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## Evaluation of durum wheat in the Czech gene bank: Quality parameters

Z. Stehno

Research Institute of Crop Production, Drnovská 507, 161 06 Prague 6, Ruzyne, Czech Republic

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**SUMMARY** – Spring durum wheat cultivars were evaluated under conditions of Prague locality for two years (1997 and 1998) and compared with check bread wheat cultivars Sandra and Munk. Grain quality parameters were evaluated in addition to characters like phenological characteristics, response to diseases, spike characters, yield components and yield estimation. Semiautomatic Kjeldahl method (Kjeltec Auto 1030 Analyzer) was used for crude protein evaluation and Glutomatic 2200 system for wet gluten content and gluten index (GI). In crude protein and wet gluten contents, the durum wheat accessions exceeded bread wheat cultivars. The highest quality parameters (17.0% of crude protein and 41.3% of wet gluten content) were recorded for Bejah cultivar. All quality characteristics were strongly influenced by different conditions of year.

**Key words:** Durum wheat, grain quality parameters, marginal growing conditions, influence of year.

**RESUME** – “Evaluation du blé dur de la banque de gènes de la République Tchèque. Paramètres de qualité”. Plusieurs nouvelles variétés importées de blé dur ont été cultivées sous les conditions climatiques de la région de Prague durant deux années (1997 et 1998) et elles ont été comparées aux cultivars de blé panifiable de référence Sandra et Munk. Les caractéristiques phénologiques, la réponse aux maladies, les caractéristiques de l'épi, les composantes du rendement et la qualité du grain ont été évaluées. Les teneurs en protéines brutes et en gluten dans les variétés de blé dur nouvellement importées ont atteint les niveaux observés chez les cultivars de référence (méthode de Kjeldahl – Kjeltec Auto 1030 Analyzer et système Glutomatic 2200). Les plus hautes teneurs en protéines brutes (17,0%) et en gluten (41,3%) ont été trouvées dans la variété Bejah. Toutes les caractéristiques de qualité sont fortement influencées par les conditions climatiques de l'année.

**Mots-clés :** Blé dur, qualité de la graine, conditions marginales de croissance, influence de l'année.

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### Introduction

Gathering, evaluation and utilisation of wheat genetic resources at the territory of the Czech Republic have had long-term tradition. In former Czechoslovakia wheat genetic resources were first gathered and used in breeding immediately after World War I. Since that time the collection has increased gradually till now, when it contains 9804 accessions. The collection is evaluated, documented and maintained in the Czech gene bank at the Research Institute of Crop Production, Prague.

Durum wheat sub-collection consists of 832 accessions. Among them botanical varieties *leucurum* (238), *hordeiforme* (143) and *leucomelan* (107) are the prevailing ones. Most of them are spring cultivars.

Because of climate conditions, which are not very suitable for durum wheat growing, this crop is grown in the warmest regions of the Czech Republic. Only two cultivars of the crop are registered in the country: Soldur (winter durum) and Grandur (spring cultivar of durum wheat).

The evaluation of the collection is aimed at the description of durum wheat accessions under conditions of marginal regions for growing and selection of the most suitable genotypes for such conditions. These materials could be used in breeding new cultivars for marginal growing areas.

Phenological data, plant height, lodging and disease resistance are evaluated during vegetation. Harvest estimation, spike analyses and evaluation of grain quality parameters are carried out after harvest. In the contribution we have paid main attention to the grain quality parameters.

## Materials and methods

Each accession in the system of wheat genetic resources evaluation is tested for two years on 4 m<sup>2</sup> plots.

In the period 1997 and 1998, 11 spring durum accessions plus two bread spring wheat check cultivars (Sandra and Munk) released in the country were evaluated (Table 1).

Table 1. List of wheat accessions evaluated in the period 1997-1998

Accession name	Botanical variety	State of origin
Alcatraz	<i>T. durum</i> var. <i>italicum</i>	MEX
Anade	<i>T. durum</i> var. <i>leucurum</i>	MEX
Aramides	<i>T. durum</i> var. <i>erythromelan</i>	MEX
Avetrilla	<i>T. durum</i> var. <i>melanopus</i>	MEX
Bejah	<i>T. durum</i> var. <i>valenciae</i>	MEX
Belladur	<i>T. durum</i> var. <i>leucurum</i>	AUT
Brzina	<i>T. durum</i> var. <i>melanopus</i>	MEX
Buttah	<i>T. durum</i> var. <i>leucomelan</i>	MEX
Fenice	<i>T. durum</i> var. <i>leucurum</i>	ITA
Semperdur	<i>T. durum</i> var. <i>leucurum</i>	AUT
Yazi	<i>T. durum</i> var. <i>leucomelan</i>	MEX
Munk – check	<i>T. aestivum</i> var. <i>lutescens</i>	DEU
Sandra – check	<i>T. aestivum</i> var. <i>aestivum</i>	CZE

Semiautomatic Kjeldahl method (Kjeltec Auto 1030 Analyzer) was used for crude protein content and Glutomatic 2200 system for wet gluten content and gluten index (GI) evaluation.

