80^0 C (December 2016) to 23 ^{0}C (August 2016), whereas the mean maximum temperature varied from 26.10^0 C (December 2016).

The experiment was laid out in Randomized block design and replicated thrice. Vine cuttings of 15-20 cm length were planted at a spacing of 60 x 30 cmand 5-7 cm depth. Standard recommended cultural practices were followed during the entire crop grown period. The experiment consisted of different PGR concentrations (GA_3 @ 25, 50 and 100 ppm, CCC @ 100, 250 and 300 ppm and IBA @ 100 and 200 ppm and control). In each treatment, the plants were sprayed twice at 45 and 60 days after transplanting. The data on vegetative growth, tuber characters were recorded and analyzed statistically.The experimental data collected on various growth, yield and quality aspects were subjected to Fisher's method of analysis of variance (ANOVA) as per methods outlined by Panse and Sukhatme (1967). The critical difference (CD) was calculated wherever the 'F' test was found significant. The data were analyzed and presented with the level of significance at 5 per cent.

Results and Discussion

The data on days taken for physiological maturity was found significantly influenced by different concentration of growth regulators and their combinations are presented in Table -1.

The minimum days taken for physiological maturity (101.67) were found in treatment combination of GA_3 @ 100 ppm and CCC @ 250 ppm (T_{10}), followed by (102.33) treatment combination of GA_3 @ 50 ppm and IBA @ 200 ppm (T_9), while the maximum days taken for physiological maturity (119.33) were observed in control (T_{11}) treatment. The lowest days taken to physiological maturity might be due to better crop establishment along with better growth up to harvest. These results are in conformity with the findings of Sillu *et al*. (2012) [15] in potato, Sawant *et al.* (2010) [13] and Roy and Nasiruddin (2011) [12] in cabbage, Chatterjee and Choudhuri (2012) [4] in cowpea.

The (number of marketable tubers significantly ranged from 3.78 to 7.61 with different concentration of growth regulators. Maximum number of marketable tubers (7.61) was found in combination of GA_3 @ 100 ppm and CCC @ 250 ppm T_{10}), followed by single treatment (T_6) of CCC @ 300 ppm (6.50). Whereas, the minimum number of marketable tubers (3.78) was observed in control (T_{11}). It was due to better plant growth and canopy area, which might have resulted in more number of marketable tubers per plant and marketable yield per hectare. Further, the significant increase in tuber yield might be attributed due to the higher chlorophyll content, photosynthetic activity, increased assimilation and accumulation of photosynthates from source to sink by foliar application of GA_3 and CCC. These results are in conformity with the findings of Shedge *et al.* (2008) [14] in sweet potato, Baijal *et al.* (1983) [3], Sillu *et al*. (2012) [15] in potato, Padmavathi (1998) [8] in onion and Remison *et al.* (2002) [11] in cassava.

The number of unmarketable tubers significantly ranged from 1.21 to 2.91. Minimum number of unmarketable tubers (1.21) was recorded in combination of GA_3 @ 100 ppm and CCC @ 250 ppm (T_{10}), followed by single treatment of CCC @ 250 ppm (T_5) (1.33). Whereas, the maximum number of unmarketable tubers per plant (2.91) was recorded in control (T_{11}). The minimum number of unmarketable tubers might be due to development of uniform sized, uninfected and medium to large size tubers. The another probable reason might be attributed due to the higher chlorophyll content, photosynthetic activity, increased assimilation and accumulation of photosynthates from source to sink by foliar application of GA_3 and CCC. These results are in conformity with the findings of Abdul and Kumaran (1980) [1], Shedge *et al.* (2008) [14] in sweet potato, Patel *et al.* (2010) [1] in onion.

