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Andasonia digitata Bombax and *Parkia filicoideae Welw:* Fruit Pulp for the Soft Drink Industry

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ABSTRACT

Both Andasonia digitata Bombax *and* Parkia filicoideae Welw *fruit pulps are very nutritive;* Parkia *fruit pulp contains 1·71% w/w total sugar and 7·3 mg/100 g ascorbic acid while* Andasonia *fruit pulp contains 1·41% w/w total sugar and 10·3 mg/100 g ascorbic acid. Both pulps are found to deteriorate fast when exposed even to a limited humid air supply and this occurs surprisingly, even when each pulp is kept intact in the pod. Addition of sodium metabisulphite effectively preserves each pulp even against heat and light effects.*

INTRODUCTION

Andasonia digitata Bombax belongs to the *Bombaceceae* family; it is found mainly in the tropics and sub-tropics. Each matured plant produces more than the average of 250 pods which may provide at least 30 kg of the fruit. Greene (1932) reported that about 50% of the pulp is soluble in water and that half of the water-soluble materials are reducing sugars, organic acids, proteins and ash while the remainder is chiefly pectic substances.

Parkia filicoideae Welw is a tropical plant that produces its fruit pods in hundreds. It is an economic tree; the seed is popularly used as condiment (Fetuga *et al.*, 1973, 1974) in soup making in West Africa. The fruit pulp is highly nutritive and is used to a very limited extent as sweet. Each plant may

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produce about 10 kg fruit and the plant population is denser than most other economic plants that are not cultivated in plantations in Nigeria.

Fruits and their products are good major natural sources of vitamins, sugar and some other valuable nutrients essential for normal human growth. Fruits have some medical implications especially in the treatment of scurvy and intestinal disorders. The qualities of the products of a fruit, however, may be affected by the plant species, maturity of the fruits, processing and chemical treatment.

Soft drink concentrates may be prepared by various methods using plant materials. Mathe *et al.* (1983) prepared refreshing and invigorating beverage concentrate by extracting plant parts. Nagai *et al.* (1983) formulated carbonated health drinks containing Kreb's cycle acids while Ito *et al.* (1983) produced non-alcoholic beverage drinks from fruits and honey. Citrus and other sugar-rich fruits are processed to obtain squash drinks.

Both *Parkia* and *Andasonia* fruit pulps are processed locally to obtain sweets; *Parkia* fruit pulp is processed to obtain tan-brown extract, a very good imitation of standard Cola drinks. Furthermore, since both fruit pulps are well known to contain some sugars, are rich in ascorbic acid, protein and minerals and *Andasonia* pulp is rich in common organic acids, a good blend of both pulps, if properly processed, could provide a suitable plant extract to serve as a concentrate for non-alcoholic beverages. For this purpose, both pulps have been studied for their stability to heat and light and the effect of sodium metabisulphite as a preservative. This paper contains our findings on the effect of the preservative on each of the two pulps.

MATERIALS AND METHODS

Andasonia fruits were collected in February while *Parkia* fruits were collected in April, the peak period of maturity of each fruit. The fruit pods in each case were broken to obtain the fruits which were then stirred mechanically to obtain the pulp which was sieved using an 80 micron sieve. Several pods of each fruit were reserved intact, kept at room temperature and samples of their pulps analysed monthly for changes in the colour, taste, sugar, ascorbic acid, total organic acids, pH, crude protein and minerals. Each pulp, as a powder and as an aqueous solution (5% w/v), with or without added sodium metabisulphite (1% w/v), was also studied monthly for sugar, ascorbic acid and pH. Each material was analysed according to the Official Analytical methods (AOAC, 1976).

The two pulps were studied under four conditions classified as follows:

UPR for untreated *Parkia* fruit pulp extract kept at room temperature.

UAR for untreated *Andasonia* fruit pulp extract kept at room temperature.

TPR and *TAR* for *Parkia* and *Andasonia* fruit pulp extract, respectively, treated with sodium metabisulphite and each material kept at room temperature.

