Scope and policy of the journal
Agricultural Science and Technology (AST) – an International Scientific Journal of Agricultural and Technology Sciences is published in English in one volume of 4 issues per year, as a printed journal and in electronic form. The policy of the journal is to publish original papers, reviews and short communications covering the aspects of agriculture related with life sciences and modern technologies. It will offer opportunities to address the global needs relating to food and environment, health, exploit the technology to provide innovative products and sustainable development. Papers will be considered in aspects of both fundamental and applied science in the areas of Genetics and Breeding, Nutrition and Physiology, Production Systems, Agriculture and Environment and Product Quality and Safety. Other categories closely related to the above topics could be considered by the editors. The detailed information of the journal is available at the website.

Submission of Manuscripts

All manuscripts written in English should be submitted as MS-Word file attachments via e-mail to editoffice@agriscitech.eu. Manuscripts must be prepared strictly in accordance with the detailed instructions for authors at the website www.agriscitech.eu and the instructions on the last page of the journal. For each manuscript the signatures of all authors are needed confirming their consent to publish it and to nominate on author for correspondence.

They have to be presented by a submission letter signed by all authors. The form of the submission letter is available upon request from the Technical Assistance or could be downloaded from the website of the journal. Manuscripts submitted to this journal are considered if they have submitted only to it, they have not been published already, nor are they under consideration for publication in press elsewhere. All manuscripts are subject to editorial review and the editors reserve the right to improve style and return the paper for rewriting to the authors, if necessary. The editorial board reserves rights to reject manuscripts based on priorities and space availability in the journal. The journal is committed to respect high standards of ethics in the editing and reviewing process and malpractice statement. Commitments of authors related to authorship are also very important for a high standard of ethics and publishing. We follow closely the Committee on Publication Ethics (COPE), http://publicationethics.org/resources/guidelines

The articles appearing in this journal are indexed and abstracted in: EBSCO Publishing, Inc. and AGRIS (FAO). The journal is accepted to be indexed with the support of a project № BG051PO001-3.3.05-0001 “Science and business” financed by Operational Programme “Human Resources Development” of EU. The title has been suggested to be included in SCOPUS (Elsevier) and Electronic Journals Submission Form (Thomson Reuters).

Address of Editorial office:
Agricultural Science and Technology Faculty of Agriculture, Trakia University, Student’s campus, 6000 Stara Zagora Bulgaria
Telephone: +359 42 699330
+359 42 699446
www.agriscitech.eu

Technical Assistance:
Nely Tsvetanova
Telephone: +359 42 699446
E-mail: editoffice@agriscitech.eu
Effects of salt-curing on physicochemical and technological properties of Japanese quail breast meat

S. Ribarski¹*, H. Lukanov², I. Penchev¹, A. Genchev², E. Lyutskanova²

¹Department of Morphology, Physiology and Nutrition, Faculty of Agriculture, Trakia University, 6000 Stara Zagora, Bulgaria
²Department of Animal Science, Faculty of Agriculture, Trakia University, 6000 Stara Zagora, Bulgaria

Abstract. The purpose of the study was to establish the physicochemical and technological properties of salt-cured breast meat from Japanese quails. It was found that the most dramatic changes occurred during the first 4 h after the slaughter. During that period, the meat temperature decreased almost linearly from 39.8 to 10°C. The values of pH decline between post slaughter min 30 and hour 4 from 6.0 to 5.59 (P<0.001). The curing of meat with 3% or 1.7% NaCl solutions did not have any effect on water holding capacity. After defrosting of frozen salt-cured meat, the water holding capacity was considerably improved (11 – 12.4%), consequently to loss of water. Japanese quail breast meat cured in salt solutions increased its weight by 7.7 – 8.4% on the average. After cooking, salted breast meat lost about 19 – 25% of its weight. During the first 24 h after the slaughter, L*a*b* values of m. Pectoralis increased. Within this period, lightness increased almost linearly from 41.29 to 45.51 at an increment ΔL* during the first post slaughter half an hour of 5.38 (P<0.01) and ΔL* of 5.21 between min 30 and hour 4 (P<0.05). Most substantial changes occurred in colour coordinates a* and b* between the 4th and 24th post slaughter hours, when they increased by 16.5 to 17.9%. Salt-curing increased significantly the values of L* and b*. The a* value was reduced (P<0.001). The analysis of L*a*b* values of salt-cured breast meat from Japanese quails did not take into consideration the effect of salt solution concentration. The meat colour index (MCI) however demonstrated that salt-curing resulted in lightening of meat samples with influence of salt solution concentration. The curing of m. Pectoralis with 3% NaCl increased the colour index by 19.5% (P<0.001), while curing in 1.7% NaCl resulted in considerably lighter meat – 58.6% (P<0.01).

