

# Effect of Pectinase on the Physico-Chemical Properties of Juice from Pawpaw (*Carica papaya*) Fruits

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**Abstract**—A procedure for the preparation of clarified Pawpaw Juice was developed. About 750ml Pawpaw pulp was measured into 2 measuring cylinders A & B of capacity 1 litre heated to 40°C, cooled to 20°C. 30mls pectinase was added into cylinder A, while 30mls distilled water was added into cylinder B. Enzyme treated sample (A) was allowed to digest for 5 hours after which it was heated to 90°C for 15 minutes to inactivate the enzyme. The heated sample was cooled and with the aid of a mucillin cloth the pulp was filtered to obtain the clarified pawpaw juice. The juice was filled into 100ml plastic bottles, pasteurized at 95°C for 45 minutes, cooled and stored at room temperature. The sample treated with 30mls distilled water also underwent the same process. Freshly pasteurized sample was analyzed for specific gravity, titratable acidity, pH, sugars and ascorbic acid. The remaining sample was then stored for 2 weeks and the above analyses repeated. There were differences in the results of the freshly pasteurized samples and stored sample in pH and ascorbic acid levels, also sample treated with pectinase yielded higher volumes of juice than that treated with distilled water.

**Keywords**— Juice, pawpaw, pectinase.

## I. INTRODUCTION

**P**AWPAW (*Carica papaya*) is a fast growing short lived single stemmed or sometimes branched by injury. It is an absorbent herb, 2-10cm in height with a straight usually cylindrical, soft loosely spongy fibres (within), juicy, hollow, gray or grayish brown trunk [1]. The papaya fruit is a fleshy beery which varies in shape from round to pyriform and contains many small round blackish seed. The skin changes from green to yellow or orange as papaya ripens. The texture, flavor, and colour of the flesh resemble that of a cantaloupe. The fresh fruit is eaten with lemon or lime juice or in fruit salad [2]. The fruits may be crystallized or made into jam. The boiled fruit is used for thickening soups, the pawpaw leaves, stems and roots are used in the treatment of malaria, and boiled pawpaw seeds in the relief of constipation [3].

The use of pectolytic enzyme (pectinase) is essential in juice clarification and has extensively been used for blackcurrant and other soft drinks which tends to destroy troublesome quantities of pectin.

The course of pectolytic enzymes action may be

conveniently followed by viscosity determination at a standard temperature [4].

The main objective of this study was to produce clarified juice using, enzyme treatment of pawpaw pulp, compare the physiochemical qualities of fresh and stored juice from pawpaw, and examine the effect of enzyme treatment on juice yield from pawpaw pulp using water treated pulp as the control.

Production of juice using pawpaw fruits would help to reduce seasonal waste of produce, and improve the economy of the country by stopping the importation of fruit juice.

## II. MATERIALS AND METHODS

### A. Production of Pawpaw Pulp

Pulp was prepared from pawpaw fruits (red varieties) which was purchased from market garden, Okpara Avenue Enugu. The fruits were washed singly with running tap water after which they were peeled. Peeling was carried out manually using stainless steel knife. During size reduction, the peeled fruit was cut longitudinally into several pieces to facilitate removal of seeds and sub pulping.

The pawpaw slices were blended into a fine pulp using Kenwood blending machine. Pulp homogenization was aided by addition of distilled water intermittently during blending.

### B. Treatment of Pulp with Pectinase

About 750ml pulp was measured into 1 litre measuring cylinder and heated to 40°C, cooled to 20°C and 30mls of pectinase which was sourced from Food Technology Laboratory I.M.T., Enugu was added. The mixture was mixed thoroughly and allowed to digest for 5 hours for clarification. The sample was heated to 90°C for 15 minutes and cooled, for inactivation of the pectinase.

At the same time, a control sample was prepared by addition of 30mls distilled water to another 1 litre measuring cylinder containing 750ml pulp, also left for 5 hours for digestion, heated to 90°C for 15 mins and cooled.

