Chemical-Physical and Colour Features of Sicilian Durum Wheat Landraces and Old Varieties

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Introduction

Modern durum wheat cultivars show lower grain protein content, compared to the older ones (Spina and Vaccino, 2018), as the wheat breeding programs are mainly focused on increasing the grain yield. Wholemeal flour quality traits, protein and gluten quality and contents, together with yellow semolina colour, are the most important features useful for characterizing durum wheat landraces, old e new cultivars. Indeed, it is well-documented that the protein content and the endosperm storage protein composition have a decisive impact on the wheat processing quality (Sissons, 2008). It has been shown that other traits, like such specific-gliadins and gluten viscoelasticity, together with vitreousness and yellow semolina color, play a pivotal role in quality, processed wheat products (Spina *et al.*, 2015). The aim of the present study was to characterize a collection of durum wheat landraces from Sicily and old varieties for quality-related traits.

Materials and Methods

Sixteen durum wheat genotypes, eleven Sicilian landraces, three old improved varieties 'Bidì', 'Cappelli' and 'Margherito' and two modern cultivars 'Claudio' and 'Simeto' (Tab. 1) were compared in a field experiment conducted in 2013/14 year in south-east Sicily (Caltagirone, Catania province, 37° 05' 58" N., 14° 29' 56" E., 280 m a.s.l.) in a medium-sandy soil, in order to assess the main bio-agronomic traits and quality of the grain and wholegrain flour. The experimental design and the agronomic management are reported by Guarnaccia *et al.*, (2020). Chemical-physical and colour analyses on wholemeal flour were carried out following the methods described by Carrubba *et al.*, 2016. The experimental data were subjected to one-way ANOVA and Tukey test was applied to compare the means ($p \leq 0.001$).

Results

A significantly higher protein content (≥15.0%) was observed in the five Sicilian landraces ('Biancuccia', 'Ciciredda', 'Farricello-'Regina", 'Paola', 'Scorsonera') and in the two old varieties ('Bidì' and 'Cappelli'), compared to the modern cultivars (<15%), whereas the lowest value (8.5%) was found in 'Tripolino', due to the high percentage of starchy kernels (Guarnaccia *et al.*, 2020).

The values of wet and dry gluten content, showed a comparable trend with a high protein content and a wide variability. The landraces 'Paola', 'Ciciredda' and 'Farricello', and the old varieties 'Bidì', and the historical cv 'Cappelli', showed a very high value of wet gluten. With regard to the gluten index, often correlated with gluten quality, most of the ancient wheat landraces showed low values, ranging from 26.5 ('Gioia') to 57.8 ('Russello-Priziusa'). By contrast, 'Martinella' and 'Tripolino' landraces showed a significant higher value (91.12 and 77.3), compared to old varieties 'Bidì' and 'Margherito' and the commercial cultivars Simeto and Claudio (86.3 and 83.1, respectively). These data confirmed the presence of a weaker gluten in Sicilian wheat landraces, as previously reported, compared to the modern cultivars.

The yellow index (b*) was significantly higher in the cv. 'Simeto' and 'Claudio' (20.1 and 19.5b*, respectively), compared to those measured in the Sicilian landraces, demonstrating the effect of selection on this important nutritional trait.

Table 1. Chemical-Physical And Colour characteristics of the studied durum wheat genotypes. Data are means ± standard deviations. Different letter in the same column indicates significant.

Genotype	Protein content (% d.m.)	Wet gluten content (%)	Dry gluten content (%)	Water Binding in wet gluten	Gluten index (0-100)	Yellow index (b*)	Red index (a*)	Brown index (100-L*)
Biancuccia	15.5±0.07D	36.0±0.57CD	11.1±0.28C	24.9±0.28BC	48.6±0.81FG	14.8±0.11IL	1.4±0.03AB	17.8±0.00B
Ciciredda	16.7±0.00B	40.1±0.85BC	12.6±0.21B	27.6±0.64B	35.4±1.37IL	15.0±0.30HI	1.8±0.08A	17.8±0.06B
Farricello (Regina)	16.3±0.07C	39.0±0.28BC	11.4±0.07BC	27.7±0.21B	42.3±0.42GH	15.2±0.03HI	1.2±0.01BC	15.9±0.12CD
Gioia	14.7±0.00F	30.2±0.71EF	9.7±0.21D	20.6±0.49DE	26.5±1.72M	17.4±0.13CDE	1.2±0.05BC	15.6±0.06DE
Martinella	12.9±0.00I	18.1±1.06HI	6.8±0.35FG	11.3±0.71H	91.1±0.52A	16.9±0.02DEFG	0.8±0.04CDE	15.0±0.06EF
Paola	15.0±0.00EF	45.4±0.71A	12.5±0.42BC	32.9±0.28A	50.9±0.77EF	11.6±0.05M	0.5±0.01EF	16.5±0.05F
Russello (Priziusa)	13.3±0.00H	24.9±0.28G	8.8±0.28DE	16.1±0.00FG	57.8±0.48D	16.3±0.22EFGH	0.7±0.06CDEF	15.4±0.01EF
Scorsonera	16.7±0.07B	38.5±0.64BC	12.1±0.14BC	26.4±0.78B	54.2±0.76DEF	18.4±0.06BC	0.9±0.03CDE	17.3±0.09BC
Timilia	13.5±0.07H	27.0±0.49FG	8.6±0.07DE	18.4±0.42EF	30.6±1.27LM	14.8±0.02IL	1.9±0.01A	19.3±0.11A
Tripolino	8.5±0.14M	15.0±0.14I	5.4±0.14G	9.6±0.28H	77.3±0.21C	13.49±0.11L	-0.7±0.28G	11.2±0.04H
Urrìa	11.5±0.07L	18.8±0.07HI	6.20±0.00G	12.7±0.07GH	39.0±0.23HI	11.2±0.16FGHI	0.2±0.01F	15.8±0.18H
Bidì	17.1±0.00A	42.5±0.64AB	14.7±0.28A	27.8±0.35B	56.7±0.65DE	15.6±0.01GHI	1.0±0.09BCD	14.8±0.12F
Cappelli	15.1±0.00DE	38.1±0.85BC	12.0±0.14BC	26.1±0.71B	19.7±1.79N	18.2±0.69BCD	-0.9±0.01G	13.9±0.35G
Margherito	12.9±0.00I	20.2±1.70H	7.8±0.35EF	12.5±1.34H	78.6±1.79C	17.1±0.13CDEF	1.0±0.07BCDE	15.8±0.10DE
Claudio	14.0±0.07G	30.8±0.72EF	9.1±0.07DE	21.7±0.65CDE	83.1±1.39BC	19.5±0.18AB	0.6±0.08DEF	17.7±0.04B
Simeto	14.7±0.07F	31.6±0.56DE	9.3±0.14D	22.3±0.42CD	86.3±0.25AB	20.1±0.29A	0.6±0.04DEF	17.3±0.18BC
Mean	**14.3**	**31.0**	**9.9**	**21.2**	**54.9**	**16.0**	**0.76**	**16.1**

Conclusions

The results obtained highlighted an appreciable variability for the all qualitative features of the Sicilian durum wheat landraces and old varieties. In addition, some of these genotypes could be exploited for the production of bread and other typical bakery products and/or to make homemade pasta.

Literature

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