Keywords: Japanese quails, m. Pectoralis, salt-curing, pH, water holding capacity, L*, a*, b*.

Introduction

Quail farming a relatively new but promising and intensively developing branch of poultry industry. In many countries around the world, Japanese quail farming employs industrial technologies and production system management. The valuable organoleptic and dietetic properties of Japanese quail meat are the reason for the increasing interest of consumers to this product. Quail meat, compared to chicken meat, is of richer protein content, with exceptionally good amino acid balance, contains a lot of phosphorus, iron, copper and B vitamins, whereas skinless meat is lean and 2/3 of its fat content comprises unsaturated fatty acids. All those facts suggested that Japanese quail meat has great potential not only as a gourmet product in cooking, but also for the meat processing industry as a source for production of healthy high-quality foods for children, athletes and medical nutrition therapy. Therefore, the preparation of meat for further use (salting, curing, seasoning) is essential for the quality and dietetic properties of the ready product.

Cooking salt is among the earliest means used for conservation of meat and meat products. Raw meat sodium content is low, therefore, cooking salt is one of primary means to increase the sodium content of meat and meat products. Apart cooking salt, other sodium sources in meat products are monosodium glutamate, sodium phosphate, sodium citrate and sometimes, sodium lactate (Ruusunen and Puolanne, 2005). At some concentrations, cooking salt has bacteriostatic and bactericide effects related to reduced water activity (a_w) and increased osmotic pressure of meat. Salt induces a number of biochemical and structural changes in bacterial cell cytoplasm and consequently, inhibiting of their vital activities as well as death (Marsh, 1983; Sofos, 1984). The antibacterial effect of salt is attributed to chloride ions (Cl−) produced after dissociation of sodium chloride. Cooking salt is responsible for the pleasant salty taste and specific flavour of meats, increases water holding capacity (WHC) of muscle proteins and stabilizes the color of salt-cured dietetic properties of Japanese quail meat are the reason for the production system management. The valuable organoleptic and

*E-mail: ribarski@uni-sz.bg
and Mc Kee, 2007). Petracci et al. (2013) reported that the most commonly used cooking salt concentrations for production of poultry meat products was from 1.0 to 1.6%.

The scientific data about the influence of cooking salt on quality parameters of chicken and chicken meat products are numerous, however, there is no information about similar effects in Japanese quail meat. Thus, the present study was designed to investigate the effects of various concentrations of salt solutions on meat pH, water holding capacity and colour of Japanese quail breast meat.

Material and methods

The experiments were performed with 33 male Pharaoh Japanese quails at 35 days of age. The breast meat quality analysis was carried out in the Meat and Meat Products unit, Faculty of Agriculture at the Trakia University, Stara Zagora.

Meat pH values were determined on post mortem min 30 (pH1), hour 4 (pH2) and hour 24 (pH3). Colour characteristics of meat were analysed at the same time intervals. The WHC of meat was measured on post mortem hour 24.

Meat pH was measured with NESTO portable pH meter supplied with glass electrode previously calibrated in standard solution with pH 4.0 and 7.0. The electrode was placed at a depth of 1 cm in muscle tissue of m. Pectoralis Superficialis.

The WHC of breast meat was determined by the classical method of Grau and Hamm, modified by Zahariev and Pinkas (1982). The muscle tissue sample was compressed between glass surfaces lined with red strip 388 filter paper sheets. Muscle WHC was determined by the formula:

\[ \text{WHC} = \left( \frac{A - B}{A} \right) \times 100, \]  

where WHC is water holding capacity of muscles, %; A is weight of sample before the compression; B is weight of sample after the compression. Lower values indicate a better WHC.

Salt-curing of breast meat was done in NaCl solutions with concentrations of 1.7 and 3%. Working solutions were prepared from analytical grade NaCl and distilled water with temperature 20°C. The working solutions were cooled over 24 h at 2 – 4°C. By the 24°C post mortem hour, cooled and weighed m. Pectoralis Superficialis samples (precision 0.01 g) were poured in salt solutions and stored for 24 hours at 2 – 4°C. In these experiments the left half of m. Pectoralis Superficialis from each quail was placed in 3% NaCl, and the right half – in 1.7% solution. After 24 hours, salt-cured breast meat samples were removed from the brine, drained for 5 min on a metal grid and weighed with precision of 0.01 g. On the basis of the difference between sample weights prior to and after the salt-curing, the WAC of meat was calculated by the formula:

\[ \text{WAC} = \left( \frac{B - A}{A} \right) \times 100, \]  

where WAC is water absorption capacity of muscles, %; A is weight of the sample prior to salt-curing; B is weight of the sample after salt-curing.

