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STUDIES ON PREPARATION OF BLENDED AONLA (*EMBLICA OFFICINALIS*) AND GUAVA (*PSIDIUM GUAJAVA*) TOFFEE

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ABSTRACT

Studies were conducted to develop a technology for preparation of blended aonla guava toffee to assess the chemical changes of blended aonla and guava toffee during storage and to find out the suitable proportion of pulp for blending of aonla and guava toffee under ambient storage condition were studied up to 120th day of storage. From the findings it was observed that, there was a gradual increase in TSS/acid ratio, total sugars content of blending of aonla and guava toffee prepared with different recipes irrespective of storage period. However, acidity, moisture and p^{H} content of blending of aonla and guava toffee were decreased with the advancement of storage period of blending of aonla and guava toffees prepared with different recipes. Minimum change in p^{H}, acidity, TSS/acid ratio, total sugars, and moisture in blending of aonla and guava toffee were observed when toffee prepared from 60 percent aonla pulp and 40 percent guava pulp compared to other treatments at 120th day of storage.
Keywords **:** Aonla (*Emblica officinalis*), Guava (*Psidium guajava L.*), Toffee

Introduction

Aonla (*Emblica officinalis*) belongs to family Euphorbiaceae, having origin of Central to South India. It is also known as Indian gooseberry, amla, amalakki. It contains 200 -900 mg of ascorbic acid per 100 g of pulp depending upon the variety and size of the fruit (Barthkur and Arnoid, 1991), its also a source of carbohydrates, carotene, thiamine, riboflavin and minerals like iron, calcium and phosphorus. The fruit is used as an antiscorbic, diuretic and laxative, hence used for treating common cold, gastric troubles, acidity and scurvy (Tandon *et al. 2005)*, Fruit is extensively used in the preparation of ayurvedic and unani medicines like chyawanprash, which promotes health and longevity (Rajkumar *et al.,* 2001).

Guava (*Psidium guajava* L.) is a member of dicotyledonous, belonging to family Myrtaceae, having Tropical America origin. It has been adopted in India so well that it appeared to be almost Indian fruit. This is also known as apple of tropics. Guava fruit is rich source of vitamin C (100-260 mg/100g) and this are rich source of dietary fiber, vitamin A, folic acid and dietary minerals. A single guava fruit contains four times more vitamin C as an orange.

Guava pulp had very strong flavour and higher amount of vitamin C content. Therefore, it will be very worthful to mix guava pulp with other fruit pulp having less flavour to form combination of both to yield good quality processed fruit product. Toffee is one of the confectionery products. It is reported that pulpy fruits like aonla, mango, guava, papaya, fig, jack fruit, etc. can be utilized for preparation of toffee. Such fruit toffees naturally are very nutritious as they contain most of the constituents of the fruit from which they are prepared (Jain *et al.* 1958). There fruits, aonla and guava are very important fruit from nutritional and medicinal point of view and if the toffees are prepared and can be stored for a long period, Therefore, the

experiment entitled "Studies on preparation of blended aonla and guava toffee"

Material Methods

Fully matured aonla (NA-7) and guava (Sardar) fruits were obtained from the Main Garden, Department of Horticulture, Dr, PDKV, Akola for research work.

Chemical and additives: Most of the chemicals used in this investigation were of analytical grade. Cane sugar, hydrogenated fat, salt and skim milk powder were obtained from local market and used as ingredients for preparation of blended aonla and guava toffee.

Packaging materials: Butter paper and metallic coated packing paper were obtained from local market.

Extraction of pulp: After selection of fruits, these were washed thoroughly in tap water to remove the adhered soil, dirt and other impurities. Cutting the guava fruit into 4 pieces and remove the seed core with the help of knife. Blanching the aonla fruits for 10 minutes, and separated the segments and seeds. Seeds were separated and segments of aonla were smashed in grinder to get fine pulps similarly after removing the seed core from guava fruits, pulping was done by using grinder.

Standardization of toffee recipe: Blended aonla and guava fruit toffees were first prepared by using 7 different combinations of pulp, along with sugar, hydrogenated fat, Skim milk power, citric acid and salt.

