

NITROGEN CONTENT IN THE SEEDLINGS OF WHEAT AS PARAMETER FOR SELECTION ON NITROGEN FIXATION

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ABSTRACT. Investigation on the nitrogen fixation of wheat, which is the most important cereal, has been the focus of attention for long time ago. The influence of nitrogen fixator's bacteria on some quality parameters of wheat was the aim of this investigation. The experiment was done in semi-controlled conditions in nitrogen free solutions. Grain surface of each cultivar were sterilized and inoculated with different strains of diazotroph. Seedling were harvested 42 days after planting and analyzed on length of seedling shoot and root, dry matter of seedling shoot and root, nitrogen content of seedling shoot and seedling root, and part of nitrogen content of seedling shoot in whole nitrogen content of seedlings. The influence of diazotroph inoculation increased some physiological components, quality parameters of the wheat and nitrogen content as a parameter of grain quality which direct effected on the grain yield.

INTRODUCTION

High grain yield with great technological quality of wheat is the first and the last aim of each investigation in wheat production (BERECZ and NEMETH, 2002). Investigation of some parameters which direct or indirect influence on grain yield may show importance indicators for possible increasing grain yield (KNEŽEVIĆ, *et al.*, 2000). Nitrogen is one of the effective parameter in forming yield (ĐURIĆ, *et al.*, 2005), especially accumulation of nitrogen in vegetative organs and its utilization in the grain filling. Greater influence on overall processing quality had protein content than any other single factor (ZEČEVIĆ, *et al.*, 2005).

The aim of this study was to determine the effectiveness of diazotrophs on wheat and its possibility as a selection criterion in wheat breeding program.

MATERIAL AND METHODS

The experiment was performed with three divergent perspective lines of plant species *Triticum aestivum* L. (KG-1, KG-6, KG-3468/97) in semi-controlled conditions in nitrogen free solutions. Grain surface of each cultivar were sterilized and inoculated with different strains of diazotroph with 0.5 ml 10^8 cell per seed. Control seedlings were grown in tubes without inoculation. Seedlings were grown to fifth leaves and were analyzed on plant height, length of root, dry matter content of seedling shoot and seedling root, nitrogen concentration and nitrogen content of seedling shoot and seedling root, and part of nitrogen content of seedling shoot in total nitrogen content of seedlings.

The seedling was dried in dryer at 75^o C whole to constant mass. Dry samples were weight and dry matter content was calculated. Nitrogen concentration in seedling shoot and root was obtained by Kjeldahl method.

RESULTS AND DISCUSSION

The associative diazotroph strains which are dominated on the root of wheat plant have favourable effect, not only on the nitrogen fixation, but also on synthesis of phytohormones (EMTSEV, 1996). However, diazotrophs and wheat does not always results in forming of effective association and usually has effect in characteristic which is not objective of investigation pointing (MIĆANOVIĆ, 1997).

Results of this investigation point out that the variability found in majority investigation parameters. Plant height is one of important yield components of wheat (ZEČEVIĆ, *et al.*, 2004) and in this experiment was equal both investigated genotype and strain of diazotrophs. Results showed significantly differences between all investigation genotype. However, the genotype KG-1 (23.03cm) produced a higher length of seedling shoot than genotypes KG-6 (21.18cm) and KG-3486/97 (18.88cm). Previous studies indicated that increasing of plant height directly influences on the grain yield (ZEČEVIĆ *et al.*, 2004). These results indicated that the length of seedling shoot were greater at inoculation than uninoculation treatment. The most important increasing was obtained with strain Dd6 (21.72cm) and the smallest with control variant (20.58cm). Most effective association was between KG-1 and Dd6 (24.4cm) (Graph. 1).

The following treatments were established also on length of seedling root. The lengthened seedling root also was found in line KG-1 (8.75cm) and the shortest in line KG-3486/97 (5.11cm), with very important differences between that. Besides that, by inoculation effect analyzing it was carried out that also differences between strains were very important. The best one derived by strains Dd5 (7.38cm) and shortest found in control variant (5.83cm). The most effective association in our investigation was between KG-1x Dd6 (10.43cm) (Graph. 2).

The influence of nitrogen fixators on many phenotypes characteristics of plant is well known, but the effect on dry matter and nitrogen content in the best parameters for specific bacteria strain and plant genotype (SARIĆ *et al.*, 1990). Mass of seedling shoot of investigated plants obtained great genotype related variability. Reserves accumulated play on important role in plant growth and photosynthesis. Mass of seedling shoot for all of three investigated genotypes was estimated in cultivar KG-1 (1859.80mg). The greatest inoculation effect was obtained with bacteria strains Dd7 (1735mg) and Dd6 (1638mg). Association between Dd7 and KG-1 was most effective (2018mg) (Graph. 3).

Beside that, in average mass of seedling root for all three investigated genotypes was the highest in genotype KG-1 (1014.63mg) and the smallest in genotype KG-3486-97 (907.25mg). The highest root mass in inoculated variant was with Dd5 (1007.11mg) and Dd6 (1005.22). Association between genotype KG-1 and strain Dd6 was most effective (1061.3mg) (Graph. 4).

Inoculation with diazotrophs increased nitrogen in the plant, special in the root (MIĆANOVIĆ, 1997). Plant under inoculation had a significantly higher percentage of nitrogen content than under uninoculation. The highest nitrogen content in seedling of shoot was in genotype KG-1 (45.5mg) and the smallest in KG-3486-97 (38.08mg) (Graph. 5). The greatest effect of inoculation was with bacterial strain Dd6 (46.56mg), and most effective interaction was between bacterial strain genotype KG-1 and strain Dd4 (54.00mg).

Previous studies have indicated that grain nitrogen in wheat primarily originates as a result of translocation from vegetative part after anthesis (SIMMONS and MOSS, 1978). However the genotype KG-3648/97 (20.96mg) produced a higher nitrogen content in seedling of root than genotype (17.00mg) and the best effect of inoculation had got with Dd6 (22.0mg). Most effective interaction was between bacterial strain Dd6 and KG-6 line (26.67mg) (Graph. 6).

To study of effect of diazotroph inoculation on the green leaf of three wheat varieties had showed as a physiological potential for plant growth, photosynthesis of plant and grain filling. Inoculation by diazotroph was found beneficial in terms of increasing these parameters over the uninoculated treatment. The highest green mass was found in genotype KG-1 (Graph.-s 7, 8, 9). Also in genotype KG-1 higher part of shoot nitrogen content was found into whole plant, which indicated potential for activities of enzymes which influences photosynthesis activities (Graph. 10).

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