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Studies on Biochemical Properties of Different Concentration of Wood-Apple and Aonla Ready-to-Serve (RTS) Beverage

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ABSTRACT

Background: Juices are important and integral part of a healthy diet and are highly recommended for the nutritional content, phyto-chemical value and the presence of health promoting compounds. Both wood apple and aonla fruits are wonderful for their nutritional value. Blending of wood apple juice with aonla juice can give a slightly tasty taste in comparison to wood apple or aonla juice alone and it is also good from health point of view.

Methods: The present investigation was carried out at Post Harvest Technology Laboratory and Biochemistry Laboratory at College of Horticulture, BUAT, Banda (U.P.) from December, 2019-March, 2020 to prepare nutritious processed products from wood-apples and aonla. Blending wood-apple juice with aonla juice is slightly tasty in comparison to a wood apple or aonla juice alone and it is also good for a health. In this study, ready-to-serve (RTS) beverage from wood apple-aonla was developed by blending aonla and wood apple in different proportions. The TSS and acidity were maintained as per FSSAI standards.

Result: The developed RTS was stored and quality parameters were recorded at 30 daysintervals for a period of 180 days. The acidity percentage and TSS were calculated and maintained as per FSSAI standards. The combinations of RTS were standardized firstly and then a storage study was carried out. There were seven combinations of blend juices including control which were used to develop nutritional ready-to-serve. It was found that in T_7 (40% wood apple+60% aonla) highest value of ascorbic acid, acidity (0.37%), TSS (11.02), total sugar (10.46%), browning (0.120) and phenol (22 mg/100 ml) was observed while the lowest value of brix: acid (30.71) and protein (0.21%) has been found in comparison to control. All treatments were consumable for up to 6 months based on sensory evaluation by the panel of 08 semi-trained judges.

Key words: Aonla, Blended, Juice, Nutritional, Ready-to-serve, RTS, Wood apple.

INTRODUCTION

Wood apple has sufficient amount of nutritional value and can grow in various types of soil and climate. The pulp of wood apples is used to prepare jam, jelly, chutney and fruit bars (Vidhya and Narain, 2011). It also has anti-diabetic and antioxidant potential thus reducing the level of blood glucose (Patel *et al.* 2012). Wood apple decaying problem has a limitation for its long time storage which occur due to Aspergillus fungus and affects the economic value of the wood apple. So emphasises the need for effective control measures to exploit the market potential that exists for wood apple currently. Therefore, it has a great potential for processing because there are many limitations with its fresh uses.

The fruits of aonla are highly nutritious and are a rich source of pectin, poly-phenols apart from ascorbic acid. The fruits are well known for their medicinal properties in curing chronic dysentery, bronchitis and diabetes in the traditional Indian system of medicine. It is an excellent source of ascorbic acid 200-900 mg/100g of fresh pulp (Goyal *et al.* 2008). The fruits are highly perishable in nature and most difficult to store or transport over long distances. Therefore, it needs immediate marketing and utilization. Aonla fruit could not be consumed in its raw state due to its high acidic and astringent taste due to polyphenolic, gallic acid and tannin. From the ancient times juices have an important place in beverage category for human consumption for taste as wel as for nutrition. Ready to serve (also called RTS in short) beverages contain at least 10% fruit juice, 10% TSS and 0.3% acid prepared from different concentration of fruit juice, sugar, water and additives (as per FSSAI). Fruits are perishable in nature and can not be preserved for a long time. Wood apple and aonla both are minor fruits and due to lack of knowledge for processing, preservation, packaging technology and transport facilities, a large quantity of aonla and wood apples is being spoiled and damaged during harvesting season, the growers faced economic loss and they lose their interest to produce more wood apple and aonla. Blending wood apple juice with aonla juice is slightly tasty in comparison to a wood apple or aonla juice alone and it is also good from health point of view.

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MATERIALS AND METHODS

The present investigation was carried out at Post Harvest Technology Laboratory and Biochemistry Laboratory at College of Horticulture, BUAT, Banda (U.P.) during 2019-20 to develop the wood apple-aonla blend nutritional ready to serve in different proportions and also study biochemical properties in developed RTS.

Healthy and ripe wood apple fruits of uniform maturity were selected. Extraction of pulp was done by adding pulp and water at a 1:2 ratio and heating at 60°C for 40 min. Aonla fruits were sliced with the help of stainless steel knives and crushed with a screw-type juice extractor for the extraction of juice.

