

THE INFLUENCE OF NITROGEN FOLIAR APPLICATION ON YIELD AND BREAD MAKING QUALITY PARAMETERS OF WHEAT

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ABSTRACT. The influence of nitrogen foliar application on yield, protein content, sedimentation value, moist gluten content, parameters of reological dough quality and bread baking quality at the winter wheat cultivar KG-56 were investigated. Two rate of nitrogen (N_1 -90 $kg\ ha^{-1}$ N; N_2 -120 $kg\ ha^{-1}$ N) were applied. Foliar application of nitrogen in flowering (Ff), milky stage (Fm) and in both flowering and milky stage (Ffm) 12 % solution of urea with 40 $kg\ ha^{-1}$ N quantity, were conducted. Nitrogen foliar nutrition resulted in increasing grain yield in average for 0.45 $th\ a^{-1}$. In average the increasing other investigated parameters were estimated in absolute percents: protein content for 2.5, sedimentation value for 21.0, wet gluten content for 7.2, water absorption for 5.2, farinograph quality number for 25.4, bread weight for 3.0 and bread volume for 37.5 of the absolute percents. Under the influence of foliar N application the B₂ quality group was improved to A₂ quality group in milky stage. After N foliar application in milky stage (Fm N_2), the highest value of analyzed parameters was established, except protein content and bread weight. However, in the case of N foliar application in both stage (flowering and milky stage) protein content and bread weight showed the highest values.

INTRODUCTION

Nitrogen fertilization can affect wheat grain quality, especially protein content. Nitrogen application on late development stages (heading and late) has positive influence on increasing of grain protein content, rarely on grain yield (FINNEY *et al.*, 1957; ĐOKIĆ, 1986; OTTMAN *et al.*, 2000). It is well known that existing negative correlation of protein content and grain yield (PAVLOV, 1984; ĐOKIĆ *et al.*, 1992). The increasing of grain protein content is following increasing of sedimentation value, gluten content, grain hardness and other technological quality parameters of flour and bread (ZEMELA and SKLYAR, 1986; KNEŽEVIĆ *et al.*, 2000; ĐOKIĆ, 1990).

The aim of this work was to study the influence of nitrogen foliar application in different growth stages on yield and some bread making quality parameters of wheat.

MATERIAL AND METHODS

The investigation on the experimental field with KG-56 wheat cultivar was carried out in a two years. The several variants were used: N₁- nitrogen fertilization low rate of nitrogen (90 kg ha⁻¹ N); N₂-higher rate (120 kg ha⁻¹ N) on the end of winter; F=N foliar application with 12 % solution of urea (40 kg ha⁻¹ N quantity) in flowering (N₁Ff- low rate, N₂Ff-higher rate), milky stage (N₁Fm, N₂Fm) and flowering and milky stage (N₁Ffm, N₂Ffm). The grain protein content was determined by *Kjeldahl* method and sedimentation value by *Zeleny* method. The wet gluten content was determined by standard method. The reological dough quality parameters (water absorption, quality number and quality group) determined by Brabender farinograph. The bread-baking test was done by micro method, with 100 g flour. All bread making quality analysis determined by KALUĐERSKI and FILIPOVIĆ, 1998.

RESULTS AND DISCUSSION

The growing of wheat plants vegetative organs finish in flowering stage. This study confirmed that nitrogen application in flowering stage mainly use for grain protein synthesis.

The nitrogen foliar application in flowering and milky stage caused increasing of grain yield. Grain yield differed between years what indicated that grain yield depended on the environmental conditions during the year of growing. In the second year grain yield was significantly higher than in the first year. The grain protein content in wheat increased under influence of nitrogen foliar application in both years of the study. In the case of nitrogen application in flowering and milky stage (Ffm) increasing of protein content was the highest. In all tested variants of nitrogen application the grain protein content was higher in the second than in the first year (Table 1). In average the grain protein content under nitrogen foliar application increased for 2%. This is in agreement with results that were established in earlier investigation (PAVLOV, 1984; ĐOKIĆ, 1986; MILOŠEV, 2003) who reported increasing of grain protein content for 2-3 % and the gluten content for 3-4 %, under N foliar application in the late stages. That increasing depended on plant nitrogen supply and the time of nitrogen application. The nitrogen application at late stages decelerate leaf senescence what can influence grain yield increasing (ĐOKIĆ, 1986; ZEMELA and SKLYAR, 1986; LOOKHART *et al.*, 2001; WILHELM *et al.*, 2002).

The sedimentation value in average increased under influence of nitrogen foliar application for 21 units (Table 1). Nitrogen application in the late stages caused higher increasing of this trait. The wet gluten content showed the same differences tendency as protein content and sedimentation value under nitrogen foliar application. The highest average sedimentation value (56.0 ml) and gluten content (38.4 %) obtained in milky stage (FmN₂).

The sedimentation value increased higher under nitrogen application at flowering and milky stage in the first than in the second year. It may be due to higher increasing protein content in the first year, because of its positive correlation. This is in agreement with obtained values by ĐOKIĆ (1986). There were the same increasing of grain protein content (OTTOMAN *et al.*, 2002), sedimentation value and wet gluten content under foliar applied nutrient at different rates and variants of fertilizer, which applied in previous experiment period. The similar results found (ĐOKIĆ, 1990; ZEMELA and SKLYAR, 1986 and ĐURIĆ, 2003).

The results of reological dough quality and bread baking quality are displayed in Table 2. The dough quality did not significant differed under nitrogen foliar nutrition. The KG 56 cultivar had B quality group in all variants, except in the case of nitrogen application in milky stage in the first year and in flowering and milky stage in the second year (A quality group).

The bread volume, as the important trait of breadcrumb quality was differed between the year of growing, and it was rather higher in the second year. The highest bread volume was found in FfmN₂ variant in the second year (470.0 ml). In the first year established higher values for bread weight per 100 g flour, but the breadcrumb quality was better in the second year. The highest bread yield was found in the second year in N₂ variant under nitrogen foliar application in flowering and milky stage (144.2g). The flour and bread quality increased under nitrogen nutrition, and that were the best with nitrogen nutrition in FfmN₂. Obtained results agree with previous studies (KOVAČEV-ĐOLAI and MALEŠEVIĆ, 1993).

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