SHORT COMMUNICATION

The effects of castration on the growth parameters, carcass yield and meat chemical composition of intensively reared Common Pheasant (Phasianus colchicus colchicus L.)

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ABSTRACT

The effects of castration on growth performance, carcass characteristics and chemical composition of m. iliotibialis cranialis and m. pectoralis superficialis of pheasants were examined. Forty pheasants reared in commercial pheasantry were included in the experiment. Half of the pheasants were castrated at 8 weeks of age. Values for live weight tended to be higher in castrated pheasants in the 24th week (P<0.1) and values for weight gain were significantly higher between the 16th and 24th weeks (P<0.05). Feed-to-gain-ratio (8th – 32nd week) was significantly better (P<0.05) in castrated pheasants. Eviscerated weight and dressing percentage at 32nd week were not significantly different between treatments. The chemical composition of m. iliotibialis cranialis and m. pectoralis superficialis showed significantly higher values of fat (P<0.01) and moisture (P<0.05) in castrated pheasants in comparison with intact ones. Protein content of both muscles was higher in intact pheasants (P<0.05). Body part weights were not influenced by the treatment with the exception of heart weight, which was significantly higher in the intact pheasants (P<0.05).

We concluded that castration tended to improve growth performance only in the first 24 weeks of the fattening period and, therefore, continuation of fattening after that period is no longer feasible. The most important characteristic of the castrated pheasant’s meat was an increased amount of fat. More studies under different feeding and alternative breeding systems are necessary to improve production.

Key words: Castration, Growth, Intactness, Meat quality, Pheasant.
Introduction

Removal of the testes and thus elimination of the male sex hormones they produce reduces the male sex instincts and changes their behaviour (Andrew, 1972; Andrew and Jones, 1992). As a result, the cockerel fails to develop secondary male characteristics or tends to lose them if they were already developed. Energy that is normally expended in sexual behaviour is greatly reduced allowing more efficient conversion of feed into growth and fat deposition (York and Mitchell, 1968).

Castration produces a unique type of poultry meat grown for a specialized market. The meat of roosters tends to become coarse, stringy, and tough as the birds age. Castrated chickens have more abdominal and subcutaneous fat but also more intramuscular fat in both the light and dark meat (Fennell and Scanes, 1992; Chen et al., 2000; Tor et al., 2002). Castration of domestic birds other than the chicken has not been extensively investigated, although some data are available for the turkey. In general, neither carcass quality nor production characteristics such as growth rate and feed-to-gain-ratio are altered by castration of toms (Marion et al., 1972) and, therefore, the practice has never been advocated on a commercial scale.

To our knowledge there is no recent literature dealing with pheasant castration and the quality of the castrated pheasant meat. Nowadays, intensive rearing of pheasants, not only as game birds, but also for meat production is becoming more popular; (Strakova et al. 2004, 2006; Večerek et al. 2004). Castration is a useful method for yielding a more valuable product for the market. The purpose of the present work was to determine growth parameters, meat quality and optimal duration of the fattening period.

RIASSUNTO
GLI EFFETTI DELLA CASTRAZIONE SULL’ACCRESCIMENTO, SUL RENDIMENTO DELLA CARCASSA E SULLA COMPOSIZIONE CHIMICA DELLA CARNE DI FAGIANO COMUNE (PHASIANUS COLCHICUS COLCHICUS L.) ALLEVATO CON METODOLOGIA INTENSIVA

Sono stati esaminati gli effetti della castrazione sull’accrescimento, sulle caratteristiche della carcassa e sulla composizione chimica dei muscoli iliotibiali craniali e pectorali superficiali di fagiani. L’esperimento è stato condotto su quaranta fagiani allevati in una fagianeria commerciale, metà dei quali castrati ad otto settimane di età.

I valori del peso vivo tendevano ad essere più alti nei fagiani castrati alla 24a settimana (P<0,1) e gli accrescimenti ponderali furono significativamente più elevati tra la 16a e la 24a settimana di età (P<0,05). L’indice di conversione, tra 8e e la 32a settimana, è stato significativamente migliore nei fagiani castrati (P<0,05). Il peso della carcassa e la resa al macello alla 32a settimana non è stato significativamente differente tra i due gruppi. L’analisi della composizione chimica di m. iliotibialis cranialis e m. pectoralis superficialis ha evidenziato valori maggiori per quanto concerne percentuale di grasso (P<0,01) e contenuto idrico (P<0,05) nei fagiani castrati rispetto a quelli interi. Il contenuto di proteine di entrambi i muscoli è stato più elevato nei fagiani interi. Il peso dei tagli non ha risentito del trattamento, con l’eccezione del peso del cuore che è risultato significativamente maggiore nei fagiani interi (P<0,05).

