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Dehydration of vegetables by application of radio frequency heating

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Radio frequency (RF) energy as emerging drying technologies. When properly applied can be energy efficient and had great potential in food and allied industries for a wide range of materials. The present investigation was undertaken to study the dehydration of vegetables by application of radio frequency (RF) heating. The dehydration of carrot and cabbage with initial moisture content 89 per cent, and French bean with 90 per cent was carried out for 180 min, 120 min and 180 min, respectively to achieve final moisture content of 5.1 for carrot,1 per cent for cabbage and French bean. The overall quality of RF dried product was observed to be superior over hot air drying.

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INTRODUCTION

Drying refers to a process in which water is removed from a moist material by using heat as the energy input. The mechanism of drying is a complex phenomenon involving combined heat and mass transfers within a biological food material. The drying has been reported to account for anywhere from 12 per cent to 20 per cent of the energy consumption in the industrial sector (Raghavan *et al.*, 2005). It is an energy-intensive process because the latent heat is to be supplied to the material to evaporate the moisture. Drying offers a means of preserving foods in a stable and safe condition as it reduces water activity and extends shelf-life much longer than that of fresh foods and agricultural products. A major challenge of drying fresh foods and agricultural products is to reduce the moisture content to a certain low level while maintaining the quality attributes such as colour, texture, chemical components and shrinkage. In conventional heating, such as hot air and infrared drying, thermal energy is transferred from material surface to interior due to temperature gradients. These drying processes have low drying rates causing long drying times in the falling rate period of drying. The long drying times at relatively high temperatures often lead to undesirable thermal degradation of the finished products (Mousa and Farid, 2002 and Zhang *et al*., 2006). Unlike conventional thermal processing in which energy is transferred from a hot medium to a cooler material through convection, conduction and radiation, dielectric heating involves the dissipation of the electromagnetic. Research on RF heating applications in the food industry started in the 1940s (McCormick ,1988 and Anonymous 1993). The first attempts were to use RF energy to cook processed meat, to heat bread and dehydrate vegetables (Moyer and Stotz , 1947 and Kinn, 1947). Thawing of frozen products was the next step on the application of RF energy in 1960s (Jason and Sanders, 1962). Demeczky showed that juices (peach, quince and orange) in bottles moving on a conveyer belt through a RF applicator had better bacteriological and organoleptic qualities than juices treated by conventional thermal methods (Demeczky, 1947). The primary application in the late 1980 s was the post-baking (final drying) of cookies and crackers (Anonymous, 1987 and Rice, 1993). RF drying methods provide opportunities to shorten drying times and improve the final quality of the dried products. RF energy in

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