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EFFECT OF NITROGEN AND ECOLOGICAL FACTORS ON QUALITY OF WINTER TRITICALE CULTIVARS

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Field experiments were conducted during three growing seasons of (2004/05, 2005/06 and 2006/07) to investigate the effect of various nitrogen doses on quality components of two winter triticale cultivars (Favorit and Trijumf). Nitrogen fertilizers are applied in four doses: N_1= 60 kg N ha^{-1}, N_2= 90 kg N ha^{-1} and N_3= 120 kg N ha^{-1}. Analysis of sedimentation, gluten content, and rheological flour and dough properties were done. The results showed that N fertilization significantly increased investigated quality traits

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in both cultivars. The highest sedimentation value and gluten content established with application of 120 kg N ha^{-1}. Triticale cultivars reacted positively to nitrogen increasing, and its rheological flour and dough properties increased with N increasing. Nevertheless, quality of investigated cultivars belonged to C_2 quality group. By the analysis of variance established high significant differences in mean values of sedimentation, wet gluten content and water absorption among the cultivars (A), years (B) and supplied nitrogen doses (C)**.** All interactions (AB, AC, BC and ABC) were significant for wet gluten content, but for sedimentation only AB interaction, while of water absorption was only significant interaction BC.

Key words: gluten, nitrogen, quality, sedimentation, rheological properties, triticale

INTRODUCTION

Triticale (*Triticosecale* Wittmack), a species resulting from the intergeneric crossing of wheat and rye, has the potential to introduce valuable economic and environmental benefits to grain production systems (IGNE *et al*., 2007). Modern winter triticale cultivars show higher yields and good adaptation to different soils and environments than wheat. Their flour is rich in proteins (average 14–15%), suggesting a promising use for the production of human foods (TÄHT *et al*., 1998; VARUGHESE *et al*., 1996). Low gluten content, poor gluten strength and high levels of alpha-amylase activity caused mainly by pre-harvest sprouting generally result in triticale flour with weak dough that is unsuitable for many bread-making operations. However, there is pre-harvest sprouting tolerance and gluten quality variability in triticale, which allows breeders to select for improved dough quality (AMAYA and PEÑA, 1991) and therefore bread-making quality.

Although in many cases triticale has proven suitable as a food grain, its food use has not reached the commercial level. Given its generally inferior bread making quality than wheat, triticale flour is not considered suitable for bread making, particularly if wheat flour is available. In a cases, when wheat is in short supply, triticale can use for bred making, particularly by small landholders, alone or blended with wheat (PEÑA and AMAYA, 1992). Whole and refined triticale flours have been evaluated for their suitability in the preparation of baking products, such as different types of bread, oriental noodles and soft wheat type products. It is apparent that the next major breakthrough in triticale breeding, production and utilization will be its development as a human food (SALMON *et al*., 2004).

Technological quality of triticale is a very complex character, which depends on the genetic potential of cultivars, production practices and agro-ecological conditions. Plant nitrogen nutrition has a great impact on the technological quality of triticale cultivars. Nitrogen, in interaction with other elements of mineral nutrition, plays a significant role in the triticale yield and quality.

For high yield and grain quality, it is necessary to adopt nitrogen by plants during the whole vegetation period (JOLANKAI and NEMETH, 2002). The desirable

cultivars for high grain yield and quality traits need to express genetic potential in different environment of growing (JOSHI *et al*., 2002). High temperatures after anthesis have negative influence in grain filling. Also, decreases of grain weight could be influenced by abiotic stress in early stage of filling what is the expressed in reduction of protein and starch accumulation (KNEŽEVIĆ *et al*., 2007; BALLA *et al*., 2008). However the mechanism by which genotype and environmental factors modified the accumulation of the protein fractions are unknown.

In the Small Grains Research Centre Kragujevac, triticale-breeding program was directed to selection for yield increasing and quality improving. New cultivars possess good quality and can be use for bread making in the mixture with high-quality cultivars of wheat (ZEČEVIĆ *et al*., 2005).

The aim of this study was to investigate grain quality of winter triticale cultivars in dependence to different nitrogen nutritions and ecological factors.