Si è potuto concludere che la castrazione ha teso a migliorare le performance di accrescimento solo nelle prime 24 settimane e che dopo tale periodo il proseguimento dell’ingrassamento non è più conveniente. La più importante caratteristica della carne di fagiano castrato è stata l’aumento della percentuale di grasso. Ulteriori studi con differenti sistemi di alimentazione e con metodi alternativi di allevamento sono necessari per migliorare la produzione.

Parole chiave: Castrazione, Accrescimento, Integrità, Qualità della carne, Fagiani.
Material and Methods

Forty male pheasants, selected from a certified commercial feathered game breeder located in central Croatia (Zelendvor, Varaždin, Republic of Croatia, gps reference), were used in the trial. Animals were obtained as 7-week-old animals and they were reared until the age of 32 weeks. After an adjustment period of 7 days the pheasants were randomly divided into two experimental treatments. Half of the animals were castrated after a fasting period of 12 hours prior to surgery. The animals were anaesthetised by using 50 mg/kg of ketamin (Narkamon 5%, SPOFA, Czech Republic) and left in a quiet environment for a period of five minutes. Feathers in the rib area were removed and the skin was disinfected with 70% ethanol. A two-centimetre incision was made through the skin and other tissues between the two posterior ribs. The skin was moved to one side before making the incision so that skin cut and muscle cut were not aligned afterwards. The abdominal air sack was punctured with a sharp hook. The testicles of an eight-week-old pheasant were about the size of a large wheat kernel and brown in colour. The testis was grasped with forceps, twisted and removed. Sutures or bandages were not used. The other half of the animals was operated in the same way but without testes removal. Air under the skin (wind puffs) was carefully punctured with a sharp instrument when necessary. The absence of testicular regeneration in the castrated pheasants was determined on live birds by visual assessment and confirmed later after slaughtering.

During the experiment each group was kept in a separate aviary and fed ad libitum standard pheasant finisher. Each aviary was additionally divided into three pens in order to test feed-to-gain-ratio. The chemical composition of the diet is provided in Table 1. Samples of the feed mixture were collected throughout the experimental period for chemical composition analyses. The samples were ground and analysed for dry matter, crude protein, crude fibre, Ca, P and ME according to AOAC procedures (AOAC, 1995). The pheasants were kept in an aviary at stocking density of 1 bird per 2 square meters.

The animals were weighed bi-weekly in the morning after they had been fasting since the previous evening. To avoid the stress of capture, we weighed the animals during the same hour on the same day, and the total process (from capture to release) lasted less than 6 min for each male. In the 32nd week (December) the pheasants were stunned, slaughtered, bled and plucked in a commercial slaughterhouse. The carcasses were quartered according to WPSA reference cutting method (Fris Jensen, 1983). The chemical composition of m. iliotibialis cranialis and m.

Table 1. Ingredients and chemical composition of the feed.

| Ingredients | %    | Chemical composition: |
|-------------|------|-----------------------|
| Corn        | 51.0 | Dry matter % 88.01    |
| Wheat flour | 15.0 | Crude protein % 17.62  |
| Soybean     | 24.0 | Crude fat % 3.37      |
| Sunflower   | 5.0  | Crude fibre % 4.20    |
| Premix1     | 5.0  | Metabolisable energy | MJ/kg 12.56 |
| Ca          | 0.81 | P % 0.64              |
| Na          | 0.22 | Methionine % 0.44     |
| Lysine      | 0.95 | Cystine % 0.34        |

1Premix for pheasants comprising per kg: Ca, 120 g; P, 30 g; Na, 30 g; vitamin A, 300,000 U; vitamin D3, 40,000 U; vitamin E, 1000 mg; Fe, 600 mg; Mn, 2000 mg; I, 20 mg; Co, 10 mg; Zn, 1200 mg; Se, 3 mg; BHT antioxidant, 2400 mg.
pectoralis superficialis was determined according to AOAC standard techniques (AOAC, 1995). The analyses included moisture (105 °C, 24 h), protein (N × 6.25) and ash (550 °C, 5 h) determinations. Total lipids were analysed by extraction with petroleum ether (Soxtec method).