Preparation of toffee: Following standardization, seven types of toffee were prepared using the optimum ratios of aonla pulp and guava pulp i.e. T_1-100:0, T_2-0:100, T_3-80:20, T_4- 20:80, T_5-60:40, T_6-40:60, T_7-50:50 w/w. The other ingredients, such as 700 g sugar, 200 g skim milk powder, 15g hydrogenated fat, pinch of salt, citric acid 3g per kg pulp, were kept constant. The homogenized pulps were placed in a stainless-steel container and mixed well with other ingredients (sugar, hydrogenated fat, skim milk powder, salt, citric acid) according to selected treatment protocol. The mixture was heated until the TSS content reached to 75^0Brix.The heated mass was spread thin layer (1.5 cm) on a stainless steel plate that had been before smeared with fat. This sheet was allowed to cool and set for two to three hours, after that preparing in to small balls and preparing toffee by covering with semi solid cocoa powder cake.

Chemical analysis of toffee: The toffee was chemically analyzed for moisture, pH, acidity, TSS/ Acid ratio, total sugars.

Packaging and storage of toffee : The toffee balls were wrapped with butter paper and then packing paper. The wrapped toffees were stored at ambient temperature (27 ± 2^0C) up to 120 days. The storage toffee was evaluated for chemical composition at an interval of 30 days.

Microbial quality of toffees: The microbial studies (CFU count) of blended aonla and guava toffee were enumerated using serial dilution method. Nutrient agar was used as growth medium and petri dish were incubated at 37 ± 5^0C for 48 hrs for formation of bacterial colonies. The colonies were counted with magnifying lens. Total count was taken along with pin point colonies.

Statistical analysis: The data obtained in the present investigation was analyzed using Completely Randomized Design (CRD) with three replications for statistical significance.

Results and Discussion

Changes in the chemical quality parameters of blended aonla and guava toffee

Effect of different proportions of aonla and guava pulp on the moisture (%) content of blended aonla and guava toffee during storage

The data in respect of moisture content of blended aonla and guava toffee as influenced by different recipes at ambient storage condition was recorded upto 120^{th} days of storage are presented in Table. 1&2 Minimum decrease 9.90 to 9.79 percent of moisture in 120^{th} day of storage period was observed in treatment T_5 which was significantly superior to rest of all the treatment. It was followed by treatments T_6 from 10.03 to 9.88 percent and T_3 from 9.07 to 8.89 percent.

However, the change in moisture during storage was found to be more (from 10.23 to 9.94) in treatment T_4 which was significantly inferior to rest of all treatment. It was followed by treatments T_1 from 8.67 to 8.41. Treatment T_1 was at par with T_7 from 9.79 to 9.55.

From the above result it is observed in general that, there was progressive decrease in moisture of blended aonla and guava toffee during storage. Bhatt and Jha (2015) stated that the moisture content of wood apple bar (control) and wood apple mango bar decreased significantly ($P\leq 0.05$) from 17.40 and 14.80 per cent to 13.52 and 10.95 per cent respectively on storage. This may be due to the evaporation of water from bar during storage.

Effect of different proportions of aonla and guava pulp on the pH content of blended aonla and guava toffee during storage

The data in respect of pH content of blended aonla and guava toffee as influenced by different recipes at ambient storage condition was recorded upto 120th days of storage are presented in Table.1&2. Minimum decrease (5.40 to 5.25) of pH in 120th day of storage period was observed in treatment T_5 which was significantly superior to rest of all the treatment. It was followed by treatments T_6 from 4.91 to 4.72 and T_2 from 5.11 to 4.85.

However, the change in pH during storage was found to be more (from 5.15 to 4.83) in treatment T_4 which was significantly inferior to rest of all treatment. It was followed by treatments T_1 (from 4.74 to 4.45) and T_7 from 5.21 to 4.97.

The results mentioned above are in conformity with the findings of various research works. Phimpharian *et al*., (2011) noticed a reduction in pH values during storage of pineapple leather. Similar decreasing trend of pH was observed during storage of guava fruit bar by Shakoor *et al.* (2015).

