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Evaluation of aonla (*Emblica officinalis* G.) cultivars for pickle preparation

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Abstract

The study was carried out during the year 2019-20 at College of Horticulture, Mudigere under laboratory condition to evaluate the aonla cultivars for value addition. Six cultivars were evaluated for candy, murabba and pickle with four replication and storage studies was also conducted. The Physico-chemical and sensory score were analysed during the product preparation and storage. Cultivars yield significant results in the parameters studied. Candy and murabba prepared from cv. Chakaiya proved much better with respect to quality parameters studied *viz.* recovery percentage (69.32 & 68.28 %), texture (5.25 - 4.81 kg/cm² & 4.64 - 4.30 kg/cm²), TSS (74.57 - 75.50 °B & 74.57 - 75.96 °B), ascorbic acid (255.23 - 250.18 mg /100g & 410.99 - 385.19 mg /100g), Total sugar (68.35 - 69.23 % & 53.46 - 55.43 %), reducing sugar (37.03 - 37.52 % & 27.25 - 29.02 %), non-reducing sugar (32.18 - 32.20 % & 26.23 - 27.41 %), overall acceptability score (8.73 - 8.95 & 8.24 - 8.35) was highest and acidity (0.31 - 0.27 % & 0.72 - 0.64%), tannin (0.19 - 0.12 % & 1.18 - 1.24 %), pH (2.37 - 3.79 & 2.24 - 2.99), microbial load (0 - 1.1×10⁴ CFU & 0 - 1.0×10⁴ CFU) respectively showed lowest value at initial and 90 days storage period. Same cultivars were also evaluated for pickle preparation the maximum recovery percentage (78.02%), ascorbic acid (498.88 - 495.20 mg /100g), texture (4.91 - 4.40 kg/cm²), acidity (2.74 - 1.32 %), and the lowest tannin (2.49 to 1.36 %) at initial and during 90 days of storage period. All the qualitative and sensory parameters were proved cv. Chakaiya significantly superior with candy and murabba and Krishna was suitable for pickle preparation.

Keywords: Aonla, *Emblica officinalis*, pickle preparation

Introduction

Aonla or Indian gooseberry (*Emblica officinalis* G) is one of the medicinal fruit trees of commercial significances. It has rich medicinal value and is dominantly used in Ayurvedic and Unani medicinal industry as a raw material. Nutritional, commercial and medicinal significance of aonla fruit makes it popular all over the world (Goyal *et al.*, 2007) [6]. Besides its medicinal value, because of its industrial value, it has also high demand in small and large-scale food industry for preparation of value added such as candy, jam, squash, pickle and RTS (Jain *et al.*, 1983) [7]. Attempts are being made to produce products which are not only nutritionally superior but also acceptable among the consumers. Hence, considering the scope of value addition of aonla it can be made into various products such as candy, pickles, murabba, sauce, jam, jelly, dried chips, capsules, etc. For processing of aonla pickle we need to select promising cultivars of aonla with best physical properties *viz.* fruit size, weight, pulp to stone ratio, texture and chemical characteristics such as ascorbic acid, tannin, sugars, titratable acidity and fiber. Hence, the present investigation was under taken to "Evaluation of aonla (*Emblica officinalis* G.) cultivars for pickle preparation".

Materials and Methods

The fruits were collected from the aonla orchard located at Krishi vigyana Kendra Herehalli, Thumakur. The fully matured fresh fruits were harvested and used for preparation of aonla pickle. The varieties studied are NA-4 or Krishna, NA-5 or Kanchan, NA-7, NA-10 or Agra Bold, Chakaiya and Herehalli Local. The matured fruits was selected and washed with running water. The fruits were cut into pieces and dipped into 15% salt solution for 24 hours. Later on, fruits pieces were added with spice mixture and oil (For 1 Kg aonla fruit salt-150 g, Turmeric powder-10 g, Red chilli powder- 35 g, Fenugreek-10 g, Clove-5nos, Oil- 350 ml). Then filled into jar and kept for curing for six days. Thus, aonla pickle prepared and packed in the glass jars which were stored for further observations (Anonymous, 2000) [1]. The same process was carried out four times for each variety as per experimental design and repetition of treatment.