MATERIAL AND METHOD

Two winter triticale cultivars (Trijumf and Favorit) were grown in a trial field of the Small Grains Research Centre Kragujevac during three years (2004/05, 2005/06 and 2006/07). The experiment was performed in a randomized block design with three replications with plot of $5m^2$ size on the smonitza soil. The experimental treatments involved the application of various rates of nitrogen: N_1= 60 kg N ha^{-1}, N_2= 90 kg N ha^{-1} and N_3= 120 kg N ha^{-1}. The fields were prepared with standard production practices for triticale cultivars. Whole of P and K and half of N (300 kg ha^{-1} NPK) was applied at sowing time and remaining nitrogen was applied after hibernation at the tillering stage in early spring in the form of KAN fertilizer (60, 90 and 120 kg N ha^{-1}). Grain samples for each cultivar from three replications were used for quality analysis. The quality analysis (Zeleny sedimentation test, wet gluten content, water absorption, quality number and quality group) were done by ICC standard methods No. 116, 106 and 115, respectively (1972, 1982).

The analysis of variance was calculated according to a random block system with three factors. The significant differences among the means were grouped according to least significant difference (LSD) test (HADŽIVUKOVIĆ, 1991).

Climatic conditions during growing seasons

For the better understanding of the efficiency of the applied nitrogen doses, the climatic conditions prevailing during the trial should be described (Table 1).

Average temperatures were similar during first (8.5°C) and second (8.3°C) investigated years, which also were similar according to the long-term period (8.5°C). In 2007, average temperature was higher than in the previous both years and long-term period. Mainly differences were in the winter period when plants were in hibernation that did not significant influenced on plant growing.

Sums of precipitation were higher in 2005 (490.8 mm) and 2006 (533.7 mm) than in 2007 (369.9 mm) investigated year. According to long-term period, precipitations in 06/07 vegetative period were lower for 47.9 mm, while in 04/05 and 05/06 were higher for (73.0 mm, 115.9 mm, respectively). In May 2007 were higher

precipitations in relation with other two investigated years and long-term period, but in April 2007 was only 3.6 mm, when was drought period which negatively influenced on plant growing.

Table 1. Monthly and mean temperatures and monthly and cumulative precipitation

Month	Temperature (°C)				Precipitation (mm)			
	04/05	05/06	06/07	1990-2000	04/05	05/06	06/07	1990-2000
X	14.7	11.5	13.3	11.83	50.1	49.0	16.7	61.02
XI	6.8	5.6	7.6	6.4	121.3	54.8	13.7	44.29
XII	3.0	3.3	3.5	1.71	19.7	47.1	51.9	44.65
I	1.5	-1.7	6.1	- 0.1	36.6	27.9	45.3	30.04
II	-1.5	1.5	6.3	2.62	66.9	38.1	32.1	29.87
III	4.5	5.6	9.1	5.99	43.6	116.1	62.9	33.21
IV	11.6	12.7	12.1	11.6	43.3	86.3	3.6	52.88
V	16.4	16.4	18.2	16.37	70.2	29.6	118.4	52.57
_VI	19.2	19.7	22.8	20.37	39.1	84.8	25.3	69.28
$\bar{x}$ / $\sum$	8.5	8.3	11.0	8.5	490.8	533.7	369.9	417.8

RESULTS AND DISCUSSION

The physical characteristics and proximate chemical composition of triticale grain are in general intermediate between its two parent species. Compared to wheat, triticale shows better protein and lysine contents with, but this species has genetically lower technological quality than wheat, because its proteins are poor quality. Proteins play major role in determination of quality of grain, flour, dough and bread (TORBICA *et al.*, 2007). Triticale quality depends on their genetic nature and influence of environment factors (JOHANSSON, 2002), and can be enhanced using N fertilizer. In this study, the sedimentation value was determined as one of important parameters for bread-making quality. Well known that Zeleny sedimentation value is important quality component because, it is in significantly positive correlation with bread volume and quality (TOHVER *et al*. 2005; ZEČEVIĆ *et al*., 2010). In this study, sedimentation value depends significantly to genotype and highly influenced by agro ecological factors and plant nitrogen nutrition (*Table 2)*. In this investigation, the highest sedimentation value was established in N_3 variant for both investigated cultivars. Sedimentation value was increasing with nitrogen increasing for about two units from N_1 to N_3 variants at both cultivars. Cultivar Trijumf (17.89 ml) have shown higher mean sedimentation values than cultivar Favorit (15.02 ml) in all investigated variants of N application. The sedimentation value varied from 13.33 ml (Favorit in 2006 year and N_1 variant) to 19.67 ml (Trijumf in 2005 and 2006 years and N_3 variants). These results are in accordance with the results, which are published by TOHVER *et al*. (2005).

