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RESEARCH PAPER

# Effect of dried powder of herbals addition on aonla jam with granulated particles of coconut

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**S**UMMARY : The experimental work was conducted in the P.G. laboratory, Department of Horticulture, Sam Higginbottom Institute of Agriculture Technology and Sciences (Deemed University), Allahabad, during the year 2008-2009 to prepare and evaluate aonla herbal jam with granulated particles of coconut for TSS, ascorbic acid and overall acceptability. The studies on compositional changes in value-added aonla products such as aonla jam revealed that there was increase in the level of TSS and ascorbic acid during the storage period (eight months). The design was used C.R.D. with ten treatment combations. The NA-7 cultivar was purposively selected for the study because it has higher recovery with ease in availability of commerce. Fully developed sound aonla fruits were selected. Small pieces of coconut @ 100 were mix in aonla jam. Three levels of each tulsi, cardamom and ginger were used as herbal additives. All the herbal treatments were found better in respect of TSS and ascorbic acid content over control. Highest mean TSS (69.26 per cent) and ascorbic acid content (102.65 per cent) were observed in $T_9$ (ginger powder @150 g). All the sensory parameters were as based on the overall acceptability which was depended on colour, texture , flavour and taste was recorded highest (8.33 score) in $T_8$ (ginger powder @100 g), Precisely, on the basis of results obtained it may be concluded that treatment $T_8$ (ginger powder @100 g) can be used in commercialization of aonla herbal jam with granulated particles of coconut preparation. This recipe may also be advocated for safe storage at ambient temperature up to 8 months.

**K**EY **W**ORDS : Aonla herbal Jam, Coconut, Tulsi, Ginger, Cardamom, TSS, Ascorbic acid, Storability, Quality

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Fruits and fruits products both are an important supplement to the human diet as they provide almost all the vital components required for normal growth and development of the human body leading to the healthy physique and mind. The edible fruit tissue of aonla (*Emblica officinalis* Geartn.) contains about 3 times as much protein and 160 times as much vitamin C as apple (Barthakur and Arnold, 1991). The fruit contains a chemical substance called leucanthocyanin which retards the oxidation of ascorbic acid. Antioxidant effect of gallic acid, present in aonla fruit is being well aknowledged. Dahiya and Dhawan (2001) reported that the fresh fruit of aonla are very rich source of ascorbic acid (454.40 mg/100g) and appreciable source of total sugar (7.53mg/100g), calcium (14.91 mg/100g), iron (0.62 mg/100g) and phosphorus (11.81 mg/100g) and also has great potential for processing. Singh *et al*. (1996) noted that vitamin 'C' content was in no way lower than that of barbados cherry. A number of the products like jam, squash, candy, dried shreds, powder, tablets, chutney, murabba and preserve may be prepared with ease from aonla fruit. Fresh fruits are highly acidic and astringent make unsuitable for the direct consumption. Therefore, fruits are essentially forced to process into palatable products. Though, preserve is most common of aonla product and has been prepared by various methods. According to the Pathak *et al*. (2003) cultivar Krishna was moderate in keeping quality hence, an ideal variety for preparing candy and juice. NA-6 is an excellent variety for making preserve, candy and jam. NA-7

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is a good variety for making chavanprash, chutney, pickle, jam and squash. Preserve prepared by using the fruit of optimum maturity also keep longer with better organoleptic qualities. Unfortunately, preserve can't be fortified with desired ingredients for particular purpose as therapeutics. Preserve also needs a standard fruit maturity indices and cultivar for ideal product. Contrary to this, aonla jam has no such limitations and judiciously may be fortified with differed maturity range of fruits.

