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RESEARCH ARTICLE

EFFECT OF MATURITY STAGE AND NAA, GA_3 AND BA ON THE ORGANOLEPTIC QUALITY OF GUAVA FRUITS (CV. LUCKNOW-49) DURING COLD STORAGE

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ABSTRACT

In the present study the organoleptic quality and shelf life of guava fruits treated with Naphthalene acetic acid (100 and 200 ppm), Gibberellic acid (150 and 300 ppm) and Benzyl adenine (25 and 50 ppm) were evaluated. Guava fruits were harvested at mature green (maximum growth of fruits is attained and skin colour changes from dark green to light green) and colour turning (skin colour turns slightly yellow from light green) stages to determine the appropriate stage of maturity during storage at 10±1°C and 90±5% RH. TSS, reducing and total sugars increased gradually and reached their peaks on days coinciding with ripe stage followed by a gradual decline towards the end of storage. Titratable acidity and ascorbic acid contents however decreased with the advancement of storage period. Organoleptic parameters such as fruit appearance and colour, flavour, taste and overall acceptance gradually increased till ripe stage while fruit texture declined continuously. Results revealed that mature green stage fruits exhibited longer shelf life and better fruit quality with all the treatments studied. Among the growth regulators, 50ppm BA exhibited longer shelf life with highest TSS, sugars and ascorbic acid content and highly acceptable fruit quality during cold storage.

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INTRODUCTION

Guava (*Psidium guajava* L.) the "apple of tropics" is the fifth most widely grown fruit crop in India. The fruit is an excellent source of dietary antioxidants like vitamin 'C', phenols, pectin and lycopene. It also has appreciable amounts of minerals such as Phosphorous, Calcium and Iron. It is normally consumed fresh as a dessert fruit or processed into puree, juice, concentrate, jam, jelly, nectar or syrup. In India it occupies an area of 0.26 million hectares with annual production of 3.66 million tonnes (Saxena and Gandhi, 2014). There is a great demand of guava fruits in both domestic and international markets for fresh and processing purposes. Mexico and India are by far the largest world producers of guava, while fruits are consumed mostly within the countries itself. However, guava fruits recently figured in the export list of Indian fruits. The share of guava in fresh fruit export from India is mere 0.65 per cent which can be further boosted, if fruit is properly handled after harvest to earn more foreign exchange. The major destinations for export are UAE, Sudan, Maldives, Oman, Bahrain, Malaysia and Saudi Arabia (Mitra *et al*., 2008). Guava is a climacteric fruit. It ripens rapidly after harvest and therefore, has short shelf life. Fruits become overripe and mealy within a week after harvest at room temperature. Due to such perishability, control of fruit ripening is fundamental for increasing shelf life after harvest (Mitra *et al*., 2012). Skin color is a measure of index for maturity and ripeness in guava (Mercado-Silva *et al*., 1998 and Asrey *et al*., 2008). Fruits attaining maturity show signs of changing colour from pale green to yellowish green. However, harvesting of fruits at appropriate stage of maturity is critical in maintaining the post harvest quality (Azzolini *et al*., 2004 and Patel *et al*., 2015). In climacteric fruits, like guava the reduction of temperature delays the climacteric peak and consequently, ripening process. Research has revealed that the post harvest application of various growth regulators like auxins, gibberellins and cytokinins on various fruit crops have enhanced their shelf life and reduced the spoilage and improved the fruit quality by delaying the onset of senescence during storage (Dhoot *et al*., 1984; Rajput *et al*., 1992 and Patel *et al*., 1993). Auxins can counteract the stimulatory effect of ethylene or abscissic acid

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on senescence, and hence are prominent as endogenous growth regulators. Cytokinins and gibberellins are also implicated to a greater or lesser extent as senescence retardants (Sacher, 1973). Keeping these view points in the forefront, the study was carried out at Post Harvest Laboratory, College of Horticulture, Rajendranagar, Hyderabad during Dec-Jan (2009-10 and 2010-11) with the objective to find out the suitable stage of maturity and postharvest treatment for improving the storage life and quality of guava fruits cultivar 'Lucknow-49'.

MATERIALS AND METHODS

Material: Uniform medium sized guava fruits apparently free from diseases and bruises were harvested at two stages of maturity. Mature green stage (MG) is when maximum growth of fruits had been attained and their skin colour changes from dark green to light green; colour turning stage (CT) is when the skin colour turns slightly yellow from light green. They were divided into requisite lots for further handling.

Postharvest treatments, packing and storage: The fruits were dipped in aqueous solutions of different concentrations of Naphthalene acetic acid (100 and 200 ppm), Gibberellic acid (150 and 300 ppm) and Benzyl adenine (25 and 50 ppm) separately each for 5-10 minutes. The control fruits were dipped in tap water for 5-10 minutes and kept for comparison. The surface of the fruit was air dried and thereafter packed in newspaper lined Corrugated Fibre Board (CFB) boxes of 400/300/140 mm size, 3 ply thickness, 4.5Kg capacity with 5 percent ventilation. The fruits were stored in walk-in cold chamber (Quality Control Laboratory, ANGRAU, Rajendranagar, Hyderabad) maintained at 10±1°C temperature and 90±5% relative humidity.

Analytical methods: The total soluble solids (TSS) were determined by using a hand refractometer, 0-32 scale (Erma, Japan) corrected at 20^0C and expressed in ^{0}Brix. Reducing and total sugars, titratable acidity and ascorbic acid content of fruits were estimated by adopting the procedure described by Ranganna (1986). The overall organoleptic rating of the fruits was done by a panel of five semi-trained judges on the basis of nine-point hedonic scale (9 = Like Extremely; 8 = Like Very Much; 7 = Like Moderately; 6 = Like Slightly; 5 = Neither Like Nor Dislike; 4 = Dislike Slightly; 3 = Dislike Moderately; 2 = Dislike Very Much; 1 = Dislike Extremely) for fruit appearance and colour, flavour, texture and taste (Amerine *et al*., 1965). The average of all the above characters was calculated and expressed as overall acceptance or palatability rating. A score of 5.5 and above is considered acceptable for consumer appeal of guava fruits. The storage life was determined by recording the number of days the fruits remained in good condition without spoilage in each replication during storage. When the spoilage (over-ripening, skin browning and rotting) of fruits under different treatments exceeded 50 percent, it was considered as the end of storage period which was judged by visual scoring.