By the analysis of variance established high significant differences in mean values of sedimentation among the cultivars, years and applied nitrogen doses**.**

Interaction cultivar x year was high significant, whereas interactions cultivar x N-dose, year x N-dose and cultivar x year x N-dose were not significant *(Table 2).*

Table 2. Mean values (ml) and analysis of variance for sedimentation value of winter triticale

Year (B)	N-dose (C)	Cultivar (A)		$\bar{x}$ B	Source	DF	MS	F	LSD	
		Favorit	Trijumf						0.05	0.01
2005	N1	15.67	17.00	16.33	R	2	0.68	-	-	-
	N2	16.33	18.00	17.16	A	1	109.80	133.50**	0.501	0.672
	N3	17.17	19.67	18.42	B	2	11.91	14.48**	1.300	2.999
2006	N1	13.33	18.00	15.66	AB	2	11.24	13.67**	1.839	4.242
	N2	13.67	18.33	16.00	C	2	20.52	24.95**	1.300	2.999
	N3	15.00	19.67	17.33	AC	2	0.52	0.63^{ns}	-	-
2007	N1	13.67	15.33	14.50	BC	4	0.35	0.43^{ns}	-	-
	N2	14.67	16.67	15.67	ABC	4	0.13	0.16^{ns}	-	-
	N3	15.67	18.33	17.00	Error	34	0.82	-	-	-
$\bar{x}$ A		15.02	17.89	-	-	-	-	-	-	-

Legend: N_1 =60 kg N ha^{-1}, N_2 =90 kg N ha^{-1} and N_3 = 120 kg N ha^{-1}

Gluten content have shown similar tendency as sedimentation value. Both of these quality components directly depend by grain protein content, especially by storage protein components. Gliadins and glutenins are the main components of storage proteins and have a positive influence on gluten quality (METAKOVSKY *et al*., 1991; MENKOVSKA *et al*., 2002; ĐUKIĆ *et al*., 2008).The results have shown that wet gluten content was generally low to middle because triticale proteins behave as that of rye, and are too low to yield good quality bread (TOHVER *et al*., 2005). In general, as nitrogen increased the wet gluten content also increased in both cultivars and all investigated years. Wet gluten content was the highest in N_3 variant in average for all cultivars and years, and the lowest in N_1 variant. With increasing of N-dose, gluten content increased in all investigated years and cultivars, which suggested with previous investigations (ALARU *et al*., 2003; *VUCANS* and *LIVMANIS, 2004).*

The analysis of variance established significant differences in mean values of wet gluten content among the cultivars, years, N-doses, and its interactions (cultivar x year, cultivar x N-doses, year x N-doses, and cultivar x year x N-doses), Table 3.

Rheological properties. - In triticale, the portion of storage protein that does not form wheat-like gluten was inherited from rye. These differences in the amount and composition of storage proteins are the main factors responsible for the inferior bread-making quality of triticale as compared to wheat. Triticale bread-making dough shows deficient viscoelasticity and poor handling properties, and yields breads with low loaf volumes and compact crumb (PEÑA, 2004).

Table 3. Mean values (%) and analysis of variance for wet gluten content of winter triticale

Year (B)	N-dose (C)	Cultivar (A)		$\bar{x}$ B	Source	DF	MS	F	LSD	
		Favorit	Trijumf						0.05	0.01
	N_1	20.53	18.45	19.49	R	2	0.71	-	-	-
2005	N_2	21.35	22.25	21.80	A	1	5.83	25.40**	0.263	0.352
	N_3	23.31	25.47	24.39	B	2	40.27	175.47**	0.324	0.435
	N_1	17.47	17.37	17.42	AB	2	2.19	9.55**	0.458	0.616
2006	N_2	19.25	18.53	18.89	C	2	58.76	256.09**	0.324	0.435
	N_3	19.63	20.33	19.98	AC	2	9.09	39.59**	0.458	0.616
	N_1	17.70	18.17	17.94	BC	4	1.35	5.90**	0.562	0.754
2007	N_2	19.52	20.33	19.92	ABC	4	2.19	9.525**	0.794	1.066
	N_3	20.42	23.19	21.80	Error	34	0.23	-	-	-
$\bar{x}$ A		19.91	20.45	-	-	-	-	-	-	-

