Industrial Residues of the Pineapple of the Agricultural Chemistry

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Abstract

In America (Capital-Mexico) pineapple processing produce industrial residues with a high deliberation of nutritional fiber. The aim of this learns was to enumerate the constituents of the rubbery residues from the manufacturing dispensation of pineapples which exhibited low concentrations of lignin.

Keywords: *Pineapple, Fiber, Lignin, Nutrition*

I. INTRODUCTION

Pineapple (*Ananas comosus*) is native to the South American continent and is measured a foreign fruit due to its taste and flavor. In Mexico, pineapple agriculture has a long convention and is of vital financial and educational significance. Mexico is the seventh largest creator of pineapples worldwide. Pineapple residues can account for 50% of waste weight and generate approximately 10 tons/year of fresh fiber. Larrauri *et al*. reported that the external part of the pineapple has a significant content of soluble carbohydrates (as the product of the pulp remaining after removal of the edible part) including more than 20% total dietary fiber (TDF), collected mostly of hemicelluloses. The residual lignocelluloses fibers are polymeric materials of great industrial interest, because they are renewable and biodegradable products. Their chemical masterpiece depends on the type and origin of the fibers which hold dissimilar amounts of cellulose, hemicelluloses and lignin (dietary fiber). In addition to the amounts of dietary fiber near in the plant tissues other important aspects but also their chemical (degree of lignifications, type and crystalline of cellulose) and physical (particle size and shape) properties, because these affect fermentation in the colon as well as the speed of transit in the gastrointestinal tract.

Toward this objective, these residues were grouped as the leaf bracts, shell and core for a study of relationship between the native cellulose phases.

II. MATERIALS AND METHODS

A. Raw Materials: Treatment and Classification

The residues were dehydrated in a horizontal drying chamber (Lumisell, Mexico, Mexico) at 60˚C moisture content was less than 10%.

B. Proximate Chemical Analysis of Raw Materials

Nearby chemical analysis for pulp and residues (leaf bracts, shell and core), was performed using the Association of Official logical Chemists (AOAC). The Insoluble (IDF) and soluble (SDF) dietary fiber contents were determined according to the AOAC method. The samples were dried, defatted and freed from carbohydrate, before the analysis. The (TDF) contents were corrected for residual protein, and ash. The total dietary fiber content was intended as the sum of IDF and SDF.

Total dietary fiber (method 991.43) was performed according to the technique described in AOAC. The samples were dried, defatted and free of carbohydrate. It was run blank through entire procedure along with samples to measure any contribution reagents to residueAfter cooling pH was adjusted to 4.5 ± 0.1 and 300 µL of amyloglucosidase (A-9913 Sigma, Chem. Co. St. Louis MO, USA) were added.

The suspension was left to in water bath at 60˚C for 30 min. After that it was filtered to obtain the supernatant and the insoluble fraction. The supernatant was precipitated with 95% alcohol to precipitate the SDF and it was quantified by drying overnight at 105˚C. The insoluble fraction was washed with 78% and 95% alcohol solutions and acetone, respectively, followed by drying overnight at 105˚C to obtain the IDF. The dietary fiber contents were corrected for residual protein, ash and blank. The total dietary fiber was indicated as the sum of IDF + SDF.

To enumerate the pleased of hemicellulose, the method for the purpose of the unbiased detergent fiber (NDF) content was used as described previously by Van Soest. Accordingly, this residue of this analysis was utilized to decide the content of cellulose and lignin called the acid detergent fibre (ADF), using method 973.18.

C. Statistical Analysis of Data

An analysis of variance was used applying Tukey's test ($\alpha = 0.05$) utilizing Statistical Analysis System 8.0 (SAS Institute Inc., Cary, North California, USA) software.

