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THE EFFECT OF TRITICALE GRAIN ON THE PERFORMANCE OF CHICKS FROM BIRTH TO NINE WEEKS OF AGE

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SUMMARY

Triticale grain was used to replace partially or completely corn in diets of chicks from birth to 9 weeks of age. When 50% corn was replaced by an equal weight of triticale, growth rate, feed efficiency, final liveweight and carcass yield were similar to those of chicks fed the all-corn diet. However, the performance of chicks was lower when triticale replaced corn completely. Female chicks produced lighter carcasses and had higher dressing percentage than male chicks. Feathering was reduced with increasing proportion of triticale in the diet and the carcass was white when triticale was the only grain in the diet.

INTRODUCTION

Triticale, a wheat x rye hybrid, is grown in many regions of the world (Hulse and Laing, 1974). In Cyprus certain triticale lines outyielded Athenais barley by 8% and Pitic 62 aestivum wheat by 11% in dryland areas, and durum and aestivum wheat by 20% in irrigated areas (Hadjichristodoulou, 1984). The metabolizable energy (ME) and protein contents of triticale grain were 20 and 13% higher than Athenais barley grain used in sheep diets (Hadjipanayiotou et al., 1985). Triticale grain contained more lysine and sulphur aminoacids than other cereal grains (Allee, 1973), and its ME content was 3.0 Mcal/kg, equal to that of wheat but lower than that of maize (Amerio et al., 1984). When supplemented with lysine and methionine its ME content was equal to that of hard spring wheat (Sell et al., 1962). Triticale grain has been used as an energy source in diets of different classes of livestock (Allee, 1973; Hulse and Laing, 1974) and particularly to replace wheat or maize in diets of growing chicks (Bixler et al., 1968; Bragg and Sharby, 1970).

The objective of the present work was to investigate the possibility of partial or complete replacement of corn by triticale grain in the diet of growing chicks.

MATERIALS AND METHODS

Fifty six birds (28 males and 28 females) were allocated to each of three treatment diets on the basis of the initial liveweight. Treatments were replicated twice in a randomized complete block design, i.e. the trial comprised a total of 336 birds.

Chicks were offered a starter ration containing 22% crude protein from birth to 5 weeks, and a finisher ration containing 19% crude protein from 6 to 9 weeks (Table 1). Sexes were placed separately in floor pens. Feed and water were provided *ad libitum*. There was continuous lighting, and wood shavings were used for bedding. Group feed consumption was recorded weekly. Individual chick body weight was recorded at the commencement of the trial, weekly thereafter, and on the last day of the trial, which lasted 9 weeks. Six male and six female chickens from each treatment were slaughtered on the last day of the trial. Body weight of slaughtered chickens was variable within each treatment but the mean weight was approximately similar to the final weight of chicks in the respective treatment. Dressing percentage was calculated as

$$\frac{\text{carcass yield}}{\text{body weight}} \times 100 \quad \text{or} \quad \frac{\text{carcass yield + giblets}}{\text{body weight}} \times 100$$

The weight of the offals was also recorded. Skin colour was evaluated using the Roche colour fan (depends on the intensity of the yellow colour: O white, 4 yellow). Growth data were analyzed using least squares means with unequal subclass numbers (Harvey, 1975). Slaughter data were analyzed using two-way analysis of variance (Steel and Torrie, 1960).

RESULTS

Eighteen chicks died (3,6 and 9 in treatments C, CT and T, respectively) and ten suffered from perosis. Data from these chicks were excluded from the analysis.

Body weight of chicks at 5 or 9 weeks, and weight gain from 0 to 5, 6 to 9 and 0 to 9 weeks were similar in diets C and CT and higher (P=0.01) than those in diet T (Table 2). Body weight of male chicks at 5 or 9 weeks and weight gain from 0 to 5, 6 to 9 and 0 to 9 weeks were higher (P=0.01) than female chicks (Table 2). Initial body weight of chicks affected significantly (P=0.01) body weight at 5 weeks but not at 9 weeks. During the 6 to 9 week period male chicks on diet T gained less weight (P=0.01) than male chicks on the other diets but weight gain of female chicks on the three diets was similar. Feed consumption was similar with chicks on diets C and CT and higher (6%) than that of chicks on diet T (Table 2). Feed efficiency in male chicks on diets C and CT was also similar and better (3%) than in male chicks on diet T. However, feed efficiency in female chicks was similar for all three diets.

Cumulative weekly gain, cumulative weekly feed intake and cumulative weekly feed efficiency (kg of feed/kg body gain) are presented in Tables 5, 6 and 7.

Carcass yield and carcass plus edible giblets yield were similar in chicks on diets C and CT and higher (P=0.05) than those in chicks on diet T; they were also higher (P=0.01) in male than in female chicks (Table 3). Differences in feather weight were significant (P=0.01) only between diets C and T (Table 3). Weight of blood, feet and head plus intestines were higher (P=0.01) in male than female chicks. Skin colour ranged from 2 to 4 for chicks on diet C, was 1 for chicks on diet CT and 0 for chicks on diet T. Dressing percentage was similar in chicks on diets C and CT and higher (P=0.05) than that of chicks on diet T. Dressing percentage of female chicks was higher (P=0.01) than that of male chicks (Table 4).