Chemical analysis:

Chemical composition of aonla pickle prepared from NA-4 or Krishna, NA-5 or Kanchan, NA-7, NA-10 or Agra Bold, Chakaiya and Herehalli Local cultivars was determined. The recovery percentage, Texture (kg/cm^2), pH, Acidity (%), ascorbic acid ($\text{mg}/100\text{g}$) and Tannin (%) as per the Ranganna (1986) [9].

Statistical analysis

The experimental values were analysed statistically by using completely randomized block design (CRD) with four replications of each cultivar.

Results and Discussion**Physico-chemical characters.**

The data presented in Fig. 1. showed the textural properties of different aonla pickle. Decreasing trend in pickle texture and significant differences was seen among all the treatments at 0 to 90 days of storage. The minimum decrease ($0.41 \text{ kg}/\text{cm}^2$) in texture from 0 to 90 days was observed in T₆ (Herehalli Local) ranged from 4.18 to 3.77 kg/cm^2 and the maximum ($2.39 \text{ kg}/\text{cm}^2$) decrease was noticed in T₄ (4.80 to 3.98 kg/cm^2) from 0 to 90 days of storage period. Significantly at

90 days of storage the maximum texture $4.40 \text{ kg}/\text{cm}^2$ was observed in cv. NA-4 or Krishna whereas, the minimum ($1.78 \text{ kg}/\text{cm}^2$) was observed in T₄ (NA-10 or Agra Bold). The decreasing in texture might be due to some of the cultivars very sensitive to fermentation and these findings are indicative the influence of the treatment condition and pickle types on the salt contents of the product. Similar results were obtained by Daisy *et al.* (2007), Choudhary *et al.* (1995) [3] and Patel *et al.* (2014). During storage (0 to 90 days) period there will be increasing trend was observed in pH in many treatments (Table 1). The changes in the pH of the pickles reflect the changes in the population abundance of the different microorganism categories. The minimum increase (1.28) pH from 0 to 90 days was observed in T₂ (2.28 to 3.56) and the maximum increase (1.72) was noticed in cv. Herehalli Local (2.45 to 4.17) from 0 to 90 day of storage period. Among the different treatments significant difference was observed in final pH. The lowest (3.46) was recorded in T₁ while, the maximum pH (4.17) was observed in T₆. The increase in pH of aonla pickle due to the activity of certain types of the bacteria, which is producing acid (Swagathika *et al.*, 2018) [10].

