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EFFECT OF FEEDING TRITICALE ON PERFORMANCE OF BROILER CHICKS

ABSTRACT

This study was to determine how to investigate the effect of using triticale on growth performance, production and slaughter characteristics of broiler chicks. The research was carried out on 400 for feeding chickens, hybrid Ross 308. The first diet was the standard starter, grower I, grower II and finisher and served as control. The other rations contained 7.5%, 12%, 15% and 18% triticale as graded replacement for maize and wheat. The experiment lasted eating chicken 49nd days. Based on recorded productive traits of examined chicken groups in this investigation conclusion can be drawn that the best results is achieved C-group of chicken for mortality, feed conversion, production index, average body weight of chicken before butchery, handled and cooled carcass weight after 49 days of age.

Keywords: broiler chickens, growth, feeding, triticale

INTRODUCTION

Triticale is very suitable nutrient for all animal variety because it is high resource of energy. Very important parameter of economical relevancy is protein increment per surface unit. Pointed characteristics are important for biological value and technological products quality dedicated as well for human nutrition as for domestic animals nutrition. Nutritive value of grain depends on protein content in the grain, and therefore the product. Proteins with higher content of irreplaceable amino acids have higher nutritive value, where the lysine content is the most important, as the first deficit amino acid on cereals. Triticale has higher percentage of protein and lysine regard the parental species and lower energetic value regard the wheat and maize (Djekic et al., 2011.a, 2013, 2014).

Some studies demonstrated that triticale grains are a good source of protein and energy. For example, Djekic, (2010) reported that triticale grains contain, 13.20-13.61%, 1.20-1.74%, 1.81-2.12%, 70.54-70.73% and 1.34-1.40% for moisture, crude protein, oil content, cellulose, starch and mineral content,

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respectively. Emam, (2010) reported that triticale grains contain, 9.5, 12.50, 1.90, 4.30, 1.00, 70.80% and 3070.00 for moisture, crude protein, ether extract, crude fiber, ash, nitrogen-free extract and MEn kcal/Kg, respectively. The energy content of modern triticale grains cultivars averages about 95 to 100% of that of maize or wheat for poultry and pigs (Boros, 2002 and Barneveld and Cooper, 2002).

Investigations comprehend influence of mixtures in broilers production with the different content of triticale on production results, quantitative and qualitative characteristics of broilers meat. Large number of scientist all around the world investigated nutritive triticale values on production characteristics at heavy line hybrids (Camiruaga et al., 2001), while there were not similar investigations in our country. Barneveld and Cooper, (2002) were examined six triticale varieties in fodder mixtures for broilers fattening. Total nutritive consumption per one kilogram of chicken body muss was fluctuate from 1.75 up to 2.24 kg. They emphases that triticale grain had higher protein content, lysine and methionine, while the digestion was the same like at the wheat and maize grain. Savage et al., (1987) pointed that triticale applying in chicken nutrition increase physical and sensor characteristics of broiled meat. Wheat replacing with triticale in the mixture didn't gain to changes on production and butchery chicken characteristics. Vohra et al., (1991) pointed that with the usage of triticale in the broiler fattening mixture we could solved the problem of commercial enzymes addition in fodder mixtures, what would also reduce the expensive in fodder production. Korver et al., (2004) gave an advantage to triticale regard higher weekly broilers accession under the equal amount of intake nutritive. Hermes and Johanson, (2004) warrant that triticale in nutrition of heavy line hybrids, in the different percentage amounts in the mixture, did not present negative effects on chicken production characteristics. The biggest examined chicken body mass was achieved with 10% triticale participation in fattening broilers fodder mixtures, while largest nutrition conversion was at mixture with 15% of triticale participation. Different formulations, as well as triticale and wheat participation in the fodder mixtures for broilers fattening were examined by Sarver et al., (2006). They concluded that biggest body mass at the end of investigation period achieved broilers feeding with the following formulations: $W_{40}T_{60}$ and $W_{60}T_{40}$. Smallest mortality was improved at the group which was feeding with fodder mixture without triticale.

Because of fore mentioned, objective of this research was to determine the effects of the introduction of triticale on growth rate, foof consumption and feed conversion ratio, as production and slaughtering characteristics of broiler feeding.

