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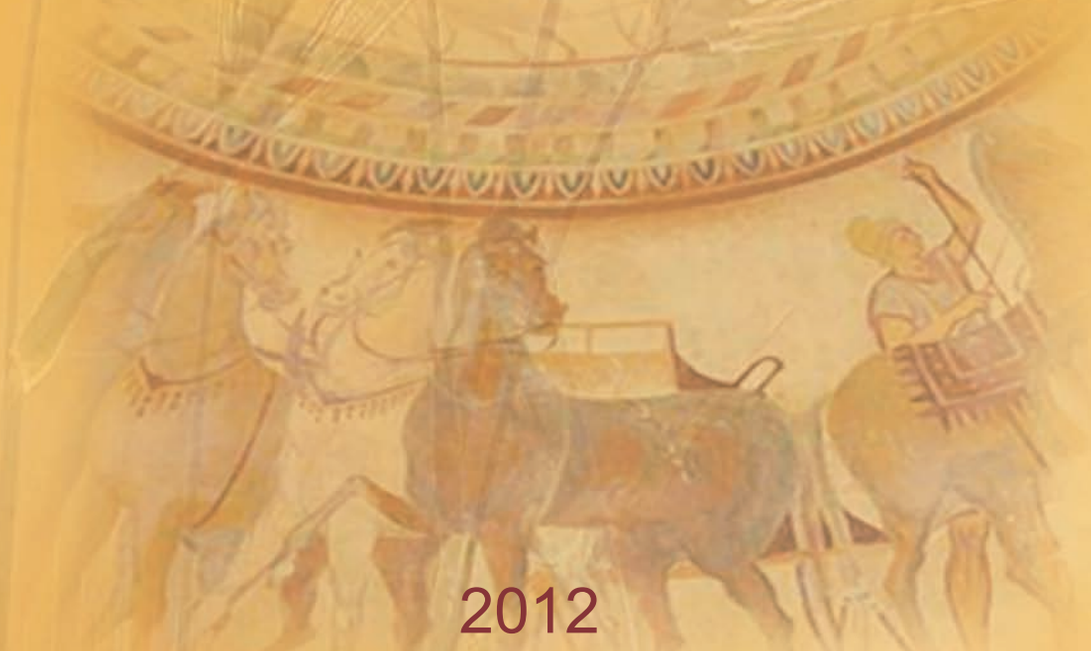

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Technological evaluation of new common winter wheat lines developed at Dobrudzha Agricultural Institute – General Toshevo

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Abstract. *This study investigated the changes in the technological properties of common winter wheat lines of the latest generation of DAI breeding during the period 2004 – 2008. The dynamics of meteorological factors during the years of investigation typical for the region of Dobrudzha allowed better evaluation of the quality of the cultivars under biotic and abiotic stress. The results from the investigation showed that cultivars Aglika, Dona, Enola, Bolyarka and Iveta were a contribution to the breeding reality of quality wheat in Bulgaria. The degree of modification of most of the technological indices of the investigated cultivars was significant and depended on the source of variation (genotype, environment and the genotype x environment interaction). The genotype effects were most important in determining glassiness, sedimentation, pharinograchic value and the characteristics of bread (>50%). The effect of the year was lower (<30%). The percent of the cultivar x year interaction was significant for wet gluten yield in 70 % flour and the pharinographic stability of dough (>70 %). The increase of the mean daily relative air humidity and the sum of rainfalls during the first decade of June had on the whole a negative effect on test weight, glassiness and partially – on wet gluten in 70 % flour of cultivars Karat, Aglika, and Iveta. The high mean daily air temperature during the first decade of June had a negative effect on bread volume, form resistance, crumb quality, dough stability and sedimentation of most of the investigated cultivars.*

Keywords: winter wheat, quality, cultivars, environment

Introduction

There is a traditional high interest to the quality and the biological nourishing values of wheat grain. The deficiency of high-quality grain determines the search for ways of its production. The frequent climatic anomalies during the period of wheat growth and the complex polygenic character of wheat quality do not allow the full expression of its nature (Acreche and Slafer, 2009; Corbellini et al., 1988; Dencic and Kobiljski, 2008; Herndl et al., 2008; Paunescu and Boghic, 2008). Since each region is a specific environmental complex, including specific expression of favorable and extreme ecological factors, each breeding program should be directed towards maximum utilization of the favorable environmental factors and resistance towards those kinds of ecological stress which are most limiting for the quality and quantity of yield in the respective soil and climatic zone (Zhuchenko, 2008).