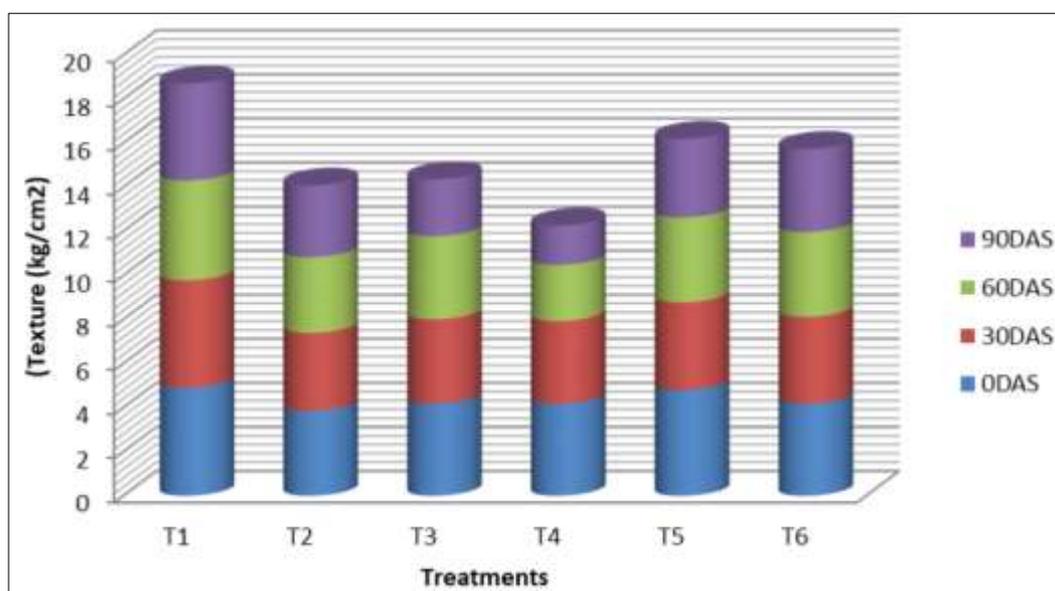


Fig 1: Performance of different aonla cultivars on texture (kg/cm^2) of pickle during storage
Treatment details

T₁- NA-4 (Krishna) T₄- NA-10 (Agra bold)
T₂- NA-5 (Kanchan) T₅- Chakaiya
T₃- NA-7 T₆- Herehalli Local

Table 1: Performance of different aonla cultivars on pH and titratable acidity (%) of pickle during storage

Treatments	pH				Titratable acidity (%)			
	0DAS	30DAS	60DAS	90DAS	0DAS	30DAS	60DAS	90DAS
T ₁ -NA-4 (Krishna)	2.16	2.22	3.35	3.46	2.74	2.53	2.14	1.32
T ₂ - NA-5(Kanchan)	2.28	2.34	3.44	3.56	2.24	2.17	2.03	1.11
T ₃ - NA-7	2.40	2.56	3.95	4.11	1.87	1.80	1.78	0.73
T ₄ - NA-10(Agra Bold)	2.46	3.14	4.03	4.13	1.93	1.86	1.68	0.84
T ₅ - Chakaiya	2.18	2.43	3.77	3.87	2.46	2.36	1.16	0.83
T ₆ - Herehalli Local	2.45	2.55	4.13	4.17	1.34	1.24	2.34	1.02
S. Em±	0.024	0.013	0.015	0.023	0.015	0.021	0.037	0.002
CD @1%	0.094	0.054	0.061	0.092	0.059	0.083	0.147	0.011

Note - Days after storage

Ascorbic acid content of pickle during storage was significantly influenced by different cultivars of aonla

presented in Fig. 2. The decreasing trend was observed during 0 to 90 days of storage period in many treatments.

Significantly the minimum (1.17) decrease in ascorbic acid was observed in T₄ (358.17 to 357.00mg/100g) while the maximum (4.06 mg/100g) decrease in T₃ (358.17 to 357.00 mg/100g).The final maximum ascorbic acid (495.20 mg/100g) was observed in T₁ (NA-4) and the minimum was noticed in NA-5 or Kanchan (348.12 mg/100g) The ascorbic acid was found to decrease more rapid in the initial stages but

became very slow in the later stages with the increase in storage period. The ascorbic acid content of the product decrease continuously during storage. This loss of ascorbic acid could be attributed to oxidation of ascorbic acid to dehydro-ascorbic acid with passage of time and also due to leaching loss of ascorbic acid. Similar findings have been confirmed by Kumar and Singh (2001) [8] in aonla product.



