

MALTING BEHAVIOUR OF BARLEY VARIETIES CULTIVATED IN ROMANIA FOR BREWING FROM THE HARVEST 2004 – CHARACTERISTICS OF BIOLOGICAL MATERIAL

**I. Stroia¹, Mihaela Begea¹, Elena Baron¹, Stela Mușu¹, Ghe. Bâldea¹,
Mariana Vlădescu¹, P. Begea¹, Raluca Andreea Ion²,
Liliana Vasilescu³**

¹Company for Applied Researches and Investments S.A. Bucharest – Department of
Food Research, 39, Ion Minulescu Str., Sector 3, 031215 Bucharest, Romania
e-mail: ionstroia@yahoo.com

²Academy of Economic Studies Bucharest, 6, Romana Square, Sector 1, 010374,
Bucharest, Romania, e-mail: ralucaa_ion@yahoo.com

³Research and Development Institute for Agriculture, Fundulea, Calarasi
E-mail: liliana@ricic.ro

Abstract

The paper presents technical information regarding barley varieties experimentally cultivated in Romania for brewing and their malting behaviour. The studied varieties are cultivated in the main research stations of Romania, the results being representative for all Romanian territory.

There were studied 67 barley samples to establish the qualitative parameters of the barley in order to select the best malting varieties. There were selected ten foreign varieties in order to be adapted to the specific Romanian conditions and 10 Romanian varieties. There are presented data regarding physical-chemical and technological quality of barley and corresponding malt from 2004 harvest. Data registered for malt samples are obtained by malting experiments performed in the malting pilot plant. On the base of results of this research only the suitable varieties can be cultivated, accordingly with the specific conditions of soil and climate for Romania. As result of this research we assess that Romania has European competitive malting barley varieties.

Keywords: *Barley, variety, malting barley, malting, brewing.*

Introduction

On the basis of the documentation and the analysis carried out by the authors regarding the Romanian malting industry the conclusion that a significant development was registered especially during the last 40 years was drawn. The main aspect evaluated in our studies was the concern for the assurance of the quality of raw materials accordingly

with the requirements of malt and brewing industry, especially the quality of malting barley.

As concerns the raw materials used in Romania for brewing industry the next aspects have to be mentioned:

- for the national brewing industry both the autochthonous and the imported barley and malt are used;
- at present Romania doesn't export malt for brewing;
- beside malt, malt adjuncts are used in brewing, such as corn flour obtained from degerminated corn, rice flour or glucose syrup which are added in a proportion of up to 25 % from malt;
- industrial enzymes produced and delivered by foreign companies are also used in brewing process (Stroia, 2003).

Significant researches were initiated in Romania during the last 40 years in order to provide for the suitable raw materials for malt and brewing industry. The creation of new barley varieties, their study and the settlement of the most appropriate locations for imported malting barley varieties cultivated in Romania were carried out by the Romanian researchers (Begea, 2005a).

The mentioned researches were carried out by the national institutes, namely:

- Research and Development Institute for Agriculture Fundulea, which performs researches regarding the creation of new malting barley varieties in Romanian specific conditions;
- Company for Applied Researches and Investments S.A. Bucharest Department of Food Research (former Institute of food Research) Bucharest through the Laboratory for Technological and Ecological Engineering, which performs test for the barley varieties cultivated in Romania and their characterization from technological point of view.

Experimental

The evaluation of barley and malt quality was performed using EBC and MEBAK analytical techniques and national standard methods. Experiments were performed using the micro-malting pilot installation produced by SEEGER equipped with 8 germination boxes (Saladin cassettes) having a capacity of 700 g barley/box.

The experimental varieties cultivated by the Research and Development Institute for Agriculture are then analysed from physical, chemical and technological point of view at the Institute of Food Research in order to establish:

- the malting behaviour of barley, malting characteristics and the quality of malt obtained experimentally;
- the brewing behaviour of malt, brewing characteristics and the quality of beer obtained experimentally.

The present paper presents only the aspects regarding the barley and malting corresponding to the studied barley varieties.

The malting technological diagram used for experiments were adapted for pilot installations, simulating the present industrial technologies. This diagram uses an alternative dried and wet steeping at 15°C, succeeded by germination at the same temperature (Begea, 2005b).