The cooking losses of salt-cured breast meat were estimated on the 48°C post mortem hour. For this purpose, meat samples were weighed with precision of 0.01 g and placed in a previously heated forced convection oven. Cooking was carried out at 200°C for 20 minutes. Afterwards, hot samples were weighed with precision of 0.01 g to determine cooking loss as per the equation:

\[ \text{Cooking loss, %} = \left( \frac{B - A}{A} \right) \times 100, \]  

where A is weight of the sample before cooking; B is weight of the sample after cooking (Petracci and Baeza, 2009).

The colour of m. Pectoralis Superficialis was determined on a Lovibond SP60 spectrophotometer manufactured by X-Rite. The analyses are described in details in a previous study of ours (Ribarskiand Genchev, 2013).

On the basis of the a* and b* coordinate values, the chroma (C*), the colour difference (ΔE*) and meat colour index (MCI) were calculated as followed:

\[ C^* = (a^* + b^*)^\frac{1}{2} \]  

\[ \Delta E^* = (\Delta L^* + \Delta a^* + \Delta b^*) \]  

\[ \text{MCI} = L^* - a^* - b^* \]  

where lower MCI values indicate a darker colour.

Data were statistically processed using the classic methods for statistical analysis in MS Excel 2010. One-way analysis of variance was applied to evaluate the effect of salt solution concentration on meat pH reduction. The effects of meat pH and salt solution concentrations on WHC of m. Pectoralis Superficialis were assessed by means of two-factor analysis of variance (Merkurieva, 1970).

Results and discussion

As could be seen from Figure 1, the most intense changes of breast meat temperature and pH occurred within the first 4 hours post mortem. The cooling rate was higher during the first hours because of the difference in temperature gradients of cooling medium and muscles. This is the time when the rigor mortis in birds occurs and subsides. During the first 4 post mortem hours, the carcass temperature decreased almost linearly from 39.8°C to 10°C. In out experiment, the average temperature difference (ΔT°)

\[ \Delta T° = 6.5 \]

where ΔT° is the average temperature difference between the meat and the surrounding medium.

<table>
<thead>
<tr>
<th>Time (h)</th>
<th>ΔpH</th>
<th>ΔE*</th>
<th>ΔE*</th>
<th>ΔE*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.27</td>
<td>39.8</td>
<td>13.49</td>
<td>26.3</td>
</tr>
<tr>
<td>30'</td>
<td>0.17</td>
<td>26.3</td>
<td>16.31</td>
<td>10.0</td>
</tr>
<tr>
<td>4h</td>
<td>0.07</td>
<td>6.5</td>
<td>3.50</td>
<td>3.50</td>
</tr>
</tbody>
</table>

Differences marked with an asterisk are statistically significant at *p<0.05, **p<0.001.

Figure 1. Time course of meat temperature and pH after the slaughter of quails
during the first 30 minutes was 13.5°C, and between the 30th min and the 4th hour ΔT was 16.3°C (P<0.001). After attaining a temperature of 10°C, the cooling rate was markedly slowed due to the small temperature differences between environment and carcass temperatures.

During the first 4 hours post mortem meat pH declined from 6.0 - 6.8 to 5.4 - 5.9 (ΔpH=0.68±0.05), corresponding to an average reduction of 10.7%. The most pronounced reduction in pH occurred between post mortem min 30 and hour 4, attaining 5.6 and average ΔpH of 0.41±0.04 (P<0.001).

After the rigor mortis phase, between storage hours 4 and 24, breast meat pH decreased slightly (ΔpH=0.07±0.01), and by the end of the period (24th hour post mortem) ultimate pH values were 5.52±0.02 on the average within the range between 5.2 and 5.8.

