# BOOK OF PROCEEDINGS

**Fourth International Agronomic Symposium**

**“Agrosym 2013”**

AGROSYM 2013

**Jahorina, October 3 - 6, 2013**

## Impressum

Fourth International Scientific Symposium „Agrosym 2013“

## Book of Proceedings


**Published by**

University of East Sarajevo, Faculty of Agriculture, Republic of Srpska, Bosnia
University of Belgrade, Faculty of Agriculture, Serbia
Mediterranean Agronomic Institute of Bari (CIHEAM - IAMB) Italy
International Society of Environment and Rural Development, Japan
Balkan Environmental Association, B.EN.A, Greece
Academy of Engineering Sciences of Serbia, Serbia
Maize Research Institute „Zemun Polje“ Serbia
Biotehnical Faculty, University of Montenegro, Montenegro
Balkan Scientific Association of Agricultural Economics, Serbia
Institute of Agricultural Economics, Serbia
Faculty of Agriculture, University of Banja Luka, Bosnia and Herzegovina

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**Website:**

http://www.agrosym.unssa.rs.ba

CIP - Каталогизација у публикацији
Народна и универзитетска библиотека
Републике Српске, Бања Лука

631(082)(0.034.2)

INTERNATIONAL Scientific Symposium "Agrosym Jahorina 2013" (4 ; Jahorina)
Book of proceedings [Elektronski izvor] / Fourth International Scientific Symposium "Agrosym 2013", Jahorina, October 3-6 , 2013 ; [editor in chef Dušan Kovačević]. - Istočno Sarajevo : Poljoprivredni fakultet, 2013. - 1 elektronski optički disk (CD-ROM) : tekst, slika ; 12 cm

CD ROM čitač. - Nasl. sa nasl. ekrana. - Bibliografija uz svaki rad.

ISBN 978-99955-751-3-7

COBISS.BH-ID 3919640

# Fourth International Agronomic Symposium
# “Agrosym 2013”
# Jahorina, October 3-6, 2013, Bosnia and Herzegovina

## Foreword

The current agro-food system failed to feed the world population and to eradicate rural poverty. The environmental and social problems caused by such an agricultural production model are well known and widespread. The most dramatic environmental damage is caused by climate change, loss of biodiversity and ecosystem functions, soil erosion and degradation, and pollution from fertilizers and pesticides.

Climate change, population growth and competing demands for land and resources are putting great pressure on the world's food systems. The world's population is set to reach nine billion by 2050. To feed them it is needed to produce 70% more food, and do so without destroying our environment. The successful management of agricultural resources for meeting the changing human needs, while maintaining or enhancing the quality of the environment and conserving natural resources, is imperative for a stable food production.

Agriculture is at the core of sustainable development. Ecological agriculture, agro-ecological practices and sustainable agricultural production are alternative farming methods to address the environmental consequences of conventional agriculture dependent on intensive chemical inputs. Sustainable agriculture is not only a technological solution but also an approach that embodies a shift in agricultural paradigms. Sustainable food systems should integrate the economic, social and environmental dimensions of sustainable development.

Appropriate agricultural and rural development strategies in the Balkan area and beyond should ensure food and nutrition security - through the sustainable and eco-functional intensification of crop and animal production systems - while conserving the natural resource base. They should also contribute to the eradication of rural poverty and improvement of livelihoods and quality of life of rural populations.

Innovative and responsible measures - based on sound and accurate scientific knowledge - are required to respond to the multiple food-related challenges of the New Millennium in a resource-constrained world. During four days; October 3-6, 2013; the 4$^{th}$ International Symposium "Agrosym 2013" made an important contribution to the improvement of knowledge in agriculture, environment and rural development fields. In fact, 224 papers were presented by scientists from 38 countries (Albania, Algeria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Egypt, Finland, Germany, Ghana, Greece, India, Indonesia, Iran, Iraq, Italy, Japan, Kazakhstan, Lebanon, Republic of Macedonia, Malaysia, Montenegro, Morocco, Niger, Pakistan, Poland, Romania, Russia, Serbia, Slovenia, South Africa, Spain, Slovakia, Tunisia, Turkey, Ukraine, Vietnam). This publication comprises all accepted full papers.