Statistical analysis: There were three replications for each treatment and each replicate was comprised of 30 fruits. The experiment was laid out in Completely Randomized Design (CRD) with factorial concept and the data was subjected to analysis as per the procedure outlined by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

TSS: Independent of maturity stages at which guava fruits were harvested, total soluble solids did not differ significantly during storage (Table 1). The TSS content (^{0}Brix) of guava fruits increased slowly and steadily upto 10 days of low temperature storage and thereafter declined gradually. This similar incline in TSS until ripe stage followed a decline during storage was also reported in the findings of Ahmed (1998) in mango, Jayachandran (2000) in guava and Alam *et al*. (2010) in papaya. Benzyl adenine treatments, 25ppm (11.67 and 11.64) and 50ppm (11.58 and 11.58) obtained higher total soluble solids closely followed by gibberellic acid treatment (150ppm). The marked increase in total soluble solids in treated fruits indicates the possible role of benzyl adenine in delaying the rapid metabolic activity of guava fruits during low temperature storage. The reports of Sharma and Dashora (2001) and Meena *et al*. (2008) in guava also lend support to the present findings. The higher concentration of GA_3 (300ppm) has been reported to retard the sequential ripening changes of fruit and hence registered lower TSS contents compared to GA_3 -150ppm. This was earlier reported in the findings of Singh *et al*. (1995) in mango and Desai *et al*. (1984) in banana who found that higher concentrations of externally applied GA_3 retarded normal ripening and found higher levels of starch, cellulose and hemicellulose compared to their soluble forms. On the other hand, the TSS levels were more in control on 5th day and 10th day of storage compared to growth regulator treatments, but there was a rapid decline in TSS during the later half of storage as a result of complete utilization of sugars, acids and other soluble forms for respiration.

Titratable acidity: The present experimental findings indicate that acidity decreased during low temperature storage irrespective of maturity stages and growth regulator treatments studied from 5th day (0.65 and 0.65 %) to a minimum of 0.50 and 0.50 percent on 20th day of storage (Table 2) and this decrease might be due to rapid utilization of organic acids in the respiratory process (Wills *et al*., 1981). It was observed that guava fruits harvested at mature green stage maintained higher levels of acidity throughout storage at low temperature compared to colour turning stage. Although, the maximum retention of acidity of guava fruits was observed with GA_3 - 300ppm (0.60 and 0.61 %) but was found very close with benzyl adenine treatments (25 and 50 ppm) which also showed reasonably higher amounts of acidity during storage. Jain and Mukherjee (2011) found similar retention of acidity in mango fruits when treated with 200ppm GA_3. On the other hand, lower acidity content was registered with untreated fruits (0.52 and 0.52 %) where the fruits were insipid in taste after 10 days of storage. The results corroborate with the findings of Bhardwaj *et al*. (2005), Sharma and Dashora (2001) in guava, Sakhale *et al*. (2009) in mango and Alam *et al*. (2010) with papaya where externally applied BA proved to be better in maintaining higher acidity as compared to control.

Table 1. Effect of maturity stages and growth regulators on Total Soluble Solids (^{0}Brix) of guava fruits cv. Lucknow-49 at low temperature storage

Maturity Stages	Storage period (Days)									
	2009-10					2010-11				
	5	10	15	20	Mean	5	10	15	20	Mean
Mature Green stage (S1)	11.17^{b}	11.96^{ab}	12.07^{a}	10.60^{a}	11.45	11.19^{b}	11.95^{ab}	12.07^{a}	10.67^{a}	11.47
Colour Turning stage (S2)	11.95^{a}	12.12^{a}	11.44^{b}	10.11^{b}	11.41	11.95^{a}	12.12^{a}	11.41^{b}	10.12^{b}	11.40
Chemical Treatments										
Naphthalene Acetic Acid - 100ppm (T1)	11.32^{bcdefg}	11.92^{abcdefg}	11.70^{abcdef}	10.08^{cdef}	11.25^{def}	11.38^{bcdefg}	11.93^{abcdefg}	11.73^{abcdef}	10.19^{cdef}	11.31^{cdef}
Naphthalene Acetic Acid - 200ppm (T2)	11.42^{abcdef}	11.99^{abcdef}	11.80^{abcde}	10.18^{bcde}	11.35^{bcde}	11.45^{abcdef}	11.97^{abcdef}	11.79^{abcde}	10.34^{abcde}	11.39^{bcde}
Gibberellic Acid - 150ppm (T3)	11.60^{abc}	12.09^{abc}	11.98^{abc}	10.56^{abc}	11.56^{abc}	11.56^{abcd}	12.06^{abc}	11.94^{abc}	10.59^{abc}	11.54^{abc}
Gibberellic Acid - 300ppm (T4)	11.47^{abcde}	12.02^{abcde}	11.89^{abcd}	10.47^{abcd}	11.46^{abcd}	11.50^{abcde}	12.00^{abcde}	11.86^{abcd}	10.52^{abcd}	11.47^{abcd}
Benzyl Adenine - 25ppm (T5)	11.58^{abcd}	12.12^{ab}	11.99^{ab}	10.66^{ab}	11.58^{ab}	11.58^{abc}	12.10^{ab}	11.98^{ab}	10.66^{ab}	11.58^{ab}
Benzyl Adenine - 50ppm (T6)	11.64^{ab}	12.14^{a}	12.08^{a}	10.82^{a}	11.67^{a}	11.62^{ab}	12.15^{a}	12.05^{a}	10.75^{a}	11.64^{a}
Control (T7)	11.89^{a}	12.04^{abcd}	10.87^{g}	9.70^{efg}	11.12^{efg}	11.88^{a}	12.03^{abcd}	10.84^{g}	9.70^{g}	11.11^{fg}
Mean	11.56^{c}	12.04^{a}	11.76^{b}	10.35^{d}		11.57^{bc}	12.03^{a}	11.74^{b}	10.39^{d}	

	S.Em±	C.D (0.05)	S.Em±	C.D (0.05)
Maturity Stages (MS)	0.047	NS	0.043	NS
Chemical Treatments (CT)	0.088	0.247	0.081	0.226
Storage Period (SP)	0.067	0.187	0.061	0.171
MS × CT	0.125	NS	0.114	NS
MS × SP	0.094	0.264	0.086	0.241
CT × SP	0.176	0.494	0.161	0.451
MS × CT × SP	0.249	NS	0.228	NS

Table 2. Effect of maturity stages and growth regulators on Acidity (%) of guava fruits cv. Lucknow-49 at low temperature storage

