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EFFECT OF ASCOGEN ON THE GROWTH PERFORMANCE AND CARCASS YIELD OF JAPANESE QUAILS

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A study was conducted to determine the effect of ASCOGEN, a biogenic performance enhancer, on growth, weight gain, feed conversion and processing performances of heavy–strain Japanese quails (Coturnix coturnix japonica).

Six hundred quails were divided into three groups and fed a basal diet (24,5% CP and 12 MJ/kg ME) or a basal diet supplemented with 500 ppm and 1000 ppm Ascogen, from day 1 until 35 days of age. The group fed 1000 ppm Ascogen achieved at 35 days of age a significantly higher (P<0.05) final body weight, carcass weight (P<0.05), carcass yield (P<0.01), wing weight (P<0.01) drumstick weigh (P<0.05) compared to the control group. It exhibited also a lower feed consumption (by 3.61%), more efficient feed conversion (by 6.68%) and higher average daily weight gain (by 3.81%). The group fed 500 ppm Ascogen had a higher carcass weight (P<0.05), carcass yield (P<0.01) higher final body weight (+2.25 %), more efficient feed conversion (+3.2%) and higher daily weight gain (+2.18%) compared to the control group.

Key words: Ascogen, body weight, carcass yield, feed conversion, Japanese quail

INTRODUCTION

The use of probiotics as dietary additives and their beneficial effect on growth rate and feed conversion of broilers (Kos and Wittner, 1982b, Holoubek, 1993), carcass yield (Kos and Wittner, 1982a), health (Kumprecht *et al*., 1994) by lowering the mortality (Samanta and Biswas, 1995) is well known.

According to the manufacturer (Chemofarma Ltd, Swizerland), Ascogen has a probiotic effect as a biologically active, multicomponent complex of RNA, nucleotides and nucleotide precursors of metabolites. Heat processed dried yeast is used as a carrier for these active substances when administered orally.

Ascogen mainly stimulates the immune system (Köppel and Portsmouth, 1995) resulting increased resistance toward diseases (Kulkarni *et al*., 1986, Glawisching and Pedit, 1992) and decreasing mortality (Ramadan *et al*., 1989b, Mazija and Matischa, 1994). Despite many data on the use of Ascogen as a growth factor which through improvement of animal health leads to better production parameters such as egg production (Mazija and Matischa, 1994), feed consumption (Ramadan *et al*., 1989b, Mazija and Matischa, 1994), growth rate (Adamek, 1994), body weight (Ramadan *et al*., 1989a, Ramadan *et al*., 1991) and production yield (Köppel and Portsmouth, 1995), no literature was found about its effect on quail performances.

The objective of this study was to investigate the effect of different levels of Ascogen on growth, weight gain, feed conversion, carcass weight and carcass yield of Japanese quails (*Coturnix coturnix japonica*).

MATERIAL AND METHODS

Six hundred, 1-day-old, non-sexed Japanese quails (*Coturnix coturnix japonica*) of heavy-strain, originating from France (Savimat comp. France), were distributed at random to 3 dietary treatments of 200 quails each. These treatments were a basal diet (Table 1) and the basal diet supplemented with Ascogen to provide 500 and 1000 ppm kg diet. Ascogen contains heat inactivated brewers yeast (84%); RNA/nucleotides (3,5%) and specific organic acids (12,5%).

The quails were given *ad libitum* access to feed (in mash form) and water (heated at 17°C during the 1st week) throughout the experimental period.

Weight gain was measured individually, while feed intake was measured per group at day 7, 14, 21, 28, and 35. Quails were raised in electrically heated battery brooders (1.0 x 0.85 x 0.3 m), placed in a temperature controlled room that was maintained at 35°C for the 1st wk, at 31°C for the 2nd wk, at 25°C for the 3rd wk, at 23°C for the 4th wk and at 21°C for the 5th wk. A continuous photoperiod of 24 hours was provided through the study. On day 35, 25 quails of each sex from each experimental group were randomly selected, weighed and then sacrificed by severing the jugular vein. The feathers were removed after scalding at 60°C for 30 sec. The neck, the edible and inedible viscera (head, preen gland, feet, intestines, lungs, gizzard, liver) were removed, but the heart remained with the carcass. The eviscerated carcasses, without the neck but 2 neck vertebrae, were weighed. Then, each carcass was dissected into 4 parts according to commercial standards (drumstick, wings, breast, and rump and back), and each part was weighed separately.