The success of the symposium was made possible thanks to the unconditional commitment and invaluable contributions of a wide range of partners and sponsors. Much appreciation is due to the authors of all papers submitted to and presented at the symposium, the reviewers for their sound comments and feedback as well as to all the symposium participants for ideas, insights and contributions.

Academician Dusan Kovacevic
President of the Scientific Committee

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President of the Organization Committee

Mr. Cosimo Lacirignola
Director, MAIB
Secretary General, CIHEAM

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10.7251/AGSY1303411N

# THE POSSIBILITIES OF USE OF NITROGEN HARVEST INDEX IN WHEAT BREEDING IN TERM OF ECOLOGICAL AGRICULTURE

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## Abstract

The topic of nitrogen wheat nutrition was becoming very actually during last decades of last century because of many reasons: fertilizers price, energetic crises, environmental protection, ecological agriculture. Despite the detrimental impacts, the use of fertilizers (N in particular) in agriculture, together with an improvement in cropping systems, mainly in developed countries, have provided a food supply sufficient for both animal and human consumption. Therefore, the challenge for the next decades, with an expanding world population, will be to develop a highly productive agriculture, whilst at the same time preserving the quality of the environment. A multidisciplinary approach to breeding winter wheat and include physiological indicators of nitrogen nutrition efficiency could help in achieving this goal. Consequently, this paper deals with physiological indicator as nitrogen harvest index, its connection with grain yield, heritability and variance and evaluation of Serbian winter wheat genotypes in term of this indicator. The best values of nitrogen harvest index were registered at KG 165/2, Pobeda and Bujna. Emphasized genotypes, selected as superior in term of this indicator, could be considered as carriers of de desirable traits in terms of wheat breeding theory, improvement of production efficiency, environmental protection and development of ecological agriculture.

**Key words**: breeding, ecological agriculture, nitrogen harvest index, wheat.

## Introduction

Despite the detrimental impacts, including pollution of soil and water and deterioration of food safety, the use of fertilizers (N in particular) in agriculture, together with an improvement in cropping systems, mainly in developed countries, have provided a food supply sufficient for both animal and human consumption. Therefore, the challenge for the next decades, with an expanding world population, will be to develop a highly productive agriculture, whilst at the same time preserving the quality of the environment (Hirel et al., 2001; Patel et al., 2004; Shrawat et al., 2008; Weinkauf, 2008). One way to enhance productivity and maintain efficient production and minimize environmental impact is to develop specific cropping strategies and select productive genotypes that can grow under low N conditions (Delmer, 2005). A multidisciplinary approach to breeding winter wheat and include physiological indicators of nitrogen nutrition efficiency could help in achieving this goal (van Ginkee et al., 2001; Baker et al., 2004; Flowers et al., 2004; Zivanovic et al., 2006; Pathak et al., 2008).

The concept of the nitrogen nutrition efficiency of a crop should be considered a function of root activity, soil texture, climate conditions, interactions between soil and bacterial processes, the nature of organic or inorganic N sources and genetics specificity (Walley et al., 2002; Burger & Jackson 2004; Lopez - Bellido et al., 2005; Haberle et al., 2006). The direct evaluation of root system activity as a measure of plant absorption efficiency is difficult under field conditions indirect measurements are possible. The relationship between indicators of absorption efficiency as well as nitrogen utilization ones and desirable traits such as grain yield in this case is an important question. Many authors (Anderson et al., 2004; Gallais & Coque, 2005) have defined parameters that affect grain yield positively.

Nitrogen harvest index (the ratio of nitrogen content in grain and in the whole plant) is a measure of the efficiency of nitrogen translocation from vegetative organs to the grains.Nitrogen harvest index reflects the grain protein content and thus the grain nutrition quality (Hirel et al., 2007) and, for wheat, usually ranges from 0.70 to 0.80 (Brancourt - Hummel et al., 2003).

The objective of this study was to investigate phenotypic variability of nitrogen harvest index and its relationship with grain yield in thirty bread wheat genotypes, grown under different environmental conditios during three year, at sub – optimal nitrogen soil provided.