Table 1: Effect of growth regulators on days taken to physiological maturity, number of marketable and unmarketable tuber per plant in sweet potato

S. No.	Treatments	Days taken to physiological maturity	Number of marketable tuber per plant	Number of unmarketable tuber per plant
1.	T_1- GA_3 @ 25 ppm	116.33	4.07	2.38
2.	T_2- GA_3 @ 50 ppm	112.67	4.58	2.05
3.	T_3- GA_3 @ 100 ppm	109.33	6.50	1.50
4.	T_4- CCC @ 200 ppm	111.00	6.83	2.21
5.	T_5- CCC @ 250 ppm	106.67	7.17	1.33
6.	T_6- CCC @ 300 ppm	108.00	7.33	1.62
7.	T_7- IBA @ 100 ppm	107.33	4.30	2.28
8.	T_8- IBA @ 200 ppm	105.67	4.78	2.16
9.	T_9- Combination of GA_3 @ 50 ppm + IBA @ 200 ppm	102.33	5.89	1.36
10.	T_{10}- Combination of GA_3 @ 100 ppm + CCC @ 250 ppm	101.67	7.61	1.21
11.	T_{11}- Control	119.33	3.78	2.91
	S.Em±	3.51	0.40	0.14
	C. D. at 5%	10.37	1.19	0.41
	C.V.	5.58	12.30	12.79

DAP = Days after planting

References

1. Abdul VM, Kumaran MN. National seminar on tuber crops production technology. Tamil Nadu Agricultural University, 1980, 137-141.
2. Babu N. Effect of NAA, IAA and GA_3sprays on growth, yield and quality of papaya (*Carica papaya* L.) fruit under foothills of Nagaland. New Agric. 2000; 11(1.2):71-75.
3. Baijal BD, Kumar P, Siddique AMA. Interaction of growth regulators and photoperiods on growth flowering, stolon development tuber interaction and yield in potato. Indian J Pl. Physiol. 1983; 26(1):61-67.
4. Chatterjee R, Choudhuri P. Influence of foliar application of plant growth promoters on growth and yield of vegetable cow pea (*Vigna unguiculata* L.). J Crop and Weed. 2012; 8(1):158-159.
5. Dhankhar. Environment being nutritional security from vegetables, roots and tubers. Indian Hort. 2001; 45(4):13-17.
6. Hung AS, Tanudjaja L, Lum D. Content of alpha- beta and dietary fibre in 18 sweet potato varieties grown in Hawaii. J Food Composition and Analysis. 1999; 12:147-150.
7. Khan N, Ansari M, Mir R, Samiullah. Effect of phytohormones on growth and yield of Indian mustard. Indian J Pl. Physiol. 2002; 7(1):75-78.
8. Padmavathi G. Effect of plant growth regulators on productivity potential of onion. M. Sc. (Agri.) Thesis, University of Agricultural Sciences, Dharwad, 1998.
9. Panse VG, Sukhatme PV. Statistical methods for agricultural workers. Indian Council of Agricultural Research, New Delhi, India, 1985.
10. Patel MJ, Patel HC, Chavda JC. Influence of plant growth regulators and their application methods on yield and quality of onion (*Allium cepa* L.). Asian J Hort. 2010; 5(2):263-265.
11. Remison SU, Ewanlen DO, Okaka VB. Evaluation of cassava varieties and effects of growth regulators on vegetative traits and yield. Trop. Agric. Res. Extention. 2002; 5(2):1-2.
12. Roy R, Nasiruddin KM. Effect of different level of GA_3 on growth and yield of cabbage. J Environ. Sci. & Natural Res. 2011; 4(2):79-82.
13. Sawant VP, Naik DM, Barkule SR, Bhosale AM, Shinde SB. Effect of foliar application of growth regulators on growth, yield and quality of cabbage cv. Golden acre. Asian J Hort. 2010; 5(2):495-497.
14. Shedge MS, Khandekar RG, Bhagwat NR. Effect of foliar application of maleic hydrazide and cycocel on growth and yield of sweet potato. J Root crops. 2008; 34(2):120-128.
15. Sillu M, Patel NM, Bhadoria HS, Wankhade VR. Effect of plant growth regulators and methods of application on growth and yield of potato (*Solanum tuberosum* L.) cv. Kufribadshah, Adv. Res. J Crop Improv. 2012; 3(2):144-147.
16. Singh M, Rajodia RB. Effect of gibberellic acid on growth and yield attributes of radish varieties. Crop Res. 2001; 21(2):174-177.
17. Thakur C. Scientific crop production. Sweet potato metropolitan Book Co. Pvt. Ltd, 1975, 122-126.