Steeping: T = 11°C; Day I - 4 h wet steeping; 20 h dry steeping

Day II - 4 h wet steeping; 20 h dry steeping

Day III - 4 h wet steeping; 20 h dry steeping

Germination: T= 11°C; τ =96 h. Initial water content of steeped barley = 48 – 50 %

Malt kilning during 24 hours was performed with a maximum temperature of 82°C in the malt drier. Malt was maintained during 4 hours at the maximum temperature in order to allow the formation flavour compounds (Stroia, 1998).

Results and discussion

The parameters studied were compared with the limits established by the Romanian Standard 13477:2003 – Malting barley.

Table 1. Malting barley analytical criteria recommended by the Romanian Standard 13477:2003

Parameter	Recommended values
Thousand corn weight	Min. 42
Foreign matters	Max. 3 %
Sieving test - Corns having the diameter higher than 2.5 mm (Fraction I+II)	Min. 85 %
Germinative energy of barley	Min. 95 %
Moisture content of barley	Max. 14 %
Protein content of barley	Max. 11.5 % d.m.

Malting behaviour of barley varieties cultivated in Romania for brewing from the harvest 2004

The recommended values for the parameters HLW and starch content were considered the values specified by EBC and MEBAK, namely min. 60% d.m. for starch and 69 kg for HLW (Analytica EBC, 1987; MEKAB, 1996).

Qualitative indicators of 10 selected barley varieties created and cultivated in Romania for brewing (harvest 2004) in order to select the high qualitative varieties, are presented in figure 1.

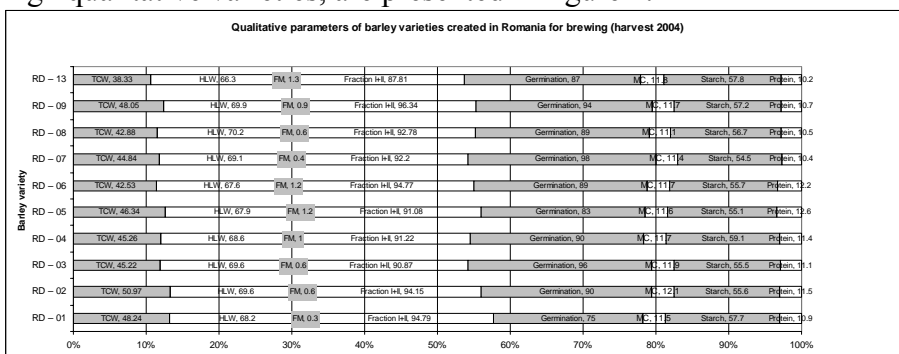


Fig. 1. Qualitative indicators of Romanian barley varieties

10 barley varieties imported and cultivated in Romania for brewing (harvest 2004) were selected in order to settle the possibility of their adaptation at the specific Romanian cultivation conditions. Their qualitative parameters are presented in figure 2.

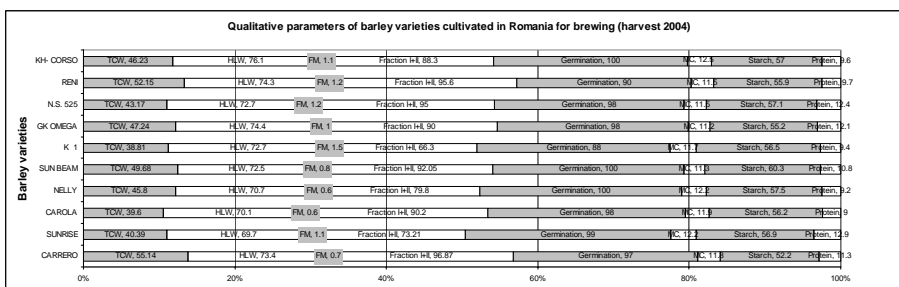


Fig. 2. Qualitative parameters of imported barley varieties

Figure 3 presents average values for the studied parameters of the 10 selected barley varieties created and cultivated in Romania for brewing (harvest 2004), in comparison with the average values for the studied parameters of the 10 barley varieties imported and cultivated in Romania for brewing (harvest 2004) and the standard values.

