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Blanching peppers using microwaves

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Abstract

Enzymatic reactions are not desirable in ripe fruits and vegetables. They cause losses along transportation, storage and processing. Blanching is a pre-treatment operation whose aim is to inactivate enzymes, and is usually applied before cutting, peeling, and freezing in order to avoid browning and changes in texture. Besides inactivating enzymes such as polyphenoloxidase, peroxidase and pectinase, blanching may induce sensory and chemical changes. The purpose of this work was to evaluate changes in antioxidant activity of *Capsicum annuum* Jalapeño type, when treating with microwaves to inactivate polyphenoloxidase. The whole fresh peppers (85% moisture) were blended until a paste was obtained. Ten grams portions were placed in a glass container and processed in a microwave oven until the inactivation of polyphenoloxidase was reached. Inactivation of the enzyme was confirmed with a spectrophotometric method using catechol as substrate. The processed peppers samples were mixed with 80% ethanol to extract phenolic compounds that were determined by the Folin Ciocalteu method. The antioxidant activity was evaluated using the radical ABTS, as described by Charurin et al (2002). Results showed that phenolic compounds were reduced from 9.6 to 7.6 mg/ g peppers (dry weight basis) and antioxidant activity was enhanced from 29 to 42 μ M de trolox/ g peppers (dry weight basis) with thermal microwave blanching. Changes in the content of phenolic compounds were confirmed using high performance liquid chromatography, and the emergence of other phenol derivatives with enhanced antioxidant activity was detected in blanched samples. It may be concluded that blanching Jalapeño peppers with microwaves may induce the formation of derivatives of phenolics with enhanced antioxidant activity.

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1. Introduction

With continuing progress in food sciences, it is reasonable to expect the design of specific processes that would result in food products with special characteristics. Peppers (*Capsicum* spp.) have shown to be

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a source of interesting phytochemicals such as phenolics, flavonoids and capsaicinoids with antioxidant, antimicrobial and pungent properties. Peppers are a source of carotenoids and phenolics correlated with antioxidant activity. On the other hand, enzymatic reactions are not desirable in ripe fruits and vegetables, particularly in peppers since they may cause losses of phytochemicals along transportation, storage and processing. Blanching is a pre-treatment operation whose main objective is to inactivate enzymes, and is usually applied before cutting, peeling, and freezing, in order to avoid browning and changes in texture. Besides inactivating enzymes such as polyphenoloxidase, peroxidase and pectinase, blanching may induce sensory and chemical changes that should be evaluated.

Jalapeño pepper (*Capsicum annuum* L) is a green to dark green vegetable that presents an intense red coloration at its completely mature state. In addition to water, the most important components of Jalapeño pepper are 1.2 % of protein, 5.3% of carbohydrates, 2.3% of fiber, and 0.1% of fat. With regard to mineral content, the most important contribution of this vegetable is potassium with 340 mg / 100 g of fresh product; it also contains 25 mg of calcium, 25 mg of magnesium, 7 mg of sodium, 2 mg of iron, and 0.3 mg of zinc [1].

The increase in the consumption of sliced Jalapeño pepper, the so called “nachos”, has generated an increase in small and medium industries dedicated to their production by fermentation and pickling. Other forms of preserving Jalapeños are refrigeration, freezing, and drying (to produce the so-called “chipotles”) [1].

Generally the first step in fruit and vegetable processing is blanching in order to avoid the production of undesirable flavors and browning. Enzymatic browning is a prominent deteriorative reaction in fruits associated with the increased concentration of polymeric derivatives of *o*-quinones, which derive from phenolic substrates through oxidative reactions catalyzed by polyphenol oxidase, in the presence of atmospheric oxygen. The blanching of peppers is usually performed using hot water or steam. Nevertheless blanching using microwaves reduces heating time, as well as the loss of water soluble nutrients that are leached into the water [2]. Considering that blanching peppers using microwaves may be of importance in the preservation of antioxidant activity of these vegetables, the aim of this work was to evaluate changes in phenolics and antioxidant activity of *Capsicum annuum* Jalapeño type, when treating with microwaves to inactivate polyphenoloxidase.

2. Materials & Methods

Whole fresh peppers (85% moisture) were blended until a paste was obtained. A series of glass containers with 10 g portions were prepared and processed in a microwave oven during 10, 15, 20, 25 and 30 s. The temperature of the surface of the peppers paste was monitored. Inactivation of the enzyme was confirmed with a spectrophotometric method using catechol as substrate. The processed peppers samples were mixed with 80% ethanol to extract phenolic compounds that were determined by Folin Ciocalteu method. The antioxidant activity was evaluated using the radical ABTS, as described by Charurin et al [3].

The samples of fresh and blanched jalapeño were analyzed by HPLC (Varian 920-LC) using a reversed-phase column (4.6 mm, 50 μ m, Supelcosil C18) at 27°C and gradient elution with solvent A (Water trifluoroacetic, pH 3) and solvent B (Acetonitrile) using the following elution profile: 0-50 min linear gradient from 90% A: 10% B to 55% A: 45% B: linear gradient from 50 -60 min to 40 % A: 60 % B and continuing isocratically at 40% A: 60 % B for 10 additional minutes. Flow rate: 1 mL/min. Injection volume: 20 μ L. A group of phenolic standards were previously analyzed by HPLC in order to determine the retention time of each of the standards.

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