Maturity Stages	Storage period (Days)									
	2009-10					2010-11				
	5	10	15	20	Mean	5	10	15	20	Mean
Mature Green stage (S1)	0.68	0.64	0.59	0.54	0.61^{b}	0.68^{b}	0.63^{b}	0.60^{b}	0.54^{b}	0.61^{b}
Colour Turning stage (S2)	0.61	0.58	0.52	0.45	0.54^{a}	0.62^{a}	0.58^{a}	0.53^{a}	0.46^{a}	0.54^{a}
Chemical Treatments										
Naphthalene Acetic Acid - 100ppm (T1)	0.64^{ab}	0.60^{b}	0.55^{b}	0.49^{b}	0.57^{b}	0.64^{ab}	0.59^{b}	0.54^{b}	0.49^{b}	0.56^{b}
Naphthalene Acetic Acid - 200ppm (T2)	0.66^{bcd}	0.61^{bc}	0.56^{bc}	0.49^{b}	0.58^{bc}	0.65^{abc}	0.59^{b}	0.56^{bc}	0.49^{b}	0.57^{bc}
Gibberellic Acid - 150ppm (T3)	0.64^{ab}	0.61^{bc}	0.57^{bcd}	0.54^{def}	0.59^{cd}	0.65^{abc}	0.61^{bc}	0.59^{de}	0.51^{bc}	0.59^{cd}
Gibberellic Acid - 300ppm (T4)	0.67^{cde}	0.64^{de}	0.59^{def}	0.51^{bc}	0.60^{de}	0.68^{cde}	0.64^{cde}	0.60^{def}	0.53^{cd}	0.61^{def}
Benzyl Adenine - 25ppm (T5)	0.64^{ab}	0.61^{bc}	0.56^{bc}	0.53^{cde}	0.59^{cd}	0.64^{ab}	0.61^{bc}	0.59^{de}	0.54^{de}	0.59^{cd}
Benzyl Adenine - 50ppm (T6)	0.65^{bc}	0.63^{cd}	0.58^{cde}	0.52^{cd}	0.59^{cd}	0.66^{bcd}	0.63^{cd}	0.58^{cd}	0.53^{cd}	0.60^{de}
Control (T7)	0.62^{a}	0.57^{a}	0.48^{a}	0.41^{a}	0.52^{a}	0.63^{a}	0.56^{a}	0.50^{a}	0.41^{a}	0.52^{a}
Mean	0.65^{d}	0.61^{c}	0.55^{b}	0.50^{a}		0.65^{d}	0.60^{c}	0.56^{b}	0.50^{a}	

	S.Em±	C.D (0.05)	S.Em±	C.D (0.05)
Maturity Stages (MS)	0.002	0.006	0.002	0.006
Chemical Treatments (CT)	0.004	0.011	0.004	0.011
Storage Period (SP)	0.003	0.008	0.003	0.009
MS × CT	0.005	NS	0.006	NS
MS × SP	0.004	NS	0.004	0.012
CT × SP	0.008	0.021	0.008	0.023
MS × CT × SP	0.011	NS	0.011	NS

Table 3. Effect of maturity stages and growth regulators on Reducing Sugars (%) of guava fruits cv. Lucknow-49 at low temperature storage

Maturity Stages	Storage period (Days)									
	2009-10					2010-11				
	5	10	15	20	Mean	5	10	15	20	Mean
Mature Green stage (S1)	3.79^{b}	4.12^{b}	4.30^{a}	3.77^{a}	3.99	3.90^{b}	4.15^{b}	4.28^{a}	3.80^{a}	4.03^{a}
Colour Turning stage (S2)	4.25^{a}	4.39^{a}	3.87^{b}	3.45^{b}	3.99	4.17^{a}	4.41^{a}	3.91^{b}	3.47^{b}	3.99^{ab}
Chemical Treatments										
Naphthalene Acetic Acid - 100ppm (T1)	3.80^{f}	4.06^{ef}	3.90^{ef}	3.39^{ef}	3.79^{fg}	3.88^{defg}	4.14^{defg}	3.98^{def}	3.45^{ef}	3.86^{fg}
Naphthalene Acetic Acid - 200ppm (T2)	3.77^{fg}	4.14^{cde}	4.01^{e}	3.49^{de}	3.85^{ef}	3.94^{cdef}	4.20^{cdef}	4.05^{cde}	3.54^{de}	3.93^{e}
Gibberellic Acid - 150ppm (T3)	4.09^{abcd}	4.29^{abc}	4.20^{abc}	3.73^{abc}	4.08^{bc}	4.03^{bcd}	4.32^{abc}	4.18^{abc}	3.78^{abc}	4.08^{bc}
Gibberellic Acid - 300ppm (T4)	3.96^{de}	4.29^{abc}	4.16^{bcd}	3.62^{cd}	4.01^{cd}	3.97^{bcde}	4.30^{abcd}	4.13^{bcd}	3.63^{cd}	4.01^{cd}
Benzyl Adenine - 25ppm (T5)	4.13^{abc}	4.38^{ab}	4.25^{ab}	3.82^{ab}	4.14^{ab}	4.10^{abc}	4.37^{ab}	4.25^{ab}	3.84^{ab}	4.14^{ab}
Benzyl Adenine - 50ppm (T6)	4.19^{ab}	4.41^{a}	4.33^{a}	3.92^{a}	4.21^{a}	4.13^{ab}	4.40^{a}	4.30^{a}	3.90^{a}	4.18^{a}
Control (T7)	4.23^{a}	4.21^{cd}	3.77^{fg}	3.31^{fg}	3.88^{e}	4.23^{a}	4.23^{bcde}	3.76^{g}	3.31^{fg}	3.88^{ef}
Mean	4.02^{c}	4.25^{a}	4.09^{b}	3.61^{d}		4.04^{bc}	4.28^{a}	4.09^{b}	3.63^{d}	

	S.Em±	C.D (0.05)	S.Em±	C.D (0.05)
Maturity Stages (MS)	0.014	NS	0.015	0.042
Chemical Treatments (CT)	0.026	0.072	0.028	0.079
Storage Period (SP)	0.019	0.054	0.021	0.060
MS × CT	0.036	0.101	0.040	0.112
MS × SP	0.027	0.076	0.030	0.084
CT × SP	0.051	0.143	0.056	0.158
MS × CT × SP	0.072	NS	0.080	NS