## Material and method

The study was carried out on the property of the Small Grains Research Center in Kragujevac city (186 m.a.s.l.) in Serbia, during the three consecutive seasons (2001/02, 2002/03 and 2003/04). The soil type was smonitza in degradation (Vertisol).

The average temperatures and monthly rainfall during the wheat vegetation period (October-June) for the three seasons and the 30 years mean (1970-2000) are shown in table 1. In all three years, the mean temperature was higher than the 30 yr average. There was considerable variability in rainfall amounts and distribution from year to year. The amount of rainfall was most suitable for plant growth in the third season. Rainfall (74.5mm), received during the germination period (October - November) in the first season was less than in other two (97.00mm and 111.8mm) and long-term average (94.73 mm). Rainfall distribution during the rest of the vegetative period in the first season was auspicious but the total amounts of rainfall were less than long – term means.

Table 1. Weather conditions during the three test growing season and long-term (30-yr) mean for (LTM) winter wheat

| Month | Average monthly temperatures ($^oC$) | | | | Monthly amounts of rainfall (l) | | | |
|---|---|---|---|---|---|---|---|---|
| | 2001/02 | 2002/03 | 2003/04 | LTM | 2001/02 | 2002/03 | 2003/04 | LTM |
| X | 13.8 | 12.2 | 10.6 | 11.40 | 10.4 | 65.5 | 83.2 | 47.53 |
| XI | 4.6 | 9.7 | 8.9 | 5.90 | 64.1 | 31.5 | 28.6 | 47.20 |
| XII | - 2.4 | 1.1 | 2.2 | 2.13 | 27.6 | 39.4 | 37.2 | 44.33 |
| I | - 0.1 | 0.7 | - 0.9 | 0.73 | 17.2 | 59.0 | 86.4 | 36.70 |
| II | 7.0 | - 2.4 | 3.0 | 2.42 | 20.1 | 19.7 | 59.5 | 35.77 |
| III | 8.9 | 5.8 | 7.1 | 6.43 | 26.0 | 2.8 | 21.3 | 41.57 |
| IV | 10.8 | 10.8 | 12.8 | 11.22 | 63.7 | 37.2 | 52.3 | 50.77 |
| V | 18.4 | 19.9 | 14.5 | 16.24 | 38.6 | 42.3 | 50.3 | 65.43 |
| VI | 21.6 | 23.3 | 19.8 | 19.40 | 57.2 | 47.7 | 61.4 | 81.27 |
| Season average | | | | | Total | | | |
| 9.18 | | 9.01 | 8.67 | 8.43 | 324.9 | 345.1 | 483.2 | 624.43 |

The experiment included 30 wheat cultivars and experimental lines, originating from the Serbia: Small Grains Research Center, Kragujevac and Institute of Field and Vegetable Crops, Novi Sad. The basic processing and pre – sowing preparation of the soil was done using

standard procedures. The randomized complete block experimental design was used with five replicates in rows 1.5m on, with spacing between rows of 0.20m. Sowing (200 grains per row) was done by hand (one genotype per row), during the optimal planting period for central Serbian conditions, for winter wheat (29. 10. 2001, 15. 11. 2002 and 06.11. 2003). NPK fertilizer, formulated 8:24:16, was applied at the rate of 300 kg $ha^{-1}$ before sowing each season. Eight grams $row^{-1}$ of nitrogen (260 kg KAN $ha^{-1}$) was added at the tillering stage of growth development each season.
Plant samples of each genotype were taken at maturity (five plants per replication). The samples were air – dried and grain yield (GY, g $m^{-2}$), weight of straw at maturity (DMstraw, g $m^{-2}$) and total above – ground biomass at maturity (BY, g $m^{-2}$) were measured. All dry vegetative samples and grain were first ground and then plant N concentration was determined by the standard macro- Kjeldahl procedure. Nitrogen content (at grain, straw and total at maturity) was calculated by multiplying the N concentration by dry weight (gN $m^{-2}$). Moreover, the nitrogen harvest index (NHI) was calculated according to Arduini et al. (2006) as follows:
NHI = Ngrain / N content of aboveground parts at maturity (Ntotal) (%)
The components of variability, broader - sense heritability, standard errors and coefficients of variability of these parameters, as correlation coefficients, their standard errors and test of significance were determined according to Chaudhary et al. (1999).