Effect of different proportions of aonla and guava pulp on the titratable acidity content of blended aonla and guava toffee during storage

The data in respect to titratable acidity content of blended aonla and guava toffee as influenced by different recipes at ambient storage condition was recorded upto 120th days of storage and presented in Table. 1&2. In general, the titratable acidity of blended aonla and guava toffee was gradually decrease in all recipes Minimum decrease (0.393 to 0.382) of titratable acidity in 120th day of storage period was observed in treatment T_5 which was significantly superior to rest of all the treatment. It was followed by treatments T_6 from 0.435 to 0.421 and T_3 from 0.414 to 0.397.

However, the change in titratable acidity during storage was found to be more from 0.441 to 0.407 in treatment T_4 which was significantly inferior to rest of all treatment. It was followed by treatments T_1 from 0.443 to 0.411 and Treatment T_7 from 0.446 to 0.422.

From the above result it is seen that, there was progressive decrease in titratable acidity of blended aonla and guava toffee during storage. The differences in the quantities of pulp used in preparation of toffee might be responsible for change in acidity in blended aonla and guava toffee. Similar decrease in acidity was found by Nalage *et al.* (2014) in aonla-ginger mixed toffee and Anisa *et al.* (2016) in peach-soy toffee.

Effect of different proportions of aonla and guava pulp on the TSS/acidity ratio content of blended aonla and guava toffee during storage

The data in respect to TSS/acidity ratio content of blended aonla and guava toffee as influenced by different recipes at ambient storage condition was recorded upto 120th days of storage and presented in Table.1&2. In general, the TSS/acidity ratio of blended aonla and guava toffee was gradually increase in all recipes Minimum increase (195.49 to 206.93) of TSS/acidity ratio in 120th day of storage period was observed in treatment T_5 which was significantly superior to rest of all the treatment. It was followed by treatments T_3 (from187.22 to 199.52) and T_6 (from 178.13 to 191.57).

However, the change in TSS/acidity ratio during storage was found to be more (from 176.68 to 195.87) in treatment T_4 which was significantly inferior to rest of all treatment. It was followed by treatments T_1 from 174.46 to 192.29 and T_2 from 194.45 to 209.70.

From the above result it is observed in general that, there was gradual increase in TSS/acidity ratio of blended aonla and guava toffee during storage. The increasing trend in Brix/acid ratio was due to higher rate of increase in acidity than ºBrix during storage period. The results mentioned above are in conformity with the findings of research work. Brix/acid ratio, a increasing trend was recorded over the entire storage period of guava leather by Safdar *et al*. (2014). Rao and Roy (1980) revealed that an ideal sugar/acid composition for the preparation of mango leather of the mango cultivar and concluded Brix/acid ratio was increased. From the above results it is observed in general that there was gradual increase in TSS/acidity ratio of blended aonla and guava toffee during storage.

Effect of different proportions of aonla and guava pulp on the total sugars (%) content of blended aonla and guava toffee during storage

The data in respect of total sugars content of blended aonla and guava toffee as influenced by different recipes at ambient storage condition was recorded upto 120th days of storage are presented in Table 1&2. In general, the total sugars in blended aonla and guava toffee was increased in all the recipes. Minimum increase (59.07 to 59.63) of total sugars in 120th day of storage period was observed in treatment T_5 which was at par with treatments T_6 from 64.36 to 64.78 and T_6 was followed by treatments T_2 from 69.14 to 69.82.

However, the change in total sugars during storage was found to be more (from 61.58 to 62.17) in treatment T_4 which was significantly inferior to rest of

all treatment. It was followed by treatments T_1 from 61.65 to 65.26 and T_7 from 64.79 to 65.57.

From the above result it is observed in general that, there was gradual increase in total sugars of blended aonla and guava toffee during storage. The increase in total sugars of blended aonla and guava toffee during storage was probably due to the increase in TSS and sugars would attribute to the conversion of starch and other insoluble carbohydrates into sugars. The results mentioned above are in conformity with the findings of various research workers. Nalage *et al.* (2014) reported that total sugars of aonla and ginger mixed toffee increase from 52.72 to 53.41 per cent and guava and strawberry mixed toffee from 73.12 to 74.15 per cent (Chavan *et al.*, 2015).

