

# Impact of different environments and management practices used by Uruguayan farmers on wheat quality variability

Cadenazzi, M ; Gonzalez, M.N.; Ernst, O.,, Suburú, G., Vázquez, D., Godiño. M., Escudero, J.

Mesa Nacional de Trigo, Uruguay.

E-Mail: noelius@adinet.com.uy

Although genotype has a major impact, wheat quality cannot be predicted only by selecting the cultivar. The good quality genetic potential may be reached depending on the growing conditions (Wrigley, 2007). Uruguay wheats are characterized by its suitability for direct breadmaking. In order to obtain this, cultivars are annually evaluated for both agronomical behavior and industrial quality. However, variables such as soil fertility, soil tillage systems, seeding date, diseases and nitrogen availability may modify cultivar behavior (Anderson et al., 1995).

The objective of the present work was to understand the impact of different environments and management practices used by Uruguayan farmers on grain and flour quality variability during 6 years.

Table 1. Quality parameters of cultivar studied in 6 years.

Year	Yield (kg ha <sup>-1</sup> )	Wet Gluten (WG%)	Baking strength (W E <sup>-1</sup> J)	Tenacity/ extensibility (P/L)	Protein (%)
1	3495	24.7	267	1.8	10.9
2	2632	27.6	255	1.5	12.0
3	3289	29.5	249	1.6	10.8
4	2952	27.6	250	2.0	11.1
5	2802	23.7	204	1.9	10.4
6	3535	25.1	261	1.8	10.8
Average	3097	26.9	250	1.7	11.1

The database obtained is composed by 787 wheat samples collected in 6 harvest years (1999-2006). All samples were obtained from farms with complete information of agronomical management (tillage system, seeding date, soil nitrogen supply, nitrogen fertilization, disease control and yield). Wheat quality was determined by grain protein content (GP), wet gluten percentage (WG) and alveogram (baking strength, W and tenacity over extensibility ratio, P/L).

Results were analyzed by cluster analysis using both Gower distance and Ward method, as well as principal components analysis. The two first principal components (PC) explained 76% of the observed quality variability. Major participants in PC1 were two variables related to "protein quantity" (GP and WG), while major participants in PC2 were related to "protein quality" (W and P/L). Statistical analysis was able to identify groups of cultivars that improved quality, and groups that had inferior quality

Using management and quality parameters, wheat farms were divided in four groups through Gower distance cluster analysis.

Table 2. Management practices and quality similarity groups obtained from the 787 samples

N° Sample	Cluster Group				AVERAGE
	1	2	3	4	
Yield (kg ha <sup>-1</sup> )	161	69	253	304	787
Yield (kg ha <sup>-1</sup> )	3185 a	3199 a	2969 a	3058 a	3068
Protein (%)	10 d	12.3 a	11.9 b	10.7 c	11.1
GH (%)	21.1 d	35 a	29.5 b	25.5 c	26.7
P/L	2.7 a	1.1 c	1.5 b	1.6 b	1.77
W (E <sup>-1</sup> J)	195 c	201 c	298 a	227 b	241
Definition	Weak and high Tenacity	Weak and Balanced tenacity-extensibility	Strong and Medium tenacity	Medium strength and Medium tenacity	

Table 3. Coefficients and partial correlation for two Principal Components defined from variables of quality of grain and flour.

	Protein	GH	P/L	W	r <sup>2</sup> proportional
Principal Components 1 (CP1)	0.60	0.57	-0.41	0.39	0.54
Principal Components 2 (CP2)	0.09	-0.15	0.63	0.75	0.23

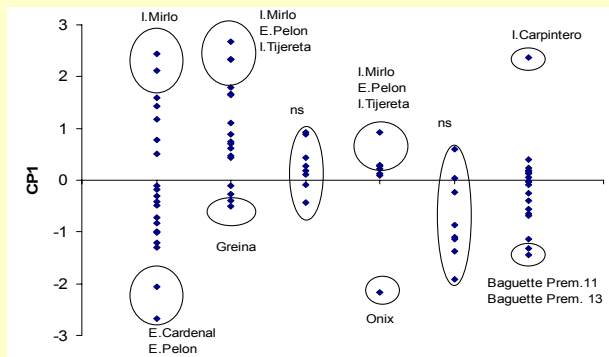


Figure 1. Value of the Principal Component (PCI) considering cultivars within the harvest year.

Note: circles shows cultivars with significant differences  $p \leq 0.05$  within the year.



Year effect determined the quality variation level, but did not modify the relative ranking of cultivars. Among management variables, nitrogen soil supply, nitrogen fertilization and seeding date were associated to quality variations into each year and cultivar

## CONCLUSIONS

All cultivars were present in the "medium strength and medium tenacity" group, which had 39% of the samples, but only some of them were presents in other groups. Soil nitrogen availability and fertilization strategy were the management practices responsible of change of group of each cultivar. Further work is being conducted with the objective to propose a specific cultivar management associated to wheat and flour quality

## References:

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