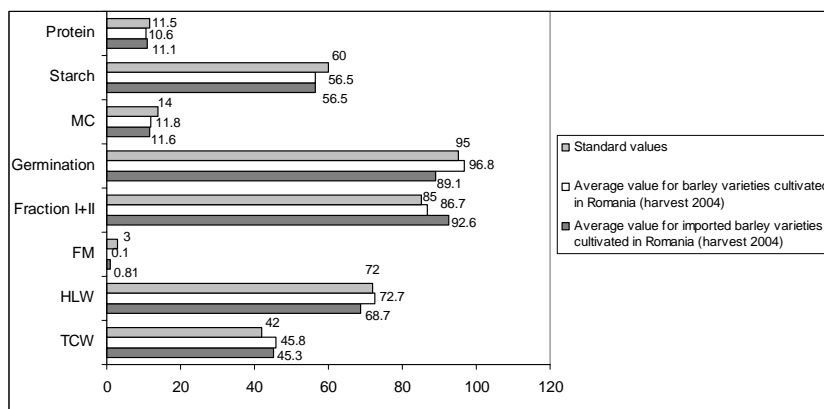


Fig. 3. Comparison of studied parameters of studied barley varieties

Analysing the results for the imported barley varieties, studied in order to be cultivated in Romania in comparison with the Romanian varieties, the conclusion are the next:

- the thousand corn weight registered values higher than 42 g, values corresponding with the brewing industry requirements;
- hectolitre weight represents a parameters at present excluded at European level, but we have mentioned it due to the specific conditions in Romania. Hectolitre weight registered values higher than 69 kg, the minimum value required by the brewing industry;
- referring to the foreign matters content, the registered values were less than the limit value of 3 %;
- the ratio of corns having the diameter higher than 2.5 mm, registered values in conformity with value required by the brewing industry, excepting one imported barley variety (K1);
- germination capacity determined after 5 germination days under standard conditions registered values between 75 – 98 % in the case of barley varieties created in Romania, and values between 90 - 100 % in the case of imported barley varieties;
- moisture content registered the optimum values in all cases, less than limit value of 14 %;
- referring to the starch content, the registered values were less than the required value by the brewing industry (min.60% d.m.), excepting the SUN BEAM imported barley variety;

- referring to the protein content, the registered values were in conformity with the required value by the brewing industry in ratio of 80% in the case of Romanian barley varieties and in ratio of 70% in the case of imported barley varieties.

We have to mention that the conclusions couldn't be significant for the barley varieties because the most appropriate technological approach of malting barley can be performed on the basis of the three consecutive year's results.

Conclusion

We consider necessary to continue the researches regarding the cultivation and testing the new malting barley varieties and to select from the imported varieties that presenting the best capacity for adaptation to the specific conditions of the barley cultivation areas in Romania. The most important aspect is to perform the technological parameters in conformity with the recognized bodies in the field of malt and brewing. It has to be emphasized the fact that at present in Romania there is a great interest for the creation of new malting barley varieties by the governmental bodies, the national institutions and the national or foreign malt producers and breweries.

Two main issues have to be taken into consideration: identification of the barley varieties in order to be the most suitable to be cultivated under the Romanian specific growth conditions, especially for the Southern Plain area, and identification of solutions in order to modulate the malting technologies depending on the barley quality.

References

- Begea, M. (2005a). *Evolution of nitrogenous compounds during brewing process, using Romanian barley varieties*, PhD Thesis, University „Dunarea de Jos” Galati
- Begea, M., Hopulele, T., Stroia, I., Begea, P. (2005b). Contribution to elaboration of correlation between content in nitrogenous compounds in barley, malt, wort and beer, *Int. Symp. "Euro – aliment 2005"*, Galați - Romania, 29 – 30 September.
- Stroia, I., Begea, M. (1998). *Factors Influencing Malt Quality*. Bucharest: Printech.
- Stroia, I., Begea, M. (2003). Malting behaviour of barley varieties cultivated in Romania for brewing. The 29th Eur. Brewery Conv. Congr. Dublin - Irland, May.
- x x x (1997). *Brautechnische Analysenmethoden – MEBAK. Band I*, 3. Auflage, Selbstverlag der MEBAK, Freising - Weihenstephann.
- x x x (1998). *European Brewery Convention. Analytica E.B.C.*
- Romanian Standard SR 13477:2003 – Malting barley.