Coconut fruit is not botanically a nut but rather a stone fruit. Coconut water is a refreshing drink which is also hygienic. Coconut water contributes little to the nutritive value. The white flesh is rich in calories though not a very good source of protein. It is extensively used in cookery in South India particularly in Kerala and Tamil Nadu. From grated wet coconut kernel good quality oil as well as protein and carbohydrate can be extracted to prepare coconut honey. Tulsi also known as Holy Basil is scientifically known as *Ocimum sanctum* and belongs to family Lamiaceae. It is an important in Hindu religious tradition and is worshiped in the morning and evening by the Hindus. The fresh leaves have more antibacterial properties while dried leaves have found more antifungal properties (Mondal *et al.* ,2007). Extract of tulsi is being used since long in Ayurvedic remedies for common colds, headaches, stomach disorders, inflammation, heart disease, various forms of poisoning, and malaria. Traditionally, tulsi is taken in many forms as a herbal tea, dried powder, fresh leaf or mixed with ghee.

Young ginger rhizomes are juicy and fleshy with a very mild taste. They are often pickled in vinegar or sherry as a snack or just cooked as an ingredient in many dishes. They can also bestrewed in boiling water to make ginger tea, to which honey is often added. Mature ginger rhizomes are fibrous and nearly dry. The juice from old ginger roots is extremely potent and is often used as a spice in Indian recipes and Chinese cuisine to flavour dishes. Ginger acts as a useful food preservative and has been proven to kill the harmful bacteria *Salmonella* (Afshari. *et al.*, 2007). Ginger powder is also used in certain food preparations particularly for the pregnant or nursing women (University of Maryland Medical Centre, 2006).

Green cardamom in South Asia is broadly used to treat infections in teeth and gums, to prevent and treat throat troubles, congestion of the lungs and pulmonary tuberculosis, inflammation of eyelids and digestive disorders. It is also used to break up kidney stones and gall stones and was reportedly used as an antidote for both snake and scorpion venom. Cardamom is used as a spice and as an ingredient in traditional medicine in systems of the traditional Chinese medicine in china, JapanKorea and used in Ayurveda in India (Álvarez, 2008). Green cardamom powder is used as a spice for sweet dishes as well as traditional flavouring in coffee and tea (Aubertine, 2004).

Therefore, it shows great opportunity to fortify the aonla jam with tulsi, cardamom and ginger with desired concentration. Such fortified jam with said herbals will not only augment the vital components but also will increase therapeutic properties of the product. Storability is the key factor for processed products especially in Indian conditions where hygienic and climatic factors are found to discoursing the processing industry. These herbals certainly may increase the storability of jam due to their germicidal, antibiotic and preservative properties. After value addition, the flavour, taste and nutritional values may also be increased this further will increases the demand of products in international markets as well. aonla based more processing industry can be established and the post-harvest losses of aonla fruits can be reduced considerably.

Keeping these aspects in view, the experiment was undertaken to find out suitable kind and quantity of herbs to be added for maximum storability, quality and nutrition of product.

## EXPERIMENTAL METHODS

The experimental work of preparation and preservation of value added herbal products of aonla was conducted in the P.G. Laboratory, Deportment of Horticulture, Sam Higginbottom Institute of Agriculture Technology and Sciences (Deemed University), Allahabad, during the year 2008-2009. The investigation was laid out in CRD with three replications and ten treatments. Data were statistically analyzed and the significance of study was tested at 5 per cent level (Panse and Sukhatme, 1967). Mature fruits of aonla were procured from the orchard of the Department of Horticulture, Sam Higginbottom Institute of Agriculture Technology and Sciences (Deemed University), Allahabad in the month of December. Coconut, fresh ginger and cardamom (elaichi) were procured from the local market. Tulsi leaves were collected from local area. Matured, uniform diseased free aonla fruits were selected. Fruits were then washed properly in runing water so that dirt that adhered on the fruits was properly cleaned. After pricking fruits were dipped in 2 per cent salt solution for 24 hrs., then washed with clean water and again dipped in 2 per cent alum solution for 24 hrs., further washed with clean water and then blanched in boiling water for 10 mins. Then seeds were removed and segments were separated then passing through pulper to get pulp. Now pulp was cooked with sugar in continuous sturing. When TSS was reached to $60^{O}$ Brix at that time herbes and citric acid were added. The mixture was cooked till the end point was not get (TSS $68^{O}$ Brix) by further cooking. Now cooled jam was filled in clean sterilized glass jar. Then jar were capped and waxed and stored at ambient temperature. Young fully expended green leaves of tulsi were plucked, washed, oven dried and powdered. Similarly dried capsules of cardamom and dried rhizomes of ginger were also powdered. Now prepared powder of herbals was added @ 50,100 and 150 g per kg of