After salt-curing, average meat pH fell up to 5.46±0.02-5.47±0.02. The curing of meat with 3% NaCl resulted in a more obvious reduction in pH as compared to curing in 1.7% (ΔpH=0.079±0.007 vs ΔpH=0.05±0.008). Although statistically insignificant, the difference marked a tendency towards influence of salt solution concentration on pH of cured meat. This fact could be explained with the slight reduction of the isoelectric point of muscle proteins from 5.2 to 5.0 resulting from the attachment of Cl1 ions to positive groups of myosin molecules, hence the positive effect on the WHC of muscle proteins (Offer and Knight, 1988; Offer, 1992; Schafer et al., 2002, Honikel, 2004; Pearce et al., 2011). The higher salt solution concentration provides a higher concentration of chloride anions, and greater decline in pH of meat cured in 3% NaCl solution. The analysis of variance showed that the effect of salt solution concentration on meat pH reduction was 13.6% of the total dispersion of the sign.

The investigation of hydrophilic properties of Japanese quail breast meat demonstrated that WHC on 24th hour post mortem (fresh, untreated meat) was very high and varied from 69.9 and 77.7% (73.34±0.33). Our data about water lost after compression (26.6%) are relatively lower than those reported in the literature from 28 – 29% (Baumgartner et al., 1987) to 31.5 – 33.9% (Drobhlov and Metodiev, 1997). This allowed evaluating the quail breast meat as very good according to this trait. The better WHC is a prerequisite for better technological properties of meat.

After salt-curing, WHC of meat increased by 0.7 and 0.9% (Figure 2). This fact is logical in the light of the different binding strength of Cl1 and Na1 ions to positively and negatively charged myosin molecule areas respectively. The binding of chloride anions to myosin is stronger than that of sodium cations. As result, electrostatic expulsion between protein filaments increases, widening the interspaces between actin and myosin myofilbrils. This way, conditions for retention of more water in meat structures are created (Offer and Trinick, 1983; Offer and Knight, 1988; Honikel, 2004). Salt solution concentration (3% or 1.7%) did not have a substantial effect on the studied sign. Average WHC values after curing of breast meat in 3% and 1.7% salt solution were 25.97±0.45 and 26.15±0.38. Despite the small difference, there was a weak tendency towards better water holding capacity in meat cured in more concentrated solution. This is in agreement with presented data for meat pH and supports the relationship between meat pH and meat WHC. The two-factor analysis of variance showed that the improvement of WHC was markedly more influenced by salt solution concentration rather than by pH values (Merkurieva, 1970). The effect of the different factors was 3.9% for meat pH and 18.9% (p<0.05) for salt solution concentration.

During defrosting, a part of the free water is released as drip loss. As a result, muscle proteins retain the major part of the immobilised water remaining within muscle fibres. This reflected on WHC after defrosting, improving it by 11 – 12.4% (P<0.001).

Another valuable trait important for technological properties of meat is the WAC and cooking losses. After the 24-hour curing in salt solutions, Japanese quail breast meat increased its weight by 3.6 and 11.3%. Thus, the established WAC of breast meat ranged between 7.7±0.35 – 8.4±0.49%. The treatment of meat in 3% NaCl solution resulted in WAC by 7.6% higher compared to the curing in 1.7% solution. At the background of the described mechanism of Cl1 and Na1 binding to myosin, the observed WAC was expected. The higher chloride ions concentration in the 3% solution was a prerequisite for higher electrostatic expulsion force between protein filaments compared to the 1.7% NaCl solution (Offer and Trinick, 1983; Offer and Knight, 1988; Honikel, 2004).

After cooking, the salt-cured breast meat lost between 15.4 and 28.7% of its weight depending on the salt solution concentration. Cooking losses of meat cured in 3% salt solution were considerably lower (P<0.001) compared to losses of meat cured in 1.7% NaCl (18.8±0.61 vs 24.9±0.87). Our data for Japanese quail meat are opposite to those published by Richardson and Jones (1987) for cooking losses of salt-cured turkey breast meat. The authors established that cooking losses were lower when salt-curing was performed with lower salt concentrations. This was probably due to the differences in the histostructure and chemical composition of both types of meat.

The colour of meat is an exceptionally important trait for its organoleptic properties. During the first 4 hours post mortem the values of breast meat colour coordinates L*, a* and b* changed. The analysis on hour 4 exhibited changes in L* values by -11.8 to -28.9% vs min 30, the values of a* varied by -57.2 to +3.3%, and the values of b* by -19.5 to +25.6%. On the 24th hour post mortem meat colour characteristics became stable: L* values varied between 38.5 and 50.6, a* from 4.7 to 21.1, and b* from 8.3 and 18.1 (Table 1). The L*, a* and b* values obtained in this study were close to those reported in previous studies of ours with the same Japanese quail breed (Ribarski and Genchev, 2013; Ribarski et al., 2013).

