EFFECT OF ORGANIC PRODUCTION ON THE WELFARE AND MEAT QUALITY OF KABIR CHICKEN

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Background

The request for organic products including poultry meat has increased during the last decade. Therefore, the European Community has decided to lay down basic guidelines for organic livestock farming. The EEC-Regulation 1804/1999 (supplementing regulation n. 2092/91 on organic production) provides specifications for housing conditions, animal nutrition, animal breeding, animal care, disease prevention and veterinary treatment. Since research in organic poultry meat is limited (Stocchi et al., 2001; Severini et al., 2001; Castellini et al., 2002) experimental data must be provided in order to support farmers.

Objective

A study was carried out on Kabir chickens reared in commercial conditions according to the organic method. Parameters such as sex and female/male ratio in the production stock and season were considered in relation to animal welfare and meat quality .

Materials and Methods

A total of 16.000 Kabir chickens (4.000 for each batch) were reared according to the organic method and grouped into four batches having different female/male (F/M) ratios (Asdrubali et al., 2001). In addition, the rearing of each batch began in a different month, thus covering a different season of the year (Table 1). The most important quality traits of breast meat were evaluated 3h and 48h after slaughter on a representative sample of each batch, except for the last batch when sampling females at the slaughter house was not possible.
All data were analysed using the Statsview package on Apple Macintosh computer (SAS Institute Inc. 1992-1998).

Results and Discussion

Quality traits of the meat of the four batches are reported in Tables 2 and 3.
With regard to the chemical composition, a slightly higher lipid content and a slightly lower protein content were detected in batches number 2 and 3. These differences were assumed to be dependent on a slightly higher percentage of lipid in the diet (Trabalza et al., 2001). However, the meat cholesterol content in all four groups was similar and therefore resulted independent of the total lipid content.
At 3h after slaughter no differences in the average L* and pH values were detected among the batches. Significant differences in the mean WHC 3h value were detected only between groups number 1 and 4, the latter showing the highest value of all the groups. A comparison between males and females showed that males generally had higher values than the females therefore the differences recorded between batches number 1 and 4 can be easily explained by the female/male ratio in the sample.
At 48h after slaughter, the pH mean values were very similar to those recorded at 3h thus showing that the final pH was already reached 3 hours after slaughter in all batches. The rapid drop to the final pH value and the early onset of the rigor mortis have been observed by several authors on chicken muscle (Grey et al., 1977; Dunn et al., 2000; Severini et al., 2001).
In all batches the average L* values detected at 48h after slaughter were slightly higher than those detected at 3h. The final values also varied among the batches. The lightness resulted related to the sex (lower values for the males), therefore the differences in L* values depended on the differences in the F/M ratio in the sample of each batch.
Cooking Loss values were different among the batches, in particular the values were slightly higher in the first two batches and lower in the other two. Also in this case, this parameter resulted related to the sex (higher values for the females), therefore the higher values recorded in batches 1and 2 could be attributed to the F/M ratio in the sample.
The second batch showed a high average shear force value and the lowest WHC at 48h ($p<0.05$). A good explanation for this was not found but an acceptable one could be that the mean carcass weight of this group was the lowest both for males (average carcass weight value 1.68 kg) and females (average carcass weight value 1.31 Kg). Thus we suppose that the poor carcass quality negatively affected the quality of meat.
The results obtained in this experiment indicate that the meat of the fourth batch showed a better quality. In general, the meat from the males showed better characteristics than that of the females, and this could explain why the fourth group resulted the best.
Nevertheless, limiting factors were observed: the males grow faster than the females, and tend to reach the appropriate slaughter weight earlier than the minimum age set by law. Negative characteristics of the meat which could be related to stressing conditions due to housing, transport or pre-slaughter handling, were not found in any of the batches. The results of previous observations conducted by colleagues who are specialists in animal behaviour already showed the very low level of stressing conditions in our organic housing (Diverio et al., 2001) and support our observation. We do not have enough data to define to what extent genetical factors and exercise contribute to making this Kabir chicken relatively resistant to the unavoidable stress due to transport and pre-slaughter handling.