## Results and discussion

Analysis of variance (ANOVA) revealed highly significant ($P<0.01$) differences among genotypes and years as well as highly significant year x genotype interaction NHI. Three-year average of all investigated genotypes was 75% (Table 2). Genotype means for NHI varied from 67% (KG 10) to 79% (KG 165/2).
The N harvest index, defined as N in grain to total N uptake, is an important consideration in cereals. NHI reflects the grain protein content and thus the grain nutritional quality (Hirel et al., 2007). It can be recommended as a selection criterion for nitrogen use efficiency improvement, while improving NUE is one of possibilities for developing new high-yielding quality wheat cultivars (Gorjanovic et al., 2011).
The fact that increasing doses of nitrogen did not lead to increased NHI is very important in terms of ecological agriculture, saving nitrogen fertilizer and minimizing their possible harmful effect on environment. Moreover, the majority of genotypes had the highest value on the control and low N variants (Le Gouis et al., 2000; Chen et al., 2011).
Nitrogen harvest index for wheat usually ranges from 0.70 to 0.80 (Brancourt-Hummel et al., 2003). More than half of studied genotypes had NHI over 75%, which is desirable from a wheat breeding point of view.

Table 2. Average values of nitrogen harvest index (NHI) in three – years investigation

| NHI<br>Genotype | $\overline{X}$<br>(%) | $S_X$ | Cv |
|---|---|---|---|
| Morava | 74 | 1.17 | 3.64 |
| Lepenica | 75 | 1.63 | 5.18 |
| Studenica | 76 | 0.75 | 2.16 |
| Takovcanka | 72 | 0.58 | 1.82 |
| Toplica | 75 | 1.05 | 3.05 |

| | | | |
|---|---|---|---|
| Srbijanka | 71 | 0.93 | 2.86 |
| KG – 100 | 72 | 0.86 | 2.76 |
| Lazarica | 73 | 0.86 | 2.70 |
| Bujna | 77 | 0.51 | 1.49 |
| Matica | 77 | 0.37 | 1.10 |
| Vizija | 72 | 0.95 | 3.26 |
| Pobeda | 78 | 0.73 | 2.14 |
| Rana 5 | 76 | 1.11 | 3.52 |
| Evropa 90 | 77 | 6.22 | 19/09 |
| Renesansa | 77 | 2.77 | 8.77 |
| Tiha | 74 | 0.97 | 3.04 |
| Mina | 71 | 0.71 | 2.33 |
| Prima | 77 | 1.69 | 5.00 |
| Kremna | 75 | 1.03 | 3.37 |
| Rusija | 74 | 0.93 | 2.98 |
| Pesma | 76 | 1.98 | 6.41 |
| KG 200/31 | 74 | 0.81 | 2.78 |
| KG 253/4-1 | 76 | 0.75 | 2.41 |
| KG 115/4 | 77 | 0.73 | 2.13 |
| KG 165/2 | 79 | 0.73 | 2.17 |
| KG 56/1 | 77 | 0.58 | 1.78 |
| KG 100/97 | 76 | 0.32 | 1.02 |
| Perla | 76 | 0.93 | 2.94 |
| KG 224/98 | 74 | 0.55 | 1.70 |
| KG 10 | 67 | 1.46 | 4.97 |
| $\overline{X}$ | 75 | | |
| Factor | A** | B** | A x B** |
| $LSD_{0.05}$ | 0.75 | 2.36 | 4.09 |
| $LSD_{0.01}$ | 0.98 | 3.11 | 5.38 |

From a practical point of selection is not desirable that the total variation (phenotypic variation Vp) has a greater share of environmental variance (Ve) compared to genetic (Vg) (Zivanovic, 1997). Significantly larger share of the total variation of genetic variance to the environment means less influence of environmental factors on the realized variation of these traits, which in terms of selection and breeding is considered a very favorable ratio. The obtained results about relation Ve : Vg = 7.92 : 25.58 (Table 3) confirm possibility of use NHI as selection criterion.

