Quality traits of international wheat cultivars grown under Kosovo condition

Ibrahim HOXHA1, Salih SALIHU2, Imer RUSINOVIC2, Abdyl SINANI1

1University of Agriculture Tirana, Faculty of Biotechnology and Food, Tirana, Albania
2University of Prishtina, Faculty of Agriculture and Veterinary, Kosovo, (e-mail: salih.salihu@boku.ac.at)

Abstract

Wheat cultivars grown today in Kosovo were originally developed and released in former Yugoslavia or other European countries. In the present study 7 winter wheat were tested for their quality traits (protein and gluten content, dough mixing and extension characters and SDS sedimentation test) during growing season 2009-2010. Highest values for most quality traits were recorded for the cultivars ‘Luna’ and ‘Lenta’, originating from Croatia. Regarding agronomic traits the best performance for grain yield indicated cultivars ‘Pobeda’ and ‘Evropa’ from Serbia, whereas for 1000 kernel weight best performance had cultivar ‘Luna’. The study demonstrated, that within these 7 international wheat cultivars, cultivar ‘Luna’ is best adapted to Kosovo growing conditions providing a relatively high yield but excellent quality traits. It is suggested, that Kosovar farmers should increase the cultivation of ‘Luna’ within the next years in order to increase both wheat quality and wheat production. However, creation of domestic wheat cultivars adapted to its prevalent growing condition remains still a big challenge for Kosovar experts and companies.

Key words: winter wheat, quality traits, bread making quality, yield, Kosovo

Introduction

Common wheat (Triticum aestivum L.) is the most important food crop in the world and it is the only material suited for the production of leavened bread and associated products. The baking quality deepens on both genetic (cultivar) and environmental (geographical origin /climate, fertilization) factors. One of the most important criteria is the loaf volume resulting from baking test. High protein content has a positive effect on the loaf volume (Finney, 1985, Pomeranz, 1988) and it is an important factor in defining the price of wheat lot. However, protein content is strongly influenced by environmental factors (Pechanek et al. 1997). Wheat cultivars grown today in Kosovo, which were originally developed and released in neighbouring countries and are, therefore, not best adapted to the Kosovo growing condition.

Very often, farmers and millers in Kosovo are faced with problems caused by import of the wheat cultivars with low quality for bread production. Therefore, the objective of study was evaluation of the quality traits of international wheat cultivars grown under Kosovo condition. Outcome results will help directly the farmers to choose the best cultivars for sowing and indirectly would help the millers and bakeries to produce quality flour and quality bread, respectively.

Material and methods

Seven wheat cultivars of different origin ‘Evropa’, ‘Pobeda’ and ‘Renesanca’ (Serbia), ‘Justus’ and ‘Brutus’ (Austria), ‘Lenta’ and ‘Luna’ (Croatia), ‘Isengrain’ (French), were used in the field trial in the year 2009-2010. Experiment was located in Viti, which lies between 500 and 600 meter above sea level and is characterised by an annual mean rainfall of 640 mm and an annual mean temperature of 10°C. In this trial the randomised block design was used. Sowing was carried out using the seed machine “Reform”, seed density was 275 kg ha⁻¹, plot size was 60 m² (3mx20m) and for each cultivar three replications were used. Fertilisation followed the

Proceedings. 46th Croatian and 6th International Symposium on Agriculture. Opatija. Croatia (613-616)
usual standards for wheat production in Kosovo by applying 60 N, 60 P and 60 K (kg ha−1) before sowing and 60 N in mid-March. For yield (YLD) estimation was harvested 1 m² for each sample and consequently threshed in a stationary thresher, whereas the rest of the wheat plants were harvested by standard thresher. 1000 kernel weight (TKW) and test weight (TW) were analysed at the laboratory of Faculty and Veterinary in Prishtina, protein content was determined by near-infrared transmittance spectroscopy at the BOKU Vienna, dough rheological characteristics were determined on 200 g flour samples using a Brabender Farinograph (DDT, dough development time; DST, dough stability; DSO, dough softening and QN, quality number) and Extensograph apparatus (Rmax, maximum dough resistance to extension; E’, dough extensibility; DE, dough energy) at the laboratory of M & Sillos Mill in Xerxa, Kosovo. SDS-sedimentation test was determined in the laboratory of Saatzucht Donau, Probstdorf, Austria, according to Dick & Quick (1983) using a 1 g whole-meal flour, milled with a Cyclotec mill equipped with a 1 mm sieve. Chopin Alveograph properties and wet gluten were analysed at the private laboratory for cereals processing (Versuchsantalt für Getreideverarbeitung, VFG) in Vienna. Results were statistically by one way ANOVA and Tukey HSD test analysed.

