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STABILITY OF BLEND OF CARROT, PINEAPPLE AND SOYMILK TREATED WITH *Aframomum danielli* POWDER.

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ABSTRACT

Juice was made from carrot *and pineapple and was blended with soymilk in the ratio 35%:35%:30% respectively and treated with powdered extract of A. danielli in varying proportions (1g, 2g and 3g). The treated samples were stored for twelve weeks with the control (sample without A. danielli extract) and analyses carried out. Ascorbic acid, total soluble solids and total sugar of the samples were analysed. The results showed that 5.0-7.50% of ascorbic acid, 0.95-1.86% of total soluble solids and 0.05-0.04% of total sugars, were lost in the treated samples, while the amount of ascorbic acid, total soluble solids and total sugars lost in the control samples was 17.50%, 7.12% and 0.90% respectively over the same period. Thus, the inclusion of powdered extract of A. danielli was able to reduce the loss of nutrients thereby preserving the chemical properties investigated in this research.*

Keywords: A. danielli extract, Stability, Juice extraction, Preservation, Blending

INTRODUCTION

Fruits and vegetables are essential components of a healthy diet that is able to decrease the risk of cardiovascular diseases and cancer (Allende *et. al*., 2006). Apart from their nutritional and sensory properties, they are currently recognised as active and protective agents (Olivas and Barbosa–Canovas, 2005). They are consumed regularly by people because they play important roles in diets, most especially, people in the tropics because of their health benefits, though it remains below the recommended daily intake in many countries, due to barriers such as complacency and lack of will power to change the diet (Ragaert *et. al*., 2004).

Fruits and vegetables provide essential minerals and vitamins; add colour, flavour and variety to monotonous diet. They are high in phenolic compounds such as anthocyanin and flavonoids, which have been correlated with lower risks of chronic diseases (Ragaert *et. al*., 2004), but highly perishable and subjected to rapid deterioration by micro-organisms, enzymes and oxidation reactions. Over 50% are lost due to wastages (World Resources Institutes, 1998), which are synonymous to wastage of human effort, farm inputs, livelihoods, investments and scarce resources such as water.

Many fruits and vegetables such as oranges, apples, lemon, mangoes, and pineapple have been utilized in the production of fruit juices than many other fruits. Processing into other valued products was developed as a means of reducing or preventing the losses being recorded by the farmers. Juices which are one of the products derived from the processing of fruits and vegetables are becoming an important part of the modern diet in many communities (Ghengbesh *et al*., 2005). Fruit juices are nutritious, healthy and blending them with milk gives a better and more nutritious product (Wong *et al*, 2003; MAPA, 2003; Pszczola, 2005; Zulueta *et al*., 2007).

Soybean products are important in the household nutrition programme because of their high protein content and their affordability (Matthew-Njoku, 2005). Soymilk is a beverage made from soybeans. It is a stable emulsion of oil, water and protein and contains about the same proportion of protein and fat as cow milk around 3.5% and 2% respectively. It also has 2.9% carbohydrate and 0.5% ash, though the

amino acid profile differs (McGee, 2004; Frank and Sacks, 2006). Soymilk is a good beverage, cheap and has little saturated fat and no cholesterol, and could be substituted for fatty products (Sacks et. al., 2006).

A. danielli is a local spice with over fifty species available in Africa and about half of them in Cameroon-Gabon region (Tane *et. al*., 2007). This natural spice is known to possess preservative properties (Adegoke *et al*., 2002) and has among other characteristics, nutritive and broad antimicrobial effect (Adegoke and Skura, 1994). Problems associated with microbial spoilage, lipid oxidation and browning in foods may have attracted the use of synthetic additives or other means of preservation, which have either affected the nutritional qualities of the product or on the long run, have adverse effects in human, even with the usage at permissible levels. There has been serious campaign against the use of synthetic additives and reverting to natural ones, which are plant parts that are consumed as food or parts of food without any adverse effect. This work aims to utilize natural plant preservative (*A. danielli* powdered extract) in preserving the ascorbic acid, total soluble solids and total sugar content of the blend of carrot, pineapple and soymilk.