Table 3. Components of variability, coefficients of variation and broad – sense heritability of NHI

| Trait | year | Vp | Ve | Vg | Relative share of Vp (%) | | CVp | CVg | $H^2$ |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Ve | Vg | | | |
| NHI | 1 | 22,63 | 12,19 | 10,44 | 24 | 76 | 6,63 | 4,51 | 0,46 |
| | 2 | 52,10 | 2,70 | 22,40 | | | 9,19 | 6,03 | 0,43 |
| | 3 | 25,76 | 8,87 | 16,89 | | | 6,81 | 5,52 | 0,66 |
| $\overline{X}$ | | 33,50 | 7,92 | 16,58 | | | - | - | 0.52 |

The correlation coefficients for NHI and GY (0.65**, 0.49**) and NHI and BY (0.37**, 0.33**) were significant in the second and third year. The relation between NHI and indicators of DM accumulation, utilization and distribution vary depending on the year (Nikolic et al., 2011). NHI is very reliable indicator of nitrogen utilization efficiency for protein synthesis and its correlation with GY depends on the intensity of that process. These results indicate the ability of these genotypes to use nitrogen for protein synthesis more efficiently than for grain filling. This feature may change depending on growing conditions.

Table 4: The simple genotypic and phenotypic correlation coefficients between nitrogen harvest index and grain and biological yield

| Indicator | Year | GY | BY |
|---|---|---|---|
| genotypic correlation coefficients | | | |
| NHI | 1<br>2<br>3 | 0,06<br>0,41**<br>0,06 | - 0.13<br>0.19<br>0.07 |
| phenotypic correlation coefficients | | | |
| NHI | 1<br>2<br>3 | 0,10<br>0,65**<br>0,49** | 0.06<br>0.37**<br>0.33** |

## Conclusion

Considering obtained results, it can be concluded that investigated materials represents a desirable variability source and has beneficial relationship between variability components and broader – sense heritability. Therefore, it can be considered as important material for future breeding programs of wheat.

Judging by obtained results, NHI, as physiological indicator, could meet requirements to the wheat selection and breeding in terms of improvement productivity in specific circumstances, characteristic, above all, as appropriate safe food production and ecosystem protection.

The strong and statistically high significant interrelationships between grain and biological yield and wheat nitrogen harvest index were registered. The results could be helpful in wheat breeding and for production efficiency while reducing the adverse impacts on the ecosystem Therefore, the nitrogen harvest index as parameter of wheat nitrogen nutrition efficiency, depending on the circumstances, could be successfully used for the evaluation and selection genotypes, adapted to the low – input systems, ecological and organic agriculture.

## Acknowledgement

This work was supported by Ministry of Education, Science and Technological Development of Serbian Goverment, project TR 31054.

## References

Andersson, A., Johansson, E., Oscarson, P. (2004): Post – anthesis nitrogen accumulation and distribution among grains in spring wheat spikes. J. Agric. Sci. 142: 525 – 533.

Arduini, I., Masoni, A., Ercoli, L, Mariotti, M. (2006): Grain yield, and dry matter and nitrogen accumulation and remobilization in durum wheat as affected by variety and seeding rate. Eur. J. Agron. 25: 309-318.

Baker, D.A., Young, D.L., Huggins, D.R., Pan W.L. (2004): Economically optimal nitrogen fertilization for yield and protein in hard red spring wheat. Agron. J., 96: 116 – 123.

Brancourt -Humel, M., Doussinault, G., Lecomte, C., Berard, P., Le Buance, B., Trottet, M. (2003): Genetic improvement of agronomic traits of winter wheat cultivars released in France from 1946 - 1992. Crop Sci., 43: 37-45.

Burger, M., Jackson, L.E. (2004): Plant and microbial nitrogen use and turnover: rapid conversion of nitrate to ammonium in soil with roots. Plant and Soil 266, 289–301.

Chaudhary, B.D., Pannu, R.K., Singh, D.P., Singh, V.P. (1999): Genetics of metric traits related with biomass partitioning in wheat under drought stress. Ann. Biol., 12: 361 – 367.

Chen, C., Han, G., He, H., Westcott, M. (2011). Yield, protein, and remobilization of water soluble carbohydrate and nitrogen of three spring wheat cultivars as influenced by nitrogen input. Agron. J., 103:786-795.