prepared aonla pulp. Herbals and granulated particles of coconut were added at the time of last cooking minutes to avoid volatile losses and yet to mix well up. Nath (1999) carried out a study on the extraction of aonla pulp and suggested a method for preparation of aonla pulp from fully mature fruits. In this process, the fruit are blanched in boiling water for about 10 min. to separate the segments from stone. Equal quantity of water is added to the segments to make pulp. If the pulp has to be preserved, it should be heated to 75° C and cooled at room temperature. Potassium metabisulphite (2g $kgG^{1}$ of pulp) should be mixed thoroughly and the pulp should be filled in clean sterilized bottles and then sealed. There were 10 treatment combinations *viz.*, $T_0$ (Without any herbals, control), $T_1$ (tulsi 50 g), $T_2$ (tulsi 100 g), $T_3$ (tulsi 150 g), $T_4$ (cardamom 50 g), $T_5$ (cardamom 100 g), $T_6$ (Cardamom 150 g), $T_7$ (ginger 50 g), $T_8$ (ginger 100 g) and $T_9$ (ginger 150 g). Recommended procedure for jam preparation was adopted in each treatment. The prepared aonla herbal jam products were stored for eight months at ambient temperature. Total soluble solids (TSS) was determined by hand refractometer. A hand refractometer was based on the principle of total refraction. The refractometer is first checked for accuracy before use by placing a few drops of distilled water on the prism in the specimen of the refractometer with the help of a glass rod after folding back the cover. Then jam was placed on the prism and the percentage of dry substance in it was read directly. The values were corrected at 20°C. TSS is expressed in °Brix. Ascorbic acid was determined according to the method, as described by Ranganna (1986). The sensory evaluation of the product was done at monthly interval starting from zero days to eight months of storage. As per treatment data were recorded and values were evaluated on hedonic scale by a panel of five judges as described by Amerine *et al.* (1965) to draw certain conclusions.

## EXPERIMENTAL FINDINGS AND ANALYSIS

TSS of aonla herbal Jam was found to increased with increase in storage duration. After 8 months of storage, the level of TSS was reached up to 69.55 per cent which was being 68.06 per cent only in the initial stage. The effect of treatments on TSS changes was observed significantly. Similar results were reported by Sogi and Singh (2001) for kinnow jam, Tomar *et al.* (1991) for apple jam, Kannan and Thirumaran (2001) for jamun jam and Singh *et al.* (2005) for ) bael/blended bael jam. The lowest mean TSS (68.50 %) was recorded in control while the highest TSS (69.26 %) was observed in $T_9$ (ginger 150 g) closely