Under the conditions of Dobrudzha Agricultural Institute General Toshevo, Bulgaria the breeding for varieties resistant to the main ecological factors limiting yield and quality is a key direction of research work and an actual basis for higher production of quality grain. Most of our new varieties possess this advantage and their introduction in mass production depends on their ability to realize their quality potential under a wide range of soil and climatic conditions (Titov, 2007; Anwar et al, 2005; Drezner et al., 2005; Matus et al., 2005; Peterson, 1998; Ortiz et al., 2008).

This paper considers the changes in the quality of a group of new common winter wheat cultivars according to the year conditions during a five-year period (2004 – 2008).

Material and methods

The investigation was carried out during 2004 – 2005 and involved the last generation of varieties developed at Dobrudzha Agricultural Institute General Toshevo, Bulgaria (Aglika, Enola, Bolyarka, Iveta, Dona, Kristy, Antonovka and Karat). The trials were designed by the standard method of 15 m^2. The mean grain samples were grinded with milling apparatus MLU-202 to 70 % flour. The following technological indices of grain were determined: test weight (BNS and ISO 9771/2); glassiness (BNS–13378-76); sedimentation (Pumpyanskiy, 1971), wet gluten in 70 % flour (BNS–13375-88), rheological properties of dough (by pharinograph–E–Brabender, ICC 115/1). The bread making properties were analyzed according to the methodology adopted at Dobrudzha Agricultural Institute General Toshevo, Bulgaria. The effect of the year and the cultivar on the respective indices was determined using ANOVA, and the correlations were calculated with the help of Statistica 6.0.

Results and discussion

The period of investigation (2004 – 2008) encompassed years of variable conditions typical for Dobrudzha region. Seasons 2003 – 2004, 2004 – 2005, 2005 – 2006 and 2006 – 2007 were unfavorable for grain quality. During 2007 – 2008 the meteorological conditions were close to the optimal for wheat growing. The temperatures at the beginning of spring in 2004, 2005 and 2007 were above the optimal. Drought had variable effect on the organogenesis of the wheat cultivars at different stages of their development. Grain filling and maturation in 2005 occurred against the background of precipitation above the norm and grain quality was limited by diseases, mainly by fusarium epiphytoty on spike. June rainfalls in 2004, 2006 and 2008 were close to and higher than the norm. The dynamics of meteorological factors by years and their interaction with the cultivar was highly variable, hardly predictable and affecting the expression of the quality indices. The comparison of the technological indices of

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Table.1 Technological properties of flour of the investigated cultivars during 2004-2008

Cultivar	Index								
	1	2	3	4	5	6	7	8	9
Aglika	81.6	34	60	23.,93	4.28	59	737	0.50	4.8
Enola	82.6	80.6	46	22.04	3.10	49	669	0.44	4.9
Bolyarka	80.0	22.6	44	23.07	3.00	49	701	0.46	4.6
Iveta	82.4	56	51	23.32	3.28	53	706	0.45	4.7
Dona	84.1	60.2	48	24.12	3.00	50	706	0.47	4.5
Kristy	79.3	8.5	34	18.73	1.34	41	671	0.45	4.4
Antonovka	78.8	22.9	33	18.47	1.35	39	617	0.44	4.4
Karat	80.8	12.6	28	17.49	1.34	36	618	0.39	4.2
GD5%	2.58	19.88	14.09	7.67	4.30	16.48	83.33	0.06	0.52

Key:1-test weight,kg ; 2-glassiness, %; 3-sedimentation, ml; 4-wet gluten yield,%; 5-dough stability min;6-pharinographic value, cond. un..;7-bread volume, ml; 8- H:D ;9-crumb quality(rate 0-5)

Table 2. Two-factor dispersion analysis of the investigated technological indices