Table 4. Effect of maturity stages and growth regulators on Total Sugars (%) of guava fruits cv. Lucknow-49 at low temperature storage

Maturity Stages	Storage period (Days)									
	2009-10					2010-11				
	5	10	15	20	Mean	5	10	15	20	Mean
Mature Green stage (S1)	6.46^{b}	6.87^{b}	7.07^{a}	6.07^{a}	6.62	6.46^{b}	6.94^{b}	7.06^{a}	6.22^{a}	6.67
Colour Turning stage (S2)	6.93^{a}	7.13^{a}	6.54^{b}	5.70^{b}	6.57	6.96^{a}	7.10^{a}	6.53^{b}	5.83^{b}	6.60
Chemical Treatments										
Naphthalene Acetic Acid - 100ppm (T1)	6.47^{defg}	6.87^{cdefg}	6.71^{def}	5.69^{ef}	6.43^{ef}	6.49^{defg}	6.87^{bcdefg}	6.70^{cdef}	5.93^{def}	6.49^{ef}
Naphthalene Acetic Acid - 200ppm (T2)	6.55^{cdef}	6.92^{bcdef}	6.81^{abcde}	5.77^{de}	6.51^{de}	6.59^{bcdef}	6.94^{abcde}	6.81^{bcde}	6.05^{bcde}	6.60^{de}
Gibberellic Acid - 150ppm (T3)	6.67^{bcd}	7.02^{abc}	6.96^{abc}	6.06^{bc}	6.68^{bc}	6.73^{abcd}	7.06^{abc}	6.95^{abc}	6.20^{abc}	6.74^{abc}
Gibberellic Acid - 300ppm (T4)	6.65^{bcde}	6.95^{abcd}	6.90^{abcd}	5.94^{cd}	6.61^{cd}	6.64^{bcde}	7.00^{abcd}	6.89^{abcd}	6.12^{bcd}	6.66^{cd}
Benzyl Adenine - 25ppm (T5)	6.73^{bc}	7.12^{ab}	7.06^{ab}	6.24^{ab}	6.78^{ab}	6.76^{abc}	7.13^{ab}	7.03^{ab}	6.30^{ab}	6.80^{ab}
Benzyl Adenine - 50ppm (T6)	6.84^{ab}	7.19^{a}	7.11^{a}	6.33^{a}	6.87^{a}	6.79^{ab}	7.20^{a}	7.08^{a}	6.40^{a}	6.86^{a}
Control (T7)	6.98^{a}	6.94^{bcde}	6.11^{g}	5.20^{g}	6.31^{g}	6.96^{a}	6.93^{bcdef}	6.12^{g}	5.20^{g}	6.30^{g}
Mean	6.70^{c}	7.00^{a}	6.81^{b}	5.89^{d}		6.71^{bc}	7.02^{a}	6.80^{b}	6.03^{d}	

	S.Em±	C.D (0.05)	S.Em±	C.D (0.05)
Maturity Stages (MS)	0.023	NS	0.025	NS
Chemical Treatments (CT)	0.042	0.118	0.047	0.131
Storage Period (SP)	0.032	0.089	0.035	0.099
MS × CT	0.060	NS	0.066	NS
MS × SP	0.045	0.126	0.050	0.140
CT × SP	0.084	0.236	0.093	0.262
MS × CT × SP	0.119	NS	0.132	NS

Table 5. Effect of maturity stages and growth regulators on Ascorbic acid (mg/100g) of guava fruits cv. Lucknow-49 at low temperature storage

Maturity Stages	Storage period (Days)									
	2009-10					2010-11				
	5	10	15	20	Mean	5	10	15	20	Mean
Mature Green stage (S1)	218.72[a]	209.87[a]	201.47[a]	174.73[a]	201.20[a]	222.08[a]	211.33[a]	196.24[a]	173.45[a]	200.77[a]
Colour Turning stage (S2)	209.60[b]	195.48[b]	178.20[b]	161.75[b]	186.26[b]	214.45[b]	193.88[b]	179.09[b]	160.00[b]	186.86[b]
Chemical Treatments										
Naphthalene Acetic Acid - 100ppm (T1)	208.95	194.02	181.13	164.36	187.11[ef]	212.63	194.26	180.45	160.47	186.95[f]
Naphthalene Acetic Acid - 200ppm (T2)	210.70	196.55	189.01	164.32	190.14[e]	216.58	198.81	187.56	164.66	191.90[e]
Gibberellic Acid - 150ppm (T3)	217.79	209.14	199.02	170.12	199.02[c]	225.61	208.42	196.33	170.42	200.20[bc]
Gibberellic Acid - 300ppm (T4)	216.65	202.00	193.27	167.61	194.88[d]	221.97	203.73	192.01	167.37	196.27[d]
Benzyl Adenine - 25ppm (T5)	221.70	215.28	198.66	179.77	203.85[b]	221.61	212.23	193.89	176.52	201.06[b]
Benzyl Adenine - 50ppm (T6)	227.30	218.61	202.63	182.39	207.73[a]	227.12	216.66	198.88	183.72	206.59[a]
Control (T7)	196.05	183.11	165.15	149.09	173.35[g]	202.35	184.11	164.56	143.92	173.73[g]
Mean	214.16[a]	202.67[b]	189.84[c]	168.24[d]		218.27[a]	202.60[b]	187.67[c]	166.72[d]	

	S.Em±	C.D (0.05)	S.Em±	C.D (0.05)
Maturity Stages (MS)	0.731	2.049	0.738	2.069
Chemical Treatments (CT)	1.368	3.834	1.381	3.870
Storage Period (SP)	1.034	2.898	1.044	2.925
MS × CT	1.934	5.422	1.953	5.473
MS × SP	1.462	4.098	1.476	4.137
CT × SP	2.735	NS	2.761	NS
MS × CT × SP	3.869	NS	3.905	NS

Table 6a. Effect of maturity stages and growth regulators on Organoleptic rating (Appearance and colour) of guava fruits cv. Lucknow-49 at low temperature storage

