RESEARCH ARTICLE

EFFECT OF PLANT GROWTH REGULATORS ON QUALITY PARAMETERS OF 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 on quality parameters of sweet potato [*Ipomoea batatas* (L.) Lam.]. The maximum beta carotene content (7.65 mg) was recorded in combination of GA_3 @ 100 ppm and CCC @ 250 ppm (T_{10}), followed by single treatment GA_3 @ 100 ppm (T_3) (6.72 mg/100g). significantly maximum reducing sugar content (7.40%) was recorded in treatment combination of GA_3 @ 100 ppm and CCC @ 250 ppm (T_{10}), significantly maximum starch content (22.50%) was recorded in treatment combination of GA_3 @ 100 ppm and CCC @ 250 ppm (T_{10}),

Keywords: *Ipomoea batatas*, Plant growth regulators, Quality parameters

INTRODUCTION

Sweet potato [*Ipomoea batatas* (L.) Lam.] is an important tuber crop belonging to the family Convolvulaceae. This family includes 55 genera and more than 1000 species (Watson and Dallwitz, 2000). In southern part of United States, it is popularly known as 'White potato' or 'Irish potato'. It is popularly called as 'Sakarkand' in India. Sweet potato is a crop of considerable economic and social importance and is a potential staple food in the developing world. It is estimated that root and tuber crops are the third most important food crops after cereals and legumes. For one fifth of the people of the world, they form either staple or important subsidiary food. Sweet potato is the second important tuber crop, first being the potato and is grown in more than 100 countries as a source of starch, protein and carotene (Woolfe, 1992).

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).

Sweet potato is second only to potato in area and production among the tuber crops of the world. The total area under sweet potato in the world is estimated to be 9.08 M/ha with a production of 135.19 MT. Asia is the largest producer of sweet potato in world with 92 per cent of world's sweet potato production is from Asia (Villareal, 1982). In India, sweet potato is being cultivated in almost all the states with an area of 111 ha, with a production of 1450 metric tonnes and productivity of 10.4 MT/ha (Anonymous, 2015). India accounts for about 68% of the total production of South Asia followed by 27% in Bangladesh and about 5% in Sri Lanka. In India, Sweet potato is cultivated mainly in Odisha, Uttar Pradesh, West Bengal, Bihar, Karnataka, Andhra Pradesh, Tamil Nadu and Kerala.

One of the recent developments in the field of agricultural science has been the use of growth regulators, which have brought about a sort of revolution in boosting up yield of different crops. The growth regulators when applied in a suitable manner and concentration regulate the growth, development and increase production of crops. Recently, the response of plant growth regulators in increasing the growth and yield has been recognized in many vegetable crops (Muthoo *et al.*, 1987, Singh and Yadav, 1987). Plant growth regulating substances have been reported to exert favourable effect on physiological and other biochemical activities of crop plants. Now days the use of plant growth regulating chemicals have become an important component of agritechnical procedure for most of the cultivated crops.

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.

Since the crop can be grown in marginal lands without much input and is rich in starch, it provides cheap source of energy for millions and can form the source of various industrial products, hence there has been renewed interest in this crop. A careful and biochemical study is needed for increasing the yield and quality of sweet potato. The favourable subtropical climate of Karnataka with deep sandy or sandy loam soil provides ample scope for improving the yield and quality parameters of sweet potato by application of growth regulating chemicals and modern cultural practices. With this background, the

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studies on effect of growth regulators on quality of Sweet potato was undertaken during *Kharif* 2016

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 parameters 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

Total soluble solids (^{0}Brix)

Among the treatments, highest TSS (13.57^{o}brix) was recorded in treatment combination T_{10} – GA_3 @ 100 ppm and CCC @ 250 ppm as compared to other treatments. In case of single treatment T_3 – GA_3 @ 100 ppm (11.45^{o}brix) recorded maximum TSS content. However, the lowest TSS content (6.92^{o}brix) was noticed in control (T_{11}). The increase in TSS may be accounted to the hydrolysis of polysaccarids, conversion of organic acids into soluble sugars and enhanced solubalization of insoluble starch and pectin present in cell wall and middle lamella. These results are in accordance with the finding of Mandal *et al.* (2012) in Okra, Sawant *et al.* (2010) in cabbage, Sinnadurai and Amuti (1973) in tomato.