Index	Source of variation					
	Cultivar (A)		Year (B)		Interaction (A x B)	
	ms	F	ms	F	ms	F
Test weight, kg	32.97	20.14*	31.01	18.94*	1.96	1.20
Glassiness, %	6603.91	68.15*	1494.92	15.42*	258.88	2.67*
Sedimentation, ml	1135.93	23.33*	154.29	3.17*	82.82	1.70
Wet gluten yield,%	73.84	5.11*	10.80	0.75	14.19	0.98
Dough stability, min	10.50	2.80*	4.30	1.15	1.63	0.43
Pharinographic value, ycond.un.	594.80	8.93*	97.02	1.46*	29.52	0.44
Bread volume, ml	18559.68	10.90*	15749.93	9.26	1517.85	0.89
H:D	0.01	12.13*	0.00	5.36*	0.00	2.05*
Crumb quality (rate 0-5)	0.51	7.83*	0.28	4.32*	0.07	1.07

the investigated cultivars during the years of investigation allowed determining the specificity of their manifestation. The variation of glassiness and sedimentation in relation to the meteorological conditions during the growing period of cultivars belonging to different grain quality groups was highest (Table 1). The mean values of glassiness varied from 8.5 % (cultivar Kristy) to 80.6 % (cultivar Enola); the values of sedimentation were from 28 ml (cultivar Karat) to 60 ml (cultivar Aglika). Cultivars Aglika, Iveta and Dona possessed high values of sedimentation, wet gluten in 70 % four, rheological properties of dough, bread volume and quality. Cultivars Enola and Dona demonstrated highest and most stable by year test weight and glassiness, which were above the required norm for quality group A; cultivar Kristy exhibited lowest values. Most of the investigated indices decreased their values to various degrees, during both dry and favorable years. The applied dispersion analysis revealed that the phenotypic expression of the studied traits was significantly determined by the genotypic potential of the cultivar (Table 2). The dynamics of meteorological conditions during the years of investigation had significant effect on the degree of expression of test weight, glassiness, sedimentation, pharinographic values, form resistance and bread volume. The variations of glassiness and form resistance of the individual cultivars were significantly influenced by the genotype x year interaction. The percent of variation caused by the genotypic potential of the cultivar was highest for glassiness (77.8 %), pharinographic value (77.4 %) and sedimentation, which can be explained by the variability of the investigated genotypes (Table 3). The contribution of the cultivar for formation of test weight, bread volume, form resistance and bread quality was more than 50 %. The meteorological year conditions had significant effect on the phenotypic expression of test weight and bread volume (>20 %). Wet gluten yield of flour and dough stability (by pharinograph) were significantly and strongly affected by the cultivar x year interaction (>70 %). In spite of the high dependence of sedimentation, dough stability, pharinographic value and bread properties on the cultivar, their expression was affected by the cultivar x year interaction. The effect of the year on the phenotypic variation of sedimentation was comparatively low (5.7 %), but its interaction with the cultivar was higher (21.3 %), indicating a specific phenotypic response of the index resulting from the variations by year of investigation.

The interaction with the environment of the respective cultivars varied; the differences being quite distinct (Table 4).The results showed that the higher mean daily relative air humidity and the sum of rainfalls during the first decade of June had negative effect on test weight, glassiness, and partially – on the amount of wet gluten in 70 % flour (cultivars Karat, Aglika, Iveta), bread volume (cultivars Enola, Bolyarka, Iveta), H:D (cultivars Iveta and Dona) and on crumb quality (cultivar Enola). The high mean daily air temperature during the first decade of June worsened bread volume, form resistance, crumb quality, dough stability and sedimentation of almost all cultivars, also

Table 3. Percent of factors for the change of quality parameters of the investigated wheat cultivars

Index	Percent of factors for the change of quality index parameters (%)		
	Cultivar (A)	Year (B)	Interaction (A x B)
Test weight, kg	56.3	30.3	13.4
Glassiness,%	77.8	10.0	12.2
Sedimentation, ml	73.0	5.7	21.3
Wet gluten yield,%	21.6	7.2	71.2
Dough stability, min	19.8	10.0	70.2
Pharinographic value, cond. un.	77.4	7.2	15.4
Bread volume, ml	55.2	26.8	18.0
H:D	51.7	13.0	35.3
Crumb quality (rate 0-5)	53.6	17.0	29.4

Table 4. Correlation of quality indices with meteorological conditionsduring the first decade of June (2004 - 2008)