Maturity Stages	Storage period (Days)									
	2009-10					2010-11				
	5	10	15	20	Mean	5	10	15	20	Mean
Mature Green stage (S1)	4.52[b]	6.27[b]	7.95[a]	5.97[a]	6.18[a]	4.31[b]	6.01[b]	7.90[a]	6.04[a]	6.07[a]
Colour Turning stage (S2)	5.65[a]	7.85[a]	6.60[b]	4.20[b]	6.07[b]	5.97[a]	7.81[a]	6.12[b]	3.98[b]	5.97[b]
Chemical Treatments										
Naphthalene Acetic Acid - 100ppm (T1)	4.67[defg]	6.80[def]	7.37[de]	5.23[abcde]	6.02[ef]	4.77[cdef]	6.67[defg]	7.10[cdef]	5.07[bcdef]	5.90[def]
Naphthalene Acetic Acid - 200ppm (T2)	4.73[cdef]	6.93[bcde]	7.50[bcd]	5.23[abcde]	6.10[de]	4.77[cdef]	6.73[cdef]	7.17[bcde]	5.10[bcde]	5.94[de]
Gibberellic Acid - 150ppm (T3)	4.87[bcd]	7.10[abc]	7.63[abc]	5.37[ab]	6.24[abc]	4.93[bcd]	6.90[bcd]	7.27[abc]	5.23[abc]	6.08[abc]
Gibberellic Acid - 300ppm (T4)	4.80[bcde]	7.03[abcd]	7.50[bcd]	5.30[abcd]	6.16[bcd]	4.83[bcde]	6.83[bcde]	7.20[bcd]	5.17[abcd]	6.01[cd]
Benzyl Adenine - 25ppm (T5)	4.93[bc]	7.17[ab]	7.70[ab]	5.33[abc]	6.28[ab]	5.03[b]	6.97[bc]	7.37[ab]	5.30[ab]	6.17[ab]
Benzyl Adenine - 50ppm (T6)	5.00[b]	7.17[ab]	7.77[a]	5.43[a]	6.34[a]	5.00[bc]	7.00[b]	7.47[a]	5.37[a]	6.21[a]
Control (T7)	6.60[a]	7.20[a]	5.47[f]	3.70[f]	5.74[g]	6.67[a]	7.27[a]	5.53[g]	3.83[g]	5.83[efg]
Mean	5.09[c]	7.06[b]	7.28[a]	5.09[c]		5.14[c]	6.91[b]	7.01[a]	5.01[d]	

	S.Em±	C.D (0.05)	S.Em±	C.D (0.05)
Maturity Stages (MS)	0.023	0.064	0.025	0.069
Chemical Treatments (CT)	0.043	0.119	0.046	0.129
Storage Period (SP)	0.032	0.090	0.035	0.097
MS × CT	0.061	0.168	0.066	NS
MS × SP	0.046	0.127	0.050	0.137
CT × SP	0.086	0.238	0.093	0.257
MS × CT × SP	0.121	0.337	0.131	0.364

Table 6b. Effect of maturity stages and growth regulators on Organoleptic rating (Flavour) of guava fruits cv. Lucknow-49 at low temperature storage

Maturity Stages	Storage period (Days)									
	2009-10					2010-11				
	5	10	15	20	Mean	5	10	15	20	Mean
Mature Green stage (S1)	4.30^{b}	6.45^{b}	7.81^{a}	5.69^{a}	6.06^{a}	4.29^{b}	6.50^{b}	7.73^{a}	5.74^{a}	6.06^{a}
Colour Turning stage (S2)	5.62^{a}	7.71^{a}	6.43^{b}	4.13^{b}	5.97^{b}	5.63^{a}	7.74^{a}	6.31^{b}	4.10^{b}	5.95^{b}
Chemical Treatments										
Naphthalene Acetic Acid - 100ppm (T1)	4.57^{cdefg}	6.93^{abcdef}	7.23^{abcdef}	4.90^{bcde}	5.91^{def}	4.53^{defg}	6.93^{defg}	7.03^{def}	4.93^{cdef}	5.86^{ef}
Naphthalene Acetic Acid - 200ppm (T2)	4.63^{bcdef}	6.97^{abcde}	7.30^{abcde}	5.00^{abcd}	5.98^{cde}	4.63^{bcdef}	7.00^{bcdef}	7.17^{bcde}	4.97^{cde}	5.94^{de}
Gibberellic Acid - 150ppm (T3)	4.73^{bcd}	7.10^{abc}	7.43^{abc}	5.17^{ab}	6.11^{abc}	4.73^{bcd}	7.13^{abcd}	7.30^{abc}	5.17^{abc}	6.08^{bc}
Gibberellic Acid - 300ppm (T4)	4.70^{bcde}	7.03^{abcd}	7.37^{abcd}	5.10^{abc}	6.05^{abcd}	4.67^{bcde}	7.07^{abcde}	7.23^{abcd}	5.03^{bcd}	6.00^{cd}
Benzyl Adenine - 25ppm (T5)	4.80^{bc}	7.17^{ab}	7.50^{a}	5.17^{ab}	6.16^{ab}	4.80^{bc}	7.20^{abc}	7.37^{ab}	5.23^{ab}	6.15^{ab}
Benzyl Adenine - 50ppm (T6)	4.87^{b}	7.17^{ab}	7.47^{ab}	5.23^{a}	6.18^{a}	4.83^{b}	7.27^{a}	7.43^{a}	5.30^{a}	6.21^{a}
Control (T7)	6.43^{a}	7.20^{a}	5.53^{g}	3.80^{f}	5.74^{g}	6.50^{a}	7.23^{ab}	5.63^{g}	3.83^{g}	5.80^{fg}
Mean	4.96^{c}	7.08^{ab}	7.12^{a}	4.91^{cd}		4.96^{c}	7.12^{a}	7.02^{b}	4.92^{cd}	

	S.Em±	C.D (0.05)	S.Em±	C.D (0.05)
Maturity Stages (MS)	0.027	0.076	0.023	0.063
Chemical Treatments (CT)	0.051	0.142	0.042	0.117
Storage Period (SP)	0.039	0.107	0.032	0.089
MS × CT	0.072	NS	0.060	NS
MS × SP	0.055	0.151	0.045	0.126
CT × SP	0.102	0.283	0.085	0.235
MS × CT × SP	0.144	0.400	0.120	0.332

Table 6c. Effect of maturity stages and growth regulators on Organoleptic rating (Texture) of guava fruits cv. Lucknow-49 at low temperature storage