Legend: N_1 =60 kg N ha^{-1}, N_2 =90 kg N ha^{-1} and N_3 = 120 kg N ha^{-1}

Water absorption is an important flour characteristic, which directly *affects* the yield of bread. Analyzed cultivars showed mean value of water absorption above 55 % (Table 4). Mean results varied from *55.27 %* (in N_1 variant and 2005 year) to *63.44 % (N_3, 2007).* Cultivar Favorit had higher mean water absorption (63.00 %) than Trijumf (58.92 %). The highest water absorption had Favorit (65.50 %, N_3 variant in 2007 year). Water absorption depended to nitrogen nutrition, and the highest mean values established in N_3 variant.

By the analysis of variance established high significant differences in mean values of water absorption among cultivar, year, N-dose, and year x N-dose interaction. Cultivar x year, cultivar x N-dose and cultivar x year x N-dose interactions were not significant (Table 4).

Environmental factors through different investigated years strongly influenced the sedimentation value, wet gluten content and water absorption, even though there was also a significant genotype effects shown by analysis of variance, what is in agreement with results of previous investigations for triticale and wheat (TOHVER *et al*., 2005; ZEČEVIĆ *et al*., 2007, 2009).

Increasing of N rate led to increased sedimentation value, wet gluten content and water absorption in both investigated cultivars. The best quality is achieved when applying 120 kg N ha^{-1}. In this investigations established higher influence of nitrogen fertilizers to increasing gluten content, whereas lower influence to rheological flour and dough properties, which are in agreement with earlier investigations for triticale and wheat (STANKOWSKI *et al*., 2004; PEPÓ *et al*., 2005; AGUIRRE *et al*., 2006). In this research, nitrogen nutrition had a significant impact on the rheological quality of flour, but triticale cultivars kept rheological quality at the level of C_2-quality group, because this species of cereal has low genetic potential for quality. As the triticale quality is low, it is possible to produce the triticale breads with an addition of wheat flour. Flour from the triticale cultivars can be use in bread

making by mixing it with up to 30 % wheat flour (TOHVER *et al*. 2000, 2005, NAEEM *et al*., 2002; ZEČEVIĆ *et al*., 2005; EREKUL and KÖHN, 2006).

Table 4. Mean values (%) and analysis of variance for water absorption of winter triticale

Year (B)	N-dose (C)	Cultivar (A)		$\bar{x}$ B	Source	DF	MS	F	LSD	
		Favorit	Trijumf						0.05	0.01
	N_1	57.37	53.17	55.27	R	2	6.23	-	-	-
2005	N_2	58.33	56.57	57.45	A	1	225.71	232.79**	0.544	0.730
	N_3	63.33	59.03	61.18	B	2	120.90	124.70**	0.667	0.896
	N_1	64.67	59.93	62.30	AB	2	1.51	1.56^{ns}	-	-
2006	N_2	64.87	60.80	62.84	C	2	27.42	28.28**	0.667	0.896
	N_3	64.40	60.10	62.25	AC	2	0.46	0.47^{ns}	-	-
	N_1	63.97	60.00	61.98	BC	4	15.64	16.13**	1.156	1.551
2007	N_2	64.60	59.27	61.94	ABC	4	1.82	1.88^{ns}	-	-
	N_3	65.50	61.37	63.44	Error	34	0.97	-	-	-
$\bar{x}$ A		63.00	58.92	-	-	-	-	-	-	-
Average quality number/ group		62.8/C_2	57.7/C_2	-	-	-	-	-	-	-

Legend: N_1 =60 kg N ha^{-1}, N_2 =90 kg N ha^{-1} and N_3 = 120 kg N ha^{-1}

CONCLUSIONS

Fertilizing of triticale cultivars with nitrogen at the tillering stage in early spring increased the sedimentation value, wet gluten content and water absorption. The highest values of sedimentation and wet gluten content are established in N_3 variant, when applied 120 kg N ha^{-1}. With increasing N-dose technological quality of triticale cultivars improved, but is retained at the level of the third class and C quality group because triticale has a lower genetic potential for quality than wheat. The results have shown that the best quality of triticale was with nitrogen applied of 120 kg N ha^{-1}. Trijumf had a higher mean sedimentation value, wet gluten content and quality number, whereas Favorit had higher mean water absorption.