Plate 1: Performance of different cultivars on appearance of pickle during storage

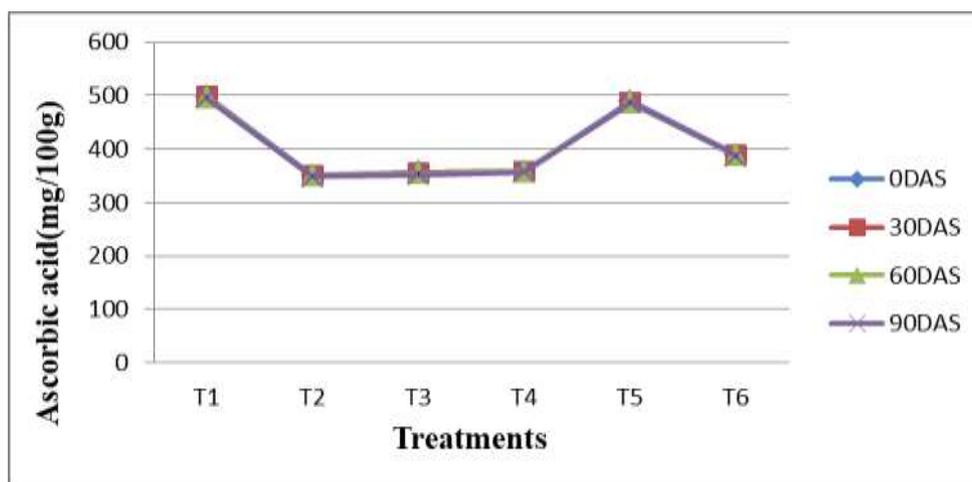


Fig 2: Performance of different aonla cultivars on ascorbic acid (mg/100g) content of pickle during storage

Treatment details

T ₁ - NA-4 (Krishna)	T ₄ - NA-10 (Agra bold)
T ₂ - NA-5 (Kanchan)	T ₅ - Chakaiya
T ₃ - NA-7	T ₆ - Herehalli Local

During storage (0 to 90 days) period there will be decreasing trend was observed in titratable acid in many treatments. The cv. NA-4 or Krishna was having significantly maximum (2.74 %) initial acid content and the minimum (1.34 %) was in cv. Herehalli Local. The minimum decrease (0.21 %) in acidity from 0 to 90 days was observed in T₆ (Herehalli Local) ranged from 1.34 to 1.02 per cent while the maximum (0.63 %) decrease in T₅ (2.46 to 0.83 %). Among the different treatments significant difference was observed in titratable acidity significantly maximum (2.14 %) was recorded in T₁ while, the minimum acidity (0.73 %) was observed in T₃ at 90 days of storage. The decrease in acidity might be because of acid base reactions. However Damame *et al.* (2002) [5] showed the decreasing trend in titratable acidity for mustard

and sesame oil based white button pickles. Data pertaining for tannin is presented in Table 1 and there will be decreasing trend was observed in tannin during 90 days of storage period in many treatments. It was recorded that the maximum decrease (1.97 %) in tannin is observed in T₃ (NA-7) is ranged from 4.54 to 2.50 per cent and the minimum decrease (0.76 %) was found in T₄ (3.04 to 2.28 %) from 0 to 90 days of storage respectively. Among the different treatments significant difference was observed in tannin. The minimum (1.36 %) was recorded in T₁ while, the maximum tannin (2.50 %) was observed in T₃.The decrease in tannins during storage might be due to the formation of precipitates with organic constituent. Similar results were obtained by Reddy and Chikkasubbannaa (2009) [4] and Chaudhary *et al.* (1995) [3].