During the first 24 hours post mortem, average L* values increased almost linearly from 41.28±0.57 to 45.5±0.67, and ΔL* for the first 30 min post mortem was 5.38 (P<0.01), whereas for the
and hour muscles occurred during the first 24 post mortem hours, according to Kotarev et al. Thus transfer of water from the muscle fibre into the extracellular space. Thus, prerequisites for stronger scattering of light are created, which resulted in increased lightness values. The contractile status of myofibrils at the time of the analysis is no less important. In this phase, according to Kotarev et al. (2010) strongly contracted and completely loose myofibrils could be simultaneously observed in different part of the same muscle.

The analysis of changes in a* and b* values between the 4th and 24th post mortem hours showed increased by 16.5 and 19.7%. More considerable changes were observed in the a* coordinate with highest variation (CV = 38.6 – 41.1). The variation could be explained by the fact that the most intensive changes of myoglobin occurred during the first 24 post mortem hours. The values of a* immediately after slaughter do not reflect the real redness of muscles (Dal Blasco et al., 1997; Petracci and Fletcher, 2002). A more realistic evaluation of this trait could be made after the 24th hour, where the relationships between myoglobin, oxymyoglobin and metmyoglobin become more stable secondary to post mortem processed in the different muscle components. The average a* values in this study ranged between 12.5 and 13.5, which was substantially higher than values in broiler chickens – a* from 2.2 (Van Laack et al., 2000) to 5.45 (Qiao et al., 2002) and turkey s– a* from 4.9 to 5.5 (Fragueza et al., 2006). A possible reason for these differences could be the higher relative share of MbO2, in Japanese quail meat, responsible for brought red colour. It is the MbO2 content that determines the redness of meat but the ratio between MbO2 and Mb is also important (Haraf et al., 2009). The origins of significant differences in breast meat colour in the red-green spectrum between Japanese quails and chickens and turkeys are also in the different proportions between the main metabolic muscle fibre types. The studies of Riegel et al. (2003) exhibited that in Japanese quails, m. Pectoralis was exclusively built of dark muscle fibres (15.5% light type and 84.5% dark type). In modern chicken and turkey broiler hybrids, the muscle was mainly composed of light (glycolytic) muscle fibres.

The yellowness of meat (b*) was influenced by the amount of intramuscular fat tissue and multiple pigments which could enhance or diminish the colour intensity in the yellow-blue spectrum. The breast meaty of Japanese quails is lean, therefore intramuscular fat did not have any effect on the values of the b* coordinate.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Untreated Mean ± SEM</th>
<th>untreated</th>
<th>Salt-cured Mean ± SEM</th>
<th>salt-cured</th>
</tr>
</thead>
<tbody>
<tr>
<td>L*</td>
<td>46.58±0.46*</td>
<td>38.49±50.65</td>
<td>48.10±0.45*</td>
<td>41.90±51.68</td>
</tr>
<tr>
<td>a*</td>
<td>12.54±0.86*</td>
<td>5.21±20.70</td>
<td>8.17±0.35*</td>
<td>3.87±11.56</td>
</tr>
<tr>
<td>b*</td>
<td>12.37±0.48*</td>
<td>8.31±18.08</td>
<td>14.86±0.32*</td>
<td>11.87±18.78</td>
</tr>
</tbody>
</table>

Differences marked with different letters are statistically significant at a-b P<0.05, a-e P<0.001.

**Figure 3.** Change in values of colour coordinates L*, a* and b* during the first 24 post mortem hours
After salt-curing, the values of $L^*$, $a^*$ and $b^*$ coordinates underwent marked changes (Table 1). The $L^*$ values increased by 13.3% ($P<0.001$). Similar changes were established with regard to the $b^*$ coordinate, whose values increased from 12.4 – 12.9 to 14.8 – 14.9 ($Δb^* = 17.5\%$ at $P<0.001$). On the contrary, the $a^*$ values decreased from 12.5 – 13.6 to 7.7 – 8.2 equivalent to 37.2% change ($P<0.001$). The concentrations of used salt solutions did not have an effect on colour traits of Japanese quail breast meat.

During the salt-curing of meat, all changes in $a^*$ and $b^*$ coordinates reflected on the colour chroma ($C^*$) (Figure 4). After the curing, $C^*$ values were statistically significantly reduced, and this relationship was more pronounced with the more diluted salt solution. The findings could be explained by the character and magnitude of changes in $a^*$ and $b^*$ values prior to and after salt-curing of meat.