Results and discussion

Overall average grain yield of the evaluated cultivars in the year 2010 was 1950 kg ha⁻¹. The reason for low yield was the unfavourable weather condition (high amount of precipitation) prevailed during flowering and grain filling phases, which directly affected the grain yield and grain quality. Among the cultivars the best performance for grain YLD indicated cultivars ‘Pobeda’ and ‘Evropa’, followed by cultivars ‘Lenta’ and ‘Isengrain’; however the differences were not significant (Fig. 1). Regarding agronomic traits a significant differences were achieved for TKW and TW. For TKW the best performance had cultivars ‘Luna’, ‘Pobeda’ and ‘Renesanca’, whereas for TW the best performance had cultivars ‘Lenta’ and ‘Pobeda’ (Fig 2). By all graphics means with the same letter are not significant from each other.

![Figure 1. Grain yield (g m⁻¹)](image)

Significant results were achieved for protein content, SDS-sedimentation test and almost quality traits carried out by Brabender Farinograph, Extensograph and Chopin Alveograph. For protein content, SDS-Sedimentation test, DDT and ‘W of Chopin’ cultivars ‘Lenta’ and ‘Luna’ were superior, whereas cultivars ‘Evropa’ ‘Pobeda’, ‘Renesanca’, ‘Andolu’ and ‘Isengrain’ had middle till inferior performance. (Fig. 3, 4, 5). It seems that cultivars from Croatia are best adapted to Kosovo growing condition. A high quality of Croatian cultivars is defined through its glutenin subunits composition for ‘Luna’ 1/7+9/5+10 und ‘Lenta’ 1/7+9/2+12. It is well known that protein bands 7+9/ 5+10 are responsible for very good quality and protein bands 7+9 / 2+12 are responsible for relatively good quality (Gröger et al. 1997a). Classification criteria of the cultivars into quality groups are different from county to country. For example in francophone countries the Chopin Alveograph is commonly used to determine the bread making quality of wheat (AACC, 1990).
Quality traits of international wheat cultivars grown under Kosovo condition

Section 5. Field Crop Production

The main trait derived from Chopin Alveograph is “W of Chopin”, which express the amount of the energy required to inflate the dough bubble to bursting point (Fig. 5). Cultivars, with the “W of Chopin” value 150-250 may be used as improver wheat and cultivars with value higher as 250 are high quality wheat with high protein level and excellent bread making quality. According to this trait “W of Chopin” in our study, only cultivars from Croatia ‘Luna’ can be classified as high quality wheat and ‘Lenta’ can be classified and used as improver wheat (Fig. 5). In many Western and Eastern European countries wheat cultivars are classified into quality groups based on Faringraph traits, protein content or SDS sedimentation test (Pelschenke, 1933, Fuchs 1954, Belderok, 1977, Oberfoster et all, 1994, Gröger et al, 1997 a). Based on these criteria and according to its performance, these 7 wheat cultivars grown under Kosovo condition in vegetation season 2009/2010 can be classified into quality group as follows: ‘Luna’=B1/B2, ‘Lenta’=B1/B2, ‘Andolu’=B2/C1, ‘Evropa’=C1, ‘Pobeda’=C1, ‘Renesanca’=C1 and ‘Isengrain’=C1. This indicates that cultivars from Serbia had a low bread making quality, but they were relative good in YLD.

A Pearson correlation was carried out. Generally, the positive correlation between protein content and dough development time (DDT) r= 0.566**, dough stability (DST) r= 0.843**, dough softening (DSO) r= -0.698** and dough energy (DE) r=0.515*, were recorded. Relation between protein content and mixing characters are well established (Feil, 1997, Triboi & Triboi-Blondel, 2002). In the present study no correlation between yield and protein content was found, however, the correlation between yield and DSO was positive r=0.442*.

Conclusion

It can be summarized that cultivars ‘Luna’ and ‘Lenta’ from Croatia are best adapted wheat cultivars presently available for growing in Kosovo. ‘Luna’ showed both agronomic and quality traits superior to the other cultivars, whereas cultivar ‘Lenta’, was best performed in regard to quality parameters. It is suggested, that Kosovan farmers should increase the cultivation of ‘Luna’ within the next years in order to increase both wheat production and wheat quality. It is an outmost need of Kosovo to start with the wheat breeding and to create its own cultivars adapted to Kosovo growing condition. Not always, foreigner cultivars adapted on its
region are suitable for growing in other regions. Therefore, creation of new cultivars for Kosovo, can boost Kosovar wheat production and wheat quality in the nearest future

References


