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Influence of pre-harvest spray of growth regulators on the quality and shelf life of baby corn during storage at room temperature

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ABSTRACT

Pre harvest spray of growth regulators on the quality and shelf life of baby corn was studied. All the growth regulators extended shelf life for 2 days at room temperature. Among the growth regulators tried, pre-harvest spray of GA_3 40 ppm followed by cycocel 1000 ppm was proved to be promising in reducing the PLW (Physiological Loss in weight), spoilage per cent, better retention of TSS, reducing sugars, titrable acidity, ascorbic acid and crude protein content.

***Keywords*:** Baby corn, preharvest sprays, quality, shelf life

Baby corn or mini corn is a new economic product of recent origin. It refers to the tender flowering maize ears harvested 1-2 days after silk emergence before fertilization. Baby corn can be used as a readymade food like egg or any other fresh vegetable with best nutritional quality and is even competing with likes of mushroom etc. in the International market. Baby corn is a highly perishable product because of the highest respiration rate among vegetables. Pre-harvest application of growth regulators have known to play a spectacular role in improving growth and quality of many vegetables and fruits. 1.Higher production of summer season vegetable cowpea can be achieved by foliar spray of gibberalic acid (150 ppm) at 30 and 60 daysafter planting at terai zone of West Bengal (*Chatterjee* and *Choudhuri*, 2012) Information relating to extension of storage life of baby corn by sprays of growth regulators is very scarce hence, the present investigation was aimed at finding the suitable growth regulator in extending the shelf life of baby corn.

MATERIALS AND METHODS

The present investigation was undertaken during the kharif season with sixteen treatments composed of 3 growth promoters GA_3 (20, 40 and 60 ppm), Benzyl adenine (10, 20 and 30 ppm), Indole acetic acid (10, 20 and 30 ppm) and growth retardants cycocel (500, 1000 and 1500 ppm) and paclobutrazol (200,400 and 600 ppm) including control (water spray) were sprayed twice. Later the cobs were harvested at optimum picking stage (2 nd day after silking) and tested for shelf life and quality at room temperature. The chemical parameters like TSS, titrable acidity, vitamin C, crude protein, reducing sugars are estimated by the standard procedures (Ranganna, 1986).

RESULTS AND DISCUSSION

There was an increase in physiological loss in weight (Table 1) as the storage period increased. Pre-harvest application of growth regulators reduced the PLW as compared to control. It was observed that GA_3 40 ppm reduced the moisture loss to a grater extent. This may be attributed to the increasing affinity of the cell to water which can retain more water against forces of evaporation resulting in lesser weight loss during storage by altering some of the pertinacious constituents of the cell (Mitchell, 1949). Spoilage was in the form of pathogen attack, denting and shrivelling of com due to reduction of losses of moisture (Table 1). In general, the pre-harvest spray of growth regulators reduced the percentage of spoilage over control. The effectiveness of growth regulators in reduction of spoilage may be due to the decrease in biochemical changes in the cobs. This in turn have imparted resistance against penetration and growth of pathogen in the cobs and thus resulted in lesser spoilage (Kumar and Singh, 1987).

Quality parameters

There was a initial rise in the TSS (Table 2) and later a decline was observed in the cobs stored at room temperature. Pre-harvest spray of GA_3 40 ppm under all conditions of storage resulted in better retention of TSS due to the increased inhibitory effect of the

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Table 1: Effect of pre harvest spray of growth regulators on PLW, shelf life and spoilage of baby corn

Treatments (ppm)	Storage days							
	Physiological loss in weight (%)				Shelf life	Spoilage (%)		
	1	3	5	Mean		1	3	5
T_1-GA_3 20	2.30	13.33	17.29	10.97	4.33	0.0	31.33	66.66
T_2-GA_3 40	2.06	13.14	17.10	10.77	5.00	0.0	27.00	60.33
T_3-GA_3 60	2.31	13.30	17.39	11.00	4.00	0.0	32.00	66.67
T_4-BA 10	2.41	13.43	17.54	11.13	4.00	0.0	33.67	66.67
T_5- BA 20	2.34	13.31	17.49	11.05	4.33	0.0	30.33	36.67
T_6- BA 30	2.43	13.39	17.52	11.11	4.00	0.0	33.67	66.67
T_7- IAA 10	2.43	13.44	17.65	11.17	4.00	0.0	34.00	67.33
T_8- IAA 20	2.34	13.35	17.469	11.05	4.33	0.0	31.33	64.33
T_9- IAA 30	2.42	13.45	17.52	11.13	4.00	0.0	34.00	67.33
T_{10}- Cycocel 500	2.44	13.34	17.40	11.06	4.00	0.0	31.30	64.67
T_{11}- Cycocel 1000	2.14	13.20	17.27	10.87	5.00	0.0	28.33	63.33
T_{12}- Cycocel 1500	2.24	13.37	17.39	11.00	4.33	0.0	32.33	65.33
T_{13}- Paclobutrazol 200	2.44	13.42	17.64	11.16	4.00	0.0	33.00	65.67
T_{14}- Paclobutrazol 400	2.33	13.33	17.56	11.07	4.33	0.0	31.67	63.333
T_{15}- Paclobutrazol 600	2.47	13.41	17.64	11.77	4.00	0.0	33.33	66.33
T_{16}- Control	2.97	14.59	19.71	12.42	3.00	0.0	52.00	84.67
Mean	**2.38**	**13.43**	**17.59**					
		SEm(±)	**LSD (0.05)**					
Days (D)		**0.02**	**0.04**	**SEm(±)**	**0.27**		**0.68**	**1.29**
Treatments (T)		**0.05**	**0.10**	**LSD (0.05)**	**0.55**		**1.35**	**2.56**
D×T		**0.09**	**0.17**					