All analyses were performed using the SAS® (SAS, 1991) general linear model procedure. Statistical significance of the differences was determined by the t-test.

Results

In the trial the dead pheasants numbered two and one in the castrated and intact groups, respectively. The castrated pheasant showed testicular regeneration in 25%.

The influence of castration on the rate of gain, feed-to-gain-ratio and dressing percentage are presented in Table 2. Values for live weight tended to be higher in castrated birds in the 24th week (P<0.1) and values for weight gain were significantly higher between the 16th and 24th weeks (P<0.05). Feed-to-gain-ratio for the entire experimental period (8th-32nd week) was significantly improved (P<0.05) in the castrated pheasants.

Values of eviscerated weight and dressing percentage at 32nd week were similar for both treatments. The weight of body parts was not influenced by the treatment with the exception of the heart weight, which was significantly higher in the intact pheasants (P<0.05). Chemical composition was significantly different between the treatments. The castrated pheasants had significantly higher values for fat (P<0.01) and moisture (P<0.05) in m. iliotibialis cranialis and m. pectoralis superficialis but lower values for protein (P<0.05) also in both muscles.

Discussion

The percentage of testicular regeneration in our trial is consistent with results that could be found in chickens (Tor et al., 2002). The mortality rate was also very low although we expected higher losses because pheasants are wild animals that are more susceptible to stress than domesticated chicken. These parameters showed that castration of the pheasants could be suc-

Table 2. Effects of castration on rate of gain, feed-to-gain-ratio and dressing percentage.

| Parameter                  | Treatment                  | Intact          | Castrated        | Significance |
|----------------------------|----------------------------|-----------------|------------------|--------------|
| Live weight 8th wk g       |                            | 280.9 ± 16.7    | 286.0 ± 22.9     | ns           |
| Live weight 16th wk g      |                            | 1081.8 ± 37.9   | 1075.0 ± 42.3    | ns           |
| Live weight 24th wk g      |                            | 1485.4 ± 100.9  | 1540.3 ± 113.9   | ns           |
| Live weight 32nd wk g      |                            | 1514.4 ± 105.8  | 1569.9 ± 118.6   | ns           |
| Weight gain 8th – 16th wk  |                            | 801.0 ± 50.2    | 789.00 ± 46.9    | ns           |
| Weight gain 16th – 24th wk |                            | 403.5 ± 41.0    | 465.3 ± 63.7     | *            |
| Weight gain 24th – 32nd wk |                            | 29.0 ± 23.9     | 29.2 ± 32.3      | ns           |
| Feed-to-gain-ratio 8th – 32nd |                        | 9.2 ± 0.9       | 8.8 ± 1.2        | *            |
| Eviscerated weight 32nd wk |                            | 1272.73 ± 98.2  | 1307.19 ± 102.2  | ns           |
| Dressing percentage %      |                            | 84.0 ± 3.60     | 83.3 ± 2.62      | ns           |

1Values represent means ± SD; ns: not significant; ns aP<0.10; * P<0.05.
CASTRATION OF COMMON PHEASANT

Successfully performed and that the procedure is as simple as in domestic chickens.

In our experiment castrated pheasants grew faster until December when the difference in live weight and weight gain decreased. The effects of castration on live weight and weight gain of poultry is controversial. In studies performed on chickens some author reported higher values in intact birds (Cason et al., 1988), while others reported higher values in castrated birds (Welter, 1976; Mast et al., 1981; Chen et al., 2005) or even found no influence at all (York and Mitchell, 1968; Ono et al., 1979). With respect to other species, Marion et al. (1972) reported that castrated turkeys weighted less than intact ones. Weight and weight gains in castrated poultry are frequently explained by the fact that androgens in chickens are not anabolic (Fennell and Scanes, 1992). If androgens in pheasants are also not anabolic, decline in growth by stimulation of sexual behaviour in the intact pheasants would not be improved by the anabolic influence of testosterone on live weights and weight gains. Other effects related to level of testosterone in castrated poultry are changes in search behaviour (Andrew, 1972; Andrew and Rogers, 1972) and increased distractibility (Andrew and Jones, 1992). These effects probably did not interfere with our results because the birds were not exposed to changes in environment, feeding program or daily routine and they were fed ad libidum.