Mucilin cloth was used to filter the samples to get pawpaw juice samples which were dispensed into plastic bottles and pasteurized at 95°C for 45 minutes.

### C. Determination of Juice Extraction Rate

40g of the pawpaw pulp was measured into two 200ml beakers A and B respectively. 5ml distilled water was added to

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beaker A while 5ml pectinase was added to beaker B. The contents were mixed thoroughly with stirrer. The samples were allowed to stand for 5 minutes, transferred to filter funnels with graduated measuring cylinders under them. The amount of juice got after every 30 minutes interval of filtration was noted as the yield.

#### D. Chemical Analysis

The specific gravity, titratable acidity reducing sugars, ascorbic acid were determined by [5] and [6] methods. The pH of the samples was measured using a pH meter Kent Ek 3055.

### III. RESULTS AND DISCUSSION

The results of physico-chemical properties carried out on the freshly prepared (zero day) juice samples are presented in Table I. The enzyme treated juice sample had pH 5.03 against 4.42 for the water extracted sample. Also ascorbic acid values varied giving 308mg/100ml and 34.8mg/100ml for enzyme and water extracted juice respectively. The other entire factor determined gave the same value.

#### A. Effect of Storage Time on the Physicochemical Properties of the Juice Samples

The results of physicochemical properties of the juice samples after two weeks of storage are presented in Table II. After two weeks of storage there were decrease in titratable acidity sugars and ascorbic acid in the two samples.

#### B. Effect of Enzyme Treatment on Rate of Juice Extraction

The rate of juice extraction determined on the samples are presented in Table III and Fig. 1 and 2. Rate of juice extraction was higher in enzyme treated sample than in the water treated sample. It was however difficult to extract juice from the left over samples even with the addition of pectinase. Pawpaw juice extracted with water jelled and separated into two phases when left on the shelf. This may be attributed to its high content of unhydrolysed pectin [7] and [8]. Heating at 90°C for 15 minutes during the enzyme treatment was an important feature since higher temperature discouraged microbial growth but tends to denature on inactive the enzymes. Addition of water to the pawpaw pulp during blending led to a high rate of extraction. This is because the addition of water lowers the viscosity of the pulp.

### IV. CONCLUSION

Pectinase reduces filtration time and increases yield of juice from pawpaw. It also increases pH of the juice but decreases the ascorbic acid content of the juice. The use of pectinase also prevent the separation of pawpaw juice into two layers thus eliminating the 'shake before drinking'.

### APPENDIX

TABLE I

PHYSICOCHEMICAL PROPERTIES OF FRESHLY (ZERO DAY) EXTRACTED JUICE

Factor determined	Enzyme extracted juice	Water extracted juice
Specific gravity	1.04	1.04
Titratable acids (%)	0.90	0.90
pH	5.03	4.42
Sugars: glucose	6.60	6.60
: fructose	7.00	7.00
Ascorbic acid Mg/100ml	30.80	34.80

TABLE II

EFFECT OF STORAGE ON PHYSICOCHEMICAL PROPERTIES OF JUICE SAMPLES

Factor determined	Enzyme extracted juice	Water extracted juice
Specific gravity	1.04	1.04
Titratable acids (%)	0.27	0.51
pH	5.03	4.42
Sugars: glucose	6.25	6.25
: fructose	6.63	6.63
Ascorbic acid Mg/100ml	29.0	33.2

TABLE III

EFFECT OF TREATMENT WITH ENZYME AND WATER ON RATE OF JUICE EXTRACTION FROM PAWPAP PULP

Time Interval (mins)	Enzyme extracted juice (mls)	Water extracted juice (mls)
30	8.50	1.3
60	12.50	1.80
90	15.0	2.30
120	16.50	2.60
150	18.0	3.10
180	18.50	4.00