After salt-curing of meat, the colour difference ($ΔE^*$) was 6.97±0.56 when using 3% NaCl solution and 8.87±0.83 with 1.7% solution. The 20% difference however was not statistically significant. In general, it could be concluded that meat colour was more unstable after curing with more diluted NaCl solution. The $ΔE^*$ values provide information about the direction and strength of changes in the colour of meat occurring after the salt-curing. In this study, meat became lighter after the curing. The treatment of $m. Pectoralis$ with 3% salt solution increased MCI by 19.5% ($P<0.001$), while the treatment with 1.7% – by 58.6% ($P<0.01$).

**Conclusion**

The biochemical changes in Japanese quail breast meat were more intensive during the first 4 post mortem hours. The curing of meat with 3% and 1.7% NaCl solutions did not have a significant effect on its water holding capacity. After wet salt-curing, Japanese quail breast meat increased its weight by 7.7 – 8.4% on the average. After cooking, salt cured breast meat lost 19-25% of its weight on the average. During the first 24 h post mortem the values of colour coordinates $L^*$, $a^*$ and $b^*$ of $m. Pectoralis$ changed, with more substantial changes between the 4th and the 24th hour. After wet salt-curing, Japanese quail breast meat became lighter, which was more pronounced in 1.7% NaCl solution.

**References**


Baumgartner J, Palanska O and Koncekova Z, 30.03.2012; available 18.05.2015 (Bg).


September 2003, Saint-Brieuc, France.
Zahariev Z and Pinkas A, 1979. Methods about leading of experiments, slaughtering analysis and quality evaluation of the meat. NAPS, Sofia (Bg).
Review

Achievements and problems in the weed control in common wheat (Triticum Aestivum L.) and durum wheat (Triticum Durum Desf.)
G. Delchev, M. Georgiev

Genetics and Breeding

Vokil – a new Bulgarian sunflower hybrid
G. Georgiev, V. Encheva, N. Nenova, Y. Encheva, D. Valkova, P. Peevska, G. Georgiev

Composition, digestibility, feeding value estimation of forage pea (Pisum sativum L.) varieties and hybrids in breeding process and genetic advance evaluation
Y. Naydenova, V. Kosev

Effect of age at first calving on conformation traits in Black-and-White cows
I. Marinov, Zh. Gergovska

Nutrition and Physiology

Stimulating feeding and development of hypopharyngeal and thoracic glands of honeybees (Apis mellifera L.)
R. Shumkova, I. Zhelyazkova

Histopathological changes in small intestines of broiler chickens with experimental aflatoxicosis
N. Grozeva, I. Valchev, Ts. Hristov, L. Lazarov, Y. Nikolov

Histopathological pancreatic changes in broiler chickens with experimental aflatoxicosis
I. Valchev, N. Grozeva, D. Kanakov, Y. Nikolov

Production Systems

Effect of foliar fertilization on sunflower (Helianthus annuus L.)
G. Milev

Changes in the productivity and the yield structural elements in some spring crops sown on damaged by frost crops of winter oilseed canola
G. Delchev

Agriculture and Environment

Chromium level in water, sediment, aquatic plants and meat of common carp (Cyprinus carpio L.) from different water bodies in Bulgaria
E. Valkova, V. Atanasov, K. Velichkova, G. Kostadinova, M. Tzanova
Visible – NIR reflectance for evaluation of luvisols and phaeozems
M. Todorova, M. Mihalache, L. Ilie, S. Atanassova

Groundwater quality as a source for irrigation in Strumica valley, Republic of Macedonia
B. Kovacevik, S. Mitrev, B. Boev, I. Karov, V. Zajkova Panova

Chemical and physical properties of the Albic luvisols from Albota-Pitești
M. Mihalache, L. Ilie, M. Todorova, N. Grozeva

Product Quality and Safety

Effects of salt-curing on physicochemical and technological properties of Japanese quail breast meat
S. Ribarski, H. Lukanov, I. Penchev, A. Genchev, E. Lyutskanova

Study of physicochemical parameters of lamb meat from North East Bulgarian fine fleece breed of sheep and its crosses from internal breeding
R. Slavov, G. Mihaylova, S. Ribarski, P. Slavova, D. Pamukova

Egg quality and shell colour characteristics of crosses between Araucana and Schijndelaar with highly productive White Leghorn and Rhode Island Red strains
H. Lukanov, A. Genchev, A. Pavlov

Influence of the sweet red peppers extract on the quality and oxidative changes in fats of sausages
A. Kuzelov, V. Ilieva, N. Taskov, D. Saneva

Effect of dietary vitamin E supplementation on the oxidative stability of lipids and proteins in cooked pork
T. Popova, P. Marinova, M. Ignatova
**Instruction for authors**

**Preparation of papers**

Papers shall be submitted at the editorial office typed on standard typing pages (A4, 30 lines per page, 62 characters per line). The editors recommend up to 15 pages for full research paper (including abstract references, tables, figures and other appendices).

