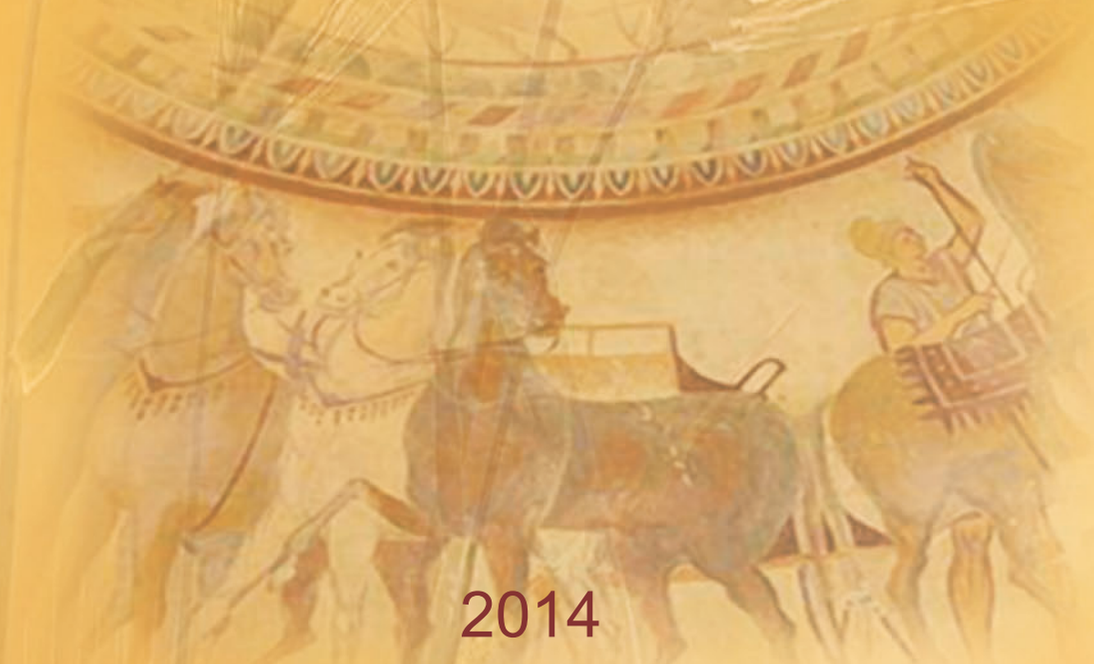
ISSN 1313 - 8820
Volume 6, Number 1
March 2014

AGRICULTURAL SCIENCE AND TECHNOLOGY



2014

An International Journal Published by Faculty of Agriculture,
Trakia University, Stara Zagora, Bulgaria

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. Proceedings of scientific meetings and conference reports will be considered for special issues.

Submission of Manuscripts

All manuscripts written in English should be submitted as MS-Word file attachments via e-mail to ascitech@uni-sz.bg. Manuscripts must be prepared strictly in accordance with the detailed instructions for authors at the website http://www.uni-sz.bg/ascitech/index.html 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 from 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 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).

Internet Access

This journal is included in the Trakia University Journals online Service which can be found at www.uni-sz.bg.

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
http://www.uni-sz.bg/ascitech/

Technical Assistance:
Nely Tsvetanova
Telephone.: +359 42 699446
E-mail: ascitech@uni-sz.bg

ISSN 1313 - 8820

Volume 6, Number 1
March 2014

AGRICULTURAL SCIENCE AND TECHNOLOGY

2014

An International Journal Published by Faculty of Agriculture,
Trakia University, Stara Zagora, Bulgaria

AGRICULTURAL SCIENCE AND TECHNOLOGY, VOL. 6, No 1, pp 24 - 27, 2014

Histometrical parameters in third eyelid (Harderian) gland of the common pheasant (*Phasianus Colchicus Colchicus*)