Conclusions

In conclusion, our data showed that Kabir chicken are fit for organic farming because they are capable of adapting to the rearing conditions provided in the regulation on organic animal production. The welfare of the chickens was guaranteed in each of the seasonal conditions and female/male ratios considered in the present experiment. Both males and females produce high quality meat. Males seem to be more suitable for producing quality meat in a short period of time but their tendency to fast growth must be carefully considered in order to avoid regulatory discrepancies between carcass weight and animal age at the time of slaughter. In our opinion, further research is needed to try to enhance the positive characteristics of this hybrid for the commercial production of organic poultry meat.

Pertinent literature

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Table 1. Rearing period and female/male ratio.

Batch	Season	N° female	N° male	Ratio F/M	Sample	
					F	M
1	October-January	3000	1000	3:1	14	6
2	February-May	3700	300	12:1	15	3
3	June-September	2500	1500	2.5:1.5	12	6
4	September-December	1000	3000	1:3	0	18

Table 2. Chemical composition and cholesterol content of *Pectoralis major* muscles.

	BATCH 1	BATCH 2	BATCH 3	BATCH 4
Protein (%)	23.13±0.47^{a}	22.70±0.24^{b}	22.42±0.43^{b}	23.06±0.31^{a}
Lipids (%)	1.28±0.22^{a}	1.73±0.23^{b}	1.59±0.28^{bc}	1.50±0.25^{c}
Moisture (%)	74.57±0.49^{a}	74.51±0.37^{a}	74.95±0.36^{b}	74.46±0.44^{a}
Ash (%)	1.02±0.06^{ab}	1.05±0.07^{a}	1.04±0.05^{a}	0.98±0.02^{b}
Cholesterol (mg/100g)	49.20±4.69	47.13±6.39	44.79±7.77	50.16±5.46

Means within a row followed by different letters are significantly different ($P < 0.05$)

Table 3. Quality traits of *Pectoralis major* muscle

	BATCH 1	BATCH 2	BATCH 3	BATCH 4
L* 3h	54.24 ± 2.51	54.12±3.44	54.14±2.5	54.51±2.22
a* 3h	0.85±0.47^{a}	0.51±0.99^{a}	-0.17±0.73^{b}	1.30±0.49^{c}
b* 3h	7.46±2.81^{a}	6.14±2.59^{ab}	4.92±1.46^{b}	5.22±2.68^{ab}
WHC 3h	0.92±0.34^{a} *	1.11±0.36^{ab}	1.03±0.41^{ab}	1.24±0.29^{b}
pH 3h	5.82±0.12	5.80±0.11	5.83±0.14	5.87±0.15
L* 48h	57.96±2.12^{a}	56.33±2.30^{bc}	57.41±2.16^{ab}	55,05±3.46^{c}
a* 48h	0.71±0.74^{ac}	0.31±0.93^{ab}	0.04±0.82^{b}	1.08±0.87^{c}
b* 48 h	8.78±2.91^{a}	7.36±2.18^{ab}	6.27±2.08^{bc}	5.34±2.49^{c}
Shear force (Kg/cm^{2})	1.34±0.26	1.54±0.41	1.32±0.19	1.29±0.33
Cooking Loss (%)	20.35±0.76^{a}	20.24±2.49^{ab}	18.91±1.60^{b}	17.30±1.94^{c}
WHC 48 h	1.21±0.28^{ac}	0.98±0.25^{b}	1.21±0.30^{c}	1.39±0.41^{c}
pH 48h	5.80±0.10	5.82±0.08	5.77±0.07	5.83±0.11

Means within a row followed by different letters are significantly different ($P<0.05$)
*males where not evaluated due to technical difficulties at slaughterhouse.