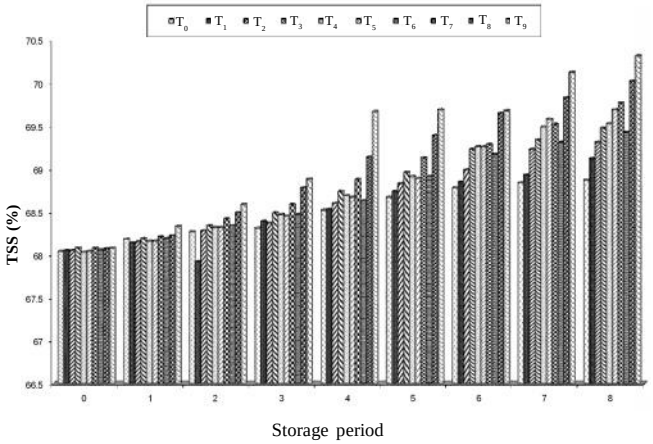


**Fig 1: Change in TSS (%) of aonla herbal jam during ambient storage (2008-09)**

**Table 1 : Effect of herbals on storability and TSS (%) of Aonla herbal jam (2008-09)**

| Treatments | Period of storage (month) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Mean |
| $T_0$ | 68.04 | 68.18 | 68.27 | 68.31 | 68.52 | 68.67 | 68.78 | 68.84 | 68.87 | 68.50 |
| $T_1$ | 68.05 | 68.14 | 67.92 | 68.39 | 68.53 | 68.74 | 68.85 | 68.93 | 69.12 | 68.52 |
| $T_2$ | 68.05 | 68.15 | 68.28 | 68.37 | 68.60 | 68.83 | 68.99 | 69.23 | 69.31 | 68.65 |
| $T_3$ | 68.08 | 68.19 | 68.34 | 68.49 | 68.74 | 68.96 | 69.23 | 69.34 | 69.48 | 68.76 |
| $T_4$ | 68.03 | 68.16 | 68.32 | 68.47 | 68.63 | 68.91 | 69.17 | 69.31 | 69.43 | 68.71 |
| $T_5$ | 68.04 | 68.16 | 68.32 | 68.45 | 68.67 | 68.89 | 69.26 | 69.58 | 69.69 | 68.78 |
| $T_6$ | 68.08 | 68.21 | 68.42 | 68.59 | 68.88 | 69.13 | 69.29 | 69.52 | 69.77 | 68.88 |
| $T_7$ | 68.06 | 68.19 | 68.34 | 68.47 | 68.69 | 68.91 | 69.26 | 69.49 | 69.53 | 68.77 |
| $T_8$ | 68.07 | 68.22 | 68.49 | 68.78 | 69.14 | 69.39 | 69.65 | 69.83 | 70.02 | 69.07 |
| $T_9$ | 68.08 | 68.33 | 68.59 | 68.88 | 69.67 | 69.69 | 69.68 | 70.13 | 70.32 | 69.26 |
| Mean | 68.06 | 68.19 | 68.33 | 68.52 | 68.81 | 69.01 | 69.22 | 69.42 | 69.55 | |
| F- test | S | S | S | S | S | S | S | S | S | |
| S.E. (±) | 0.003 | 0.003 | 0.149 | 0.003 | 0.298 | 0.015 | 0.130 | 0.013 | 0.005 | |
| C.D. (P = 0.05) | 0.005 | 0.005 | 0.311 | 0.005 | 0.622 | 0.032 | 0.271 | 0.027 | 0.011 | |

followed by (69.07 %) in $T_8$ (ginger 100 g). All the ginger treatments levels were proved better in relation to TSS over cardamom and tulsi, respectively. Among the herbs tulsi was found to inferior in improving the TSS level of the aonla jam in all the treatments. Higher level of herbs yielded higher value of TSS. TSS was found gradually increased with increase in storage period. This might be due to the conversion of polysaccharides into sugars during hydrolysis process. Increase in TSS might also be attributed to the reduction in moisture content of the product with storage. Increase in TSS with storage was also reported by Tripathi *et al.* (1988), Kumar and Singh (2001) and Pathak, (1988) in aonla products (Table 1 and Fig. 1).

Ascorbic acid content of aonla herbal Jam was found to decrease with increase in storage duration. At initial stage mean ascorbic acid content was 119.15 mg/100g which was decreased up to 81.22mg/100g after 8th months of storage. Agrawal and