MATERIALS AND METHODS

Ross 308 hybrids were used for the investigations. Chickens were assigned in four groups, of 100 birds each. On that occasion, formed four groups of broiler chicks, or treatment, with 100 broiler chicks in each group, namely A-control group (classic mixture for fattening broilers), B-group (mixture with triticale genotype Kg

20), C-group (mixture with triticale genotype Favorit) and D-group (mixture with triticale genotype Trijumf). Trial groups received in the same mixture addition of 7.5%, 12%, 15% and 18% triticale produced in the Center for Small Grains, Kragujevac, Serbia. Chickens were feed four basal diets: starter, grower I, grower II and finisher.

Tab. 1. Ingredient composition of the starter, grower I, grower II and finisher diet

Diet (%)	Starter		Grower I		Grower II		Finisher	
	C	E	C	E	C	E	C	E
Wheat	40.00	40.00	42.00	35.30	43.10	35.10	48.30	35.10
Corn	19.80	12.20	19.00	13.50	19.10	12.00	18.30	13.50
Triticale		7.50		12.00		15.00		18.00
Soybean oil meal	30.90	30.90	28.10	28.10	25.40	25.40	22.00	22.00
Sunflower oil meal	2.50	2.50	3.00	3.00	4.00	4.00	4.00	4.00
Soybean oil	3.15	3.25	4.55	4.70	5.25	5.25	4.70	4.70
Salt	1.20	1.20	1.00	1.10	1.00	1.10	0.80	0.80
Monocalcium phosphate	1.20	1.20	1.10	1.05	0.90	0.90	0.65	0.65
Vitamin-mineral premix	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Total:	100	100	100	100	100	100	100	100

*C-control group, E-experimental groups

**To provide the following per kg of feed: Vit. A-9000 IU; Vit. D_3-3300 IU; Vit. E-30,0 IU; Vit. K-2,2 mg; Vit. B_1-2,2 mg; Vit. B_2-8,0 mg; Ca pantothenate-12 mg; Niacin-66,0 mg; Vit. B_6-4,4 mg; Folic acid 1,0 mg; holin-550 mg; Vit. B_{12}-0,022 mg; Biotin-0,20 mg; Salt-0,30-0,45%; Managanese-100 mg; Zinc-75 mg; Iodine-0,45 mg; Copper-8 mg; Selenium-0,10 mg; Iron-100 mg.

Basic chemical composition (moisture, crude proteins, crude fat and mineral matters) of chicken feed was determined according to official A.O.A.C. (1984).

Table 2. Chemical composition of the starter and grower I diet

The chemical composition:	Starter				Grower I			
	A	B	C	D	A	B	C	D
Crude protein, %	22.37	22.38	22.40	22.40	20.17	20.20	20.25	20.27
Fat, %	6.36	6.37	6.38	6.38	9.51	9.67	9.46	9.54
Metabolic energy, MJ/kg	12.59	12.63	12.63	12.68	13.39	13.39	13.39	13.39
Ca, %	1.29	1.20	1.23	1.16	0.79	0.77	0.85	0.85
P (available), %	0.53	0.47	0.37	0.34	0.42	0.42	0.42	0.42
The chemical composition:	Grower II				Finisher			
	A	B	C	D	A	B	C	D
Crude protein, %	19.70	19.64	19.76	19.82	18.42	18.44	18.50	18.49
Fat, %	9.90	9.78	9.72	9.79	8.47	8.68	8.46	8.54
Metabolic energy, MJ/kg	12.86	12.85	12.87	12.87	13.39	13.39	13.40	13.40
Ca, %	0.79	0.77	0.85	0.85	0.88	0.89	0.90	0.90
P (available), %	0.42	0.42	0.42	0.42	0.64	0.64	0.66	0.66

Content of following elements: calcium and phosphorus are determined according to Regulations for methods for sampling and methods for feed physical, chemical and microbiological analyses (1987).