III. RESULTS AND DISCUSSION

In Table 1 the proximate chemical composition of the pineapple pulp and residues (leaf bracts, shell and core) are shown. Statistical analysis revealed significant differences ($p \leq 0.05$) in the parameters total protein, ash and crude fat values. The total protein content ranged from 0.7 g/100g of leaf bracts to 1.58 g/100g of pulp; this total protein could be mainly attributed to hydroxyproline-rich glycoprotein, Because Bartolome and Ruperez. and Smith *et al*. reported that the glycoprotein's in the shells of fruits, are immersed in the primary cell wall forming a network of micro fibrils with the cellulose . The leaf bracts exhibited the highest ash content, which was twice that in the pulp; although the values reported by Chau and Huang in orange peels (3.3 g/100g) are twice those of the pineapple's shell and core. One important consideration is that carbohydrate content was determined by calculation
and may include simple sugars such as monosaccharide's and disaccharides. The highest content of crude fat was found in the edible fraction of the pulp, followed by the core (in the case of the residue), whereas the lowest concentration of crude fat was in the leaf bracts.

Table: 1 Proximate Chemical Composition of the Residues Pineapple (Leaf Bracts, Shell, And Core) Compared with Pulp of Pineapple.

(g/100g)	Pulp	Leaf bracts	Shell	Core
Total protein	1.58 ± 0.01d	0.70 ± 0.01a	0.75 ± 0.01b	0.85 ± 0.01c
Ash	3.0 ± 0.01b	7.37 ± 0.0d	1 .5 ± 0.00b	1.3 ± 0.00a
Crude fat	3.19 ± 0.00b	3.5 ±.01c	2.0 ± 0.01a	3 .17 ± 0.01b
Crude fiber	24.14 ± 0.01a	62.5 ± 0.00c	65 ±0.00c	47.6 ± 0.00b
NFE*	68.79 ± 0.00	25.93 ± 0.02	32.1 ± 0.02	47.08 ± 0.01

*NFE = Nitrogen-free extract. Results are given for dry basis and correspond to the average from three independent determinations ± standard
Deviation. Different letters in the same row indicate statistically significant difference ($p \leq 0.05$) after applying Turkey's test.

Table 2 . Comparison of the Chemical Composition of the Pineapple Residues (G/100g Dry Weight).

Fibre	Leaf bracts	Shell	Core
IDF	43.53 ± 0.93a	46.20 ± 0.50b	42.92 ± 0.09a
SDF	29.16 ± 0.46b	35.67 ± 0.37c	21.27 ± 0.61a
TDF	74.69	81.8	64.19
Hemicelluloses	21.88 ± 0.22a	28.69 ± 0.35b	28.53 ± 1.37b
Cellulose	43.53 ± 1.17c	40.55 ± 1.02b	24.53 ± 1.68a
Lignin	13.88 ± 1.70c	10.01 ± 0.38b	5.78 ± 0.429a
Pectin	2.32 ± 0.37b	2.49 ± 0.20b	1.58 ± 0.17a

A. Proximate Chemical Analysis

The raw fiber contents ranged from 24.14%, in the pulp, to 65%, in the leaf bracts. The raw fiber content of the residue fraction is greater than the edible fraction.

B. Determination of Soluble (SDF) and Insoluble (IDF) Dietary Fiber

The results obtained for the dissimilar dietary fiber fractions, the numerical analysis showed that important differences exist among the leaf bracts,

shell and core. The contented of dietary fiber (TDF) in the remains depended on the source from which it was extracted, with the shell having the uppermost content. Results are given for dry basis and correspond to the average from three independent determinations standard deviation. Different letters in the same row indicate statistically significant difference after applying Tukey's test. Furthermore, the main fiber fraction found in the residues studied fibers was the represented 56% - 65% of the TDF, similar to the value reported for orange peel, but greater than that reported for grape peels. These results indicated that the samples tested were composed mainly of cellulose micro fibrils containing hemicelluloses and lignin, as shown in Table.2

IV. CONCLUSION

The agro industrial pineapple residues had a greater fraction of fiber than the edible portion or pulp, and even more than other agro industrial residues. The amount of dietary fiber found in the pineapple leaf bracts, shell and core residues, was relatively high and with the insoluble fraction being the main component.

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