

## Physical Attributes of Garlic (*Allium sativum* L.)

A. A. Masoumi<sup>1\*</sup>, A. Rajabipoor<sup>2</sup>, L. G. Tabil<sup>3</sup> and A. A. Akram<sup>2</sup>

### ABSTRACT

Some physical attributes of two common types of Iranian garlic cloves (white and pink) were identified and compared. A machine vision system was used to determine three dimensions and both major and minor projected areas of garlic cloves at a moisture content of 42.4% w. b. The geometric mean diameter and sphericity were calculated, as well as the unit mass and volume of cloves were measured. In the moisture range from 34.9 to 56.7% w.b., the unit density, bulk density and porosity for both types were measured. Results showed that the unit density, bulk density and porosity of cloves were affected significantly by moisture content ( $p < 0.01$ ). The type of garlic had a highly significant effect on the unit density and porosity ( $P < 0.01$ ), and a significant effect on the bulk density ( $P < 0.05$ ). The relationship between volume and dimensions of cloves was established using regression analysis. The effect of moisture content on physical properties of cloves was also expressed by appropriate equations.

**Keywords:** Garlic, Machine vision, Physical attributes.

### INTRODUCTION

Garlic (*Allium sativum* L.) has been cultivated since ancient times all over the world especially in Asia. Garlic has medicinal properties and it is an important ingredient in the leading cuisines around the world. Garlic as a spice is utilized in both fresh and dehydrated state in the food industry. It is dehydrated into different products such as flakes, slices, and powders (Ahmad, 1996).

Garlic does not produce seeds, so it must be propagated vegetatively with garlic cloves as the most common planting material. The yield quality of garlic is affected by planting methods and clove rates and sizes (Nourai, 1994; Matlob and Khalel, 1986). Lack of basic engineering properties of this planting material is a problem identified in the development of new methods of sowing

the garlic crop, development of new equipment for processing and control strategies for crop storage. A number of researchers have worked on the physical properties of garlic (Madamba *et al.*, 1993, 1995, 1997; Pezzutti and Crapiste, 1997; Park *et al.*, 1981; Bhatt *et al.*, 1998; Sharma and Prasad, 2002).

Madamba *et al.*, (1993) measured the length, width, and thickness of garlic slices by using vernier caliper. Song and Litchfield, (1991) measured the length and width of seed grains by using a computer imaging system while using a caliper to measure the third dimension. Tabil *et al.*, (1999) used an image analysis program to determine the size and shape characteristics of some specialty crops such as chickpeas, lentils and peas including the length of the longest and shortest axes, cross section area, perimeter

<sup>1</sup> Department of Agricultural Machinery, Faculty of Agriculture, Isfahan University of Technology, Isfahan, Islamic Republic of Iran.

<sup>2</sup> Department of Agricultural Machinery, Faculty of Agriculture, University of Tehran, Karaj, Islamic Republic of Iran.

<sup>3</sup> Department of Agricultural and Bioresource Engineering, University of Saskatchewan, 57 Campus Drive, Saskatoon, SK, Canada S7N 5A9.

\* Corresponding author.