Preparation of RTS for the formulation of recipes total soluble solids and total titratable acidity present in extracted juices were first determined by hand refractometer and titration, respectively. Then calculation was done for sugar and acid present in the pulp as well as for the remaining amount of sugar, citric acid, potassium metabisulphite and water required to prepare the finished RTS in different proportions according to desired recipes.

Different combinations of wood apple and aonla juice were tried for preparing ready-to-serve drinks (Table 1). Wood apple juice was used to make the base of RTS. The RTS was made by FSSAI specification.

Prepared RTS was filled in sterilized bottles (200 ml capacity) by leaving 2cm head space and the crown corked. Bottled RTS was pasteurized for 20 minutes in simmering water, cooled in air and stored at ambient temperature for further study and biochemical constituents in RTS were analyzed till the acceptability of the product. Treated juice blends were filled into pre-sterilized 200 ml capacity, 84 bottles (Treatment (7) × Storage studies (4) × Replication (3) = 84 bottles as soon as possible and tightly closed using a crown corking machine. The bottles containing blended juice were stored at room temperature (28±4°C).

Table 1: Treatment details (blending ratios of woodapple and aonla).

Treatments combinations	Wood apple juice %	Aonla juice %
T_1 (Control)	100	0
T_2	90	10
T_3	80	20
T_4	70	30
T_5	60	40
T_6	50	50
T_7	40	60

TSS was determined with the help of a hand refractometer of the range 0-45° Brix (QA Supplies, LLC). Titrable acidity was calculated by the method given by Ranganna, 1986. Ascorbic acid was determined by using the 2,6-Dichlorophenol-indophenols visual titration method (Johnson and Dana, 1948).pH was taken with ELTOP-3030 pH meter before pH measurement and the instrument was standardized with the buffer solutions of pH 4, 7 and 9. The pH of the samples was estimated directly. The amount of total phenolics in the sample was determined with the Folin-Ciocalteu reagent according to the method of Bray and Thorpe (1954) using catechol as a standard.

All the data obtained for the experiment were subjected to statistical analysis by OPSTAT (Developed by C.C.S.H.A.U, Hisar) Statistical Software. Data on the sensory evaluation and biochemical analysis of products were carried out by using factorial completely randomized design (CRD).

RESULTS AND DISCUSSION

Data related to TSS is given in Table 2, By data, it is clear that TSS in developed RTS was different in different treatments due to various concentrations of wood apple and aonla juice in various treatments (T_1 to T_7) and with increasing the aonla concentration in blend juice TSS significantly increase, thus the lowest value of TSS was notice in T_1 (10.20) and highest value at T_7 (11.02). The result of the study was in accordance with Kumar and Deen (2017) in wood apple RTS, Surya *et al.* (2020) in aonla ready-to-serve beverage fortified with dietary fiber, Shukla *et al.* (2017) in pasteurized mango-based milk beverage.

Data indicate that regarding recipe acidity increase significantly with increased aonla juice concentration, the overall highest mean value of acidity was observed in T_7 (0.37%), follow in T_6 (0.36%) and minimum in T_1 (0.33%). Acidity in RTS increases in different combinations of treatment (T_1 to T_7). Here it is clear that as the concentration of aonla juice increases the value of acidity also increases, the highest acidity was noticed in T_7 and the lowest in T_1.

Table 2: Effect of blending ratios of wood apple-aonla on TSS, Acidity, Ascorbic acid and sugar content of developed RTS.

Treatments	TSS (°Brix)	Acidity (%)	Ascorbic acid (mg/100 ml)	Reducing sugar (%)	Total sugar (%)
T_1 Control (Wood apple 100%)	10.00	0.30	0.23	0.28	9.83
T_2 (90%W+10%A)	10.00	0.30	1.56	0.31	9.90
T_3 (80%W+20%A)	10.00	0.30	3.10	0.33	9.86
T_4 (70%W+30%A)	10.06	0.30	4.50	0.34	9.86
T_5 (60%W+40%A)	10.00	0.31	6.20	0.36	9.86
T_6 (50%W+50%A)	10.00	0.31	7.66	0.38	9.83
T_7 (40%W+60%A)	10.10	0.31	9.86	0.38	9.84
Mean	10.02	0.304	4.73	0.34	9.86
C.D. (0.05)	0.084	0.004	0.037	0.03	0.023
SEM ±	0.030	0.011	0.106	0.011	0.066

Table 3: Effect of blending ratios of wood apple-aonla on Non-enzymatic browning, protein, brix: acid ratio and pH of developed RTS.