D. Dimitrov*

Department of Veterinary Anatomy, Histology and Embryology, Faculty of Veterinary Medicine, Trakia University, 6000 Stara Zagora, Bulgaria

Abstract. *Forty Harderian glands obtained from 20 clinically healthy and sexually mature common pheasants (10 birds of each gender) were investigated. Permanent histological preparations were made from previously fixed glands using routine histological techniques. Morphometric studies were performed by means of a light microscope with a built-in eyepiece micrometer. Data was statistically processed by a computer program (StatMost for Windows). The histometric analysis showed that the average size of pheasant Harderian gland lobules was 399.02 μm and 555.69 μm in female and male common pheasants, respectively. The average outer diameter of the acini was 39.64 μm in the female pheasants and 43.65 μm in the males. The average height of the covering glandular epithelium of the ducts was 18.67 μm in females and 21.41 μm in males. On the basis of our results, it could be concluded that the Harderian gland of the common pheasant by the time of the commercial realization presents a clear sexual dimorphism.*

Keywords: Harderian gland, common pheasant, histometry

Introduction

All vertebrates – fish, amphibians, reptiles and mammals possess lachrymal gland, but in birds, the lachrymal gland and the third eyelid gland are the fundamental intraorbital glands and the Harderian gland is better developed and of greater size (McLelland, 1975; Popivanov et al., 1995). While all terrestrial vertebrate species possess a classic lachrymal gland, the Harderian gland was discovered and described only in some mammalian species. After the congress on bird anatomy held at Manchester (1976), the Harderian gland in the birds, is called third eyelid gland.

After the scientific report of Mueller et al. (1971), that both lachrymal and Harderian glands are a possible source of antibody-producing cells in chickens, the interest towards them has greatly increased. Since then, a number of studies have demonstrated that the glands contained immunocompetent cells (Burns, 1976; Burns et al., 1979; Aitken et al., 1987; Survache et al., 1998; Akaki et al., 2000; Khan et al., 2007). Despite the numerous evidence in different bird species, there is still no unanimous statement about the predominant role of either the lachrymal or Harderian gland for the local immunity within the eye orbit (Burns, 1996; Boydak et al., 2009; Bogdan, 2010; Kozlu et al., 2010; Bayraktaroglu et al., 2011). Today, the prevailing opinion is that the Harderian gland in birds is a lymphoepithelial organ providing almost entirely the local immunity of the eye orbit.

The phasianidae family includes about 150 species with different size and color forms, accustomed to and inhabiting almost all continents of the planet (Madge et al., 2002). According to Petkov et al. (2007), in Europe and the Republic of Bulgaria, the main subspecies with economic importance for hunting are the Caucasus pheasant, the Mongolian pheasant and the ring-necked pheasant. The common pheasant (*Phasianus Colchicus Colchicus*) is believed to be the only subspecies in Bulgaria living in the wild in Tundzha and Maritsa river valleys. The male bird attains 1 metre in length (half of this length is the tail) and weighs 1300–1500 g, whereas the female is smaller (850–1000 g).

* e-mail: dimitardimit@gmail.com

The scientific literature provides data about the anatomical, structural, ultrastructural and immunomorphological features of this gland especially in chickens, dicks and turkeys (Burns, 1996). Few authors only have investigated the Harderian gland in different avian species, bred by hybridization techniques for commercial purposes. A detailed study on pheasant's Harderian gland and its histometry is not available so far.

The scarce information on the subject and our long – standing interest on avian intraorbital glands (Dimitrov et al., 1987; Dimitrov 1997; 1999; 2001; 2005; 2009; Dimitrov et al., 2009; Dimitrov 2010; 2011; 2012), the weight and morphometric studies on intraorbital glands of common pheasant (Dimitrov 2012) were the incentive of the present study. It aimed to perform a light microscopy histometric analysis to determine the parameters of microstructural elements of the Harderian gland in common pheasant by the time of its commercial realization.

