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SEED GERMINATION OF SICILIAN DURUM WHEAT LANDRACES UNDER THE INFLUENCE OF DIFFERENT TEMPERATURE REGIMES

Mauro Vaccarella, Benedetto Frangipane, Luciano Raimondo, Antonino Rigoglioso, Claudia Miceli

Council for Agricultural Research and Economics, Plant Protection and Certification Centre, Palermo – Italy
mauro.vaccarella@crea.gov.it

Introduction

Sicily, with its variable pedoclimatic conditions, represents an important source of agro-biodiversity. In this context, over the past centuries, farmers have made a continuous selection that has led to the creation of numerous landraces. Today 23 Sicilian durum wheat landraces [(*Triticum turgidum* L. subsp. *durum* (desf.) Husn.] are listed in the national register of varieties. Wheat landraces are composed of traditional crop varieties developed by farmers through many years of natural and human selection and are adapted to local environmental conditions and management practices. Landraces are named and maintained by traditional farmers to meet their social, economic, cultural, and environmental needs. Landraces, which have arisen through a combination of natural selection and the selection performed by farmers usually have a broader genetic base and can therefore provide valuable characteristics important for breeding [1]. Seed germination and seedlings vigor are prerequisites for successful stand establishment and are extremely important factor in determining yield of the crop [2]. Temperature is a key factor driving this physiological process and, since no previous work on these genotypes has been carried out, it was thought to perform this study.

Research objectives

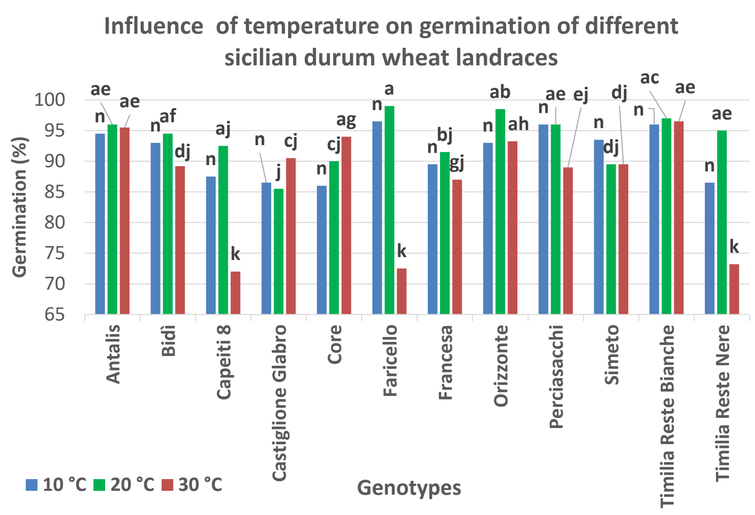
The aim of this study was to determinate how different temperature regimes affect seed germinating traits of four conventional varieties of durum wheat most cultivated in Sicily (Simeto, Core, Antalis and Orizzonte) and eight landraces (Bidì, Capeiti 8, Castiglione glabro, Faricello, Francesa, Perciasacchi, Timilia Reste Bianche e Timilia Reste Nere).