Starch content (%)

It was observed that significantly maximum starch content (22.50%) was recorded in treatment combination of GA_3 @ 100 ppm and CCC @ 250 ppm (T_{10}), followed by single treatment GA_3 @ 100 ppm (T_3) (21.40%). Whereas, the minimum starch content (15.75%) was recorded in control (T_{11}). Increase in starch content in the tubers might be due to accumulation of metabolites as a result of increase in chlorophyll content in the leaves. Similar results of increase in starch by application of GA_3 were recorded by Gizawy *et al.* (2006) in potato and Rao *et al*. (2017) in sweet potato.

Reducing sugar (%)

It was observed that significantly maximum reducing sugar content (7.40%) was recorded in treatment combination of GA_3 @ 100 ppm and CCC @ 250 ppm (T_{10}), followed by single treatment GA_3 @ 100 ppm (T_3) (7.15%). Whereas, the minimum reducing sugar content (5.23%) was recorded in control (T_{11}). The increase in content of total sugars might be due to the quick transformation of starch into soluble solids and rapid mobilization of photosynthetic metabolites and minerals from other parts of the plant to developing parts, Similar results were observed by Rao *et al*. (2017) in sweet potato, Kumar *et al.* (2012) in potato, Sinnadurai and Amuti (1973) in tomato and Chakrabortty (2001) in ground nut, Indira *et al.* (1980) in coleus.

Beta carotene content (mg/100g of fresh weight)

With respect to different levels of plant growth regulators, the maximum beta carotene content (7.65 mg) was recorded in combination of GA_3 @ 100 ppm and CCC @ 250 ppm (T_{10}), followed by single treatment GA_3 @ 100 ppm (T_3) (6.72 mg/100g). Whereas, the minimum beta carotene content (4.60 mg/100g) was recorded in control (T_{11}). Similar results were observed by Rao *et al*. (2017) in sweet potato, Singh *et al*. (2012) in coriander

Table 1. Effect of different concentration of plant growth regulators on quality parameters of sweet potato

Sl. No.	Treatments	TSS (^{o}Brix)	Starch (%)	Reducing sugar (%)	B- Carotene (mg/100g FW)
1.	T_{1-} GA_3 @ 25 ppm	8.11	17.20	6.10	5.85

2.	T_2- GA_3 @ 50 ppm	8.70	19.25	6.29	6.10
3.	T_3- GA_3 @ 100 ppm	11.45	21.40	7.15	6.72
4.	T_4- CCC @ 200 ppm	9.68	17.58	6.13	6.22
5.	T_5- CCC @ 250 ppm	10.45	18.20	6.27	6.45
6.	T_6- CCC @ 300 ppm	11.23	19.55	6.55	6.68
7.	T_7- IBA @ 100 ppm	7.75	16.85	5.43	5.60
8.	T_8- IBA @ 200 ppm	8.53	17.10	5.68	5.73
9.	T_9- Combination of GA_3 @ 50 ppm + IBA @ 200 ppm	10.31	21.15	6.56	6.55
10.	T_{10}- Combination of GA_3 @ 100 ppm + CCC @ 250 ppm	13.57	22.50	7.40	7.65
11.	T_{11}- Control	6.92	15.75	5.23	4.60
	S.Em ±	**0.12**	**0.28**	**0.14**	**0.14**
	C. D. at 5%	**0.35**	**0.86**	**0.43**	**0.42**
	C.V.	**2.14**	**2.71**	**4.03**	**4.04**

FW: Fresh weight

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