Material and methods

The study was carried out on biological material from 20 clinically healthy and sexually mature common pheasants (10 female and 10 male), purchased from the pheasant farm of the Elhovo Hunting Reserve. After transportation, pheasants were reared in conditions, appropriate for the species – in aviaries in groups of 10, ambient temperature 18 – 22°C, mixed lighting regimen and air humidity 55 – 60 %. Feed and water were offered *ad libitum*.

In the beginning of the experiment, the individual live body weights of the birds were determined with automated balance ADAM AAA 100L with a precision of 0.1 mg. Biological material was obtained as per the requirements of the Ethical Animal Experimentation Committee at the Trakia University, Stara Zagora. After inhalation anaesthesia followed by decapitation, a pair of Harderian glands (right and left)were obtained from each bird by the method of Aitken et al. (1976). Before fixation, each gland was weighted and its metric parameters were determined. The 40^{-th}

Harderian glands were put in 10 % neutral formalin solution and in Bouin's and Karnoy's fixatives. Fixed specimens were processed by routine histological techniques. Single and serial paraffin sections (longitudinal and transverse) were cut on a Reichert microtome (Austria). After staining with haematoxylin (Ehrlich) and eosin, permanent histological preparations were obtained (Kiernan, 2008). All microstructural elements of the common pheasant Harderian glands were determined using a light microscope with built-in eyepiece micrometer (Carl Zeiss, Jena, Germany). Data were statistically processed by statistical software (StatMost for Windows) and presented in a table.

Results

The common pheasant Harderian gland situated deeply in ocular orbit, protected by bony orbit and ocular muscles, is covered by a thin connective tissue capsule. The histometric study showed that the average thickness of the capsule in all parts of the gland in the male common pheasants was thicker than the female birds with 3.60 μm (Table 1).

Along the surface of the gland, the capsule gave rise to connective tissue strands towards the inner part, thicker in their initial part, which divided the glandular parenchyma to lobules of different shape and size. The average thickness of interlobular septa of this lobular organ, in the male pheasants was thicker than the female with 2.44 μm (Table 1).

Using 10 X magnification, the histometrical investigation showed 1.95 in male and 1.75 in female glandular lobules per microscope observation field, but the average size of glandular lobules of the male pheasants was bigger than this of the female with 156.66 μm (Table 1). In the common pheasant each lobule, regardless of its location, size or cut surface shape, possessed a very specific architectonics, which suggested that the organ was composed by numerous lobules of the same structure. The peripheral zone of each lobule was always occupied by densely located glandular acini. The investigation showed that the average outer diameter of the male glandular acini was bigger than the female with 4.01 μm because of which, under 10X magnification, the number of female acini was bigger than the male with 1.3 per microscope observation field (Table 1). Without being sharply delineated, a system of intricately branching tertiary, secondary and primary secretory glandular ducts was found to originate from each acinus in the lobule periphery. At magnification 20X, the average number of glandular ducts per one observation field was in the male 27 (tertiary), 19 (secondary), 12 (primary) and in the female 26, 22 and 14 respective. The results showed that from the periphery to the centre of each lobule, the number of ducts reduced almost twice. The number of secretory glandular ducts in the male pheasant was bigger only in the tertiary duct, but the number in the female, was bigger on the secondary and primary secretory ducts (Table 1). Contrary to the decreased number of glandular tubules, the average outer diameter of secretory ducts showed a moderate increase. The male pheasant showed only in the tertiary tubules bigger outer diameter from the female birds with 0.61 μm, while of the female secondary and primary secretory tubules, the outer diameter was

Table 1. Histometric parameters of the Harderian gland in common pheasant (*Phasianus Colchicus Colchicus*)