Cultivar	Test weight. kg.			Glassiness.%			Sedimentation. ml		
	1	2	3	1	2	3	1	2	3
Aglika	0.58	-0.78	-0.55	0.81	-0.64	-0.58	-0.55	0.84	0.70
Enola	0.48	-0.28	-0.15	0.57	-0.25	-0.49	-0.39	0.06	0.00
Bolyarka	0.40	-0.50	-0.24	0.63	-0.61	-0.48	-0.56	0.83	0.91*
Iveta	0.49	-0.63	-0.37	0.85	-0.84	-0.85	0.35	0.44	0.18
Dona	0.21	0.19	-0.04	0.92*	-0.48	-0.68	-0.07	0.17	0.12
Kristy	0.41	-0.58	-0.31	0.75	-0.73	-0.69	-0.34	0.48	0.25
Antonovka	0.39	-0.49	-0.22	0.54	-0.67	-0.42	-0.15	-0.06	0.28
Karat	0.29	-0.57	-0.25	-0.67	-0.09	0.20	-0.49	0.22	0.13

Cultivar	Wet gluten yield.%			Dought stability. min			Pharinographic value. cond.un.		
	1	2	3	1	2	3	1	2	3
Aglika	0.90*	-0.49	-0.56	0.28	0.39	-0.01	0.25	0.36	-0.05
Enola	-0.33	0.25	0.04	-0.12	0.75	0.65	-0.76	0.70	0.64
Bolyarka	-0.37	0.77	0.67	0.42	0.11	0.13	0.18	0.38	0.37
Iveta	0.98**	-0.62	-0.81	0.22	0.40	0.24	0.10	0.19	0.39
Dona	-0.88	0.77	0.92*	-0.01	0.46	0.50	0.15	0.28	0.30
Kristy	-0.76	0.81	0.69	-0.02	0.54	0.32	-0.58	0.95**	0.79
Antonovka	0.96*	0.66	0.87*	-0.41	0.38	0.66	-0.61	0.93*	0.95**
Karat	-0.18	-0.12	-0.24	-0.32	0.26	0.02	-0.36	0.37	0.11

Cultivar	Bread volume.ml			H:D			Crumb quality (rate 0-5)		
	1	2	3	1	2	3	1	2	3
Aglika	-0.49	0.52	0.30	-0.56	0.78	0.68	0.24	0.07	0.13
Enola	-0.09	-0.30	-0.41	-0.76	0.23	0.34	0.75	-0.74	0.93*
Bolyarka	-0.20	-0.48	-0.38	-0.50	0.55	0.77	-0.07	-0.29	0.09
Iveta	-0.15	-0.17	-0.26	0.64	-0.64	-0.73	0.02	0.57	0.22
Dona	-0.67	0.23	0.25	-0.25	-0.33	-0.29	0.06	0.63	0.30
Kristy	-0.89	0.33	0.49	-0.81	0.92*	0.95**	-0.48	0.80	0.53
Antonovka	-0.68	0.09	0.17	-0.74	0.55	0.84	-0.39	0.45	0.22
Karat	-0.60	0.69	0.50	-0.17	0.43	0.12	-0.60	0.65	0.44

Note 1. Mean daily air temperature,C0;2.Mean daily relative air humidity,%; 3.Sum of rainfalls , ml *- significant at P0,05 **- at P0,01

the content of wet gluten of cultivars Enola, Bolyarka, Dona, Kristy, Antonovka and Karat and the pharinographic value of Enola, kristy, Antonovka and Karat.

The five-year observation on the technological indices of the investigated cultivars showed that the differences between them were due to the planned breeding and the specific environmental