Maturity Stages	Storage period (Days)									
	2009-10					2010-11				
	5	10	15	20	Mean	5	10	15	20	Mean
Mature Green stage (S1)	8.13	6.88	5.64	4.20	6.21^{a}	8.22	7.01	5.62	4.15	6.25^{a}
Colour Turning stage (S2)	8.07	6.69	5.30	3.95	6.00^{b}	8.01	6.80	5.38	4.03	6.05^{b}
Chemical Treatments										
Naphthalene Acetic Acid - 100ppm (T1)	7.97	6.63	5.47	4.03	6.03^{def}	8.00	6.80	5.40	4.00	6.05^{ef}
Naphthalene Acetic Acid - 200ppm (T2)	8.07	6.73	5.47	4.10	6.09^{de}	8.07	6.87	5.50	4.03	6.12^{de}
Gibberellic Acid - 150ppm (T3)	8.13	6.83	5.57	4.17	6.18^{abcd}	8.13	6.97	5.57	4.17	6.21^{bcd}
Gibberellic Acid - 300ppm (T4)	8.27	6.93	5.60	4.20	6.25^{abc}	8.27	7.10	5.67	4.23	6.32^{abc}
Benzyl Adenine - 25ppm (T5)	8.27	6.93	5.63	4.27	6.28^{ab}	8.30	7.07	5.67	4.30	6.33^{ab}
Benzyl Adenine - 50ppm (T6)	8.33	7.03	5.70	4.27	6.33^{a}	8.37	7.13	5.77	4.33	6.40^{a}
Control (T7)	7.67	6.37	4.83	3.50	5.59^{g}	7.67	6.40	4.93	3.57	5.64^{g}
Mean	8.10^{a}	6.78^{b}	5.47^{c}	4.08^{d}		8.11^{a}	6.90^{b}	5.50^{c}	4.09^{d}	

	S.Em±	C.D (0.05)	S.Em±	C.D (0.05)
Maturity Stages (MS)	0.030	0.083	0.026	0.071
Chemical Treatments (CT)	0.056	0.154	0.048	0.134
Storage Period (SP)	0.042	0.117	0.036	0.101
MS × CT	0.079	NS	0.068	NS
MS × SP	0.060	NS	0.052	NS
CT × SP	0.111	NS	0.096	NS
MS × CT × SP	0.158	NS	0.136	NS

Table 6d. Effect of maturity stages and growth regulators on Organoleptic rating (Taste) of guava fruits cv. Lucknow-49 at low temperature storage

Maturity Stages	Storage period (Days)									
	2009-10					2010-11				
	5	10	15	20	Mean	5	10	15	20	Mean
Mature Green stage (S1)	4.75^{b}	6.48^{b}	7.90^{a}	6.10^{a}	6.31^{a}	4.57^{b}	6.43^{b}	7.83^{a}	6.06^{a}	6.22^{a}
Colour Turning stage (S2)	6.22^{a}	8.01^{a}	6.06^{b}	4.18^{b}	6.12^{b}	6.25^{a}	7.94^{a}	6.13^{b}	4.09^{b}	6.10^{b}
Chemical Treatments										
Naphthalene Acetic Acid - 100ppm (T1)	5.13^{cdefg}	7.10^{cdef}	7.10^{bcdef}	5.23^{abcde}	6.14^{def}	5.00^{defg}	7.07^{bcdef}	7.07^{bcde}	5.07^{cdef}	6.05^{def}
Naphthalene Acetic Acid - 200ppm (T2)	5.20^{bcdef}	7.17^{bcde}	7.20^{abcde}	5.27^{abcd}	6.21^{cde}	5.07^{def}	7.13^{abcde}	7.13^{bcd}	5.13^{bcde}	6.12^{de}
Gibberellic Acid - 150ppm (T3)	5.33^{bcd}	7.33^{abc}	7.30^{abc}	5.43^{ab}	6.35^{abc}	5.20^{bcd}	7.27^{abc}	7.33^{ab}	5.33^{abc}	6.28^{abc}
Gibberellic Acid - 300ppm (T4)	5.27^{bcde}	7.27^{abcd}	7.23^{abcd}	5.33^{abc}	6.28^{bcd}	5.13^{bcde}	7.20^{abcd}	7.20^{abc}	5.23^{abcd}	6.19^{cd}
Benzyl Adenine - 25ppm (T5)	5.37^{bc}	7.40^{ab}	7.37^{ab}	5.43^{ab}	6.39^{ab}	5.37^{bc}	7.30^{ab}	7.33^{ab}	5.37^{ab}	6.34^{ab}
Benzyl Adenine - 50ppm (T6)	5.43^{b}	7.47^{a}	7.43^{a}	5.50^{a}	6.46^{a}	5.40^{b}	7.37^{a}	7.47^{a}	5.43^{a}	6.42^{a}
Control (T7)	6.67^{a}	6.97^{efg}	5.23^{g}	3.80^{g}	5.67^{g}	6.70^{a}	6.97^{defg}	5.33^{f}	3.93^{g}	5.73^{g}
Mean	5.49^{c}	7.24^{a}	6.98^{b}	5.14^{d}		5.41^{c}	7.19^{a}	6.98^{b}	5.07^{d}	

	S.Em±	C.D (0.05)	S.Em±	C.D (0.05)
Maturity Stages (MS)	0.027	0.075	0.027	0.074
Chemical Treatments (CT)	0.051	0.141	0.050	0.139
Storage Period (SP)	0.038	0.107	0.038	0.105
MS × CT	0.072	NS	0.071	NS
MS × SP	0.054	0.151	0.053	0.148
CT × SP	0.102	0.282	0.100	0.277
MS × CT × SP	0.144	0.399	0.141	0.392

Table 6e. Effect of maturity stages and growth regulators on Organoleptic rating (Overall acceptance) of guava fruits cv. Lucknow-49 at low temperature storage

