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The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(8): 561-562

www.thepharmajournal.com
Received: 15-05-2023
Accepted: 19-06-2023

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Studies on the influence of plant growth regulators on quality of sweet potato (*Ipomoea batatas* L.) cv. Kiran

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Abstract
A field experiment was conducted at College of Horticulture, Mojerla during Rabi 2016-17 to study the influence of plant growth regulators and their time of application on growth and tuber yield of sweet potato Cv. Kiran. The treatment comprised six plant growth regulators *viz*... Cycocel, Paclobutrazole, ALAR, Salicylic acid, Gibberellic acid and Ethrel each with two different concentrations and control (water) were used as foliar spray at 30 and 45 days after planting. Experiment was carried out under factorial randomized block design (FRDB) with two replications. The result revealed that, among different plant growth regulator treatments, CCC 500 ppm recorded significantly maximum carbohydrate percentage (27.05) and protein percentage (2.33) as compared to other treatments.

Keywords: Studies, influence of plant growth regulators, their time, application on quality

Introduction
Sweet potato (*Ipomoea batatas* L.) is one of the important tuber crop of tropical and sub-tropical regions of the world, belongs to the family convolvulaceae and is native to South America. It is popularly known as sakar kand in India. It constitutes the staple diet for tribal population due to hardiness and adaptability into diversified farming system. It is a crop of economic, social importance and a potential staple food in the developing world. In the worldwide, Sweet potato is the sixth most important food crop after rice, wheat, potato, maize and cassava.

One of the recent developments in the field of Horticultural science has been the use of growth regulators, which have brought about a sort of revolution in boosting up different crop yields. Plant growth regulating substances have been reported to exert a 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 Agri-technical procedure for most of the cultivated crops Gibberellic acid is an important growth regulator that may have many uses to modify the growth, yield and yield contributing characters of plant (Alexopoulos *et al*., 2006) [1]. Cycocel, one of the growth retardants, has been widely applied for chemical manipulation of growth and development of various crops, and it causes retardation of vegetative part while photosynthetic activities are accelerated at appreciable rate (Stoddart 1964) [2]. Alar (B-995 or SADH) is another important growth retardant which retard the growth of plants. The inhibition of growth by alar application was reported by Devi (2002) and Bora (2002) [3].

Materials and Methods
The study was conducted in College of Horticulture, Mojerla. Sri Konda Laxman Telangana State Horticultural University, Hyderabad. Experiment consisting of one cultivar Kiran and 6 growth regulators with two different concentrations (CCC 250 ppm, CCC 500 ppm, PBZ 50 ppm, PBZ 100 ppm, ALAR 250 ppm, ALAR 500 ppm, SA 100 fppm, SA 200 ppm GA3 100 ppm GA3 200 ppm, Ethrel 250 ppm and Ethrel 500 ppm) and control (water) with two different time of schedule (30 and 45 days after planting) are arranged in FRBD with two replication.

The land was thoroughly ploughed to a depth of 15-20 cm and brought in to a fine tilth. Well decomposed FYM @ 10 t ha-1 was incorporated into the soil uniformly during the final ploughing as a basal application. The experimental area was divided in to plots of 3.5 × 1.2 m size. Irrigation channels of 0.5 m size were prepared between two plots. Cuttings were planted in the plots at a spacing of 60×30 cm and 5-7 cm depth.

Standard recommended cultural practices were followed during the entire crop period.

The required weight of the PGRs was taken using electronic sensitive balance and solution was prepared by dissolving in 1 mg L-1. The solution was poured into hand-held sprayer and was directly sprayed on the plants at 30 and 45 days after planting. Spraying was performed early in the morning to avoid rapid drying of the spray solution, due to transpiration. All the recommended cultural practices were followed during the conduction of the experiment. Data were collected from selected plants in the rows.

Results and Discussion

Total carbohydrate (%)

The results related to the total carbohydrate per cent is presented in the table 1. Total carbohydrate per cent in sweet potato Cv. Kiran differed significantly due to plant growth regulator treatments. Significantly the highest value was recorded in CCC 500 ppm (27.05), whereas minimum in control treatment (19.68). The data pertaining to schedule of spray and their treatment interaction did not influence the parameter significantly. The data enunciated on total carbohydrate per cent revealed that, CCC 500 ppm recorded the highest value which was due to suppressed vine growth, ultimately increased the endogenous carbohydrate concentration in tuber portion. Similar results were also reported by Ravichandran *et al* (2007) [4] in poato and Seema Sarkar and Sarma (2008) [5] in sweet potato.

Crude protein (%)

The data pertaining to crude protein per cent is presented in the table 1. There was significant difference observed among the growth regulator treatments with respect to crude protein per cent. Among the treatments, CCC 500 ppm recorded significantly maximum crude protein per cent (2.33), whereas control has taken minimum value (1.36). The results related to the schedule of spray and their treatment interactions were found to be non-significant. The highest crude protein per cent was recorded in CCC 500 ppm might be due to completely blocked GA_3 biosynthesis as compare to rest of the treatments. Similar observation was also reported by Telkalign and Hammes (2005) [6] in potato.

Table 1: Effect of plant growth regulators and their time of application on total carbohydrate per cent and crude protein content of Sweet potato Cv. Kiran

Treatments (G)	Total carbohydrate (%)			Total protein (%)		
	S_1	S_2	Mean	S_1	S_2	Mean
G_1 - CCC 250 ppm	25.20	24.90	25.05	2.15	2.05	2.10
G_2 - CCC 500 ppm	27.25	26.85	27.05	2.25	2.40	2.33
G_3 - PBZ 50 ppm	23.90	23.80	23.85	2.00	2.05	2.03
G_4 - PBZ 100 ppm	24.30	22.80	23.55	2.00	2.25	2.13
G_5 - ALAR 250 ppm	23.00	24.65	23.83	1.55	1.75	1.65
G_6 - ALAR 500 ppm	24.10	23.65	23.88	1.70	1.75	1.73
G_7 - SA 100 ppm	21.65	21.65	21.65	1.55	1.85	1.70
G_8 - SA 200 ppm	22.70	22.65	22.68	1.70	1.90	1.80
G_9 - GA_3 100 ppm	22.40	22.85	22.63	1.70	1.55	1.63
G_{10} - GA_3 200 ppm	24.15	24.05	24.10	1.65	1.50	1.58
G_{11} - Ethrel 250 ppm	24.10	23.20	23.65	1.50	1.55	1.53
G_{12} - Ethrel 500 ppm	22.20	22.25	22.23	1.60	1.73	1.66
G_{13} - Control	19.70	19.65	19.68	1.31	1.40	1.36
Mean	23.44	23.30		1.75	1.83	
	SEm ±		CD at 5 %	SEm ±		CD at 5 %
Plant growth regulators (G)	0.34		1.00	0.09		0.26
Schedule of spray (S)	NS		NS	NS		NS
(G × S)	NS		NS	NS		NS

S_1= spray at 30 days after planting. S_2 = spray at 45 days after planting.

Conclusion

It could be concluded from the present investigation that, the plant growth regulators significantly influence the quality of Sweet potato Cv. Kiran. Among the different plant growth regulator treatments, CCC 500 ppm showed positive effect on quality parameter; higher carbohydrate and protein percentage.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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