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Variation in Lysine Content in Durum Wheat (*Triticum durum* L.) Genotypes under Irrigation Conditions

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A B S T R A C T

The present investigation was carried out to analyze the variation in lysine content in thirty six durum wheat genotypes under irrigation conditions. The cereal proteins are low in lysine one of the essential amino acids that cannot be synthesized by humans and must therefore be obtained entirely from dietary sources. Thus, lysine content constitutes an important feature for defining the nutritive value of flour obtained from cereals. Lysine content was found maximum in WHD 954 (3.53 g/16g N) followed by UAS 448 (3.52 g/16g N) and minimum was observed in MACS 3944 (2.05 g/16g N). These genotypes were found promising and may be used in crossing programme in order to improve grain quality.

Introduction

Wheat is the world's most widely cultivated food plant which is used for the production of a wide range of food products. Durum wheat is the main raw material for pasta products due to its balanced components that interact during processing, allow receiving products with desired quality. It is tetraploid wheat known for its hardness, protein, intense yellow colour, nutty flavor and excellent cooking qualities. The availability of nutrients from a particular food depends on its chemical composition. The pasta quality of durum wheat is influenced mainly by the physical and biochemical properties of wheat kernels, which are in turn determined by genotype, environment and their interactions (Taghouti *et al.*, 2010). The quality of wheat is largely dependent upon its chemical composition which is influenced by genetic, environmental factors and processing conditions. Grain protein content is considered as the main characteristic of durum wheat grain quality (Ottman *et al.*, 2000; Clarke, 2001). Protein content in durum wheat is higher than bread

wheat and is one of the main factors influencing the functional properties of flour (Rojo *et al.,* 1986; Tiwari *et al.,* 2008). The protein quality depends upon the balance of amino acid composition in the wheat grains (Li and Zhang, 2000; Liu *et al.,* 2002). The nutritional quality of a protein can be measured by a variety of criteria but in essence it is the relative amounts and the balance of essential amino acids in the dietary protein. Quality improvement has been a great challenge in wheat research.

Constant efforts are being made all over the world to improve/combine quality with yield along with biotic and abiotic stresses so that the developed material could be released as a variety. Amino acid composition is an important feature in determining the nutritional value of durum wheat grain for human and animal diets. The cereal proteins are low in lysine one of the essential amino acids that cannot be synthesized by humans and must therefore be obtained entirely from dietary sources. Thus, lysine content constitutes an important feature for defining the nutritive value of flour obtained from cereals (Luis *et al.,* 2007). The possibility of engineering of metabolic pathway for improving lysine content in seeds has increased with the understanding of the genes involved in its biosynthesis and degradation. The development of product specific varieties depends on the knowledge of quality requirements of different end use products and the genetic components controlling different quality traits. Thus, present study helps in identification of superior genotypes rich in lysine content.

