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Genetic Diversity for Grain Protein Content in Wheat Inbred Lines Derived from Marvdasht × Nurstar

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Introduction: Cereal grains are a major source of energy, carbohydrates, and dietary proteins. Bread wheat (Triticum aestivum L.) is a staple crop for an estimated 35% of the world’s human population providing a fifth of global food energy (Erenstein et al., 2022). Wheat was cultivated on an estimated 219 million hectares, making it the most widely grown crop worldwide. The global production reach 808.44 million tones one of the big global staple cereals (FAO, 2024). Wheat grain protein content (GPC) is considered the main source of vegetable protein in human diets, particularly in regions where animal protein is scarce or expensive (Poutanen et al., 2022). The protein content varies from 10–18% of the entire dry mass of the wheat grain. In general, the characteristics of wheat grain make it a staple crop with diverse applications in various food crops around the world (Khalid et al., 2023).

Materials and methods: In this study, grain protein content in 131 F6 lines derived from the cross of Marvdasht × Nurstar cultivars (along with parents) were evaluated (Details of parental in Table 1). This investigation was conducted during 2019–2020 cropping season at the Research Farm of Razi University. The rainfall at the cropping season of the experiment was 521 mm. Experimental layout design was based on alpha lattice design with two replicates. Seed sowing was performed by hand at three row plots, one meter length, and 0.22 m row spacing as 400 seeds per square meter density. Chemical fertilizers, herbicides and pesticides were not used at both sites. At full physiological maturity, 10 plants of each plot were harvested by hand to determine studied traits. Grain protein was determined on a whole grain dry weight basis by Near Infrared Reflectance spectrometer (NIR), using a Perten Instruments DA-720000 instrument (Osborne et al., 2007) and the results were confirmed by the Kjeldahl method (Bradstreet, 1954).

Table 1: Name, year of introduction, origin and pedigrees of the studied wheat line

	Cultivar	Year of introduction	Origin	Pedigree
Maternal parent	Marvdasht	1999	Iran	HD2172/Bloudan//Azadi
Paternal parent	Nurstar	1977	Canada	Imported Cultivar

Table 2: Summary of simple analysis of variance and mean comparison in the 133 wheat inbred line and parental

	Genotypes No.[a]	Genotypes No.[b]	Mean (n=133)	Minimum	Maximum	F test	C.V. %	LSD 5%	Broad-sense heritability (h_b^2)
GPC (%)	28,81,35,100, 43,69,38,149, 103,48	101,123,125, 137,17,131, 72,26,44,107	15.43	12.82	18.29	**	7.60	2.32	61.79

F test: ** Significant at 1% probability level

[a] This row shows the genotypes with following property: (Mean + 1.2 STDEV)

[b] This row shows the genotypes with following property: (Mean-1.2 STDEV)

Results and Discussion: The results showed that the studied lines had highly significant differences for grain protein content. Results indicated that some lines have higher values than the parents for grain protein content (GPC). Wheat varieties with high GPC are generally preferred for bread-making because result in bread with better volume, texture, and crumb structure (Alomari et al., 2023). Grain protein had high heritability based on Johnson et al., (1955). According to the obtained results, grain protein content can be taken into consideration for selecting superior lines (28, 35, 81 and 100) in this population due to high diversity and less effect of the environment.

Conclusion: Since the positive association between GPC and baking quality is critical for producing high quality flour and baked products, more genetic diversity studies are necessary to deepen our knowledge of how to improve protein contents. Taking into consideration the fact that selecting varieties with higher GPC was indicated as one of the priorities among breeders.

Keywords: Genetic Diversity, Grain Protein, Inbreed Line.

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