Materials and Method

Carrot, pineapple and *A. danielli* pods were purchased from a local market in Ibadan while soybean was obtained from International Institute for Tropical Agriculture (IITA). *A. danielli* powder extract was produced by the method of Adegoke and Skura, (1994). Juice extraction from the carrot and pineapple was done by adopting Battock *et. al*., (1998), the soymilk was produced according to the method of Osho (1991). Total Soluble Solids (TSS) and Total Sugars (TS) were determined by the method of Wong *et. al*., (2003), while ascorbic acid of the samples were determined using High Performance Liquid Chromatography (HPLC). Data were analysed with Statistical Analyses System (SAS) package (Version 8.2 of SAS Institute INC., 1999). The processed samples were stored at 27^{o}C $\pm$2^{o}C.

Results and Discussion

The samples were analysed for ascorbic acid, total soluble solids (TSS) and total sugars (TS) contents and the results are as displayed in the tables below. Table 1 shows the ascorbic acid content of the samples (treated) preserved with *A. danielli* powder extract in comparison with the control. There were significant differences in the values of the control sample over the period of storage at $p<0.05$. The ascorbic acid content of the treated samples was higher than that of the control after the period of storage.

Table1: Vitamin C Content (mg/ml) of Carrot, Pineapple, and Soymilk Blend

	Treatment with *A. danielli* Powder (g)			
Storage Time	CTR	1g	2g	3g
0	0.80±0.01^{a}	0.80±0.02^{a}	0.80±0.00^{a}	0.80±0.00^{a}
2	0.77±0.00^{a}	0.80±0.00^{a}	0.80±0.00^{a}	0.80±0.00^{a}
4	0.76±0.00^{a}	0.79±0.00^{a}	0.79±0.00^{a}	0.80±0.00^{a}
6	0.74±0.00^{b}	0.78±0.00^{a}	0.79±0.00^{a}	0.79±0.00^{a}
8	0.73±0.00^{b}	0.77±0.00^{a}	0.78±0.00^{a}	0.79±0.00^{a}
10	0.70±0.00^{b}	0.76±0.00^{a}	0.77±0.00^{a}	0.78±0.00^{a}
12	0.66±0.02^{c}	0.74±0.16^{a}	0.75±0.02^{b}	0.76±0.00^{a}
% Loss	17.50	7.50	6.25	5.00

Superscripts down a column are significantly different with a>b>c**,** Values are means of four determinations +SD, CTR – Control

The ascorbic acid content ranged from 74mg/100mls to 80mg/100mls for the treated samples, while that of the control sample ranged from 66mg/100mls to 80mg/100mls over the period of the twelve weeks that the samples were stored. The treated samples had higher vitamin C content than those of control sample. The range of percentage losses of the treated samples over the period of storage was 5-7.5%, while the control sample had 17.50% losses over same period.

Table 2:Total Soluble Solids (mg/l) of Carrot, Pineapple, and Soymilk Blend

	Treatment with *A. danielli* Powder (g)			
Storage Time	CTR	1g	2g	3g
0	52.74±0.00^{a}	52.74±0.00^{a}	52.74±0.00^{a}	52.74±0.00^{a}
2	52.66±0.00^{b}	52.73±0.00^{a}	52.72±0.00^{a}	52.73±0.00^{a}
4	52.61±0.00^{c}	52.71±0.00^{a}	52.70±0.00a	52.70±0.00^{a}
6	50.48±0.00^{d}	52.70±0.00^{a}	52.68±0.00^{b}	52.69±0.00^{a}
8	49.74±0.00^{e}	52.31±0.00^{b}	52.65±0.00^{b}	52.67±0.00^{b}
10	49.52±0.44^{f}	51.98±0.00^{c}	52.48±0.30^{c}	52.55±0.01^{c}
12	48.9±0.13^{g}	51.76±0.01^{d}	52.11±0.02^{d}	52.24±0.01^{d}
% loss	7.12	1.86	1.19	0.95

Superscripts down a column are significantly different with a>b>c>d>e>f>g, Values are means of four determinations ± SD, CTR – Control

