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Ultrasound-assisted extraction for enhanced retention of physicochemical properties of garlic powder obtained by spray-drying

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ABSTRACT

This work aims to produce garlic powder with the retention of physicochemical properties by using different methods. Garlic is extracted by an ultrasonic-assisted extraction technique to remove the undesired compounds. In this study, garlic powder is incurred through freeze-drying and spray-drying with maltodextrin as a carrier agent. To compare the efficiency of two drying techniques, garlic is dried without maltodextrin. This study is intended to find a technique to get garlic powder with the best quality. The physicochemical and microstructural properties of the garlic powder obtained were analyzed and compared. It was found that garlic powder spray-dried with maltodextrin has the highest retention of physicochemical properties compared to those treated with other techniques. Although freeze-dried and spray-dried powder developed without carrier agent could maintain the flavor and color, they failed to hold the structure and formed into clusters soon after they are exposed to air. Thus, the obtained results showed spray-drying with maltodextrin as the best drying technology for the maintenance of its physical and chemical properties.

INTRODUCTION

Enhancement in the intake of herbs, fruits, and vegetables lowers the endangerment caused by diseases. Garlic is an allium species that has been considered broadly for its health benefits. Garlic is a bulb-shaped plant with a pungent smell and therapeutic properties (Rivlin, 2001). It is an agricultural product that has a rich source of phenolic materials, phosphorous, potassium, sulfur, selenium, zinc, Vitamins A and C, and a lesser degree of sodium, manganese, and calcium (Brewster, 1977). It consists of bioactive components significant for medicinal properties (Macpherson *et al*., 2005). It provides substantial benefits in reducing blood pressure (Xiong *et al*., 2015; Wang *et al*., 2015) and low-density lipoprotein oxidation (Lau, 2006). In old times, garlic has been utilized as a curative for wounds, flatulence, intestinal discomforts, and other ailments. Garlic is potentially formulated with a self-protective mechanism against microbial growth. There are many active compounds present in garlic along with other compounds. The activity of these compounds occurs when the garlic bulb is crushed, thereby causing the release of alliinase enzyme which plays a major role in enzymatic reaction required for the production of thiosulfinates. Alliin gathers in the whole garlic naturally when stored at the cool temperature. Garlic is well known for its odor, which comes from alliin and other sulfur compounds. It contains more sulfur compounds of about 1.1–3.5% when compared with onions which have 0.4–1.2% (Patra, 2012). These compounds lose their nature when exposed to heat and oxygen. During processing, entire garlic is converted into organosulfur compounds in a short period. It is a long-known fact that the extraction of food can enhance potentiality and wipe out displeasing features such as acidic, irritating, and oxidizing components.

The traditional method of the extraction of garlic has certain disadvantages of long extraction time, degradation of

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