The manuscript should be structured as follows: Title, Names of authors and affiliation address, Abstract, List of keywords, Introduction, Material and methods, Results, Discussion, Conclusion, Acknowledgements (if any), References, Tables, Figures.

The title needs to be as concise and informative about the nature of research. It should be written with small letter /bold, 14/ without any abbreviations.

Names and affiliation of authors

The names of the authors should be presented from the initials of first names followed by the family names. The complete address and name of the institution should be stated next. The affiliation of authors are designated by different signs. For the author who is going to be corresponding by the editorial board and readers, an E-mail address and telephone number should be presented as footnote on the first page. Corresponding author is indicated with *.

Abstract should be not more than 350 words. It should be clearly stated what new findings have been made in the course of research. Abbreviations and references to authors are inadmissible in the summary. It should be understandable without having read the paper and should be in one paragraph.

Keywords: Up to maximum of 5 keywords should be selected not repeating the title but giving the essence of study.

The introduction must answer the following questions: What is known and what is new on the studied issue? What necessitated the research problem, described in the paper? What is your hypothesis and goal?

Material and methods:

The objects of research, organization of experiments, chemical analyses, statistical and other methods and conditions applied for the experiments should be described in detail. A criterion of sufficient information is to be possible for others to repeat the experiment in order to verify results.

Results are presented in understandable tables and figures, accompanied by the statistical parameters needed for the evaluation. Data from tables and figures should not be repeated in the text. Tables should be as simple and as few as possible. Each table should have its own explanatory title and to be typed on a separate page. They should be outside the main body of the text and an indication should be given where it should be inserted.

Figures should be sharp with good contrast and rendition. Graphic materials should be preferred. Photographs to be appropriate for printing. Illustrations are supplied in colour as an exception after special agreement with the editorial board and possible payment of extra costs. The figures are to be each in a single file and their location should be given within the text.

Discussion: The objective of this section is to indicate the scientific significance of the study. By comparing the results and conclusions of other scientists the contribution of the study for expanding or modifying existing knowledge is pointed out clearly and convincingly to the reader.

Conclusion: The most important consequences for the science and practice resulting from the conducted research should be summarized in a few sentences. The conclusions shouldn't be numbered and no new paragraphs be used. Contributions are the core of conclusions.

References:

In the text, references should be cited as follows: single author: Sandberg (2002); two authors: Andersson and Georges (2004); more than two authors: Andersson et al. (2003). When several references are cited simultaneously, they should be ranked by chronological order etc.: (Sandberg, 2002; Andersson et al., 2003; Andersson and Georges, 2004).

References are arranged alphabetically by the name of the first author. If an author is cited more than once, first his individual publications are given ranked by year, then come publications with one co-author, two co-authors, etc. The names of authors, article and journal titles in the Cyrillic or alphabet different from Latin, should be transliterated into Latin and article titles should be translated into English. The original language of articles and books translated into English is indicated in parenthesis after the bibliographic reference (Bulgarian = Bg, Russian = Ru, Serbian = Sr, if in the Cyrillic, Mongolian = Mo, Greek = Gr, Georgian = Geor., Japanese = Ja, Chinese = Ch, Arabic = Ar, etc.)

The following order in the reference list is recommended:

**Journal articles:** Author(s) surname and initials, year. Title. Full title of the journal, volume, pages. Example:


**Books:** Author(s) surname and initials, year. Title. Edition, name of publisher, place of publication. Example:


**Book chapter or conference proceedings:** Author(s) surname and initials, year. Title. In: Title of the book or of the proceedings followed by the editor(s), volume, pages. Name of publisher, place of publication. Example:


**Todorov N and Mitev J, 1995. Effect of level of feeding during dry period, and body condition score on reproductive performance in dairy cows,IX” International Conference on Production Diseases in Farm Animals, September 11–14, Berlin, Germany.**

Thesis:

Hristova D, 2013. Investigation on genetic diversity in local sheep breeds using DNA markers. Thesis for PhD, Trakia University, Stara Zagora, Bulgaria, (Bg).

The Editorial Board of the Journal is not responsible for incorrect quotes of reference sources and the relevant violations of copyrights.