Diets compositions are presented in Table 1 and chemical composition in Table 2. Fed under the same conditions in the period of 49 days. During whole chickens growing period water and feed were fed *ad libitum*. During feeding the following parameters were followed health state and mortality. Every 7 days body weight was tested. After growing and 12^{h} starving period, chickens were slaughtered, body mass was weighted.

On the basis of achieved research results the usual variation statistical indicators were calculated: average values, error of the mean (arithmetic) and standard deviation. Statistical analysis was made in the module Analyst Program SAS/STAT (SAS Institute, 2000).

RESULTS AND DISCUSSION

During the analysis of the observed production, production results for all groups have been followed closely. The follow up was conducted on a weekly level. It is extended fattening in duration of seven weeks. Average body mass of broilers breed Ross 308 in groups are shown in Table 3.

As it could be seen from the presented results, after the second week the first period of the trail (starter diet), higher live weight achieved C-group (423.83 g). In the second period of the triticale supplementation showed stimulant effects on growth performances, and after the fourth week (grower I diet) experimental C-group had 6.42% higher body weight, comparing to control, while the B- and D-group had slightly lower body weight than A-group. During the 49^{th} day, live weight of chickens from the experimental C-group which were fed triticale cultivar Favorit in mixture was higher by 6.59%, respectively, compared to control A-group, and live weight of chickens from the D-group which were fed triticale cultivar Trijumf, was higher by 2.02%, of chickens fed mixtures without triticale.

Table 3. General performance of broilers given triticale

Parameters	A	B	C	D
Initial weight, g/bird	41.25	41.35	41.98	40.88
Live weight at 2 weeks, g/bird	398.26	390.36	423.83^{a}	395.00
Live weight at 4 weeks, g/bird	987.63^{b}	978.21	1038.42^{a}	963.08
Live weight at 5 weeks, g/bird	1415.26^{b}	1353.42^{d}	1435.76^{a}	1395.58^{c}
Live weight, g/bird	2302.55^{c}	2269.00^{c}	2454.39^{a}	2348.99^{b}
Weekly gain at 2 weeks, g/bird	352.26	335.87	387.24	347.82
Weekly gain at 3-4 weeks, g/bird	573.93	566.67	598.60	553.59
Weekly gain at 5 weeks, g/bird	438.00	349.72	397.88	473.27
Weekly gain at 6-7 weeks, g/bird	866.75	916.39	1016.83	972.42
Feed intake, g/bird	5.682^{c}	5.662^{c}	5.815^{a}	5.703^{b}
Feed conversion ratio	2.468^{a}	2.495^{b}	2.369^{c}	2.429^{b}
Production index	182.784^{b}	176.316^{c}	207.209^{a}	185.518^{b}
Mortality, %	4.0^{c}	5.0^{b}	2.0^{d}	6.0^{a}

*Means in the same row wich different superscript are significantly different ($p<0.05$)

At the end of the trail chickens from experimental C- and D-group had significantly higher body weight ($p<0.001$ and $p<0.01$). Our results are consistent with the results of Sarver et al., (2006) and Djekic et al., (2011.b).

Similarly, with broiler chickens, live body weight did not differ significantly ($p<0.05$) among the wheat/triticale based diets (Hermes and Johnson, 2004 and Korver et al., 2004).

Average daily food consumption of chickens in trial C-group during initial and the fattening period was higher by 2.30% and 5.15% compared to control group. During the entire trial, triticale in the experimental C-group and D-group improved feed intake by 2.34% and 0.37% compared to the control group of chickens. However, with broiler chickens, feed intake, did not differ significantly among the wheat/triticale or corn/triticale based diets (Korver et al., 2004).

The feed conversion ratios (FCR) were significantly increased by inclusion of triticale in the diet during the finishing and overall period when compared with the control. During the finishing period, FCR values for chicks fed dry fat (2.468) were significantly lower compared with the C-group fed triticale cultivar Favorit, but there was significant difference between the C- and D-groups fed triticale Kg 20 and Trijumf. In some reports, triticale feeding has resulted in similar or improved feed efficiency relative to other grains. In quail, Vohra et al. (1991) found no statistically significant differences in feed conversion ratios among quail fed triticale- or corn- based diets to 21 d of age. However, other researchers have observed poorer feed conversion ratios with triticale-based diets in broilers (Djekic, 2010; Djekic et al., 2011b).