Parameters	Weight, number and sizes (Mean ± SEM)	
	Female	Male
Body weight of the birds (g)	1.9996 ± 0.0298	1.9996 ± 0.0298
Thickness of gland's capsule (μm)	17.3333 ± 0.4029	17.3333 ± 0.4029
Thickness of interlobular septa (μm)	24.2760 ± 0.3560	24.2760 ± 0.3560
Number of lobules per microscopic observation field	1.9500 ± 0.1995	1.9500 ± 0.1995
Number of acini per microscopic observation field	29.5000 ± 0.5416	29.5000 ± 0.5416
Number of glandular ducts per microscopic observation field		
tertiary tubules	27.6000 ± 0.8635	27.6000 ± 0.8635
secondary tubules	19.6000 ± 0.7235	19.6000 ± 0.7235
primary tubules	12.1000 ± 0.9355	12.1000 ± 0.9355
All ducts	19.7666 ± 0.1962	19.7666 ± 0.1962
Female and male ducts 20.3833 ± 0.0986		
Size of glandular lobules (μm)	555.6800 ± 0.5600	555.6800 ± 0.5600
Outer diameter of acini (μm)	43.6560 ± 0.2350	43.6560 ± 0.2350
Outer diameter of glandular ducts (μm)		
tertiary tubules	36.9240 ± 0.7091	36.9240 ± 0.7091
secondary tubules	38.1840 ± 0.7991	38.1840 ± 0.7991
primary tubules	49.9800 ± 0.2724	49.9800 ± 0.2724
lobular duct	307.1000 ± 0.1873	307.1000 ± 0.1873
excretory duct of the gland	403.0000 ± 0.2190	403.0000 ± 0.2190
Height of the glandular lining epithelium (m)		
acini	18.5960 ± 0.1017	18.5960 ± 0.1017
tertiary tubules	17.5440 ± 0.1174	17.5440 ± 0.1174
secondary tubules	18.9100 ± 0.8482	18.9100 ± 0.8482
primary tubules	19.5900 ± 0.9062	19.5900 ± 0.9062
lobular duct	26.1590 ± 0.8443	26.1590 ± 0.8443
excretory duct of the gland	27.6790 ± 0.2268	27.6790 ± 0.2268
All ducts	21.4130 ± 0.1447	21.4130 ± 0.1447
Female and male ducts 20.0420 ± 0.1266		

bigger from the male with 3.15 μm and 7.27 μm respective.

All histological preparations showed lobules who exhibited glandular ducts of varying size, whose central part was occupied by the common collecting duct (lobular duct). The histometrical investigation showed that average outer diameter of the male lobular duct was bigger with 9.26 μm from the female. Although not all cuts were made across the duct passing through the gland and collecting the secretion of glandular lobules, we detected that average outer diameter of the female excretory glandular duct was bigger with 33.22 μm from the male (Table 1).

In all preparation, the lining and secretory glandular epithelia, coverering the acini and all types of tubules, was actively functioning. The average epithelium height varied within a narrow range. The results showed that the epithelium height of the common pheasant Harderian gland increased by almost 5.35 μm in the female and with 9.08 μm in male, from acini towards the excretory glandular duct. In all the microstructural glandular elements, the height of the epithelia in the male common pheasant, dominated in comparison to the female with 0.96 μm (acini), 0.74 μm (tertiary tubules), 1.91 μm (secondary tubules), 3.61 μm (primary tubules), 4.53 μm (lobular duct), and 4.68 μm (excretory glandular duct) (Table 1).

Discussion

Burns (1996) investigated over 80 bird species in an attempt to determine the histological structure of Harderian gland, and he concluded for the presence of 4 main histological types in the birds, confirmed also by Shirama et al. (1996) and other researches. According to Burns (1996), and in a previous studies of ours Dimitrov et al. (1987), Dimitrov et al. (2009) and Dimitrov (2012), the pheasant Harderian gland was identified as a compound tubuloacinar gland.

There is no data in available research literature related to histometric measurements of Harderian gland in the common pheasant thus, a comparison could be only made to data obtained in Mongolian pheasant (Dimitrov, 2012). The Harderian gland of Mongolian pheasant is also a compound tubuloacinar gland, with a similar microarchitectonics patern.