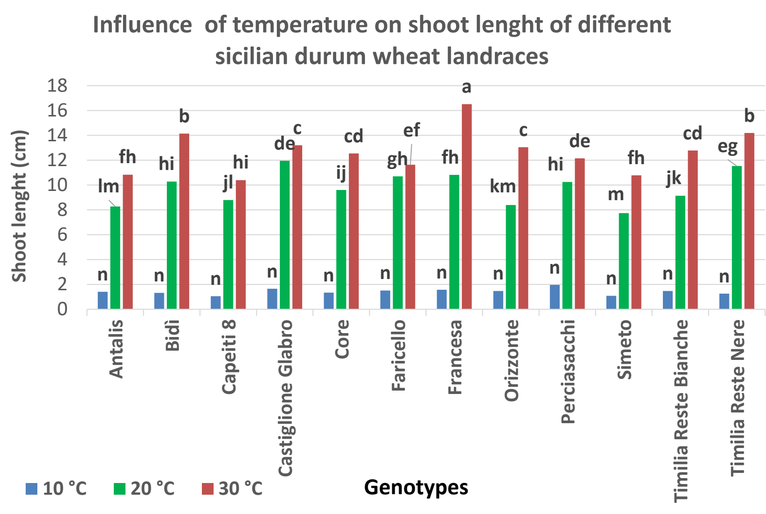
Materials and methods

Seeds were tested under 3 temperature regimes (10 °C, 20 °C and 30 °C). Experiments were laid out in a two factorial design using a complete randomize design (CRD) with four replications. Nine parameters were measured under laboratory condition: germination, shoot length, root length, roots number, seed vigor index, fresh shoot weight, fresh root weight, dry shoot weight, dry root weight. The data collected were examined using analysis of variance techniques (ANOVA) to identify significant differences among temperatures and genotypes. Duncan's Multiple Range test was applied at 5% level of probability to compare the mean differences.

Results

Temperature, genotype and their interaction determined highly significative differences in all the germination traits studied as shown in table 1. Raise in temperature has determined a specific increasing trend of value for Shoot Length, Seed Vigour Index, Fresh Shoot weight, Dry Shoot Weight and Dry Root Weight. The growth of the root system has decreased to the highest temperature. Correlation study among germination parameters showed a positive and highly significant correlation of Shoot Length with Seed Vigour Index and Fresh Shoot Weight in all temperature regime. No positive and significative correlation between Germination and Shoot length, Root length, Fresh Shoot Weight, Fresh Root Weight, Dry Shoot weight and Dry Root Weight has been shown (see Table 2).





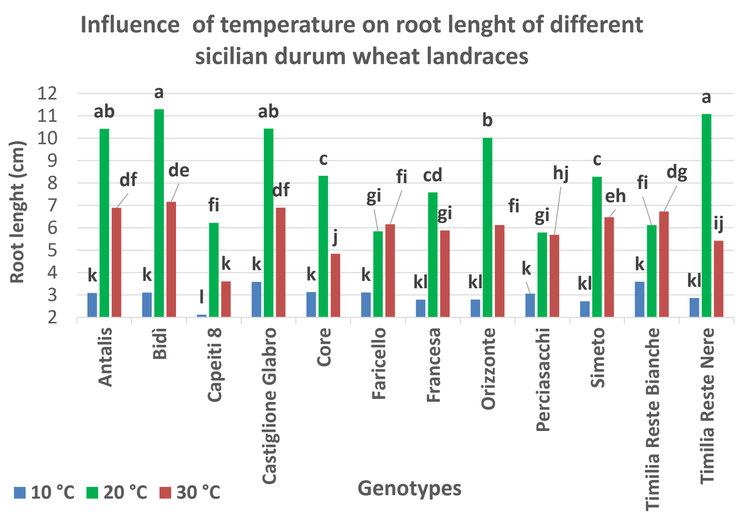


Figure 1. Seedlings growth stage of Bidì at different temperature regimes just before parameters assessment

Table 1. Factorial analysis of variance showing the means square of the temperature and genotypes and their interaction for the germination traits

Source of variation	Degree of fredom	Germination (%)	Shoot Lenght (cm)	Root Lenght (cm)	Number of roots	Seed Vigor Index	Fresh Shoot Weight (mg)	Fresh Root Weight (mg)	Dry Shoot Weight (mg)	Dry root Weight (mg)
Temperature (T)	2	***	***	***	***	***	***	***	***	***
Genotype (G)	11	***	***	***	***	***	***	***	***	***
T X G	22	***	***	***	***	***	***	***	***	***
Error	108	17,583	0.322	0.337	0.204	4099.38	0.086	0.081	0.004	0.003