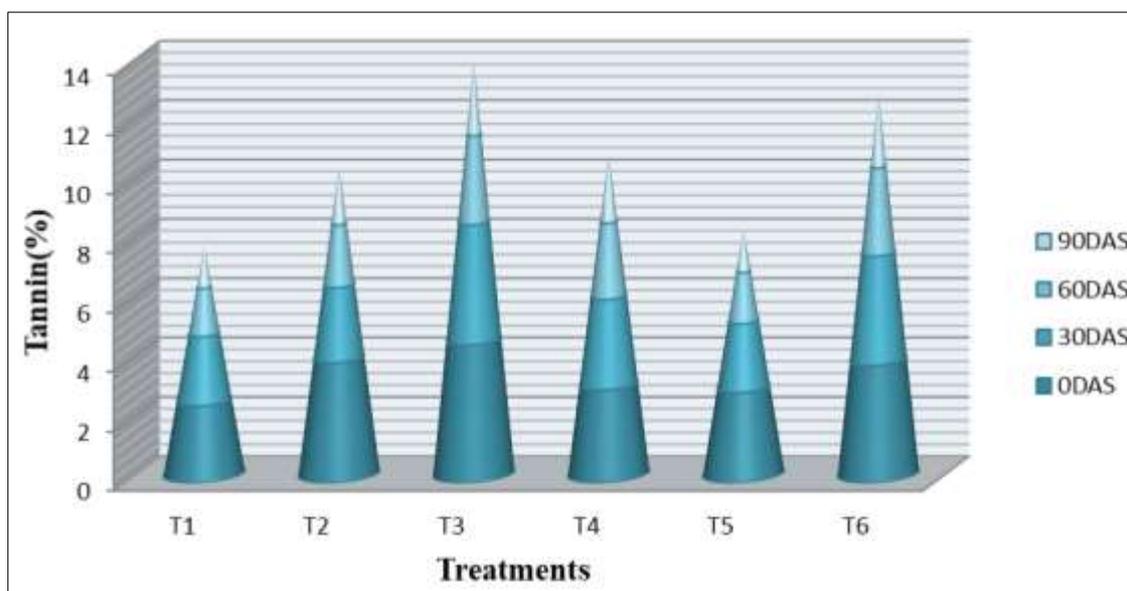


Fig 2: Effect of different aonla cultivars on tannin (%) content of candy during storage
Treatment details

T₁- NA-4 (Krishna) T₄- NA-10 (Agra bold)
T₂- NA-5 (Kanchan) T₅- Chakaiya
T₃- NA-7 T₆- Hirehalli Local

Sensory qualities

There was a significant difference between the effect of treatments on storage of pickle and the data pertaining to sensory quality that is appearance presented in the Table 2. Decreasing trend was observed in appearance from 0 to 90 days of storage in many treatments. Increasing trend was observed in some treatments. It was recorded that the minimum decrease score (0.22) in appearance is observed in T₁ (NA-4 or Krishna) and ranged from 8.04 to 7.82 and the maximum score decrease (3.46) was found in T₃ (6.78 to 3.32) from 0 to 90 days of storage respectively. Among the different treatments significant difference was observed in appearance at 90 days of storage. Significantly maximum score (7.82) was recorded in T₁ while, the minimum score (3.32) was observed in T₃. Gradual decrease in colour and appearance score of aonla candy during storage might be due to the phenolic compound play an important role to determining the color and flavour of the product, but its loss

might be due to these compounds are highly volatile and easily oxidizable, which condensed into brown pigments. Similar findings have been confirmed by Kumar and Singh (2001) [8] in aonla product, Damam *et al.* (2002) [5] in aonla product, Tandon *et al.* (2003) in aonla candy, Chaudary *et al.* (1995) [3] in aonla syrup. Data compiled for taste is presented in Table 2, and there will be decreasing trend was observed in taste during 90 days of storage period in many treatments and increasing trend was observed in some treatments is observed in T₁ (NA-4 or Krishna) is ranged from 8.16 to 8.44 followed by T₅ (7.28 to 7.71) and whereas maximum decrease (4.09) was found in T₂ (7.40 to 3.31) from 0 to 90 days of storage. Among the different treatments significant difference was observed in taste. The maximum (8.44) was recorded in T₁ while, the minimum taste (2.56) was observed in T₆ at 90 days of storage. Better retention of taste in T₁ might be due to corresponding higher value of ascorbic acid and decreasing in tannin content. Similar results were obtained by Reddy and Chikkasubbannaa (2009) [4] and Chaudhary *et al.* (1995) [3].

