A RESEARCH NOTE

THE DETERMINATION OF ASCORBIC ACID, CHLOROPHYLL AND PECTIN CONTENTS OF TURKISH KIWIFRUIT

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ABSTRACT

The contents of ascorbic acid, chlorophyll and pectin in kiwifruits (Hayward cultivar) grown in Turkey were investigated. While chlorophyll and pectin contents were similar to previous studies, the ascorbic acid content tended to be lower.

INTRODUCTION

Production and consuming of kiwifruit (*Actinidia chinensis* Planch var. *hayward*) in Turkey has increased in recent years. Turkey has various ecology and microclimates because of its geographical location and different climates. Kiwifruit with high nutritional value, vitamins and minerals in its composition as well as appearance, storage convenience, variety of processing and capability of wide adaptation plays an important role in its increase of production and consumption.

The aim of this research was to investigate ascorbic acid, chlorophyll and pectin contents of kiwifruits harvested in Turkey in order to designate the composition of fruit.

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MATERIALS AND METHODS

Kiwifruits (Hayward cultivar) were obtained from Ataturk Central Horticultural Research Institute, Yalova, Turkey. Seventy kg of kiwifruit were used in the research. Kiwifruits were harvested with approximately 9.2% soluble solids from trees at the beginning of November.

The fruits were ripened at 1 ± 1C and 85-90% relative humidity in a cabinet (Sanyo MIR 252) until they reached the desired maturity level for processing (approximately 3 weeks). The fruits were stored at 1C prior to analysis. The average weight, size and soluble solids of the kiwifruits used in the experiments are presented in Table 1.

TABLE 1.
PROPERTIES OF KIWIFRUIT USED IN THE RESEARCH

Weight (Average of 15 fruits), g	88.60 ± 7.20[1]
Height, cm	7.40 ± 0.21
Axis, cm	5.60 ± 0.24
pH	3.27
Titratable acidity (% as citric acid)	1.43
Soluble solids (Brix at 20C)	16.10

[1]: ± Standard deviation

Analyses

Peeled kiwifruits, with the seeds and cores removed were homogenized at 1C for 3 min in a Blender (Waring, 32 BL 79, Torrington, CT) and used in the analysis. All product analyses were carried out in triplicate. pH was measured using a combination glass electrode and pH meter (Model 10, Fisher Sci. Co., Pittsburgh, PA). Titratable acidity was determined by diluting 10 mL kiwifruit puree to 100 mL with distilled water and titrating with 0.1 N NaOH to an endpoint of pH 8.1. Results were expressed as g anhydrous citric acid per 100 g. The soluble solids of the kiwifruit samples were measured with an Atago refractometer (TYP 1 T).

Ascorbic Acid

Kiwifruit puree (25 g) was combined with 175 mL of 4% oxalic acid. The fruit/acid mixture was stirred in a blender (Waring 32 BL79) for 5 min. 2,6-dichlorophenol indophenol was used as color reagent in the method presented by Pearson (1970). The concentration of ascorbic acid was read at 520 nm using

a standard curve. Concentrations of ascorbic acid were designated as mg/100 g. Ascorbic acid here implies both L-ascorbic acid and dehydroascorbic acid.

Chlorophyll

Chlorophyll contents were measured using a Hitachi U 2000 UV/Vis spectrophotometer (121-002 Tokyo, Japan), to read the absorbance at 660 and 642.5 nm (AOAC 1980). Results were reported as chlorophyll a, chlorophyll b and total chlorophyll (Matsumoto *et al.* 1983).

Pectin

Pectic substances of kiwi fruits were extracted, with modifications, according to the method reported by Yu *et al.* (1996). Total pectin was obtained according to the Ahmed and Labavitch's (1977) method. Difference between water-soluble pectin, total pectin and oxalate soluble pectin was used to determine the amount of nonextractable pectin (as protopectin). All pectin extracts were kept at 4C for 12 h prior to analysis.

Measurement

M-hydroxydiphenyl (Merc) reagent was used in the analysis of the pectin content of kiwi extracts. One milliliter of extract was pipetted into a test tube. Six milliliter of 0.0125 M sodium tetra borate in concentrated sulfuric acid was added to the test tube in an ice water bath and mixed thoroughly. Duplicate samples were prepared for each measurement with a corresponding blank. Tubes containing sample, were heated in a boiling water bath for exactly 5 min and immediately put into ice water to cool. As color reagent, 0.1 mL aliquot of 0.15% m-hydroxydiphenyl was added. Sodium hydroxide (0.1 mL of 0.5% - Merc) was added into the blank tube. All samples (including the blank) were mixed and allowed to stand 15 min at room temperature. After formation of the chromogen in the tubes was observed, the absorbance value of the samples was measured at 520 nm using a Hitachi U 2000 UV/Vis spectrophotometer (Model 121-002). As a standard, galacturonic acid (Merc Company) was used. To zero the spectrophotometer, a solution of distilled water (1 mL), sulfuric acid/tetra borate (6 mL), and 0.5% sodium hydroxide (0.1 mL) were used as a blank.

RESULTS

The contents of ascorbic acid, chlorophyll and pectin in kiwifruits are given in Table 2. Ascorbic acid content obtained from this research was lower than most previous researches (Table 3). Pectin and chlorophyll contents were similar

to previous ones. Total pectin contents of kiwifruit in previous researches were 0.7% (Fuke and Matsuoka 1984) and between 0.5-0.6 % (Lodge *et al.* 1985).

TABLE 2.
THE CONTENTS OF ASCORBIC ACID, CHLOROPHYLL AND PECTIN IN KIWIFRUITS

Ascorbic acid (mg/100 g)	68.24
Chlorophyll (mg/100 g)	
A	4.17
B	2.28
Total	6.45
Pectin (%)	
Water soluble	0.41
Oxalate soluble	0.15
Nonextractable	0.05
Total	0.61

TABLE 3.
ASCORBIC ACID CONTENTS OF KIWIFRUITS IN PREVIOUS RESEARCHES

Ascorbic Acid Content (mg/100 g Edible Flesh)	Reference
57	Benk (1972)
74	Westin (1974)
105	Zanutto and Caraffini (1980)
101	Wildman and Luh (1981)
190	Matsumoto *et al.* (1983)
80-300	Ferguson (1984)
90-110	Fuke and Matsuoko (1984)
60.5	Lodge *et al.* (1985)
110-126	Venning *et al.* (1989)
95	Cano *et al.* (1993)

There are two principal reasons for the difference determined in ascorbic acid content. One of these was that vitamin C is sensitive to oxidation and can lose that characteristic easily. Any loss during sample preparation is hard to prevent in spite of oxalic acid added into the kiwi sample as a stabilizing and protecting agent. Soil characteristics and climate can also cause differences in the composition of fruit (Salunkhe and Kadam 1995). Because ascorbic acid loss takes place underneath the peel during peeling, a significant amount of ascorbic acid with tissue can be lost.

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