Table 3: Total Sugar (%) of Carrot, Pineapple, and Soymilk Blend

	Treatment with *A. danielli* Powder (g)			
Storage Time	CTR	1g	2g	3g
0	19.92±0.00^{a}	19.92±0.00^{a}	19.92±0.00^{a}	19.92±0.00^{a}
2	19.91±0.00^{a}	19.90±0.00^{a}	19.20±0.00^{a}	19.92±0.00^{a}
4	19.87±0.00^{b}	19.91±0.00^{a}	19.90±0.00^{a}	19.92±0.00^{a}
6	19.82±0.00^{c}	19.90±0.00^{a}	19.89±0.00^{a}	19.92±0.00^{a}
8	19.79±0.00^{c}	19.89±0.00^{a}	19.89±0.00^{a}	19.91±0.00^{a}
10	19.80±0.00^{c}	19.86±0.00^{b}	19.86±0.00^{b}	19.91±0.00^{a}
12	19.74±0.21^{d}	19.89±0.00^{a}	19.84±0.00^{b}	19.92±0.00^{a}
% loss	0.90	0.30	0.40	0.05

Superscripts down a column are significantly different with a>b>c>d. Values are means of four determinations ± SD

The low value of the total sugar of the control sample may be due to some factors such as heat, light, oxygen, pH and probably excessive air spaces above the juice; factors which the treated samples were not exempted from, except for the fact that a preservative, in this case, powdery extract of *Aframomum danielli* was added. The decrease in Vitamin C could also be attributed to oxidation, which occurs in fruit juices during storage which is highly dependent on the presence of oxygen in the head or dissolved in the juice (Costal *et. al*., 2003). The retention of the ascorbic acid in the treated samples could be attributed to the preservative property of *A. danielli*, as all the treated samples including the control were subjected to the same condition right from the point of production. Changes in the value of ascorbic acid could occur due to pH change (Kennedy *et. al*, 1990) and high temperature storage with pH change could affect degradation process (Sawamural *et.al*, 1994). It should be noted that ascorbic acid is used as an index of the nutrient quality of fruit and vegetable products because when compared to other nutrients, it is much more sensitive to various modes of degradation in food processing and subsequent storage (Ozkan *et. al*., 2004), as well as used as standard for monitoring the quality of juices in storage (Shaw, 1992).

As much as aerobic and acidic conditions causes oxidation of ascorbic acid to dehydroascorbic acid and then 2,3-diketo-L-gulonic acid (Deutche, 1998) or degradation by cleavage of ring (Jiang-Piang *et. al*.,

1998) or heat degradation, the quantity of ascorbic acid is not only important in nutrition, but is also related to flavour and colour changes of the juice. Addition of *A. danielli* powder was able to substantially retain the quantity of ascorbic acid content of the juice.

Table 2 displayed the result of the total soluble solids of the treated samples in comparison with the control. Total Soluble Solids (TSS) content of the fruit juices indicate maturity of the fruits procured for juice extraction. The treated samples recorded slight changes in their values as compared to that of the control. Treated samples recorded between 0.95 and 1.86% reduction in quantity, while the control had 7.12% reduction over same period. The stability of the soluble solids in the treated samples could be attributed to the effect of the preservative used, though matured fruits were used for the juice sample.

Research has shown that *A. danielli* had been used to preserve cashew juice (Ogunwolu and Adio, 2003) and to maintain the quality of apple slices (Adegoke *et. al.*, 2002a). The slight reduction observed in the sample was similar to what Fasoyiro *et. al, (*2005) reported for roselle-orange drink over one week at ambient temperature. The slight reduction in TSS might be due to the utilization of the sugars by fermenting organisms leading to degradation of the sugars, which was similar to what Costa *et. al*, (2003) reported for juice stored after hot fill and aseptic processing.

In Table 3, the result of total sugar analysis was shown. The reduction of the total sugar content of the treated samples was very minute while that of the control sample was higher than those of the control. Treated sample lost between 0.05 to 0.4%, while control sample 0.90%. The loss of sugars with storage time might be attributed to non-enzymatic browning reactions, either caramelization or maillard reactions occurring between amino-acids or reducing sugars. Non-enzymatic browning during processing or storage of the juices may have affected the flavour, colour, or other quality factors of the product.

CONCLUSION

It has been demonstrated in this research work that active components of *A. danielli* are excellent natural food preservatives and could equally improve the stability and safety of foods. The powdery extract of *A. danielli* exhibited strong preservative potentials on food products such as soymilk-based juice. It can be used to extend the shelf life of the products, and could be a better alternative to synthetic additives, which normally come with various side effects on the long run.

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