DISCUSSION

Body weight at 5 and 9 weeks and growth rate were not affected when triticale formed 33-38% of the total ration, replacing an equal weight of corn, but total replacement of corn by triticale had an adverse effect on weight gain and growth rate. Similar findings have been reported for partial (33%) or complete replacement of corn by triticale in chick diets from birth to 2 weeks (Bixler et al., 1968) and from birth to 4 weeks (Angelova et al., 1980).

The higher crude protein content of triticale grain, compared to corn, reduces the inclusion rate of soybean meal in the rations (Bixler et al., 1968; Angelova et al., 1980; Amerio et al., 1984). This may have reduced the level of lysine, resulting in lower gain and feed efficiency (Bixler et al., 1968). In the present study, however, the diets were supplemented with lysine, and during the period birth to 5 weeks the level of lysine was 5.3% of the total protein while during the period 6 to 9 weeks it was 5.0%, compared to the recommended level of 4.9% (NRC, 1977). Despite this, growth rate was depressed with the triticale diet. This may be attributed to the lower feed intake (6%). Since the diets were isocaloric, total energy intake was reduced, and simultaneously the protein intake was also reduced. This is in agreement with the reduced performance of male and female chicks when energy was reduced by 5% during the finishing period (Moran, 1980a).

In agreement with other reports (Krivosic and Kralik, 1975; Tarrago and Puchal 1977; Moran, 1980b) body weight and rate of growth were higher and feed efficiency better for male than for female chicks. The growth of female chicks was similar in all diets but male chicks on the triticale diet grew slower than male chicks on the other two diets during the finishing period because of lower protein intake. According to Grey et al. (1982) males continue to grow linearly until 76 days of age and have higher crude protein requirements than female chicks, which grow at a slower rate after 35 days of age and have lower protein requirements.

In agreement with other reports (Krivosic and Kralik, 1975; Moran, 1980a, 1980b; Grey at al, 1982) female chicks produced lighter carcasses with higher dressing percentage than male chicks. The higher offal weight of male chicks at slaughter (blood, feet, and head plus intestines) was due to the larger body size and larger digestive system of male chicks.

The decrease of feather weight with increasing proportion of triticale in the diet may indicate an effect of triticale grain on the degree of feathering. Males had higher feather weight because of richer plumage than females. Yellow skin colouring was present on chick carcasses reared on corn, but not on those reared on triticale grain, which contains very low level of xanthophylls (Amerio et al., 1984). This enables rearing chickens with white meat, which is preferred by many consumers.

Table 1. Composition (g/kg), and energy and protein content of the diets.

Ingredient	0 - 5 weeks			6 - 9 weeks		
	C	CT	T	C	CT	T
Protein concentrate*	110	110	110	100	100	100
Soybean meal (44% C.P)	260	215	165	184	130	70
Corn	620	335	20	703.5	378	—
Triticale	—	330	695	—	380	818
Dicalcium phosphate	4	4	4	5.5	6	6
Limestone	6	6	5	7	6	6
**DL-Methionine	—	—	—	—	0.35	0.7
**Lysine	—	—	—	—	0.85	1.86
Metabolizable Energy (MJ/kg)	12.33	12.30	12.30	12.70	12.70	12.62
Crude Protein (g/kg)	219	217	214	187	184	181

* Protein concentrate contained 50% C.P., 10.45 MJ ME/kg, 1.6% Methionine, 2.1% Methionine + Cystine, 3.5% Lysine, 5.3% Ca, 3.2% available P, 2.5% salt, 125,000 I.U./kg vitamin A and 300 I.U./kg vitamin E.

** DL - methionine and lysine were added to provide equal quantities per kg finished feed.

All diets were supplemented with a mineral-vitamin premix (VTN, SYN III, Cyprus) at the rate of 1.67 kg/ton finished feed and with Amprolplus (0.5kg/ton finished feed).

Table 2. The effect of partial or complete replacement of corn by triticale on the performance of broilers.

	Corn (C)		Corn + Triticale (CT)		Triticale (T)		SD
	Males	Females	Males	Females	Males	Females	
	52(51)*	56	49	54(53)*	52(48)*	53(51)*	
Live weight (g)							
Initial	37	38	37	37	37	37	3
5-week	1319	1128	1350	1122	1250	1048	104
9-week	3055	2479	3110	2443	2895	2322	210
Weight gain(g)							
0-5 weeks	1282	1090	1313	1085	1213	1011	106
6-9 weeks	1735	1351	1760	1328	1649	1275	179
0-9 weeks	3017	2441	3073	2407	2859	2285	210
Feed intake (g)							
0-5 weeks	2453	2223	2526	2149	2400	2162	—
6-9 weeks	4996	4274	5076	4270	4896	3902	—
0-9 weeks	7449	6497	7602	6419	7296	6064	—
Feed/gain							
0-5 weeks	1.91	2.04	1.92	1.98	1.98	2.14	—
6-9 weeks	2.88	3.16	2.88	3.22	2.97	3.06	—
0-9 weeks	2.47	2.66	2.47	2.66	2.55	2.65	—

* Number of birds from 6th week to end of trial.