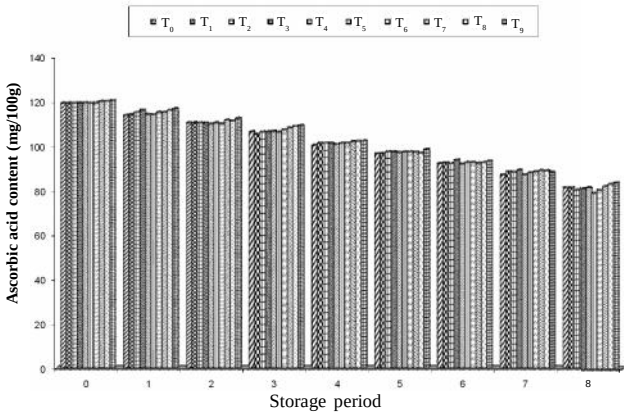


**Fig 2: Change in ascorbic acid content (mg/100g) of aonla herbal jam during ambient storage (2008-09)**

**Table 2 : Effect of herbals on storability and ascorbic acid content (mg/100g) of aonla herbal jam (2008-09)**

| Treatments | Period of storage (month) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Mean |
| $T_0$ | 119.15 | 113.69 | 110.36 | 106.32 | 100.29 | 96.52 | 92.02 | 86.92 | 81.13 | 100.71 |
| $T_1$ | 119.20 | 114.11 | 110.36 | 105.19 | 101.13 | 96.63 | 92.47 | 88.37 | 81.15 | 100.96 |
| $T_2$ | 119.21 | 115.03 | 110.32 | 106.26 | 101.14 | 97.42 | 91.99 | 88.13 | 79.97 | 101.05 |
| $T_3$ | 119.23 | 116.10 | 110.29 | 106.27 | 101.16 | 97.42 | 93.57 | 89.11 | 80.83 | 101.55 |
| $T_4$ | 119.26 | 114.19 | 109.69 | 106.43 | 100.69 | 96.94 | 91.69 | 86.99 | 81.47 | 100.82 |
| $T_5$ | 119.19 | 114.08 | 110.32 | 106.24 | 101.12 | 97.39 | 92.54 | 87.87 | 78.87 | 100.85 |
| $T_6$ | 119.29 | 115.09 | 109.81 | 107.27 | 101.15 | 97.41 | 92.56 | 88.27 | 80.31 | 101.24 |
| $T_7$ | 119.97 | 115.04 | 111.57 | 108.12 | 101.77 | 97.11 | 92.13 | 88.77 | 81.87 | 101.82 |
| $T_8$ | 120.17 | 116.11 | 111.28 | 108.84 | 102.10 | 96.75 | 92.56 | 88.69 | 82.95 | 102.16 |
| $T_9$ | 120.33 | 116.61 | 112.33 | 109.13 | 102.24 | 98.33 | 93.07 | 88.16 | 83.61 | 102.65 |
| Mean | 119.50 | 115.01 | 110.63 | 107.01 | 101.28 | 97.19 | 92.46 | 88.13 | 81.22 | |
| F- test | S | S | S | S | S | S | S | S | S | |
| S.E.(±) | 0.015 | 0.026 | 0.008 | 0.009 | 0.010 | 0.015 | 0.258 | 0.298 | 0.282 | |
| C.D. (P = 0.05) | 0.031 | 0.054 | 0.016 | 0.019 | 0.022 | 0.031 | 0.539 | 0.622 | 0.589 | |

**Table 3 : Effect of herbals on storability and overall acceptability of aonla herbal jam (2008-09)**

| Treatments | Period of storage (month) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Mean |
| $T_0$ | 6.17 | 6.08 | 5.94 | 5.80 | 5.67 | 5.47 | 5.33 | 5.18 | 5.03 | 5.63 |
| $T_1$ | 6.58 | 6.49 | 6.35 | 6.21 | 6.08 | 5.94 | 5.81 | 5.64 | 5.47 | 6.06 |
| $T_2$ | 5.76 | 5.67 | 5.47 | 5.33 | 5.17 | 5.03 | 4.89 | 4.76 | 4.62 | 5.19 |
| $T_3$ | 5.52 | 5.39 | 5.23 | 5.09 | 4.95 | 4.82 | 4.68 | 4.53 | 4.39 | 4.96 |
| $T_4$ | 7.03 | 6.94 | 6.80 | 6.70 | 6.55 | 6.41 | 6.27 | 6.14 | 6.00 | 6.54 |
| $T_5$ | 8.38 | 8.33 | 8.24 | 8.12 | 8.06 | 7.97 | 7.88 | 7.79 | 7.69 | 8.05 |
| $T_6$ | 7.79 | 7.69 | 7.61 | 7.45 | 7.29 | 7.12 | 6.99 | 6.85 | 6.71 | 7.28 |
| $T_7$ | 8.11 | 8.02 | 7.92 | 7.83 | 7.74 | 7.62 | 7.47 | 7.32 | 7.20 | 7.69 |
| $T_8$ | 8.65 | 8.61 | 8.52 | 8.43 | 8.33 | 8.24 | 8.15 | 8.06 | 7.97 | 8.33 |
| $T_9$ | 7.60 | 7.33 | 7.20 | 7.03 | 6.89 | 6.76 | 6.62 | 6.48 | 6.35 | 6.92 |
| Mean | 7.16 | 7.06 | 6.93 | 6.80 | 6.67 | 6.54 | 6.41 | 6.28 | 6.14 | |
| F- test | S | S | S | S | S | S | S | S | S | |
| S.E. (±) | 0.067 | 0.085 | 0.062 | 0.116 | 0.044 | 0.031 | 0.039 | 0.083 | 0.258 | |
| C.D. (P = 0.05) | 0.140 | 0.178 | 0.129 | 0.242 | 0.092 | 0.065 | 0.081 | 0.172 | 0.539 | |