Data for each character from two years of evaluation were statistically analysed by multiple analysis of variance and contrasts were tested by Tukey HSD test on 95 percent significance level.

## Results and discussion

### Grain quality parameters

Seed samples of particular accessions were tested after harvest at quality lab for crude protein content, wet gluten content and gluten index (GI).

High crude protein content was identified in grain of most durum wheat cultivars and varied from 13.8 (Belladur) to 17.0% (Fenice and Bejah) (Table 2). Only Yazi had crude protein content (12.8%) on the level between the check bread wheat cultivars Munk (12.4%) and Sandra (13.0%). In this character Fenice and Bejah (17.0%) were significantly different from Yazi and the check bread wheat cultivars that had crude protein content 13.0% or lower. Six cultivars (Semperdur, Brzina, Avetrilla, Aramides, Fenice and Bejah) overcame 14% level and according to Sgrulletta *et al.* (1997) they should belong to the group No. 3 (protein content >14%). High protein content in durum wheat up to 15.8% (cultivar Karel) was described by Motzo *et al.* (1996). Average crude protein content of durum wheat cultivars (14.7%) exceeded the average protein content of bread wheat cultivars (12.7%) by 2%, similar to those described by Rachon (1997).

Bread wheat cultivars with low protein content had also the lowest wet gluten content. Durum wheat accessions contained wet gluten in the range from 27.1 (Fenice) to 41.3% (Bejah). Unfortunately owing to strong influence of growing conditions in the years of evaluation the differences among accessions were not significant.

Gluten index of tested wheat accessions was very variable; from 36.6 (Aramides) to 88.3 (check cultivar Sandra). For the same reason as in the case of gluten content also in gluten index the deep

differences were not significant. But gluten quality (GI) of the Semperdur cultivar was very high – on the level *T. aestivum* check cultivars.

Table 2. Main quality parameters of tested durum wheat cultivars (1997-1998)

Crude protein content			Wet gluten content			Gluten index		
Cultivar	(%)	Homogen. groups	Cultivar	(%)	Homogen. groups	Cultivar	(%)	Homogen. groups
<i>Munk</i>	12.4	X	<i>Sandra</i>	25.1	X	Aramides	36.6	X
Yazi	12.8	X	<i>Munk</i>	26.6	X	Alcatraz	41.3	X
<i>Sandra</i>	13.0	X	Fenice	27.1	X	Brzina	49.2	X
Belladur	13.8	XX	Yazi	27.4	X	Belladur	49.8	X
Alcatraz	14.0	XX	Alcatraz	31.4	X	Bejah	51.5	X
Buttah	14.0	XX	Anade	31.4	X	Anade	57.4	X
Anade	14.0	XX	Semperdur	31.7	X	Buttah	66.3	X
Semperdur	14.1	XX	Belladur	31.9	X	Fenice	68.1	X
Brzina	14.7	XX	Buttah	32.5	X	Yazi	68.8	X
Avetrilla	15.2	XX	Brzina	32.9	X	Avetrilla	75.5	X
Aramides	15.3	XX	Avetrilla	36.2	X	<i>Munk</i>	75.6	X
Fenice	17.0	X	Aramides	38.1	X	Semperdur	81.5	X
Bejah	17.0	X	Bejah	41.3	X	<i>Sandra</i>	88.3	X
<i>Average</i>	<i>14.4</i>			<i>31.8</i>			<i>62.3</i>	

The methodology, design of experiment and cultural practice during vegetation were the same in both years of the evaluation. That means that we can consider climate differences to be the main source of differences between the years of evaluation.

All quality parameters were strongly influenced by year conditions – significant differences between the years (Table 3). A wide variation of quality parameters was described in addition to other authors also by Mariani *et al.* (1995) and Szwed-Urbas *et al.* (1997). In the case of gluten characteristics (wet gluten content and gluten index) the influence of the year was so strong that no significant differences among accessions might be identified.

Table 3. Differences between years of evaluation (1997-1998)

Character	Significant difference between years (1997-1998)
Crude protein content	Yes
Wet gluten content	Yes
Gluten index	Yes

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