Performance index of quails fed triticale the C-group were significantly higher during these periods when compared with those fed the B-group diet, but did not differ when compared with the control (A-group) of triticale (B- and D-groups). Emam (2010), reported that inclusion of triticale in the broiler diets at different levels (from 25 to 100%) caused a significant improve in performance index during the finisher and overall periods compared with those fed the control diet**.** Also, Hermes and Johnson (2004) found that feeding broiler chicks triticale up to 15% with corn did not affect their performance.

In chickens growing, the most evident positive results of the diet with triticale, low mortality should be emphasized (Table 3). In control and experimental group (B, C and D) total number of dead chickens was 4 and 5, 2 and 6 respectively, so concerning better chicken health, the great advantage of triticale in the diet is obvious.

By analysis of values of slaughter yields "conventional processing" it was established that there were significant differences between investigated groups, whereas the slaughter yield "ready to roast" and "ready to grill" in statistically significant differences (Table 4). Insignificantly higher values for all three dressing yields were established in group C, with the addition of triticale Favorit (83.77%, 77.76% and 71.75%), followed by group D with the addition of triticale Trijumf (83.77%, 77.56% and 71.58%, respectively), followed by group B with the addition of triticale Kg 20 (83.32%, 77.29% and 71.25) and group A

(82.29%, 76.46% and 70.68%), control group of chickens was fed mixture without additive triticale.

Table 4. Yield of processed carcasses

Group	Sex	Trait	Body mass prior to slaughter, g	Conventional processing		Ready to roast		Ready to grill	
				Mass, g	Dr.Per %	Mass, g	Dr.Per%	Mass, g	Dr.Per%
A	m+f	x	2433.33	2064.42	82.29	1901.00	76.46	1742.00	70.68
		Sd	202.73	166.19	3.48	149.94	3.32	149.94	3.02
B	m+f	x	2378.75	2012.00	83.32	1873.75	77.29	1708.42	71.25
		Sd	182.63	171.11	1.28	154.47	1.63	137.67	1.64
C	m+f	x	2511.25	2145.08	83.77	1987.92	77.76	1821.00	71.75
		Sd	210.94	184.74	1.47	167.29	1.77	159.79	1.80
D	m+f	x	2467.08	2093.42	83.77	1950.92	77.56	1782.00	71.58
		Sd	213.61	185.29	1.46	182.61	1.76	167.10	1.88

The data obtained on the average values of slaughter yield ready to roast slightly higher than results achieved with chickens fed triticale in tests conducted by Rao et al., (1976) and most are in agreement data quoted by Camiruaga et al., (2001). Besides reduced opportunities for comparisons with data from the literature available, it may be inferred that the study results presented in this paper are in accordance with those reported by Barneveld and Cooper, (2002), Hermes and Johanson, (2004), as well as Djekic et al., (2011.b).

CONCLUSION

Grains of triticale cultivars Kg 20, Favorit and Trijumf from Kragujevac, Serbia produced on field of Center for Small Grains in Kragujevac, has been used for fodder mixture preparing. In that moment there are formed four groups of chicken: A-group: classical mixture for broiler fattening, B-: mixture with genotype Kg 20, C-: mixture with genotype Favorit and D-group: mixture with genotype Trijumf. Based on recorded productive traits of examined chicken groups in this investigation conclusion can be drawn that the best results is achieved C-group of chicken for mortality, feed conversion, production index, average body weight of chicken before butchery, handled and cooled carcass weight after 49 days of age. In regard to slaughter yield (conventional processing, ready to roast and ready to grill), the best results are achieved chickens from C-group and D-group.

Recorded data are showing that triticale had a great potential as fodder in broiler diet, because it could be a successful replacement for wheat in broiler diet mixture. It does not affect significant changes in productive and abattoir traits of chicken, in other words broiler chickens body weight feed with triticale is not significantly different from the same trait of broiler chicken feed with wheat.

Generally, it can be concluded that triticale grains can be substitute by yellow corn and wheat in growing broiler diets to get the best performance and the highest economical and relative efficiency.

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