

XIV International Gluten Workshop



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Introduction

In Portugal, sown areas with durum wheat were declined due to several factors, however, the edafoclimatic conditions tend to favour grain high quality: moderately dry climate, high number of sunshine hours during grain filling period.

Quality of durum wheat is defined according to technological parameters related to yield, processing and characteristics required to final product.

The objectives of this study were: analyse genetic and environmental influence of durum wheat quality parameters; analyse grain and ash composition, to better understand grain ash content.

Results

Table 1: Analysis of variance for *mass per hectolitre*, vitreousness, ash and protein content of 13 genotypes sown at Elvas and Beja (N=78).

Source of Variation		Hectolitre (R ² =0,955)	Vitreousness (R ² =0,757)	Protein (R ² =0,909)	Ash (R ² =0,685)
	df	F			
Genotype (G)	12	64,1***	2,5*	10,8***	5,5***
Environment (E)	1	173,1***	109,9***	322,4***	23,2***
GxE	12	12,8***	1,9^{ns}	5,7***	2,0*

*, **, *** significant at 0,05, 0,01 and 0,001 levels of probability, respectively.

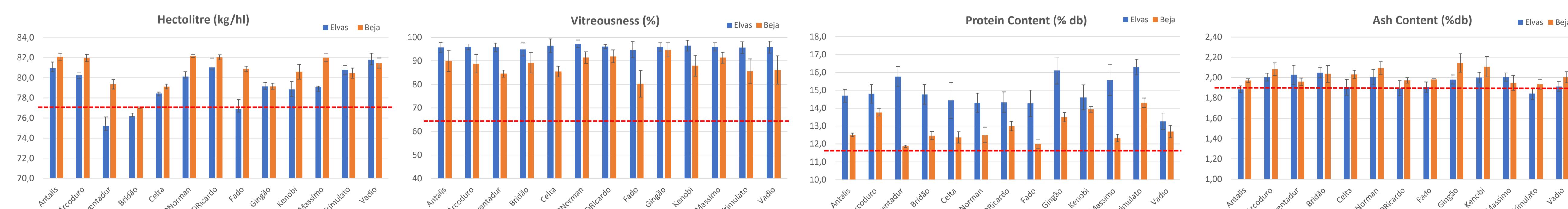


Figure 1: Mean values of (a) *mass per hectolitre*, (b) vitreousness, (c) protein content, (d) ash content, for 13 durum wheat genotypes grown in Elvas and Beja trials. The red line marks the minimum limit specified by the industry for test weight, vitreosity, protein content and maximum for ash content.

Genotype (**G**), environment (**E**) and its interaction (**GxE**) explained the variation of traits, with a more significant influence of environment (Table 1). Most genotypes had higher values of *mass per hectolitre* and ash content in Beja. The inverse happened for protein and vitreousness. Good values were obtained for all parameters excluding ash content, that was above or over the limit specified by industry 1,9% db (Figure 1).

Table 2: Mean values for macro and microelement concentration detected on grain samples and ash samples of the 13 genotypes sown at Elvas and Beja.

Element	Grain Samples		Ash Samples	
	Elvas	Beja	Elvas	Beja
K (mg/g)	8,0±1,0	4,9±0,5	196±22	110±14
P (mg/g)	1,7±0,2	2,1±0,2	52,9±7,1	52,6±6,6
Ca (mg/g)	0,53±0,09	0,41±0,06	14,3±2,9	8,2±1,7
S (mg/g)	0,53±0,08	0,60±0,04	-	-
Cl (mg/g)	0,16±0,08	0,24±0,04	-	-
Macro (%)	99,1	98,6	98,3	97,9
Fe (µg/g)	44,0±7,4	42,1±5,7	1300±217	789±92
Mn (µg/g)	35,9±7,0	37,1±5,5	1120±240	762±120
Zn (µg/g)	21,3±3,6	30,1±3,2	727±17	650±85
Cu (µg/g)	3,5±1,5	7,9±1,1	153±34	124±15
Si (µg/g)	-	-	289±353	1106±390
Rb (µg/g)	-	-	956±311	198±61
Sr (µg/g)	-	-	41±14	49±13
Ti (µg/g)	-	-	48±13	31±8
Micro (%)	0,9	1,4	1,7	2,1