Ba - Benzyl Adenine

chemicals on enzymes responsible for degradation of soluble fraction. There was a gradual decline in the titrable acidity (Table 2) with the increase in the storage period due to the utilization of acids in the respiratory process (Pool *et al*., 1972).

Pre-harvest application of GA_3 was found to retain significantly higher acidity which explains the effectiveness of GA_3 on the slower degradation of organic acids for increased shelf life as suggested by Ahalawat *et al*. (1984). With the progress in storage period there was a continuous decline in the reducing sugars (Table 2). This may be due to heavy moisture losses and utilization of sugars for respiration as suggested by Pool *et al.*(1972). Pre-harvest spray of GA_3 40 ppm resulted in better retention of sugars during storage due to the lower rate of respiration, lower enzymatic activity which resulted in slower utilization of sugars for the respiration.

There was a gradual decline in the protein content (Table 3) with the advancement of storage period under all the conditions of storage. However, the process of reduction of crude protein in all treatments is not understood properly. During storage under all conditions, there was a decline in the ascorbic acid content (Table 3). This may be due to the activity of the oxidizing enzymes like ascorbic acid oxidase, peroxidase and catalase which might have converted ascorbic acid to dehydro ascorbic acid. Pre-harvest application of GA_3 might have slowed the activity of these enzymes (Khader, 1991) and led to better retention of ascorbic acid.

Fresh baby corn has a crisp taste and subtle slightly

Table 2: Effect of pre harvest spray of growth regulators on biochemical parameters of baby corn

Treatments (ppm)	Storage days											
	Total soluble solids (º Brix)				Titrable acidity (%)				Reducing sugars (%)			
	1	3	5	Mean	1	3	5	Mean	1	3	5	Mean
T_1- GA_3 20	10.1	10.6	9.1	10.0	0.3	0.2	0.2	0.2	2.3	1.2	0.9	1.5
T_2- GA_3 40	10.2	10.7	9.2	10.1	0.4	0.3	0.2	0.3	2.5	1.3	1.0	1.6
T_3- GA_3 60	10.1	10.6	9.1	10.0	0.3	0.2	0.2	0.2	2.3	1.2	0.8	1.5
T_4- BA 10	10.1	10.5	9.0	9.9	0.3	0.2	0.2	0.2	2.3	1.2	0.8	1.4
T_5- BA 20	10.1	10.6	9.0	9.9	0.3	0.2	0.2	0.2	2.3	1.2	0.8	1.5
T_6- BA 30	10.0	10.5	8.9	9.8	0.3	0.2	0.2	0.2	2.3	1.2	0.8	1.4
T_7- IAA 10	9.9	10.5	8.9	9.8	0.3	0.2	0.2	0.2	2.2	1.2	0.8	1.4
T_8- IAA 20	10.0	10.6	9.0	9.9	0.3	0.2	0.2	0.2	2.3	1.2	0.8	1.4
T_9- IAA 30	9.9	10.5	8.9	9.8	0.3	0.2	0.2	0.2	2.2	1.2	0.8	1.4
T_{10}- Cycocel 500	10.1	10.6	9.0	9.9	0.3	0.2	0.2	0.2	2.3	1.2	0.8	1.4
T_{11}- Cycocel 1000	10.1	10.7	9.1	10.0	0.3	0.3	0.2	0.3	2.4	1.3	0.9	1.5
T_{12}- Cycocel 1500	10.1	10.6	8.9	9.9	0.3	0.2	0.2	0.2	2.3	1.2	0.9	1.5
T_{13}- Paclobutrazol 200	10.0	10.4	8.9	9.7	0.3	0.2	0.2	0.2	2.2	1.1	0.8	1.4
T_{14}- Paclobutrazol 400	10.0	10.5	8.9	9.8	0.3	0.2	0.2	0.2	2.2	1.2	0.8	1.4
T_{15}- Paclobutrazol 600	9.9	10.4	8.7	9.7	0.3	0.2	0.2	0.2	2.2	1.1	0.8	1.4
T_{16}- Control	9.6	10.3	8.0	9.3	0.3	0.2	0.1	0.2	2.2	1.0	0.6	1.2
Mean	**10.0**	**10.5**	**8.9**		**0.3**	**0.2**	**0.2**		**2.3**	**1.2**	**0.8**	
	Sem(±)	**LSD (0.05)**			**SEm(±)**	**LSD (0.05)**			**Sem(±)**	**LSD(0.05)**		
Days (D)	**0.01**	**0.03**			**0.00**	**0.01**			**0.01**	**0.02**		
Treatments (T)	**0.03**	**0.06**			**0.01**	**0.02**			**0.02**	**0.05**		
D×T	**0.05**	**0.10**			**NS**	**NS**			**0.04**	**0.08**		