Maturity Stages	Storage period (Days)									
	2009-10					2010-11				
	5	10	15	20	Mean	5	10	15	20	Mean
Mature Green stage (S1)	5.43^{b}	6.52^{b}	7.33^{a}	5.49^{a}	6.19^{a}	5.35^{b}	6.49^{b}	7.27^{a}	5.50^{a}	6.15^{a}
Colour Turning stage (S2)	6.39^{a}	7.56^{a}	6.10^{b}	4.12^{b}	6.04^{b}	6.46^{a}	7.57^{a}	5.99^{b}	4.05^{b}	6.02^{b}
Chemical Treatments										
Naphthalene Acetic Acid - 100ppm (T1)	5.58^{fg}	6.87^{efg}	6.79^{def}	4.85^{def}	6.02^{ef}	5.58^{fg}	6.87^{efg}	6.65^{ef}	4.77^{ef}	5.96^{f}
Naphthalene Acetic Acid - 200ppm (T2)	5.66^{def}	6.95^{cde}	6.87^{cde}	4.90^{bcde}	6.09^{e}	5.63^{def}	6.93^{def}	6.74^{cde}	4.81^{de}	6.03^{e}
Gibberellic Acid - 150ppm (T3)	5.77^{bcd}	7.09^{abc}	6.98^{abc}	5.03^{abc}	6.22^{bc}	5.75^{cd}	7.07^{abc}	6.87^{bc}	4.98^{abc}	6.16^{c}
Gibberellic Acid - 300ppm (T4)	5.76^{bcde}	7.07^{abcd}	6.93^{bcd}	4.98^{abcd}	6.18^{cd}	5.73^{de}	7.05^{bcd}	6.83^{bcd}	4.92^{bcd}	6.13^{cd}
Benzyl Adenine - 25ppm (T5)	5.84^{bc}	7.17^{ab}	7.05^{ab}	5.05^{ab}	6.28^{ab}	5.88^{bc}	7.13^{ab}	6.93^{ab}	5.05^{ab}	6.25^{ab}
Benzyl Adenine - 50ppm (T6)	5.91^{b}	7.21^{a}	7.09^{a}	5.11^{a}	6.33^{a}	5.90^{b}	7.19^{a}	7.03^{a}	5.11^{a}	6.31^{a}
Control (T7)	6.84^{a}	6.93^{def}	5.27^{g}	3.70^{g}	5.69^{g}	6.88^{a}	6.97^{cde}	5.36^{g}	3.79^{g}	5.75^{g}
Mean	5.91^{c}	7.04^{a}	6.71^{b}	4.80^{d}		5.91^{c}	7.03^{a}	6.63^{b}	4.77^{d}	

	S.Em±	C.D (0.05)	S.Em±	C.D (0.05)
Maturity Stages (MS)	0.014	0.040	0.012	0.033
Chemical Treatments (CT)	0.027	0.075	0.023	0.063
Storage Period (SP)	0.020	0.056	0.017	0.047
MS × CT	0.038	0.106	0.032	0.089
MS × SP	0.029	0.080	0.024	0.067
CT × SP	0.054	0.149	0.045	0.125
MS × CT × SP	0.076	0.211	0.064	0.177

Table 7. Effect of maturity stages and growth regulators on Shelf life (days) of guava fruits cv. Lucknow-49 at low temperature storage

Chemical Treatments	Maturity Stages					
	2009-10			2010-11		
	Mature Green Stage (S1)	Colour Turning stage (S2)	Mean	Mature Green stage (S1)	Colour Turning stage (S2)	Mean
Naphthalene Acetic Acid - 100ppm (T1)	22.33^{de}	21.00^{cde}	21.67^{ef}	22.00^{ef}	20.67^{ef}	21.33^{ef}
Naphthalene Acetic Acid - 200ppm (T2)	22.33^{de}	21.33^{bcd}	21.83^{e}	22.33^{de}	21.00^{de}	21.67^{e}
Gibberellic Acid - 150ppm (T3)	23.00^{cd}	21.67^{bc}	22.33^{d}	23.00^{cd}	21.67^{bcd}	22.33^{d}
Gibberellic Acid - 300ppm (T4)	23.67^{abc}	22.00^{b}	22.83^{bc}	23.67^{bc}	22.00^{bc}	22.83^{bc}
Benzyl Adenine - 25ppm (T5)	24.00^{ab}	22.00^{b}	23.00^{b}	24.00^{ab}	22.33^{ab}	23.17^{b}
Benzyl Adenine - 50ppm (T6)	24.33^{a}	23.00^{a}	23.67^{a}	24.67^{a}	23.00^{a}	23.83^{a}
Control (T7)	21.00^{f}	19.67^{f}	20.33^{g}	20.67^{g}	20.00^{fg}	20.33^{g}
Mean	22.95^{a}	21.52^{b}		22.90^{a}	21.52^{b}	

	2009-10		2010-11	
	S.Em±	C.D (0.05)	S.Em±	C.D (0.05)
Maturity Stages (MS)	0.089	0.258	0.089	0.258
Chemical Treatments (CT)	0.167	0.483	0.167	0.483
MS × CT	0.236	0.683	0.236	0.683

Reducing and total sugars: The present experimental findings revealed that reducing and total sugars of guava fruits increased upto 10 days of low temperature storage and subsequently decreased till the end of storage period irrespective of maturity stages and growth regulators studied (Tables 3 and 4). The increase in sugars might perhaps be due to conversion of pectin and hemicellulose into reducing sugars and the subsequent decrease may be due to utilization of these sugars for respiration as suggested by Pool *et al*. (1972). Guava fruits picked at mature green stage and stored in low temperature resulted in reasonably higher amounts of reducing and total sugars for a period of 20 days compared to colour turning stage. There was a progressive increase in sugars with CT and MG stage fruits during storage upto 10 and 15 days respectively. However, peak values of reducing and total sugars were obtained with colour turning stage fruits on 10^{th} day of low temperature storage. It appears that fruits harvested at later stage received more nutrients and metabolites which get accumulated while there is disruption in the flow of nutrients and other metabolites in the fruits picked at earlier stage (Mukherjee and Dutta, 1967).

The maximum amounts of reducing sugars were found in fruits treated with benzyl adenine at both the concentrations, 25ppm (4.21 and 4.18 %) and 50ppm (4.14 and 4.14 %) followed by gibberellic acid at lower concentration. This may be attributed to the free radical quenching property of BA which inhibited ethylene biosynthesis resulting in retardation of senescence and facilitated gradual build up of sugars (Meena *et al*., 2008; Jayachandran *et al*., 2007; Sharma and Dashora, 2001). The increased concentration more than 150ppm of GA_3 might have inhibited the ripening process in the present study characterized by uneven and improper ripening till the end of shelf life of guava fruits stored at 10 ± 1^0C. Pila *et al*. (2010) advocated that post harvest dipping of tomato fruits in GA_3 delayed the conversion of starch to sugars, reduced peroxidase activity and ethylene production.