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DURUM WHEAT QUALITY: GENETIC AND ENVIRONMENTAL INFLUENCE OF SEMOLINA YIELD PARAMETERS

Matherial & Methods

Trial Location: INIAV-Elvas (38° 53' 39"N, 7° 03' 20"W), IP Beja/ESA (38° 02' 14"N, 7° 53' 06"W);

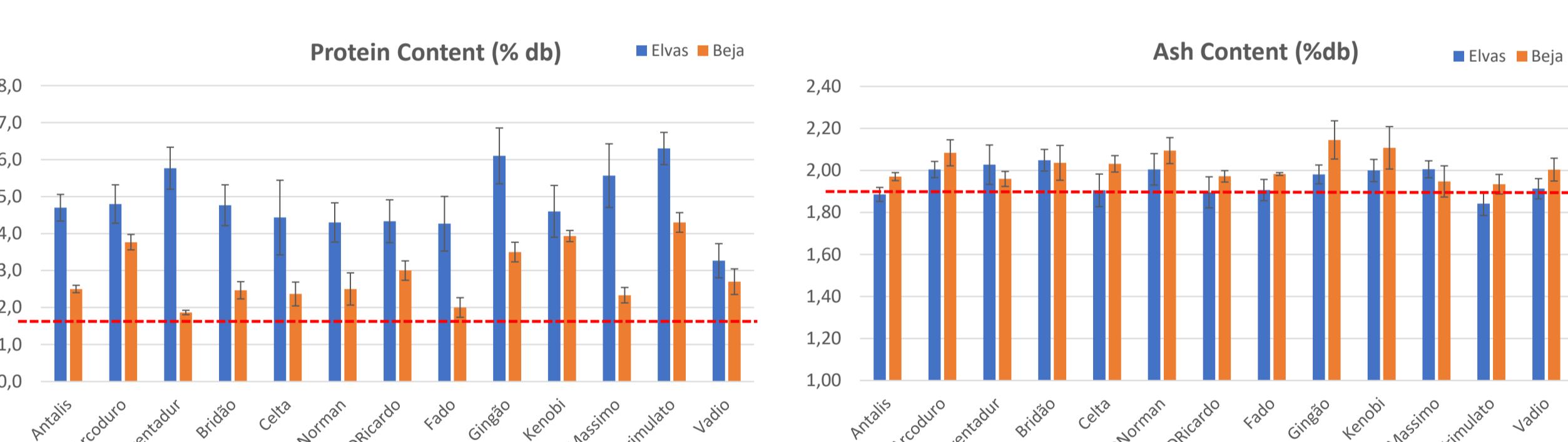
Field Experiment: randomized complete block design with 3 replications, 9,6 m² of area, under irrigation. Conventional fractionated fertilization (165 UN).

Durum Wheat Varieties: Portuguese (*Celta*, *Fado*, *Vadio*, *Bridão*, *Gingão*); Spanish (*Arcoduro*, *Don Norman*, *Don Ricardo*, *Trimulato*); Italian (*Antalis*, *Aventadur*, *Kenoby*, *Massimo Meridio*).



Quality determinations: protein content (EN 15948), vitreouness (EN 15585), *mass per hectolitre* (ISO 7971-3) and ash content (ISO 2171).

Mineral composition was analysed by µ-EDXRF in milled grain samples and ash samples.



Macroelements represented 99% of the total concentration detected by µ-EDXRF in **grain samples** and microelements represented 1%. The elements identified were: K, P, Ca, S, Cl, Fe, Mn, Zn, Cu. The main elements were K and P.

The elements remained highly concentrated on **ash samples**. The microelement content increased to 2% of the total. They were detected: K, P, Ca, Fe, Mn, Zn, Cu, Si, Rb, Sr, Ti (Table 2). The main elements still remained K and P.

Ash content was significantly correlated with the mineral composition of the grain (Table 3). The correlation was positive with P, Cu, S, Cl, Zn and negative with K.

Multiple regression analysis was performed but no well-fitted model was found to explain the ash content from grain composition.

Table 3: Correlation coefficient of Pearson between ash content and macro and microelement concentration of grain samples.

	K	P	Ca	Cl	S	Fe	Mn	Zn	Cu
Ash content	-0,25 *	0,43 ***	-0,05 ns	0,29 **	0,29 **	-0,03 ns	0,12 ns	0,34 **	0,40 ***