Data were analysed by one-way analysis of variance using the GLM (General Linear Model) procedure of SAS (SAS Institute, 1985). A probability level $P<0.05$ was considered significant and means were separated using Duncan's New Multiple Range Test.

Table 1. Composition of the basal diet

Ingredient	Level in the diet (%)
Yellow corn	49.00
Soybean meal	30.00
Extruded soybean	14.50
Fish meal	3.00
Ground limestone	1.00
Dicalcium phosphate	1.50
Salt	0.30
DL-Methionine	0.20
Vitamin-mineral supplement[1]	0.50
Total	100.00
Composition by analysis	
Crude protein	24.50
Ether extract	6.23
Crude fibre	3.80
Ash	7.45
Calcium	1.02
Phosphorus	0.75
Composition by calculation	
AMEn, MJ/kg	12.00
Lysine	1.42
Lysine, g/MJ	1.19
Methionine and cystine	0.87
Methionine and cystine, g/MJ	0.73
Energy to protein ratio	0.49

[1] Supplies the following per kilogram: vitamin A, 12 000 UI; holecalciferol, 3 000 UI; vitamin E, 30 UI; vitamin K 3.0 mg; vitamin B_1, 3.0 mg; vitamin B_2, 6.0 mg; vitamin B_6, 4.0 mg; vitamin B_{12}, 0,015 mg; biotin, 0,1 mg; nicotinic acid, 60 mg; panthotenic acid, 15 mg; folic acid, 1.0 mg; choline chloride 1 300 mg; manganese, 100 mg; iodine, 2.0 mg; zinc, 100 mg; iron, 50 mg; copper, 7.5 mg; selenium, 0.3 mg; cobalt, 0.4 mg; and antioxidant (BHT), 100 mg.

RESULTS AND DISCUSSION

Means of average daily body weight gain, feed consumption and feed conversion ratio are presented in Table 2. For the whole experimental period the average daily weight gain was greater in those groups to which Ascogen was added to the feed. These results are consistent with the results achieved in broilers fed probiotic supplemented diets (Atherton and Robbins, 1987, Kumprecht *et al*., 1994). Available data on the use of ASCOGEN also indicate a strong correlation between Ascogen supplementation and growth rate in broilers (Ramadan *et al*., 1989a), fish (Ramadan, 1991) and rainbow trout (Adamek, 1994). Throughout the whole experimental period the group fed 1000 ppm Ascogen obtained lower feed consumption (-3.61%) compared to the control, while the control had (-1.14%) feed consumption compared to the group fed 500 ppm Ascogen. It can be concluded that only 1000 ppm Ascogen was efficient to reduce feed consumption.

Table 2. Daily weight gain, feed consumed/bird/day and feed conversion ratio

Added Ascogen (ppm)	Age (days)					
	0-7	8-14	15-21	22-28	29-35	0-35
Average daily weight gain (g)						
0	2.48	5.95	7.56	6.84	4.66	5.50
500	2.75	5.67	7.55	6.69	5.47	5.62
1000	2.56	5.60	8.24	7.28	4.87	5.71
Feed consumed/bird/day (g)						
0	5.82	14.30	20.70	21.85	24.74	17.48
500	6.51	13.11	20.50	23.02	25.29	17.68
1000	5.58	13.68	17.76	22.51	24.82	16.87
Conversion ratio (kg/kg)*						
0	2.33	2.40	2.75	3.19	5.30	3.19
500	2.37	2.31	2.72	3.44	4.61	3.09
1000	2.17	2.44	2.15	3.10	5.09	2.99

*feed consumed per kg of weight gain

The accomplished feed conversion to body weight of quails, points out the effectiveness of Ascogen. The group fed 1000 ppm Ascogen had the most efficient feed conversion, followed by the group fed 500 ppm Ascogen and the control group. It can be noted that feed conversion has a definite tendency toward a higher ratio in the control group.

The results of the present study confirmed that probiotic supplementation could increase growth and improve feed conversion (Dhingra, 1993, Mohan *et al*., 1996) this is in agreement with the published literature data on more efficient feed conversion through the use of probiotics in broiler fattening (Atherton and Robbins, 1987, Kumprecht *et al*., 1994, Wambeke and Peters, 1995).