Table 3: Effect of pre harvest spray of growth regulators on biochemical parameters of baby corn

Treatments	Storage days											
	Crude protein(%)				Ascorbic acid content (mg 100^{-1} g)				Organoleptic score(10 scale)			
	1	3	5	Mean	1	3	5	Mean	1	3	5	Mean
T_1- GA_3 20	12.3	9.6	5.9	9.3	12.2	8.6	4.9	8.6	9.7	6.7	5.0	7.1
T_2- GA_3 40	12.8	10.5	7.6	10.3	12.7	9.1	6.5	9.4	10.0	8.0	6.0	8.0
T_3- GA_3 60	12.3	9.9	5.9	9.4	12.2	8.6	4.9	8.6	9.3	6.7	4.7	6.9
T_4- BA 10	12.0	9.6	5.9	9.2	12.2	8.3	4.7	8.4	9.3	6.7	5.0	7.0
T_5- BA 20	12.3	9.9	6.3	9.5	12.2	8.6	5.5	8.8	9.7	7.0	5.3	7.3
T_6- BA 30	12.0	9.6	5.9	9.2	12.2	8.3	4.7	8.4	9.7	6.7	4.7	7.0
T_7- IAA 10	12.0	9.6	5.6	9.5	12.0	7.8	4.9	8.2	9.3	6.7	5.3	7.1
T_8- IAA 20	12.3	9.9	6.3	9.2	12.2	8.1	4.9	8.4	9.7	7.0	5.3	7.3
T_9- IAA 30	12.0	9.6	5.6	9.1	12.5	7.8	4.7	8.3	9.3	7.0	5.0	7.1
T_{10}- Cycocel 500	12.3	9.6	5.9	9.3	12.2	8.6	5.2	8.7	9.7	7.3	5.3	7.4
T_{11}- Cycocel 1000	12.5	10.2	6.8	9.8	12.5	8.8	5.7	9.0	10.0	7.7	5.7	7.8
T_{12}- Cycocel 1500	12.3	9.6	5.9	9.3	12.2	8.6	5.2	8.7	9.3	7.0	5.3	7.2
T_{13}- Paclobutrazol 200	11.7	9.6	5.6	9.0	12.0	7.3	4.9	8.1	9.3	7.0	5.3	7.2
T_{14}- Paclobutrazol 400	12.3	10.2	5.9	9.5	12.5	7.8	4.9	8.4	9.7	6.7	5.0	7.1
T_{15}- Paclobutrazol 600	12.0	9.6	5.6	9.1	12.2	7.5	4.7	8.1	9.3	7.0	4.7	7.0
T_{16}- Control	11.4	7.0	3.5	7.3	12.0	6.5	3.1	7.2	8.7	5.3	3.0	5.7
Mean	**12.1**	**9.6**	**5.9**		**12.3**	**8.1**	**4.9**		**9.5**	**6.9**	**5.0**	
	Sem(±)	**LSD (0.05)**			**SEm(±)**	**LSD (0.05)**			**Sem(±)**	**LSD(0.05)**		
Days (D)	**0.09**	**0.18**			**0.09**	**0.17**			**0.17**	**0.33**		
Treatments (T)	**0.21**	**0.41**			**1.20**	**0.39**			**0.39**	**0.77**		
D×T	**0.36**	**0.71**			**0.34**	**0.68**			**NS**	**NS**		

sweet corn flavour and these attributes are considered as earmarks of high quality baby corn. Quality is a measure of the degree of excellence or degree of acceptability by the consumer. The acceptance of baby corn depends solely on consumer preference. Sensory characteristics of quality include appearance in terms of appearance, taste, crispness and colour. With the progress in the storage period, there was a decline in the organoleptic score (Table 3) in all the treatments. Highest organoleptic score was observed in cobs sprayed with GA_3 40 ppm in terms of as compared to all other treatments.

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