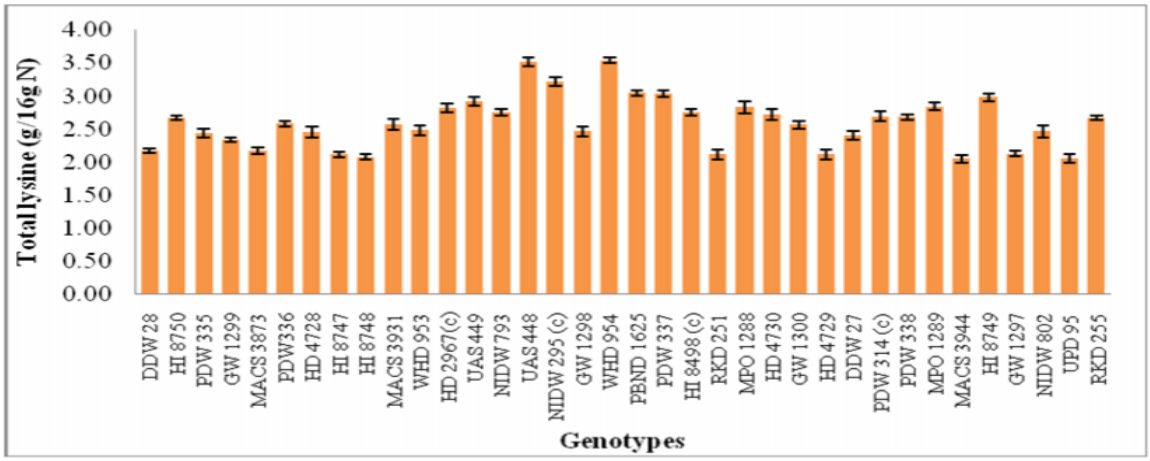
Materials and Methods

The crop was raised during *rabi* season under irrigated conditions in the field of Wheat and Barley Section, Department of Genetics and Plant Breeding, CCS Haryana Agricultural University, Hisar (Haryana) identify durum wheat genotypes superior in lysine content. The experiment was laid out in Randomized Block Design (RBD) with three replications. The varieties were sown with a plot size of 6×1.20 sq. meter. The experiment consists of 36 durum wheat genotypes including four checks (two bread and two durum wheat).The recommended cultural practices were carried out to raise good crop. The grains of durum wheat genotypes were collected after harvest and stored in paper bags for the estimation of lysine content. Total lysine was estimated as per the method described by Mertz *et al.,* (1975). Hundred mg of finely ground defatted grain sample was transferred into a glass vial and 5 ml of papain solution was added and incubated at 65°C. The hydrolyzed samples were then centrifuged it at 3000 rpm for 5 minutes and 0.1 ml of 2-chloro-3, 5-dinitropyrindine solution was added. Five ml of 1.2 N HCl and 5 ml of ethyl acetate were added and the upper layer was discarded. The absorbance of aqueous phase containing ε-DNPyr-lysine was read at 390 nm. The amount of lysine content (g/16g N) of the samples was then calculated by referring to a standard curve of L-lysine HCl as the standard (0-200 µg lysine/ml).

Results and Discussion

The nutritional quality of wheat relies on amino acid composition; therefore evaluation of lysine in various genotypes might reveal the relative importance to nutritional status which will be used to improve the already existing genotypes further through specified breeding programmes. The cereal proteins are low in lysine which is one of the essential amino acids that cannot be synthesized by human beings. Lysine content constitutes an important feature for defining the nutritive value of flour obtained from cereals. The lysine content among various genotypes was estimated.

Fig.1 Total lysine (g/16g N) in durum wheat genotypes



C.D. at 5 per cent = 0.171

Total lysine of durum wheat genotypes is depicted in Figure 1. It ranged from 2.05 to 3.54 g/16g N with an overall mean value of 2.59 g/16g N. Highest level of total lysine was found in WHD 954 (3.54 g/16g N) followed by UAS 448 (3.52 g/16g N) and lowest was observed in MACS 3944 (2.05 g/16g N).

The results of present investigation corroborate the previous reports of Rharrabti *et al.,* (2001) and Luis *et al.,* (2007). Hira *et al.,* (1991) analyzed 19 wheat varieties for crude protein and available lysine. The mean values for crude protein and available lysine were 11.7 per cent and 2.43 g per 16 g N, respectively.

The lysine content of protein of spring wheat, durum wheat, other wheat varieties, rye and triticale were analyzed and it was found that lysine content of *T. durum*, *T. aestivum* and rye ranged from 1.84-3.10g/16gN, 2.15-2.77g/16gN, 2.55-4.26/16gN, respectively (Lawrence *et al.*, 1958; Villegas *et al.*, 1970). The genotypes WHD 954 (3.53 g/16g N) and UAS 448 may be used in the breeding strategy to improve wheat quality by incorporating useful traits in future wheat genotypes.

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