Ascorbic acid: Independent of maturity at harvest and post harvest application of growth regulators, the ascorbic acid content of guava fruits declined continuously as the fruits ripened during storage at low temperature (Table 5). Similar reports were made in guava by Dashora (2001). The loss of ascorbic acid on prolonged storage might be mainly due to rapid conversion of L- ascorbic acid into dehydroascorbic acid in the presence of oxidizing enzymes like ascorbic acid oxidase, peroxidase and catalase (Mapson, 1970). Initially at harvest, the ascorbic acid content was more in guava fruits picked at colour turning stage compared to mature green stage, but during storage, fruits at MG stage obtained higher levels of ascorbic acid than CT stage fruits. Teaotia *et al*. (1970) and Dhillon *et al*. (1989) also reported this behaviour in 'Allahabad Safeda' and 'Sardar' guava cultivars respectively. Guava fruits treated with benzyl adenine at higher concentration (207.73 and 206.59 mg/100g) effectively delayed the loss of ascorbic acid for prolonged storage at low temperature compared to NAA and GA_3 treatments. The delayed ripening by benzyl adenine might have reduced the degradation of ascorbic acid. The results are in agreement with those of Jayachandran (2000) and Bhardwaj *et al*. (2010).

Organoleptic quality: Organoleptic quality (fruit appearance and colour, flavour, texture and taste and overall acceptance) obtained significant differences due to maturity stages, growth regulators, days of storage and their interaction during low temperature storage (Tables 6a, 6b, 6c, 6d and 6e). Visual appearance or look of the fruit is important from the view point of acceptance by the consumer. The fruit appearance and colour improved during ripening with both the maturity stages. The textural quality of a fruit is influenced by skin toughness and flesh firmness. Mature green stage fruits were higher in texture than colour turning stage fruits throughout storage. Brito and Narain (2002) also reported similar decrease in sapota fruit texture during maturation and ripening. Retention of TSS, sugars, acidity and ascorbic acid content of fruits during storage is desirable for the preservation of fruit quality. Taste and flavour of guava is mainly determined by proper brix-acid blend. They were predominantly higher in fruits at colour turning stage during the initial days of storage (5^{th} and 10^{th}) and were rated 'like moderately' to 'like very much', but scored lower than mature green fruits after 10 days of storage. Similar trends were also noticed with fruit flavour and taste during ripening of guava fruits. A rapid decline in these attributes with CT stage fruits after 10 days of low temperature storage could probably be due to over-ripening and rapid

senescence. Soares *et al*. (2007) pointed out that esters are the volatile compounds related to the flavour of mature fruits of guava. Sensory scores for fruit appearance and colour, flavour and taste increased until ripe stage, *i.e.* on 10^{th} day and 15^{th} day of storage with CT and MG stages respectively and then tend to decline till the end of storage. The extended storage life and delay in the climacteric peak of early harvested fruits might be the reason for obtaining highest scores during the later days of storage. On the other hand, fruit texture gradually decreased with the two stages of maturity during ripening. Therefore, the highest scores for overall acceptance were attributed to the fruits harvested at mature green stage (6.19 and 6.15) over colour turning stage (6.04 and 6.02) for a period of 20 days of storage at 10 ± 1^0C. Post harvest treatment of guava fruits with BA at both the concentrations irrespective of maturity stages studied, recorded the best scores for organoleptic quality which may be attributed to the retarded ripening and softening in BA treated fruits.

Control fruits registered highest scores than treated fruits on 5 and 10 days during storage, but the scores were drastically reduced after 10 days as a consequence of over-ripening and rapid senescence resulting in excessive softening, off flavour, poor taste and dull appearance of the fruits. On an average, the treatment control registered poor overall acceptance scores for a period of 20 days and the fruits maintained a score just above 5.5 and were rated as 'Neither like nor dislike'. However, guava fruits treated with BA at both the concentrations scored highest overall acceptance scores on 15^{th} day of storage and were rated as 'Like moderately' to 'Like very much'. The possible reason for obtaining higher organoleptic scores with BA treatments was attributed to the fact that they obtained higher TSS and sugars, as evidenced by the results. It might also be due high absorption or diffusion of the chemical at higher levels through dipping. Sharma and Dashora (2001) in guava, and Bhardwaj *et al*. (2010) in orange also found that BA treated guava fruits scored higher for fruit quality during storage. These results are also in close conformity with those of Sharma *et al*. (2002) and Brahmachari and Rani (2005) in guava. In the present study, GA_3 -300ppm effectively delayed ripening related changes, but showed poor organoleptic quality till the end of storage period compared to the corresponding lower concentration (GA_3 -150ppm). Moreover, gibberellic acid has been proved to increase storage life and maintain fruit quality to a maximum extent when applied before harvest (pre harvest spray) compared to post harvest applications. Though NAA has been reported to improve storage life of guava (Singh, 1988 and Jagadeesh *et al*., 1998) and many fruits (Gautam *et al*. 2003 in mango and Sudha *et al*, 2007 in sapota) in the present study, it failed to exert any significant influence over control. However, explaining the discrepancies among the results from various studies is rather difficult.

Shelf life: The present experimental findings indicate that mature green stage significantly extended shelf life than colour turning stage which might be due to a shift in climacteric peak and exhibited slow changes in chemical parameters like total soluble solids, organic acids, reducing sugars during ripening and the delay in these changes being more prominent in storage at low temperature. Guava fruits treated with growth regulators (NAA, GA_3 and BA) showed an extended storage life or marketable period compared to untreated ones (Tables 7). Among the growth regulators, benzyl adenine irrespective of concentrations studied, significantly increased the storage life of guava fruits closely followed by gibberellic acid (300ppm). However, BA (50ppm) treated mature green guava fruits were the best among all the treatment combinations, having obtained highest storage life of 23.67 and 23.83 days during both the years of investigation. It may be attributed to the fact that BA is a strong and potent anti-oxidant as well as a free radical scavenger, may serve to prevent membrane deterioration by restricting lipid peroxidation and its autocatalytic propagation (Jayachandran, 2000). It has also been reported by Ahmed (1998) in mango, Gouthami (2004) in pomegranate and Alam *et al*. (2010) in papaya, where an increased shelf life with post harvest application of BA is due to inhibition of alternative respiration and also protection from senescence as a cytokinin. The results are in confirmation with those of Jayachandran (2000), Roy (2006) and Pandey *et al*. (2010) in guava. This may be due to retarded production of ethylene and a higher degree of resistance against pathogens which in turn is being seen as resistance factor in ripening of fruits.

Conclusion

The stage of maturity or ripeness at harvest had a significant effect on extending storage life of guava. It could be concluded that freshly harvested mature green guava fruits treated with Benzyl adenine (50 ppm) can be stored at 10 ± 1^0C and 90±5% RH for more than 23 days during cold storage with moderately acceptable fruit quality.

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