Table 3. Slaughter data of chicks at nine weeks of age.

Weight (g)	Corn (C)		Corn + Triticale (CT)		Triticale (T)		SE
	Males	Females	Males	Females	Males	Females	
At slaughter	3083	2342	3073	2360	2892	2192	114
Carcass	2249	1718	2240	1739	2086	1596	86
Carcass + giblets	2369	1819	2364	1842	2202	1689	90
Feathers	175	151	160	137	142	139	10
Blood	108	74	119	83	117	82	7
Feet	133	76	132	85	125	77	7
Head + intestines	299	218	299	214	306	223	20

Table 4. Carcass and offals of slaughtered birds as a percentage of liveweight.

Percent of liveweight	Corn (C)		Corn + Triticale (CT)		Triticale (T)	
	Males	Females	Males	Females	Males	Females
Carcass	72.93	73.35	72.87	73.67	72.14	72.81
Carcass + giblets	76.83	77.64	76.91	78.04	76.16	77.00
Feathers	5.66	6.43	5.21	5.81	4.89	6.33
Blood	3.50	3.17	3.86	3.50	4.05	3.73
Feet	4.31	3.26	4.30	3.59	4.33	3.51
Head + intestines	9.69	9.31	9.71	9.06	10.57	10.19

Table 5. Cumulative weekly gain (g/bird).

Week	Corn (C)		Corn + Triticale (CT)		Triticale (T)	
	Males	Females	Males	Females	Males	Females
1	93	85	96	87	84	80
2	264	241	276	243	243	218
3	525	463	540	462	485	425
4	877	766	889	752	821	700
5	1282	1090	1313	1085	1213	1011
6	1713	1450	1780	1431	1625	1313
7	2205	1813	2222	1776	1993	1636
8	2645	2137	2675	2107	2465	1978
9	3017	2441	3072	2413	2862	2286

Table 6. Cumulative weekly feed intake (g/bird).

Week	Corn (C)		Corn + Triticale (CT)		Triticale (T)	
	Males	Females	Males	Females	Males	Females
1	130	122	141	122	143	133
2	417	401	436	393	422	402
3	876	831	908	787	859	810
4	1559	1450	1620	1386	1559	1425
5	2453	2223	2526	2149	2400	2162
6	3568	3184	3579	3163	3496	2975
7	4898	4233	4839	4180	4629	3925
8	6145	5350	6194	5279	5948	4919
9	7449	6497	7602	6419	7296	6064

Table 7. Cumulative weekly feed efficiency (kg feed/kg weight gain).

Week	Corn (C)		Corn + Triticale (CT)		Triticale (T)	
	Males	Females	Males	Females	Males	Females
1	1.40	1.45	1.45	1.40	1.70	1.65
2	1.60	1.65	1.60	1.60	1.75	1.85
3	1.65	1.80	1.70	1.70	1.75	1.90
4	1.80	1.90	1.80	1.85	1.90	2.05
5	1.90	2.05	1.90	2.00	2.00	2.15
6	2.10	2.20	2.00	2.20	2.15	2.25
7	2.20	2.35	2.20	2.35	2.30	2.40
8	2.30	2.50	2.30	2.50	2.40	2.50
9	2.45	2.65	2.45	2.65	2.55	2.65

It may be concluded that the performance of chicks on diets containing 33-38% triticale (replacing equal quantity of corn) from birth to 9 weeks of age is similar to that of chicks on a corn-soybean meal diet. However, complete replacement of corn by triticale reduces final liveweight, weight gain, feed efficiency and carcass yield, the main contributing factor being the lower feed consumption. Although more work is needed to clarify the cause of this lower feed consumption in order to increase the efficiency of utilization of triticale grain, its use as the sole grain in chick diets may not be excluded if cost of production is lower than with corn based diets. Indeed, there are suggestions that certain feedstuffs promoting slower growth rate and weight at slaughter but leading to lower cost per unit gain may be preferred in chick diets (Ward, 1978).

Economic analysis based on the performance data of the present study showed that feeding cost per unit carcass gain, which comprises over 70% of the total cost of production, was 38.1, 36.1 and 34.7 cent/kg for corn, corn plus triticale and triticale diets, respectively. From the same economic analysis the selling price of triticale grain was calculated to be £52.7 in the corn-triticale diet (CT) and £48.9 in the triticale diet (T) compared to the selling price of corn at £37/ton (subsidized price). It is obvious, that triticale grain should be given more attention as a poultry feed in the future.

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