Current Horticulture 12(1): 61–63, Januray–April 2024 DOI: 10.48165/chr.2023.12.1.02

Effect of pre-harvest application of growth regulators on yield and quality of elephant- foot yam (*Amorphophallus paeoniifolius*) during storage

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Received: 11 February 2022; Accepted: 19 March 2023

ABSTRACT

The effect of pre-harvest application of growth regulators on yield and quality of elephant-foot yam (*Amorphophallus paeoniifolius* Dennst.) was studied during storage at Horticultural College and Research Institute, TNAU, Coimbatore during 2017-18. Thirteen pre-harvest treatments with cycocel, ethrel and kinetin were used individually and in combination with ridomil at different concentrations 15 and 30 days before harvesting. The combination of cycocel @ 500 ppm + ridomil @ 0.5% sprayed 30 days before harvesting recorded highest mean corm weight (820.60 g) and yield 36.70 tonnes/ha. After harvesting, corms were stored in well-ventilated dry room with relative humidity of 60-75 %. There was a significant loss in corm weight, starch content, dry matter and oxalate content during storage. The corm weight was significantly higher in T_8 (791.60 g), followed by T_{11} (773.30 g) and T_2 (686.10 g) after 6 months of storage. There was no significant loss in starch and dry-matter content in corms in all treatments during storage. The starch content ranged from 8.96 to 10.20% and dry-matter content from 21.50 to 25.25%. The oxalate content was significantly lower in T_8 (115.5 mg/100g), followed by T_2 (120 mg/100g) and T_9 (123 mg/100g).

Key words: Growth regulators, Corm weight, Starch, Dry matter, Oxalate content

Elephant-foot yam *(Amorphophallus paeoniifolius* Dennst.), Araceae, is profitable tuber crops grown in subtropical and tropical region of the world. Growth regulators plays an important role in regulating morphological characters (Shankaraswamy *et al.,* 2015). Chemicals influence the dormancy breaking (Muthuraj *et al.,* 2016), yield and quality in elephant-foot yam (Samatha Punna *et al.,* 2018). Oxalate is considered to be anti-nutritional and toxic (Guil-Guerrero, 2014). On storage of corms, oxalate gets reduced. Corms can also be cured in naturally- ventilated barns or other storage structures. Keeping in view, an experiment was conducted to find out the effect of pre-harvest treatments on tuber weight, yield, starch and calcium oxalate content in elephant-foot yam.

MATERIALS AND METHODS

The elephant-foot yam variety Appakoodal local was used. The experiment was laid out in a randomized block design with 13 treatments replicated thrice each in a plot size of 4.5 m × 4.5 m during 2017-18. The corms were planted at a spacing of 90 cm × 90 cm. Two crops were raised for two consecutive years, post-harvest and storage studies were conducted. The following 13 pre-harvest treatments using cycocel, ethrel and kinetin were used individually and in combination with ridomil at different concentrations 15 days and 30 days before harvesting for improving the quality of storage life.

After 8 months, corms were harvested and stored at room temperature under well-ventilated and dry room with relative humidity of 60-75 %. The data were recorded on mean corm weight (g), corm yield (t/ha), starch content (%), dry-matter content (%) and oxalate content (mg/100 g) at weekly intervals to assess quality of treated yam. The data were subjected to statistical analysis (Panse and Sukhatme, 1985).

RESULTS AND DISCUSSION

There was a significant difference in mean corm weight after pre-harvest application of growth regulators. The treatment T_8 (cycocel @ 500 ppm + ridomil @ 0.5% 30 days before harvesting) recorded highest mean corm weight (820.60 g), followed by treatment T_{11} (cycocel @ 500 ppm + ridomil @ 0.5% 15 days before harvesting) with individual corm weight of 806.30 g as compared to the control (390.00 g). The treatment, T_8 (cycocel @ 500 ppm + ridomil @ 0.5%

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Table 1. Effect of pre-harvest treatment on yield and quality immediately after harvesting

Treatment	Mean corm weight (g)	Corm yield (tonnes/ha)	Starch content (%)	Dry-matter content (%)	Oxalate content (mg/100 g)
T_1	390.00	16.70	10.15	22.25	693.00
T_2	722.60	31.30	10.84	24.00	151.00
T_3	563.60	28.50	10.42	21.00	595.00
T_4	488.00	22.20	10.28	23.00	181.00
T_5	721.60	30.90	10.70	22.00	184.00
T_6	540.60	29.30	10.41	22.50	183.00
T_7	434.30	19.70	10.24	20.00	393.00
T_8	820.60	36.70	11.03	23.00	151.00
T_9	679.60	30.90	10.55	21.03	204.00
T_{10}	528.60	24.50	10.31	23.25	280.00
T_{11}	806.30	32.40	11.00	20.78	232.00
T_{12}	587.30	28.90	10.51	22.25	356.00
T_{13}	410.60	18.90	10.23	21.50	356.00
Mean	**591.82**	**26.99**	**10.51**	**22.04**	**304.54**
SEd	0.54	0.68	2.08	1.66	1.16
CD (p=0.05)	0.27	0.34	1.54	0.88	0.58