*** significantly different at P < 0,0001

Table 2. Pearson's correlation matrix for the germination parameters studied

T °C	Parameter	Germination (%)	Shoot length (cm)	Root length (cm)	Root number	Seed vigor index	Fresh shoot weight (mg)	Fresh root weight (mg)	Dry shoot weight (mg)	Dry root weight (mg)
10 °C	Germination (%)	**1**	0.322	0.229	0.208	0.517	0.451	0.448	-0.447	**-0.588**
	Shoot length (cm)	0.322	**1**	0.547	**0.602**	**0.976**	**0.947**	**0.881**	0.234	0.212
	Root length (cm)	0.229	0.547	**1**	-0.009	0.527	0.565	0.495	-0.150	-0.101
	Root number	0.208	**0.602**	-0.009	**1**	**0.598**	0.518	**0.672**	0.494	0.455
	Seed vigor index	0.517	**0.976**	0.527	**0.598**	**1**	**0.956**	**0.900**	0.120	0.062
	Fresh shoot weight (mg)	0.451	**0.947**	0.565	0.518	**0.956**	**1**	**0.946**	0.135	0.077
	Fresh root weight (mg)	0.448	**0.881**	0.495	**0.672**	**0.900**	**0.946**	**1**	0.220	0.146
	Dry shoot weight (mg)	-0.447	0.234	-0.150	0.494	0.120	0.135	0.220	**1**	**0.935**
	Dry root weight (mg)	**-0.588**	0.212	-0.101	0.455	0.062	0.077	0.146	**0.935**	**1**

T °C	Parameter	Germination (%)	Shoot length (cm)	Root length (cm)	Root number	Seed vigor index	Fresh shoot weight (mg)	Fresh root weight (mg)	Dry shoot weight (mg)	Dry root weight (mg)
20 °C	Germination (%)	**1**	-0.222	-0.214	-0.040	0.110	-0.154	0.069	**-0.666**	**-0.675**
	Shoot length (cm)	-0.222	**1**	0.147	0.031	**0.943**	**0.632**	-0.307	0.044	-0.129
	Root length (cm)	-0.214	0.147	**1**	-0.326	0.064	0.538	**0.756**	0.563	0.548
	Root number	-0.040	0.031	-0.326	**1**	0.019	0.221	0.016	0.204	0.049
	Seed vigor index	0.110	**0.943**	0.064	0.019	**1**	**0.594**	-0.298	-0.172	-0.355
	Fresh shoot weight (mg)	-0.154	**0.632**	0.538	0.221	**0.594**	**1**	0.410	0.420	0.175
	Fresh root weight (mg)	0.069	-0.307	**0.756**	0.016	-0.298	0.410	**1**	0.476	0.454
	Dry shoot weight (mg)	**-0.666**	0.044	0.563	0.204	-0.172	0.420	0.476	**1**	**0.951**
	Dry root weight (mg)	**-0.675**	-0.129	0.548	0.049	-0.355	0.175	0.454	**0.951**	**1**

T °C	Parameter	Germination (%)	Shoot length (cm)	Root length (cm)	Root number	Seed vigor index	Fresh shoot weight (mg)	Fresh root weight (mg)	Dry shoot weight (mg)	Dry root weight (mg)
30 °C	Germination (%)	**1**	0.083	0.545	0.105	**0.637**	0.330	0.436	0.189	0.247
	Shoot length (cm)	0.083	**1**	0.209	0.475	**0.818**	**0.633**	0.137	0.525	-0.069
	Root length (cm)	0.545	0.209	**1**	0.367	0.451	0.568	0.072	0.007	0.036
	Root number	0.105	0.475	0.367	**1**	0.426	**0.703**	0.292	**0.577**	0.248
	Seed vigor index	**0.637**	**0.818**	0.451	0.426	**1**	**0.673**	0.361	0.530	0.144
	Fresh shoot weight (mg)	0.330	**0.633**	0.568	**0.703**	**0.673**	**1**	**0.586**	**0.721**	0.209
	Fresh root weight (mg)	0.436	0.137	0.072	0.292	0.361	**0.586**	**1**	**0.657**	0.222
	Dry shoot weight (mg)	0.189	0.525	0.007	**0.577**	0.530	**0.721**	**0.657**	**1**	0.304
	Dry root weight (mg)	0.247	-0.069	0.036	0.248	0.144	0.209	0.222	0.304	**1**

Bold value are significant at 0,05 probability level

Conclusions

All parameters studied were highly influenced by Temperature, Genotype and their interaction. No significative difference between landraces and conventional varieties has been reported. Our findings indicate that Faricello, Castiglione glabro and Perciasacchi have a good germination to low temperature and Bidì has a good growth rate of many germination traits that makes this landrace very attractive. To confirm our findings, further research is needed.

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