Conclusion

For the investigations conducted on "Standardization of recipes for preparation of blended aonla and guava toffee" following conclusion could be drawn. The increase in, TSS/acid ratio and total sugars of aonla-guava fruit toffee were observed during storage. Whereas, p^H, acidity, and moisture were decreased during storage. The aonla and fruit toffee prepared by using 60% aonla pulp and 40% guava pulp and stored at ambient storage, secured the highest score in bio chemical analysis as compared to other recipes at 120^{th} days of storage. The above conclusion is however based on the laboratory study and hence suggestive.

Table 1: Effect of different proportions of aonla and guava pulp on chemical constitutions of blended aonla and guava toffee during initial day of storage.

Treatments	Initial day of storage				
	Moisture (%)	pH	Titratable Acidity (%)	TSS/acidity ratio	Total sugars
T_1	8.67	4.74	0.443	174.46	61.65
T_2	10.49	5.11	0.391	194.45	69.14
T_3	9.07	4.86	0.414	187.22	56.33
T_4	10.23	5.15	0.441	176.68	61.58
T_5	9.90	5.40	0.393	195.49	59.07
T_6	10.03	4.91	0.435	178.13	64.36
T_7	9.79	5.21	0.446	172.00	64.79
F -test	Sig	Sig	Sig	Sig	Sig
SE (m)±	0.1127	0.0585	0.0073	2.1349	0.5774
CD@5%	0.3420	0.1775	0.0232	6.4755	1.7512

Table 2: Effect of different proportions of aonla and guava pulp on chemical constitutions of blended aonla and guava toffee during 120 days of storage.

Treatments	During 120 days storage				
	Moisture (%)	pH	Titratable acidity (%)	TSS/acidity ratio	Total sugars
T_1	8.41	4.74	0.411	192.29	65.26
T_2	10.28	5.11	0.372	209.70	69.82
T_3	8.89	4.86	0.397	199.52	57.07
T_4	9.94	5.15	0.407	195.87	62.17
T_5	9.79	5.40	0.382	206.93	59.63
T_6	9.88	4.91	0.421	191.57	64.78
T_7	9.55	5.21	0.422	186.66	64.57
F -test	Sig	Sig	Sig	Sig	Sig
SE (m)±	0.1107	0.0585	0.0070	2.2657	0.7350
CD@5%	0.3357	0.1775	0.0212	6.8722	2.2294

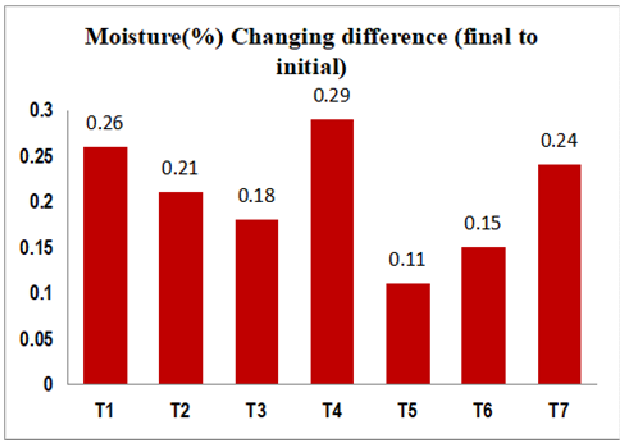

Fig. 1: Effect of different proportions of aonla and guava pulp on the total decrease in moisture (%) of toffee during 120th day of storage.