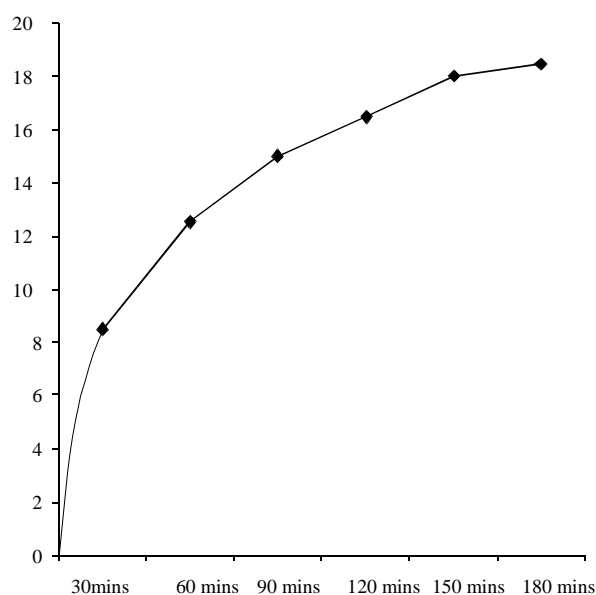


Fig. 1 Graph of the flow rate of Pawpaw Juice against Time using Pectinase Enzyme for Extraction

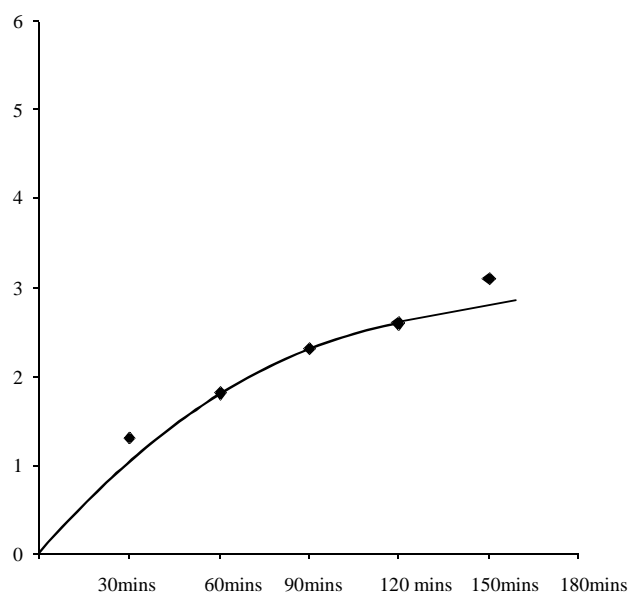


Fig. 2 Graph of the flow rate of Pawpaw Juice against Time using water for Extraction

#### ACKNOWLEDGMENT

The authors are grateful to the British Council sponsored four polytechnic programs under oversee Development Agency (ODA) in which I.M.T. was included for providing the pectinase used in this experiment. To our families, we thank you immensely.

#### REFERENCES

- [1] J. J. Ochse, M.J. Soule, M. Dijkman and C. Wehlburg. The papaya in tropical and subtropical Agriculture, 1980. Macmillan Co. London pp 586-589
- [2] V.H. Heywood Cotyledon families in the flowering plant of the world, 1978. Oxford University Press, Oxford London, p 105
- [3] J.C. Okafor. The place of wild fruits and vegetables in Nigeria diet. In Agriculture in Nigeria – an introduction, 1975, FAO home, pp 5-6
- [4] Simmond, Fruit juices and soft drinks in food industry manual (1984). Kapitan Szabo Publishers Washington D.C., pp 244-251
- [5] D. Pearson, Pearson's Composition and Analysis of Foods, 9<sup>th</sup> edition, Longman Scientific Publishers 1991
- [6] AOAC Official Methods of Analysis of the Association of Analytical Chemists, 14<sup>th</sup> edition Washington DC, 1980
- [7] A.N. Spiranagarajain and A.J. Shrikhande, Comparative aspects of pectin extracted peels of different varieties of mango, 1979, *J. Fd Technol*, 14 (3) pp 277-287
- [8] P.G. Inon, E. Balogh and P.O. Ngoddy Agbolumo, Pectin: Extraction and properties, 1977. Proceedings of the launching and first annual conference of NIFST Vol. 1 pp 61-67