Delmer, D. (2005): Agriculture in the developing world: connecting innovations in plant research to downstream applications. Proceedings of the National Academy of Sciences, USA 102: 15739–15746.

Flowers, W., Weisz, R., Heiniger, R., Osmond, D., Crozier, C. (2004): In – season optimization and site – specific nitrogen management for soft red winter wheat. Agron. J. 96:124 – 134.

Gallais, A., Coque, M. (2005): Genetic variation and selection for nitrogen use efficiency in maize: a synthesis. Maydica, 50: 531–537.

Gorjanovic, B., Brdar-Jokanovic, M., Kraljevic-Balalic, M. (2011). Phenotypic variability of bread wheat genotypes for nitrogen harvest index- Genetika, 43(2): 419 -426.

Haberle, J., Svoboda, D., Krejchova, J. (2006): Uptake of mineral nitrogen from subsoil by winter wheat. Plant Soil Environ., 52: 377 – 384.

Hirel, B., Bertin, P., Quilleré, I., Bourdoncle, W., Attagnant, C., Dellay, C. (2001): Towards a better understanding of the genetic and physiological basis for nitrogen use efficiency in maize. Plant Physiology, 125:1258-1270.

Hirel, B., le Gouis, J., Ney, B., Gallais, A. (2007): The challenge of improving nitrogen use efficiency in crop plants: toward a more central role of genetic variability and quantitative genetics within integrated approaches. J. Exp. Bot., 58: 2369-2387.

Le Gouis, J., Beghin, D., Heumez, E., Pluchard, P. (2000). Genetic differences for nitrogen uptake and nitrogen utilization efficiencies in winter wheat. Eur. J. Agron., 12: 163-173.

Lopez – Bellido, L., Lopez – Bellido, R.J., Redondo, R. (2005): Nitrogen efficiency in wheat under rained Mediterranean conditions as affected by split nitrogen application. Field Crop Res. 94: 86 – 97.

Nikolic, O., Sorrells, M., Jelic, M., Đalovič, I., Pavlovic, M. (2011): Interaction beetwen indicators of dry matter status and nitrogen nutrition efficiency in the winter wheat. Proceedings of Intenational Conference Soil, Plant and Food Interactions. Mendel University in Brno, Czech Republic, 6th – 8th September, 2011. 316 – 323.

Pathak, R.R., Ahmad, A., Lochab, S., Raghuram, N. (2008): Molecular physiology of plant nitrogen use efficiency and biotechnological options for its enhancement. Current Sci. 94:1394 – 1403.

Patel, A.M., Augustine, N., Patel, D.R. (2004): Nitrogen management for productivity of macaroni wheat (Triticum durum). Indian J. Agron. 49 (3): 168-170.

Shrawat, A.K., Carroll, R.T., DePauw, M., Taylor, G.J., Good, A.G. (2008): Genetic engineering of improved nitrogen use efficiency in rice by the tissue-specific expression of alanine aminotransferase. Plant Biotechnology Journal, 6(7):722 – 732.

Weinkauf, A. M. (2008): Improving wheat yield and grain nitrogen concentration through efficient use of nitrogen fertilizer. Dissertation. South Dakota State University. 1 – 71.

Walley, F, Yates, T., van Groeningen, J.W., van Kessel, C. (2002): Relationships between soil nitrogen availability indices, yield, and nitrogen accumulation of wheat. Soil Science Society American Journal, 66: 1549–1561.

van Ginkel, M., Ortiz – Monasterio, R., Trethowan, R., Fernandez, E. (2001): Methodology for selecting segregating populations for improved N use efficiency in bread wheat. Wheat in a global environment. Kluwer Academic Publishers, Netherland. 611 – 620.

Zivanovic, T. (1997), The influence of recombination to variability of quantitative traits of ZPSinEP corn populations (*Zea mays* L.), *Doctoral thesis*, Faculty of Agriculture, Zemun, 1 – 123.

Zivanovic, T., Vuckovic, S., Prodanovic, S., Todorovic, G. (2006): Evaluation of inbred lines as sources of new alleles for improving elite maize hybrid. Cereal Research Communications, 34(2-3): 941-948.