conditions. The interaction of the cultivar with the changeable meteorological factors during the years affected the formation of differences in the phenotypic expression of the technological indices. Thus, for example, the strongest expression of test weight was observed in cultivar Dona (from 84.1 kg in 2006 to 85.5 kg in 2005) followed by cultivars Enola and the lowest – in cultivar Antonovka. Highest glassiness was registered in cultivars Enola and Iveta, and highest sedimentation – in Aglika and Iveta. The sedimentation amplitude was from 19 ml in Karat (2004) to 68 ml in Aglika (2005). The mean values of wet gluten amount were lowest in cultivar Karat (17.5 %) and highest in cultivar Dona (24.1 %). High variability during the years of investigation was observed in cultivars Antonovka, Enola, Karat and Aglika. The results showed that that the growing conditions of these varieties did not guarantee good results during the years of investigation. The observed variability was related to the cultivar x year interaction which was determined by the various degree of response of the cultivars to the environment. In cultivars Dona, Bolyarka, Kristy and Antonovka higher wet gluten was observed at high relative air humidity and good moisture reserves in soil during the first decade of June, while in cultivars Iveta and Aglika the effect increased with the increase of the mean daily air temperature. The comparatively low correlations of wet gluten content in 70 % flour in cultivar Enola with the investigated factors proved its better tolerance to their variability. Similar response was observed with regard to dough stability and the pharinographic value of Iveta, Aglika and Karat. Extremely high negative effect on the values of the investigated indices in 2005 and 2007 was caused by the drought and high temperature (above 30° C) which occurred prior to and during heading stage of wheat. It affected the following indices: wet gluten content in 70 % flour of cultivars Dona, Kristy, Antonovka; pharinographic value of cultivars Enola, Kristy and Antonovka; bread volume of cultivars Dona, Kristy, Antonovka and Karat. The negative changes in the values of the above technological indices were related to disturbances of the water balance of plants and to impeded supply of nutrients to the grain caused by the intensity and duration of the stress and also by the thermal effect suffered by plants prior to the stress (5). Since the cultivars differed by their vegetation period, they were affected by drought at different stages of their development. The limiting effect on their technological properties was probably related to modification in their protein content, especially in the ratio insoluble/soluble protein. The high air humidity and the frequent rainfalls during grain filling and maturation of grain in 2004, 2006 and 2008 had negative effect on the quality of the wheat cultivars, additionally worsened by diseases on wheat caused by powdery mildew, brown rust, fusarium on spike and damages by Sunn pest. Severe damages caused by fusarium were registered in 2005 which considerably deteriorated the quality of grain, especially its physical properties. In such years the size of the interacting effects was higher than the effect of the cultivars. Considering all investigated indices, in accordance with the classification restrictive norms and technological parameters, the analysis on the data from the last six years allowed referring the grain of cultivar Aglika to first quality group in three of the harvest years (2004, 2005 and 2007), and the grain of cultivars Bolyarka (2004, 2007 and 2008), Dona (2004, 2008 and 2009) and Iveta (2004, 2008 and 2009) to the second quality group of increased strength. During the rest of the years these cultivars did not show high quality. During this period the technological parameters of the rest of the investigated wheat cultivars varied from moderate to weak.

The data showed that sedimentation, dough stability, pharinographic value and bread volume and quality were positively affected by the relative air humidity and the rainfalls during the first decade of June. The unfavorable hydro-thermal regime, however, during the subsequent stages of wheat development had negative effect on their grain quality in most of the investigated years. The insufficient mean daily temperature and rainfalls during this period increased the uptake of low molecular soluble carbohydrates and nitrogen substances necessary for the processes of grain respiration, which was one of the reasons for its worsened technological properties (Titov, 2007). Furthermore, the greater part of the investigated wheat cultivars were strong and with increased strength and required well performed agronomy practices. When such practices were not accordingly performed, the cultivars failed to realize their quality potential.

Conclusion

Cultivars Aglika, Dona, Enola, Bolyarka and Iveta are contribution to the breeding reality of quality wheat in Bulgaria. The degree of modification of most of the technological indices of the investigated cultivars was significant and depended on the source of variation (genotype, environment and their interaction). The genotypic effects were most important for determining glassiness, sedimentation, pharinographic value and quality and the properties of bread (>50 %). The effect of the year was lower (<30 %). The percent of the cultivar x year interaction was significant for wet gluten in 70 % flour and pharinographic dough stability (>70 %). The increase of the mean daily relative air humidity and the sum of rainfalls during the first decade of June had a general negative effect on test weight, glassiness and partially on the amount of wet gluten in 70 % flour of cultivars Karat, Aglika and Iveta. The high mean daily air temperature during the first decade of June deteriorated bread volume, form resistance, crumb quality, dough stability and sedimentation of most of the investigated cultivars.

References

Acreche M and Slafer G, 2009. Grain weight, radiation interception and use efficiency as affected by sink-strength in Mediterranean wheats released from 1940 to 2005, Field Crops Research, 110, 2, 98–105.

Anwar MR, O'Leary G, McNeal D, Hossain H and Nelson R, 2007. Climate change impact on rainfed wheat in south-eastern Australia. Field Crops Research, 104, 1-3, 139-147.