**Animal welfare**

Studies performed on experimental animals should be carried out according to internationally recognized guidelines for animal welfare. That should be clearly described in the respective section “Material and methods”.

**Instruction for authors**

**Preparation of papers**

Papers shall be submitted at the editorial office typed on standard typing pages (A4, 30 lines per page, 62 characters per line). The editors recommend up to 15 pages for full research paper (including abstract references, tables, figures and other appendices).

The manuscript should be structured as follows: Title, Names of authors and affiliation address, Abstract, List of keywords, Introduction, Material and methods, Results, Discussion, Conclusion, Acknowledgements (if any), References, Tables, Figures.

The title needs to be as concise and informative about the nature of research. It should be written with small letter /bold, 14/ without any abbreviations.

Names and affiliation of authors

The names of the authors should be presented from the initials of first names followed by the family names. The complete address and name of the institution should be stated next. The affiliation of authors are designated by different signs. For the author who is going to be corresponding by the editorial board and readers, an E-mail address and telephone number should be presented as footnote on the first page. Corresponding author is indicated with *.

Abstract should be not more than 350 words. It should be clearly stated what new findings have been made in the course of research. Abbreviations and references to authors are inadmissible in the summary. It should be understandable without having read the paper and should be in one paragraph.

Keywords: Up to maximum of 5 keywords should be selected not repeating the title but giving the essence of study.

The introduction must answer the following questions: What is known and what is new on the studied issue? What necessitated the research problem, described in the paper? What is your hypothesis and goal?

Material and methods:

The objects of research, organization of experiments, chemical analyses, statistical and other methods and conditions applied for the experiments should be described in detail. A criterion of sufficient information is to be possible for others to repeat the experiment in order to verify results.

Results are presented in understandable tables and figures, accompanied by the statistical parameters needed for the evaluation. Data from tables and figures should not be repeated in the text. Tables should be as simple and as few as possible. Each table should have its own explanatory title and to be typed on a separate page. They should be outside the main body of the text and an indication should be given where it should be inserted.

Figures should be sharp with good contrast and rendition. Graphic materials should be preferred. Photographs to be appropriate for printing. Illustrations are supplied in colour as an exception after special agreement with the editorial board and possible payment of extra costs. The figures are to be each in a single file and their location should be given within the text.

Discussion: The objective of this section is to indicate the scientific significance of the study. By comparing the results and conclusions of other scientists the contribution of the study for expanding or modifying existing knowledge is pointed out clearly and convincingly to the reader.

Conclusion: The most important consequences for the science and practice resulting from the conducted research should be summarized in a few sentences. The conclusions shouldn’t be numbered and no new paragraphs be used. Contributions are the core of conclusions.

References:

In the text, references should be cited as follows: single author: Sandberg (2002); two authors: Andersson and Georges (2004); more than two authors: Andersson et al. (2003). When several references are cited simultaneously, they should be ranked by chronological order etc.: (Sandberg, 2002; Andersson et al., 2003; Andersson and Georges, 2004).

References are arranged alphabetically by the name of the first author. If an author is cited more than once, first his individual publications are given ranked by year, then come publications with one co-author, two co-authors, etc. The names of authors, article and journal titles in the Cyrillic or alphabet different from Latin, should be transliterated into Latin and article titles should be translated into English. The original language of articles and books translated into English is indicated in parenthesis after the bibliographic reference (Bulgarian = Bg, Russian = Ru, Serbian = Sr, if in the Cyrillic, Mongolian = Mo, Greek = Gr, Georgian = Geor., Japanese = Ja, Chinese = Ch, Arabic = Ar, etc.)

The following order in the reference list is recommended:

**Journal articles:** Author(s) surname and initials, year. Title. Full title of the journal, volume, pages. Example:


**Books:** Author(s) surname and initials, year. Title. Edition, name of publisher, place of publication. Example:


**Book chapter or conference proceedings:** Author(s) surname and initials, year. Title. In: Title of the book or of the proceedings followed by the editor(s), volume, pages. Name of publisher, place of publication. Example:


**Thesis:**

Hristova D, 2013. Investigation on genetic diversity in local sheep breeds using DNA markers. Thesis for PhD, Trakia University, Stara Zagora, Bulgaria, (Bg).

The Editorial Board of the Journal is not responsible for incorrect quotes of reference sources and the relevant violations of copyrights.

**Animal welfare**

Studies performed on experimental animals should be carried out according to internationally recognized guidelines for animal welfare. That should be clearly described in the respective section “Material and methods”.