The weight gain decreased in December and consequently the difference in live weight between intact and castrated pheasants also

Table 3. Body parts weight and chemical composition of m. iliotibialis cranialis and m. pectoralis superficialis at 32nd week of age in intact and castrated pheasants.

| Parameter               | Treatment         | Intact            | Castrated         | Significance |
|-------------------------|-------------------|-------------------|-------------------|--------------|
| Thigh                   | g                 | 287.54 ± 19.31    | 298.53 ± 18.74    | ns           |
| Breasts                 | "                 | 306.87 ± 19.33    | 321.53 ± 28.28    | ns           |
| Drumstick               | "                 | 130.57 ± 10.36    | 136.33 ± 11.24    | ns           |
| Wing                    | "                 | 92.14 ± 5.25      | 97.94 ± 6.02      | ns           |
| Heart                   | "                 | 5.84 ± 0.51       | 5.30 ± 0.39       | *            |
| Liver                   | "                 | 27.57 ± 9.09      | 25.55 ± 4.74      | ns           |
| Spleen                  | "                 | 0.64 ± 0.17       | 0.74 ± 0.15       | ns           |

\( M. \) iliotibialis cranialis:

| Parameter               | Treatment         | Intact            | Castrated         | Significance |
|-------------------------|-------------------|-------------------|-------------------|--------------|
| Protein                 | %                 | 22.93 ± 0.32      | 20.73 ± 0.24      | **           |
| Fat                     | "                 | 3.21 ± 0.13       | 3.90 ± 0.29       | **           |
| Moisture                | "                 | 72.03 ± 0.39      | 73.94 ± 0.32      | *            |
| Ash                     | "                 | 1.19 ± 0.15       | 1.07 ± 0.11       | ns           |

\( M. \) pectoralis superficialis:

| Parameter               | Treatment         | Intact            | Castrated         | Significance |
|-------------------------|-------------------|-------------------|-------------------|--------------|
| Protein                 | %                 | 22.94 ± 0.42      | 20.74 ± 0.43      | **           |
| Fat                     | "                 | 2.81 ± 0.11       | 3.97 ± 0.16       | **           |
| Moisture                | "                 | 72.11 ± 0.47      | 73.91 ± 0.40      | *            |
| Ash                     | "                 | 1.21 ± 0.12       | 1.15 ± 0.10       | ns           |

1Values represent means ± SD; ns: not significant; * P<0.05; ** P<0.01.
decreased probably because of very low temperatures. These data showed that fattening of the castrated pheasant for meat production in opened aviaries should be finished before winter. A possible alternative could be to keep the castrated pheasants indoors for the whole or part of the fattening period.

The castrated pheasants had better feed-to-gain-ratio, as was also observed in castrated chickens by Mast et al. (1981). On the contrary, other authors found poorer feed-to-gain-ratios in the castrated chicken, either with higher live weight (Welter, 1976) or with the same live weight (York and Mitchell, 1968) as in the intact chickens.

In contrast to our results York and Mitchell (1968) reported higher dressing percentages in castrated chickens when live weights were not significantly different between castrated and intact birds. Similar dressing percentages in castrated and intact chickens were reported only when the live weights of castrated birds were higher (Welter, 1976; Mast et al., 1981).

When investigating the meat chemical composition, we used m. iliobibialis cranialis as a representative for the dark meat and m. pectoralis superficialis as a representative for the light meat. The main effect of castration is to increase subcutaneous and intercellular lipid accumulation (Fennell and Scanes, 1992; Chen et al., 2005). In our experiment, the concentration of fat in both the light and the dark meat of the castrated pheasants was greater than that of the intact birds. The same results were reported by York and Mitchell (1968) in surgically castrated or estradiol-17β-monopalmitate treated chicken broilers. Fatness may play an important role in meat quality because it has been observed that intramuscular fat content is positively associated with chicken meat quality (Yamashita et al., 1975; Welter, 1976). The castrated pheasant had similar values of fat in the dark and light meat as opposed to the intact pheasant, which had higher values of fat in the dark meat. Moisture content was higher in the dark and light meat of castrated pheasants, although York and Mitchell (1968) found that castration did not influence moisture content in light and dark meat.

Conclusions

The performed study showed that castration of pheasants is a simple procedure that can be successfully done without a high mortality rate. The major effect of castration is on fat deposition that was noticed in the dark and light meat. Castration improves feed-to-gain-ratio and tended to increase live weight and weight gain before the winter period. If pheasants are reared in open aviaries, fattening should be finished before the winter period. More studies under different breeding systems and feeding regimes are necessary to improve and justify production.

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