

Carbohydrate composition and electrophoretic pattern of garlic (*Allium sativum* L.) cloves

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ABSTRACT

Developing cloves of HG-1, HG-6, HG-17, HG-19 and G-1 at four stages, beginning 150 days after sowing at 15 days intervals were analyzed for total water-soluble carbohydrates, sucrose, reducing sugars, total fructose and structural carbohydrates. At maturity, electrophoretic pattern of garlic proteins was also conducted. Average water-soluble carbohydrates decreased up to 180 days after sowing and increased thereafter. Sucrose level increased up to 165 days after sowing and decreased thereafter. Reducing sugars decreased, whereas total fructose increased continuously throughout bulb development. Acid detergent fibre, cell wall constituents, cell contents, hemicellulose, cellulose and lignin of non-edible parts averaged to 42.85, 54.56, 45.35, 11.78, 32.48 and 10.38 per cent, respectively. Total proteins of garlic cloves resolved into 6-8 subunits with Mr values ranging from 14 to 60 kD.

Key words : Non-structural carbohydrates, Structural carbohydrates, Electrophoretic pattern, *Allium sativum*, Garlic cloves.

Garlic (*Allium sativum* L.) is a unique, most important commercial bulbous crop belonging to the family alliaceae and is available both at immature and mature stages. This alliaceous crop has gained considerable momentum as a cash crop rather than a semi perishable spice because of its high export potential. It is a source of carbohydrates, proteins and minerals (Sood *et al.*, 2003; Chhokar *et al.*, 2006). Non structural water soluble carbohydrates of alliums are sucrose, fructose, glucose and fructans, a series of fructosyl polymers based upon sucrose with varying degree of polymerisation (Bacon, 1959; Bose and Srivastava, 1961; Darbyshire and Henery, 1978; Bancal *et al.*, 1992; Baumgartner *et al.*, 2000). Besides these water soluble carbohydrates, garlic is characterized by polar compounds of phenolic and steroidal origin, often glycosilated, showing interesting pharmacological properties (Lanzotti, 2006). Structural carbohydrates contained in non edible parts may find uses in industrial processing of garlic for various use and they also regulate the digestibility of non structural carbohydrates (Hall, 1999). Electrophoretic studies of allium proteins concluded that leek and garlic having a common ancestor and Kurrat is derived from leek (Etoh *et al.*, 1992). The uniformity, stability and additive nature of garlic proteins seem to be useful for taxonomic and evolutionary studies. Recent studies on allinase gave evidence that allinase obtained from garlic powder consists of two slightly different subunits with Mr values of 53 and 54 kD, whereas allinase from fresh garlic consists of two identical subunits (Krest and Kelisgen, 1999). Keeping in view the above facts and little scattered information

existing in literature, the present study was designed and the results are reported.

MATERIALS AND METHODS

Raising of crop and drying of tissues:

Five varieties of garlic namely HG-1, HG-6, HG-17, HG-19 and G-1 were grown during *rabi* season at the Vegetable Research Farm of Chaudhary Charan Singh, Haryana Agricultural University, Hisar with four replications. The recommended doses of fertilizers and other agronomic practices were followed to raise the crop. Five plants from such replication were uprooted at four development stages namely 150, 165, 180 and 195 days after sowing (DAS), bulbs separated and replicates pooled together to make a representative sample. The cloves and non-eatable parts were separated manually, oven dried at 60°C and ground to pass through 80 mesh sieve.

Bulb analysis:

Total water soluble carbohydrates (TWSC) were extracted by using the methods of McKee (1985) and estimated according to the method of Yemn and Willis (1954). Total fructose was determined by the method of Walte and Boyd (1953) reducing sugars by the method of Somogyi (1953) and sucrose by the method of Johnson *et al.* (1964). Structural carbohydrates namely neutral detergent fibre, acid detergent fibre, cellulose, hemicellulose and lignin of non-eatable parts of garlic bulbs were estimated as per the procedure of Goering and Van Soeat (1970). Total proteins of garlic bulbs of different varieties were separated using denaturing discontinuous