Average body weight data are shown in table 3. Although, the group fed 500 ppm Ascogen had a significantly higher ($P<0.01$) body weight at the age of 7 days compared to other groups, it can be stated that the difference was not influenced by Ascogen supplementation while taking into consideration differences in body weights over the whole experimental period. Also, the group that received 500 ppm Ascogen had a non significantly higher final body weight at 35 days of age compared to the control. Over the second fattening period (starting from week 3), body weights in the group fed 1000 ppm Ascogen were clearly superior (P<0.05) compared to the control group.

Table 3. Effect of Ascogen supplementation on body weight of Japanese quails(g)

Age (days)	Ascogen supplementation (ppm)					
	0		500		1000	
	Mean	SE	Mean	SE	Mean	SE
0	9.73	0.07	9.89	0.06	9.83	0.06
7	27.15^{d}	0.43	29.15^{c}	0.43	27.79^{d}	0.45
14	68.82	0.88	68.86	0.84	67.03	0.93
21	121.77	1.49	121.70	1.33	124.72	1.44
28	169.69^{b}	1.72	168.56^{b}	1.75	175.68^{a}	1.96
35	202.33^{b}	2.03	206.89^{ab}	1.90	209.77^{a}	1.95

Mean = arithmetical mean; SE = standard error of mean
^{ab}groups with different supersripts within a column are significantly different (P<0.05)
^{cd}groups with different supersripts within a column are significantly different (P<0.01)

This corresponds to greater final body weights achieved by Holoubek (1993) through the use of probiotics added to the broiler diet, as well as to higher body weights affected by Ascogen supplementation in broilers (Ramadan, 1989a) and fish (Ramadan, 1991).

Table 4 shows the effect of Ascogen supplementation on carcass weight. The higher portion of Ascogen (1000 ppm) increased carcass weight by 5.60% (P<0.05) compared to the control group, but while the group fed 500 ppm Ascogen had a higher carcass weight (+1.93%), the difference in relation to the control group was not significant. The achieved results on carcass weight correspond to the results of Kos and Wittner (1982b) who reported heavier carcass weights in broilers supplemented with 1000 mg/kg Nutrigen in the diet.

Ascogen significantly increased (P<0.01) carcass yield in the treated groups. The differences are not, however, as great as those reported by Köppel and Portsmouth (1995) who stated that Ascogen supplementation to the diet increased broiler carcass yield by 4 to 6 %. Although in our experiment the groups fed 1000 and 500 ppm Ascogen achieved higher carcass yield by only 2.93% and 3.20%, the tendency was similar.

Our results are in agreement with those described by Kos and Wittner (1982b) in an experiment with fattened broilers where the authors achieved higher carcass yields of groups treated with Nutrigen supplemented diet (1000 mg/kg

Table 4. Effect of Ascogen supplementation on carcass composition of Japanese quails

Added Ascogen (ppm)	n	Live body weight (g)		Carcass weight (g)		Drumstick weight (g)		Wing weight (g)		Breast weight (g)		Rump and Back weight (g)	
		Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
0	50	202.62	2.91	137.28^{b}	2.17	34.55 ^{b}	0.55	13.26^{d}	0.32	56.63	1.26	33.19	0.91
500	50	200.45	2.79	139.93^{ab}	2.04	34.83 ^{b}	0.60	13.42^{d}	0.41	56.87	1.02	34.56	0.97
1000	50	207.88	3.25	144.97^{a}	2.47	36.50 ^{a}	0.64	16.54^{c}	0.29	58.37	1.09	33.48	0.63

Mean = arithmetical mean; SE = standard error
^{a,b} groups with different supercripts within a column are significantly different (P<0.05)
^{c,d} groups with different supercripts within a column are significantly different (P<0.01)

Table 5. Effect of Ascogen supplementation on carcass composition of Japanese quail

Added Asco-gen (ppm)	Sex	n	Live body weight (g)		Carcass weight (g)		Carcass yield %		Drumstick weight (g)		Wings weight (g)		Breast weight (g)		Rump and back weight (g)	
			Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
0	male	25	195.58^{b}	3.71	133.86^{b}	2.95	68.36^{cd}	0.37	33.88^{b}	0.75	12.98^{d}	0.40	54.72	1.42	33.28	1.42
	female	25	209.65^{a}	4.09	140.69^{ab}	3.09	67.05^{d}	0.45	35.23^{ab}	0.80	13.54^{d}	0.50	58.55	2.06	34.10	1.13
500	male	25	199.75^{ab}	3.65	139.18^{ab}	2.89	69.63^{c}	0.39	34.65^{b}	0.89	13.36^{d}	0.58	56.80	1.27	34.32	1.44
	female	25	201.16^{ab}	4.30	140.68^{ab}	2.92	70.11^{c}	1.05	35.00^{b}	0.84	13.48^{d}	0.59	56.94	1.64	34.81	1.31
1000	male	25	203.47^{ab}	3.86	141.84^{ab}	3.01	69.65^{c}	0.34	35.39^{ab}	0.75	16.20^{c}	0.30	56.75	1.34	33.50	0.86
	female	25	212.29^{a}	5.16	148.11^{a}	3.88	69.74^{c}	0.50	37.62^{a}	1.00	16.88^{c}	0.45	59.99	1.71	33.46	0.93