By the analysis of variance established high significant differences in mean values of sedimentation, wet gluten content and water absorption among the cultivars (A), years (B) and supplied nitrogen doses (C)**.** All interactions (AB, AC, BC and ABC) were significant for wet gluten content, but for sedimentation only AB interaction, while of water absorption was only significant interaction BC.

Examined triticale cultivars have acceptable grain quality and in the mixture with high quality wheat cultivars can be use for the production of bread.

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REFERENCES

AGUIRRE, O., J. RUBIOLO, P.D. RIBOTTA, J.S. LUJÁN, G.T. PERÉZ, and A.E. LEÓN (2006): Effects of incident radiation and nitrogen availability on the quality parameters of triticale grains in Argentina. Expl. Agric. *42*: 311-322.

ALARU, M., U. LAUR, and E. JAAMA (2003): Influence of nitrogen and weather conditions on the grain quality of winter triticale. Agronomy Research *1* (1): 3-10.

AMAYA, A. and R. J. PEÑA (1991): Triticale industrial quality improvement at CIMMYT: Past, present and future. In Proc. 2nd Int. Triticale Symp., Passo Fundo, Rio Grande do Sul, Brazil, 1-5 Oct. 1990, p. 412-421. Mexico, DF, CIMMYT.

BALLA, K., I. KARSAI, and O. VEISZ (2008): Analysis of the quality of wheat varieties at extremely high temperatures. Cereal Research Communications *37*:13-16.

ĐUKIĆ N., D. KNEŽEVIĆ, and V. ZEČEVIĆ (2008): Genetic determination of technological quality in *Triticum durum*. Periodicum Biologorum *110* (3): 285-289.

EREKUL, O. and W. KÖHN (2006): Effect of weather and soil conditions on yield components and bred-making quality of winter wheat (*Triticum aestivum* L.) and winter triticale (*Triticosecale* Wittm.) varieties in North-East Germany. Journal of Agronomy & Crop Science *192* (6): 452-464.

HADŽIVUKOVIĆ, S. (1991): Statistical methods with applications in agriculture and biological research. Second edition. Faculty of Agriculture, Novi Sad.

ICC (1972, 1982). Standard methods of the international association of cereal chemistry. Methods No. 106, 115, 116. Detmold, Germany.

IGNE, B., L. R. GIBSON, G. R. RIPPKE, A. SCHWARTE, and C. R. HURBURGH (2007): Triticale moisture and protein content prediction by near-infrared spectroscopy (NIRS). Cereal Chem. *84* (4): 328-330.

JOLANKAI, M. and T. NEMETH (2002): Crop responses induced by precision management techniques. Acta Agronomica Hungaria, *50* (Suppl.): 173-178.

JOSHI, S.K., S.N. SHARMA, D.L. SINGHANIA, and R.S. SAIN (2002): Genetic analysis of quantitative and quality traits under varying environmental conditions in bread wheat. Wheat Information Service *95*: 5-10

KNEŽEVIĆ, D., A. PAUNOVIĆ, M. MADIĆ, and N. ĐUKIĆ (2007): Genetic analysis of nitrogen accumulation in four wheat cultivars and their hybrids. Cereal Research Communications *35* (2): 633-336.

MENKOVSKA, M., D. KNEŽEVIĆ, and M. IVANOSKI (2002): Protein allelic composition, dough rheology and baking characteristics of flour mill streams from wheat cultivars with known and varied baking qualities. Cereal Chemistry *79* (5): 720-725.

METAKOVSKY, E.V., D. KNEŽEVIĆ, and B. JAVORNIK (1991): Gliadin allele composition of Yugoslav winter wheat cultivars. Euphytica *54*: 285-295.

NAEEM, H.A., N.L. DARVEY, P.W. GRASS, and F. MACHRITCHIE (2002): Mixing properties, baking potential and functionality changes in storage proteins during development of triticale-wheat flour blends. Cer. Chem. *79*: 332-339.

PEÑA, R. J. and A. AMAYA (1992): Milling and bread making properties of wheat-triticale grain blends. J. Sci. Food Agric. *60*: 483-487.

PEÑA, R. J. (2004): Food uses of triticale. In: Triticale improvement and production, ed. M. Mergoum and H. Gómez-Macpherson. Fao plant production and protection paper *179*, 37-48.

PEPÓ, P., P. SIPOS, and Z. GYORI (2005): Effect of fertilizer application on the baking quality of winter wheat varieties in a long-term experiment under continental climatic conditions in Hungary. Cereal Research Communications *33* (4): 825-832.