Corbellini M, Mazza L, Ciaffi M, Lafiandra D and Borghi B, 1988. Effect of heat shock during grain filling on protein composition and technological quality of wheats. Wheat: Prospects for global improvement, 213-220.

Dencic S and Kobiljski B, 2008. Results of half century of wheat breeding at Institute of Field and vegetable crops 9n Novi Sad. Proc of International Conference "Conventional and Molecular Breeding of Field and Vegetable Crops" 24-27 November 2008.

Drezner G, Dvojkovic K, Novoselovic D, Horvat D, Guberac V, Maric S, Kovacevic J and Lalic A, 2005. Grain yield and quality of winter wheat cultivars in different environmental condition. 7th international wheat conference, wheat production in stressed environments, 2005, November 27 to December 2-Mar del Plata, Argentina.

Herndl M, White JW, Graev S and Claupein W, 2008. The impact of vernalization requirement, photoperiod sensitivity and earliness

per se on grain protein content of bread eat (Triticum aestivum L.) Euphytica, 163, 309–320.
Matus I, Del Pozo A, Pinares M, Madariaga R and Mellado M, 2005. Characterization of old and new spring wheat cultivars using multivariate analysis. 7th international wheat conference, wheat production in stressed environments, 2005, November 27 to December 2-Mar del Plata, Argentina.
Ortiz R, Sayre K, Govaerts B, Gupta R, Subbarao G, Ban T, Hodson D, Dixton J, Ortiz-Monasterio JI and Reynolds M, 2008. Climate change: Can wheat beat the heat?Agriculture Ecosystems & Environments 126, 1, 46-58.
Paunescu G and Boghic O, 2008. Performance of several wheat cultivars under contrasting conditions of water stress in central part of Oltenia. Romanian Agricultural Research, 25, 13-18.
Peterson CJ, Graybosch RA, Shelton DR and Baenziger PS, 1998. Baking quality of hard winter wheat: response of cultivars of environment in the great plains. Wheat: Prospect for global improvement, 223-228.
Poumpyanskiy AY, 1971. Technological properties of soft wheat, L., 22 (Ru).
Titov YN, 2007. Adaptive response of winter wheat cultivars in the steppe zone of pre-Altai provinces. Thesis for PhD (Ru).
Zhutchenko AA, 2008. Adaptive plant breeding (ecological and genetic basis): theory and practice. Adaptability of cultural species – the basis for development of agrarian civilization. Agrorus, 2008, 1, 814 (Ru).

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The manuscript should be structured as follows: Title, Names of authors and affiliation address, Abstract, List of keywords, Introduction, Material and methods, Results, Discussion, Conclusion, Acknowledgements (if any), References, Tables, Figures.

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The names of the authors should be presented from the initials of first names followed by the family names. The complete address and name of the institution should be stated next. The affiliation of authors are designated by different signs. For the author who is going to be corresponding by the editorial board and readers, an E-mail address and telephone number should be presented as footnote on the first page. Corresponding author is indicated with *.

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Oldenbroek JK, 1999. Genebanks and the conservation of farm animal genetic resources, Second edition. DLO Institute for Animal Science and Health, Netherlands.

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Mauff G, Pulverer G, Operkuch W, Hummel K and Hidden C, 1995. C3-variants and diverse phenotypes of unconverted and converted C3. In: Provides of the Biological Fluids (ed. H. Peters), vol. 22, 143-165, Pergamon Press. Oxford, UK.

Todorov N and Mitev J, 1995. Effect of level of feeding during dry period, and body condition score on reproductive performance in dairy cows, IX th International Conference on Production Diseases in Farm Animals, Sept.11 – 14, Berlin, Germany, p. 302 (Abstr.).

Thesis:

Penkov D, 2008. Estimation of metabolic energy and true digestibility of amino acids of some feeds in experiments with muscus duck (Carina moshata, L). Thesis for DSc. Agrarian University, Plovdiv, 314 pp.

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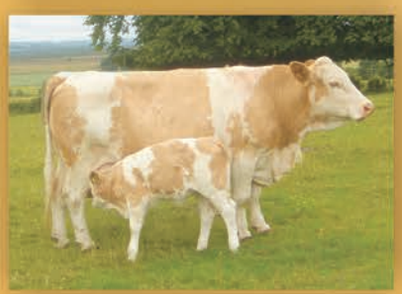

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