Mean= arithmetical mean; SE= standard error
^{a,b} groups with different supercripts within a column are significantly different (P<0.05)
^{c,d} groups with different supercripts within a column are significantly different (P<0.01)

diet) by 1.42% using a feed containing an insufficient amount of proteins, and by 1.47% in broilers (Kos and Wittner, 1982a) fed adequate quantity of all nutrient components with Nutrigen supplementation (1000 mg/kg diet). Both groups fed Ascogen achieved not only greater carcass weights, but also weights of all parts of carcass compared to the controls. These differences were significant for the group fed 1000 ppm Ascogen (weight of drumsticks ($P<0.05$), carcass ($P<0.05$) and wings ($P<0.01$) compared to the control.

The interaction between Ascogen supplementation and sex of the quails on body and carcass weights is given in Table 5. Females were heavier and had larger carcasses than males, even though none of the quails of either sex exhibited signs of sexual maturity. Several cuts of the carcasses followed the same pattern as body weights. It is known that female quails are larger than males, thus the difference in body weights between males and females occurred due to sex, not supplementation. There was no significant difference due to supplementation and sex in the weight of breast as well as rump and back of birds.

This study indicates that 500 ppm Ascogen supplementation has no significant effects on production and carcass composition in Japanese quails. On the other hand, 1000 ppm Ascogen supplementation, when fed at the age from 1 to 35 days, stimulated growth, reduced feed intake and improved daily gain, feed efficiency and carcass composition. When evaluating this effect from the production point of view, the addition of 1000 ppm Ascogen to commercial heavy-strain quail diet could be recommended for improving growth performance and slaughter value of Japanese quail. Ascogen leaves no residues in tissues (Ramadan *et al*., 1991) and can be freely used as a feed additive.

The effect of Ascogen is based on the use of naturally arising metabolites as active substances for promotion of nutritional performance. Biogenic performance promoters, such as ascogen have a positive effect on the intestinal flora, thereby improving digestion (Walters, 1984). Ascogen does not compensate for a lack of amino acids in the feed, but through lowering the degradation process improves utilisation of nutrients from the feed, thereby encouraging growth (Kos and Wittner, 1982b).

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UTJECAJ ASCOGENA NA PROIZVODNE I KLAONIČKE REZULTATE JAPANSKIH PREPELICA

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SADRŽAJ

Svrha naših ispitivanja je bila da se oceni značaj dodatka Ascogena, biološkog stimulatora rasta, na rast, prirast, konverziju hrane i klaoničke pokazatelje brojlerskog tipa Japanskih prepelica (*Coturnix coturnix japonica*). Šest stotina prepelica je bilo podeljeno u tri grupe i hranjeno osnovnom hranom (24,5% SP i

12 MJ/kg ME) bez ili uz dodatak Ascogena od 500 ppm ili 1000 ppm, od 1-35 dana starosti.

Grupa hranjena dodatkom 1000ppm Ascogena je ostvarila signifikantno značajnu ($P<0.05$) završnu telesnu masu sa 35 dana starosti, težinu trupa ($P<0.05$), randman klanja ($P<0.01$), težinu krila ($P<0.01$) i leđa ($P<0.05$) uspoređujući s kontrolnom grupom. Ostvarena je i manja konzumacija hrane (za 3.61%), efikasnija konverzija hrane (za 6.68%) i veći dnevni prirast (za 3.81%). Grupa hranjena dodatkom 500ppm Ascogena je imala veću težinu trupa ($P<0.05$), randman klanja ($P<0.01$), veće završne telesne mase (+2.25 %), bolju konverziju hrane (+3.2%) i veći dnevni prirast (+2.18%) u usporedbi s kontrolnom grupom.