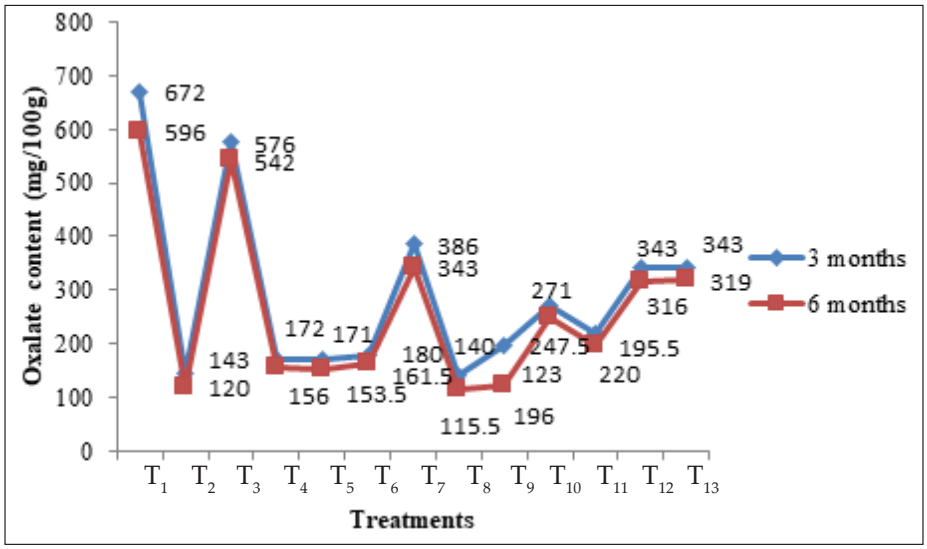

Fig. 1. Effect of pre-harvest growth regulators on oxalate content during storage

30 days before harvesting) showed highest yield of 36.70 tonnes/ha followed by T_{11} (cycocel @ 500 ppm + ridomil @ 0.5% 15 days before harvesting) with yield of 32.40 tonnes/ha.

There was non-significant difference in starch and dry-matter content of corms. There was a significant difference in oxalate content in corms after pre-harvest application of growth regulators. The oxalate content was significantly lower in T_8 (151.00 mg/100g) and T_2 (151.00 mg/100g), followed by T_4 (181.00 mg/100g), T_6 (183.00 mg/100g) and T_5 (184.00 mg/100g) compared to the control T_1 with highest oxalate content (693.00 mg/100 g) (Table 1).

Under well-ventilated and dry room, yams can be stored up 6 months. There was a significant loss in corm weight, starch content and dry-matter content

Table 2. Effect of pre-harvest growth regulators on corm weight, starch and dry-matter content during storage

Treatment	Mean corm weight (g)		Starch content (%)		Dry-matter content (%)	
	3 months	6 months	3 months	6 months	3 months	6 months
T_1	373.30	359.30	9.65	9.41	25.25	23.75
T_2	695.30	686.10	9.83	9.75	27.00	25.00
T_3	541.00	528.00	9.20	9.03	23.50	22.00
T_4	464.60	456.30	9.08	8.96	24.90	24.00
T_5	700.05	683.15	10.00	9.72	24.15	23.00
T_6	518.30	512.60	10.01	9.85	25.00	23.50
T_7	403.30	402.60	9.90	9.65	23.20	21.50
T_8	795.60	791.60	10.25	10.03	26.00	24.50
T_9	649.30	641.00	10.01	9.86	25.75	23.05
T_{10}	512.00	489.60	9.89	9.80	27.20	25.25
T_{11}	806.30	773.30	10.53	10.20	24.00	22.78
T_{12}	572.30	564.30	10.03	9.91	24.30	22.99
T_{13}	398.60	381.60	9.97	9.82	24.00	22.50
Mean	**571.53**	**559.19**	**9.87**	**9.69**	**24.94**	**23.37**
SEd	1.453	0.705	0.534	0.936	1.958	1.423
CD (p=0.05)	0.725	0.352	0.267	0.468	0.979	0.711

T_1, control; T_2, cycocel @ 500 ppm 30 days before harvesting; T_3, ethrel @ 250 ppm at 30 days before harvesting; T_4, kinetin @ 100 ppm 30 days before harvesting; T_5, cycocel @ 500 ppm 15 days before harvesting; T_6, Ethrel @ 250 ppm 15 days before harvesting; T_7, kinetin @ 100 ppm 15 days before harvesting; T_8, cycocel @ 500 ppm + ridomil @ 0.5% 30 days before harvesting; T_9, ethrel @ 250 ppm + ridomil @ 0.5% 30 days before harvesting; T_{10}, kinetin @ 100 ppm + ridomil @ 0.5% 30 days before harvest; T_{11}, cycocel @ 500 ppm + ridomil @ 0.5% 15 days before harvesting; T_{12}, ethrel @ 250 ppm + ridomil @ 0.5% 15 days before harvesting; T_{13}, kinetin @ 100 ppm + ridomil @ 0.5% 15 days before harvesting.

during storage. Reduction in weight may be due to respiration and water loss. Growth regulators have an inhibitory effect on wound healing and periderm formation. The corm weight was significantly higher in T_8 (791.60 g), followed by T_{11} (773.30 g) and T_2 (695.10 g) after 6 months of storage. There was non-significant loss in starch and dry-matter content in all treatments during storage. The starch content ranged from 8.96 to 10.20% and dry-matter content from 21.50 to 25.00%. The oxalate content was significantly lower in T_8 (115.5 mg/100g), followed by T_2 (120 mg/100g) and T_9 (123 mg/100g) (Table 2). Decrease in total oxalate content in corms was found during storage (Singh *et al.,* 2018).

CONCLUSION

The pre-harvest foliar spraying of cycocel @ 500 ppm + ridomil @ 0.5% 30 days before harvesting improved the quality of corms. The oxalate content significantly lower in T_8 (115.5 mg/100g), followed by T_2 (120 mg/100g) and T_9 (123 mg/100g).

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