TPD and *TAD* for *Parkia* and *Andasonia* fruit pulp extract, respectively, treated with sodium metabisulphite and kept in the dark at room temperature.

TPF and *TAF* for *Parkia* and *Andasonia* fruit pulp extract, respectively, treated with sodium metabisulphite and kept at 10°C. The extract used in each condition was prepared by stirring 5% w/v of each pulp in water at room temperature and the suspension centrifuged.

Total sugar was determined by measurement of the refractive index by the standard Brix method and the spectrophotometric anthrone method used for glucose. Ascorbic acid content was determined by the spectrophotometric-Folic-Phenol reagent method.

Total acidity was determined using a titrimetric method.

Nitrogen was determined by the Kjedahl method. The crude protein content was determined by multiplying the nitrogen value by the factor 6·25.

RESULTS AND DISCUSSION

Andasonia fruit with a much thicker pod testa keeps its pulp intact for a longer time than *Parkia* fruit. The same disparity in the rates of deterioration of the pulps was observed for the pulps kept in a beaker at room temperature. The highest rate of deterioration was observed in the months of July to September, the peak period of rains and highest humidity of the air in Nigeria. The pulps under this condition turned black and lost all nutritional value after 100 days. It has also been shown that if *Parkia* fruit pulp is dried at 60°C overnight the material showed an improved resistance to deterioration. Both pulps are also found to be very stable even with their natural moisture as long as they are kept in air-tight containers.

Table 1 shows that *Parkia* fruit pulp extract or powder kept at room temperature and monitored for its sugar, ascorbic acid, and pH, without the metabisulphite suffered a faster deterioration, particularly after the second month, than *Andasonia* fruit pulp maintained under identical conditions. Under this condition, *Parkia* fruit pulp suffered a loss of 35% total sugar and 55·7% ascorbic acid while *Andasonia* fruit pulp suffered a loss of 11·3% and 49·9% sugar and ascorbic acid, respectively, at the end of six months. Other constituents of each pulp and, surprisingly, protein, however, maintained a fairly constant value throughout the period of study.

The monthly comparative results are given in Table 2. Sodium metabisulphite proved to be a very efficient antioxidant that arrests deterioration of ascorbic acid and other acids of both pulps either as powder

TABLE 1
Chemical Constituents of *Parkia* and *Andasonia* Fruit Pulps at Start and End of Experiment

Nutrients	Parkia		Andasonia		*Citrus fruit juice*
	March	*October*	*March*	*October*	*March*
Glucose (%)	1·50	1·00	1·30	1·15	2·02
Sucrose (%)	0·21	0·10	0·11	0·10	10·1
Ascorbic acid (mg/100 g)	7·31	3·25	10·31	5·20	209·3
Acidity (%)	1·02	1·10	4·10	4·34	1·25
pH	6·49	6·60	6·40	6·50	3·99
Ash	0·31	0·29	0·10	0·73	0·19
Ca^{2+} (ppm)	95·2	87·3	183	174	163
K^{+} (ppm)	931	880	973	940	817
Na^{+}	0·12	0·09	0·11	0·12	0·12
Mg_g^{2+}	77·1	76·25	71·3	70·8	109
Mn^{2+}	0·85	0·81	0·70	0·60	1·89
Fe^{3+}	0·13	0·12	1·01	1·02	2·54
Pb^{2+}	0·12	0·12	0·18	0·17	0·09
Cu^{2+}	0·14	0·13	0·17	0·16	0·20
In^{2+}	0·75	0·76	0·87	0·82	0·91
N (mg/100 g)	1·76	1·58	1·38	1·35	21·4
Protein (mg/100 g)	11·0	9·88	8·53	8·44	
Total sugars (%)	1·71	1·10	1·41	1·25	12·1

or as an aqueous extract; for instance, both materials showed no remarkable variations in the analytical data for the various monthly analyses. This is interpreted to imply that the two pulps can be safely stored or served as components of soft drinks kept at room temperature. The results obtained for samples kept at 10°C, however, indicate that soft drink prepared from any of the pulp will keep better at low temperature (10°C). Results of samples kept in the dark confirm that deterioration of the pulp in the pod is light-independent. Ascorbic acid, however, showed a slightly higher deterioration rate when either pulp is exposed to light.