Table 2: Performance of different aonla cultivars sensory score of appearance and taste of pickle during storage

Treatments	Appearance				Taste			
	0DAS	30DAS	60DAS	90DAS	0DAS	30DAS	60DAS	90DAS
T ₁ -NA-4 (Krishna)	8.04	8.02	7.95	7.82	8.16	8.26	8.31	8.44
T ₂ - NA-5(Kanchan)	7.25	7.21	7.15	6.52	7.40	7.21	6.60	3.31
T ₃ - NA-7	6.78	5.50	4.24	3.32	6.28	5.49	4.56	2.56
T ₄ - NA-10(Agra Bold)	7.23	6.22	5.55	4.22	7.18	6.26	5.58	3.27
T ₅ - Chakaiya	7.40	7.26	7.18	6.95	7.28	7.36	7.40	7.71
T ₆ - Herehalli Local	7.22	7.01	6.75	5.55	7.22	6.57	5.56	4.44
S. Em±	0.011	0.022	0.042	0.021	0.002	0.039	0.024	0.045
CD @1%	0.047	0.087	0.168	0.083	0.010	0.154	0.097	0.178

Note - Days after storage

There was a significant difference between the effect of treatments on storage of pickle and the data pertaining to sensory quality that is flavour presented in the Table 3. Decreasing trend was observed in flavour from 0 to 90 days of storage. It was recorded that the minimum score decrease

(0.09) in flavour is observed in T₁ (NA-4 or Krishna) and ranged from 8.52 to 8.61 and the maximum score decrease (4.46) was found in T₃ (7.00 to 2.54) and T₄ (6.95 to 2.49) from 0 to 90 days of storage respectively. Among the different treatments significant difference was observed in

flavour at 90 days of storage. Significantly maximum score (8.61) was recorded in T₁ while, the minimum score (2.49) was observed in T₂. Loss in flavour might be due to loss in volatile compounds during storage. Similar findings have been confirmed by Kumar and Singh (2001) [8] in aonla product, Damame *et al.* (2002) [5] in aonla product, Tandon *et al.* (2003) in aonla candy, Chaudary *et al.* (1995) [3] in aonla syrup. The data presented in Table 3 showed the decreasing trend in pickle texture and significant differences were seen among all the treatments at 0 to 90 days of storage. The minimum decrease (0.51) in texture from 0 to 90 days was observed in T₅ (Chakaiya) ranged from 7.57 to 7.06 and followed by (0.99 decrease) NA-4 or Krishna ranged from 8.16 to 7.17 the maximum (3.97) decrease was noticed in T₂ (7.16 to 3.19) from 0 to 90 days of storage period. Significantly at 90 days of storage maximum texture score 7.17 was observed in cv. NA-4 or Krishna whereas the minimum (3.16) was observed in T₄ –NA-10 or Agra Bold. Decrease in texture might be due to absorption of moisture

and increase in microbial decay of pickle during storage. Akhtar (2011) [2] reported that pickles became soft after three months, but otherwise remained satisfactory up to 6 months of storage. Data compiled for overall acceptability is presented in Fig. 3. and there will be decreasing trend was observed in overall acceptability during 90 days of storage period in many treatments. It was recorded the minimum decrease (0.038) in overall acceptability is observed in T₁ (NA-4) is ranged from 8.20 to 7.82 and whereas the maximum decrease (4.17) was found in T₃ (7.42 to 3.25) from 0 to 90 days of storage. Among the different treatments significant difference was observed in overall acceptability significantly maximum score (7.82) was recorded in T₁, the minimum overall acceptability score (2.27) was observed in T₄ at 90 days of storage. Better retention of overall acceptability might be due to cumulative maintenance in appearance, texture and taste of the product during storage. The results were in conformity with the finding of Akhtar (2011) [2]

Table 3: Performance of different aonla cultivars on sensory score of flavour and texture of pickle during storage