Chopra (2004) carried out a study with regard to changes occurring in ascorbic acid and total phenols during storage in different aonla products. They observed that the shreds registered greater loss in ascorbic acid followed by jam, candy and squash, respectively. However, the candy showed greater loss in total phenols followed by shreds and squash while in jam recorded slight increase in total phenol content. Ascorbic acid content was found to vary with herbal treatment. The highest level of ascorbic acid content was observed (102.65) in $T_9$ (ginger 150 g) closely followed by $T_8$ (ginger 100 g) (102.76). Among the herbs ginger was better to improve ascorbic acid content, followed by tulsi and cardamom, respectively. The lowest value was observed (100.71) in control. Similar results were also obtained by Singh (2002) and reported that fresh fruit of aonla were found to be very rich source of ascorbic acid (454.40mg/100g) and appreciable source of total sugar (7.53%/100g), calcium (14.91g/100g), iron (0.62mg/100g) and have great potential for processing (Table 2 and Fig.2).

Overall acceptability was influenced significantly with the treatment. Higher level of herbal could not produce top acceptability due to deviation from standard colour, texture, flavour of the product retained after 8th month of strange. Though, the best result was recorded (8.33 score) in $T_8$ (ginger @ 100 g). Closely followed by (8.05 score) in $T_5$ (cardamom @ 100 g). Even control was proved better as compared to high level of tulsi. No certain pattern was observed with overall acceptability with treatment concerned, findings are in conformity with the findings of Singh (2011) in aonla jam. Storage duration had influence on overall acceptability which was initially 7.16 score and reduced 6.14 score after 8th months of storage. These findings are in accordance with that of Koli *et al.* (2004) in spota jam, and Saravanan *et al.* (2004) in papaya jam.

Aonla herbal Jam showed decreasing trend in overall acceptability in all the treatments during storage period which might be due to the changes in colour as indicated by increase in browning and changes in texture as indicated by the texture scores awarded by judges (Mulla, 2007; Relekar *et al.*,2011) (Table 3 and Fig. 3).

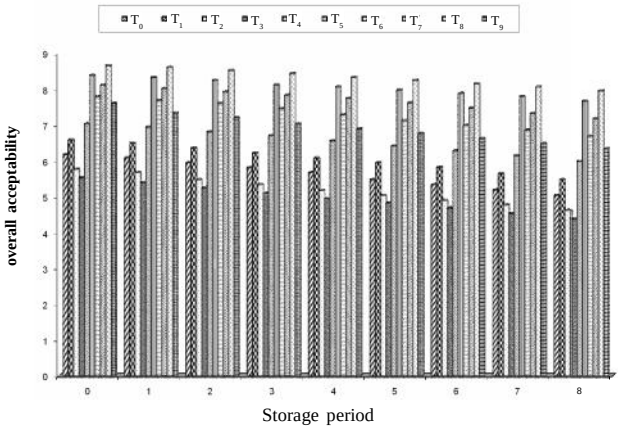


**Fig 3: Change in overall acceptability of aonla herbal jam during ambient storage (2008-09)**

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