Natural fruit juice organic acids includes mainly citric-, tartaric-, malic-acids and at times quinic-, and succinic-acids. These together must be responsible for the low pH value and sour taste of the pulp and extracts. A comparatively high deterioration of both glucose and ascorbic acid in each pulp correlates with a drop in the acidity, tending to suggest some enzymatic activities that must be destroying the acids or producing some basic products. This correlation between the pH and acidity is more prevalent in untreated pulps studied at room temperature and least in the treated sample kept at 10°C.

The results of this study highlight the positive role played by sodium

TABLE 2
Monthly Analysis of Pulp Extracts for the Nutrients

Nutrients	*Sample*	*March*	*April*	*May*	*June*	*July*	*August*	*September*	*October*
Glucose (%)	UPR	1·80	1·60	1·25	1·15	1·05	0·90	0·88	0·81
	TPR	1·82	1·59	1·20	1·15	1·10	1·10	1·08	1·08
	TPD	1·51	1·80	1·22	1·20	1·15	1·15	1·12	1·11
	TPF	1·82	1·60	1·29	1·28	1·26	1·25	1·25	1·26
	UAR	1·50	1·30	1·20	1·10	1·00	0·95	0·90	0·90
	TAR	1·50	1·40	1·35	1·38	1·35	1·37	1·30	
	TAD	1·50	1·47	1·42	1·40	1·37	1·35	1·32	1·30
	TAF	1·50	1·50	1·51	1·45	1·50	1·50	1·50	1·50
Sucrose (%)	UPR	0·11	0·10	0·10	0·10	0·10	0·10	0·10	0·10
	TPR	0·10	0·10	0·10	0·10	0·10	0·10	0·10	0·10
	TPD	0·11	0·10	0·10	0·10	0·10	0·10	0·10	0·10
	UAR	0·10	0·10	0·11	0·10	0·10	0·11	0·10	0·10
	TAR	0·09	0·10	0·10	0·09	0·10	0·10	0·10	0·10
	TAD	0·09	0·10	0·10	0·10	0·11	0·10	0·10	0·09
	TAF	0·10	0·10	0·11	0·10	0·09	0·11	0·09	0·10
Ascorbic acid (mg/100 g)	UPR	7·31	7·20	6·10	5·50	4·80	4·70	4·65	4·30
	TPR	7·30	7·30	7·25	7·20	7·10	7·00	6·80	6·85
	TPR	7·33	7·30	7·27	7·21	7·22	7·20	7·21	7·20
	TPF	7·29	7·30	7·28	7·28	7·25	7·26	7·24	7·25
	UAR	10·3	10·2	7·10	5·40	5·00	4·60	4·25	4·20
	TAR	10·3	10·2	10·0	9·85	9·50	9·00	8·10	7·10
	TAD	10·3	10·3	10·1	10·0	9·80	9·90	10·1	9·80
	TAF	10·3	10·3	10·3	10·3	10·3	10·3	10·3	10·1
pH	UPR	6·47	6·50	6·60	6·70	6·80	6·81	6·80	6·85
	TPR	6·49	6·45	6·50	6·60	6·70	6·67	6·70	6·80
	TPD	6·50	6·40	6·40	6·65	6·70	6·70	6·80	6·80
	TPF	6·48	6·45	6·50	6·70	6·80	6·75	6·70	6·70
	UAR	6·50	6·55	6·60	6·70	6·75	6·80	6·80	6·80
	TAR	6·50	6·55	6·60	6·60	6·60	6·65	6·65	6·65
	TAD	6·50	6·50	6·61	6·60	6·65	6·65	6·65	6·65
	TAF	6·50	6·50	6·52	6·50	6·50	6·50	6·65	6·65

metabisulphite in stabilising the pulp. Furthermore, the pulps keep better at low temperature and if eventually a beverage drink is produced from the pulps, it would not matter whether coloured or clear glass containers were employed.

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