SALMON, D.F., M. MERGOUM, and H. GÓMEZ-MACPHERSON (2004): Triticale production and management. In: Triticale improvement and production, ed. M. Mergoum and H. Gómez-Macpherson. Fao plant production and protection paper *179*, 27-36.

STANKOWSKI, S., G. PODOLSKA, and K. PACEWICZ (2004): The effect of nitrogen fertilization on yielding and grain quality of winter wheat cultivars. *Annales UMCS, Sec. E.* 59 *(3): 1363-1369.*

TÄHT, R., A. KANN, P. KASEARU, E. JAAMA, and M. VIJAND (1998): Baking qualities of winter triticale. In Food and nutrition 5: 76–83. Tallinn Technical University: Estonia.

TOHVER, M., R. TÄHT, A. KANN, and I. RAHNU (2000): Investigation of seed storage protein and bread-making quality of triticale. Acta Agronomica Hungarica *48* (1): 41–49.

TOHVER, M., A. KANN, R. TÄHT, A. MIHHALEVSKI, and J. HAKMAN (2005): Quality of triticale cultivars suitable for growing and bread-making in northern conditions. Food Chemistry *89*: 125–132.

TORBICA, A., M. ANTOV, J. MASTILOVIĆ, and D. KNEŽEVIĆ (2007): The influence of changes in gluten complex structure on technological quality of wheat (*Triticum aestivum* L.). Food Research International *40*: 1038-1045.

VARUGHESE, G., W. PFEIFFER, and R. J. PEÑA (1996): Triticale (Part 1): A successful alternative crop. Cereal Foods World *41* (7): 474-482.

VUCANS, R. and *J. LIVMANIS (2004): Soil agrochemical parameters and grain quality indices change in crop rotation. Annales UMCS, Sec. E.* 59 *(4): 1533-1542.*

ZEČEVIĆ, V., D. KNEŽEVIĆ, and D. MIĆANOVIĆ (2005): Technological quality of wheat-triticale flour blends. Tractors and power machines *10* (2): 448-453.

ZEČEVIĆ, V., D. KNEŽEVIĆ, and D. MIĆANOVIĆ (2007): Variability of technological quality components in winter wheat. Genetika *39* (3): 365-374.

ZEČEVIĆ, V., D. KNEŽEVIĆ, J. BOŠKOVIĆ, and M. MADIĆ (2009): Effect of genotype and environment on wheat quality. Genetika *41* (3): 247-253.

ZEČEVIĆ, V., D. KNEŽEVIĆ, J. BOŠKOVIĆ, D. MIĆANOVIĆ, and G. DOZET (2010): Effect of nitrogen fertilization on winter wheat quality. Cereal Research Communications *38* (2): 244-250.

UTICAJ AZOTA I EKOLOŠKIH FAKTORA NA KVALITET SORTI OZIMOG TRITIKALEA

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I z v o d

U ovom radu je ispitivan uticaj različitih doza azota na tehnološki kvalitet dve sorte ozimog tritikalea (Favorit i Trijumf). Istraživanja su obavljena u poljskom ogledu tokom tri vegetacione sezone (2004/05, 2005/06 i 2006/07). Primenjene su tri doze azota u prihranjivanju: N_1= 60 kg N ha^{-1}, N_2= 90 kg N ha^{-1} i N_3= 120 kg N ha^{-1}. Urađene su analize sedimentacione vrednosti, sadržaja glutena i reološke osobine brašna i testa. Rezultati su pokazali značajno povećanje vrednosti ispitivanih osobina kvaliteta sa povećanjem doze azota. Najveće vrednosti sedimentacije i sadržaja glutena ostvarene su pri primeni 120 kg N ha^{-1}. Sorte tritikalea su pozitivno reagovale na povećanje doze azota, ali su se reološke osobine brašna zadržale na nivou C_2 kvalitetne grupe. Analizom varijanse su ustanovljene visoko značajne razlike u srednjim vrednostima za sedimentaciju, sadržaj glutena i apsorpciju vode između sorti (A), godina (B) i doza azota (C). Interakcije AB, AC, BC i ABC su bile visoko značajne za sadržaj glutena, a za sedimentacionu vrednost samo interakcija AB, dok je za apsorpciju vode bila visoko značajna interakcija BC.

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