Treatments	Non-enzymatic browning (O.D.)	Protein (%)	Total phenol (mg/100ml)	Brix: acid ratio	pH
T_1 Control (Wood apple 100%)	0.030	0.63	13.8	33.57	3.43
T_2 (90%W+10%A)	0.031	0.54	15.1	32.97	3.46
T_3 (80%W+20%A)	0.037	0.48	16.5	32.97	3.50
T_4 (70%W+30%A)	0.050	0.42	18.2	33.74	3.43
T_5 (60%W+40%A)	0.060	0.35	19.7	32.28	3.46
T_6 (50%W+50%A)	0.063	0.30	21.3	32.28	3.50
T_7 (40%W+60%A)	0.083	0.24	25.6	31.15	3.43
Mean	0.050	0.42	18.6	33.02	3.46
C.D. (0.05)	0.003	0.012	0.08	0.33	0.018
SEM ±	0.007	0.035	0.227	N/A	0.051

Data related to ascorbic acid given in Table 2 indicate that the effect of a recipe on ascorbic acid value was observed significant as aonla juice percentage increase in blended juice, ascorbic acid value also increases thus highest value observed in T_7 (9.58 mg/100 ml) and lowest in T_1 (0.17 mg/100 ml). The ascorbic acid content was also affected by the recipe as aonla juice concentration increased the value of ascorbic acid also increase because the aonla fruits have high ascorbic acid compared to wood apple fruits. Thus the highest value of ascorbic acid was recorded in T_7 (40% wood apple + 60% aonla) and the lowest in T_1 (100% wood apple fruit pulp). Yadav (2013) said that the ascorbic acid content decrease by the heating process in carrot and fruit blend juice nectar. Kumar and Deen (2017) also observed that ascorbic acid content decreased in RTS (wood apple pulp used) during the storage period.

Data indicated that as the aonla juice concentration increased, the value of reducing sugar was also increased, the highest mean value of reducing sugar was observed in T_7 (0.42%) and the lowest in T_1 (0.31%). Processing also has a positive considerable effect on reducing sugar content. The same result in the context of reducing sugar was observed by Surya *et al.* (2020) in aonla ready-to-serve beverage. Yadav (2013) same result was found in the context of reducing sugar in carrot and fruit juice blend nectar.

Data showed that with increasing the aonla juice concentration the value of total sugar also increases and the maximum value of total sugar was observed in T_7 (10.46%) followed by in T_6 (10.38%), T_5 (10.37%), T_4 (10.32%), T_3 (10.15%), T_2 (10.1%) and lowest in T_1 (10.05%) which are the significant difference among the treatments.

The blending of juice also affects the Brix: acid ratio, the highest ratio was noticed in T_1 (30.71) and the lowest in T_6 (29.71). It is clear by data given in Table 3 that the highest mean value of Brix: acid ratio was found in T_1 (30.71) and the lowest in T_7 (29.71). It happens due to as aonla concentration increased the acidity percentage which increases to a higher rate as compared to TSS value, thus the value of brix: acid ratio continuously decreases.

The quantity of aonla juice has shown a positive relation to Non-enzymatic browning in RTS, as the percentage of aonla juice increases the value of browning also increases in RTS. The highest value of browning was observed in T_7 (0.120) and the lowest in T_1 (0.049) in terms of O.D.(Optical density). it is clear as the aonla juice concentration increase browning also increase, thus the highest mean value of browning was recorded in T_7 and the lowest in T_1. Devera *et al.* (2017) reported that non-enzymatic browning increase with storage period in aonla-based RTS beverage.

In the context of the recipe, it has been found that as aonla juice concentration increases the protein value in RTS was decreased. The protein value decreased with decreased wood apple juice concentration in RTS, thus the highest value of protein was observed in T_1 (0.45%) and the lowest in T_7 (0.21%).

Data indicated in Table 3 that the maximum value of pH was observed in T_5 (3.23) than in T_4 (3.21) and T_2 (3.21) lowest in T_7 (3.13). The quantity of total phenol also significantly affected by the recipe, it is clear in Table 03 that as the concentration of aonla juice increased in blended juice RTS the quantity of total phenol also increase, thus in T_7 the value of total phenol was recorded highest (22 mg/100 ml) and lowest in T_1 (11.6 mg/100 ml). The same result was observed by Jain and Meena (2013) in aonla-kinnow RTS beverage.

CONCLUSION

40% wood apple+60% aonla recorded the highest value of ascorbic acid, acidity (0.37%), TSS (11.02), total sugar (10.46%), browning (0.120) and phenol (22 mg/100 ml) was observed while the lowest value of brix: acid (30.71) and protein (0.21%) were found in comparison to control. The developed product was found microbial safe for consumption up to six months of storage studies.

Conflict of interest: None.

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