Treatments	Flavour				Texture			
	0DAS	30DAS	60DAS	90DAS	0DAS	30DAS	60DAS	90DAS
T ₁ -NA-4 (Krishna)	8.52	8.41	8.47	8.61	8.16	7.61	7.37	7.17
T ₂ -NA-5 (Kanchan)	7.14	6.96	5.62	4.28	7.16	6.54	5.52	3.19
T ₃ -NA-7	7.00	6.46	3.56	2.54	7.24	6.93	5.63	3.38
T ₄ -NA10 (AgraBold)	6.95	5.54	3.33	2.49	6.56	5.50	3.58	3.16
T ₅ -Chakaiya	7.28	7.33	7.36	7.48	7.57	7.37	7.20	7.06
T ₆ -Herehalli Local	7.22	6.55	5.49	4.57	6.63	5.87	5.30	4.18
S. Em±	0.003	0.016	0.059	0.031	0.131	0.118	0.028	0.032
CD @1%	0.013	0.065	0.235	0.122	0.380	0.343	0.220	0.127

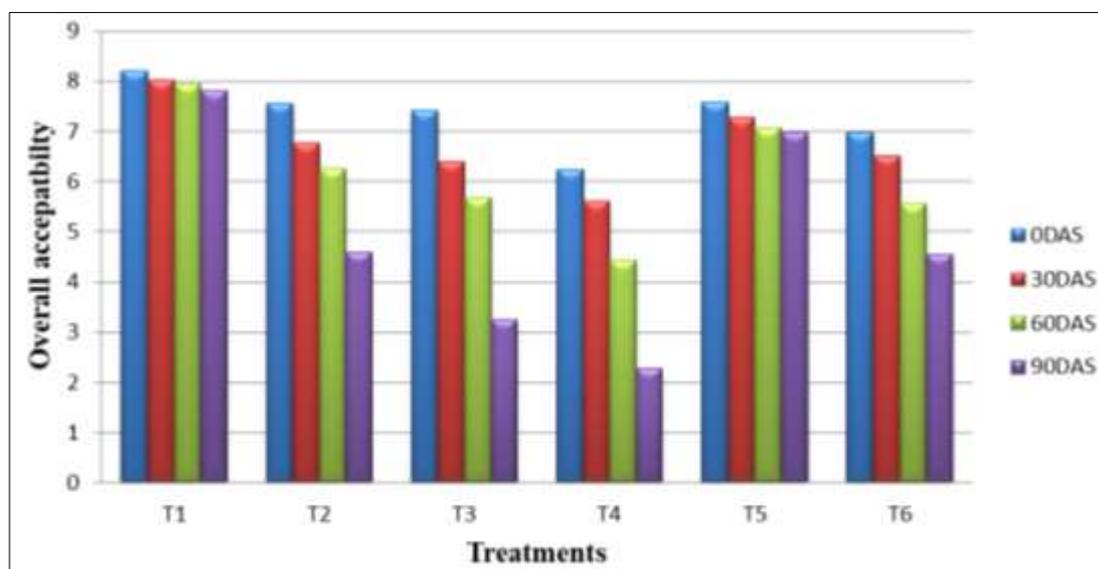


Fig 3: Performance of different aonla cultivars on overall acceptability score of pickle during storage
Treatment details

T₁- NA-4 (Krishna) T₄- NA-10 (Agra bold)
T₂- NA-5 (Kanchan) T₅- Chakaiya
T₃- NA-7 T₆- Herehalli Local

Conclusion

Six aonla cultivars were evaluated for preparation of value added product like pickle there physico- chemical characteristics were studied. Among six cultivars the cultivar NA-4 or Krishna was obtained good physico- chemical characteristics such as texture, ascorbic acid, acidity, sensory score and minimum tannin content during initial and storage period. Based on the Physico-chemical and sensory attributes cv. NA-4 or Krishna suitable for pickle preparation.

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