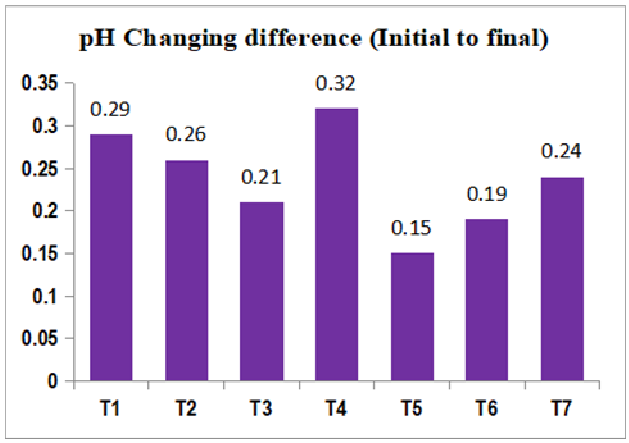

Fig. 2: Effect of different proportions of aonla and guava pulp on the total decrease in pH of toffee during 120th day of storage.

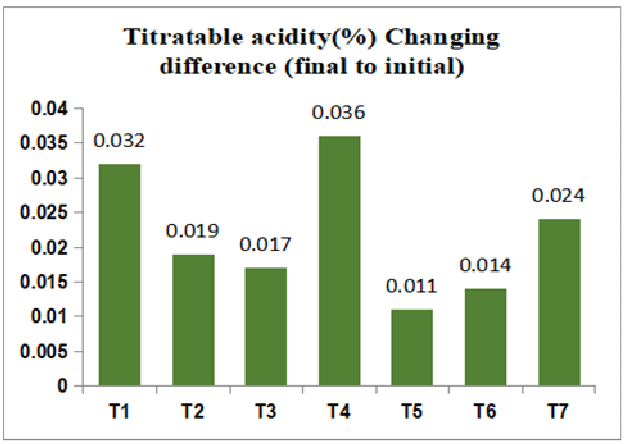

Fig. 3: Effect of different proportions of aonla and guava pulp on the total decrease in titratable acidity (%) of toffee during 120th day of storage.

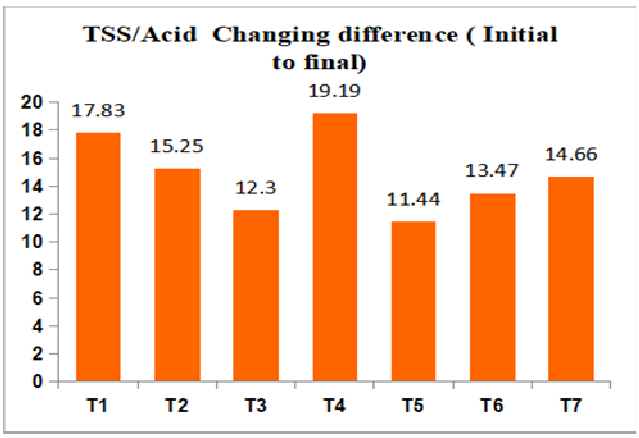

Fig. 4: Effect of different proportions of aonla and guava pulp on the total decrease in TSS/acidity ratio of toffee during 120th day of storage.

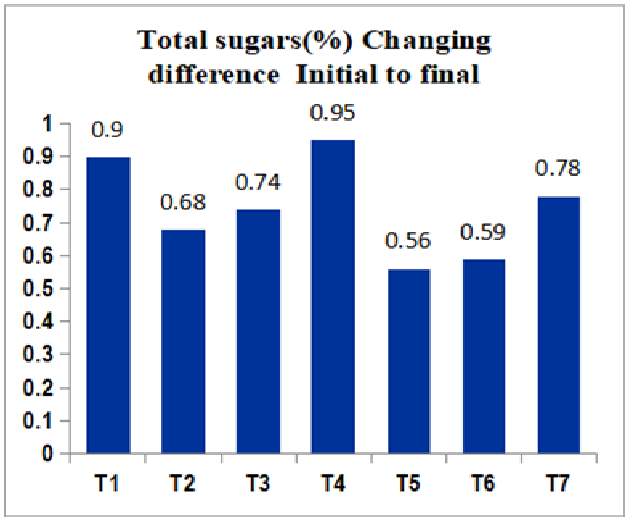

Fig. 5: Effect of different proportions of aonla and guava pulp on the total decrease in total sugars (%) of toffee during 120th day of storage.

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