By the time of the commercial realization of the birds, the glandular lobules per microscopic observation field in Mongolian pheasant Harderian gland were more numerous (3.37) as compared to common pheasant (1.95). The difference (1.32) was due to the larger size of lobules in common pheasant (Table 1) *vs* the respective dimension in Mongolian pheasant (285.42 μm). A similar relationship was observed for the average number of acini per microscopic observation field – 18.70 in Mongolian pheasant and 29.50 in common pheasant, but it could be stated that the average outer diameter of Mongolian pheasant acini was with 2.58 μm (46.24 μm) larger than that of common pheasant acini (Table 1).

The comparison of histometric data between the pheasants Harderian glands showed differences in the dimensions of microstructural parameters, but similar patterns in glandular microarchitectonics. In the both pheasant hybrids, the number of secretory ducts (tertiary, secondary and primary) gradually decreased from the periphery to the centre of the lobule, in to parallel to increasing tubular diameters. The height of glandular and lining epithelium in the both hybrids was highest in acini, insignificantly reduced in secretory ducts, but increased again in the lobular and excretory ducts of the gland, indicating a most intensive secretory activity of acinar epithelium, but also a higher level of activity in glandular secretory ducts.

Conclusion

On the basis of our results, it could be concluded that the Harderian gland of the common pheasant present a clear sexual dimorphism in the microstructural histometrical parameters.

References

Aitken I and Survache B, 1987. Lymphoid cells in avian paraocular glands and paranasal tissues. Comparative Biochemistry and Physiology, 58A, 3, 235-244.

Aitken I and Survache B, 1976. A procedure for location and removal of the lachrymal and Harderian glands of avian species. Comparative Biochemistry and Physiology, 53A, 193-195.

Akaki C, Simazu M, Baba T, Tsuji S, Kodama H, Mukamoto M and Kojikawa T, 2000. Possible migration of Harderian gland Immunoglobulin A bearing lymphocytes into the caecal tonsil in chickens. Journal of Veterinary Medicine, 44, 199-206.

Avtandilov G, 1990. Medical morphometry, Medicina, Moscow, 191-247 (Ru).

Bayraktaroglu A, Korkmaz D, Asti R, Kurtdede N and Altunay H, 2011. Conjunctiva Associated Lymphoid Tissue in the Ostrich (*Struhtio camelus*). Kafkas Universitesi Veteriner Facultesi Dergisi, 17, 1, 89-94 (Tr).

Bogdan R, 2010. Aspects concerning Harderian gland morphology in some domestic birds. Anatomie si Histologie Comparata, 1, 45-53 (Ro).

Boydak M and Aydin M, 2009. Histology of the Harderian gland of domestic geese (*Anser anser domesticus***)**. Acta Veterinaria, (Brno), 78, 199-204.

Burns R and Maxwell M, 1979.The structure of the Harderian gland and lachrymal ducts of the turkey, fowl and duck. Alight microscopical study. Journal of Anatomy, 128, 285-292.

Burns RB, 1996. The Harderian gland in birds: Histology and Immunology. In: Harderian glands, Springer Verlag, Berlin, Heidelberg, 131-140.

Dimitrov D, **Nikiforov I, Kolev K and Dimitrova D**, 1987. Histological features of the infraorbital glands in pheasants, affected by tuberculosis. Journal of Veterinary Medical Science, 24, 9, 78-84 (Bg).

Dimitrov DS, 1997. Aged structural properties in the broiler chickens intraorbital glands. Veterinarnomeditcinski nauki, 29, 1-2, 19-23 (Bg).

Dimitrov DS, 1999. Some weight and morphometric parameters in the broiler chickens lachrymal gland (1-56 day). In: Proceedings of the Scientific conference, Union of Bulgarian Scientist, Stara Zagora, I, 340-345.

Dimitrov DS, 2001. Comparative study on some weight and morphometric parameters of Harderian and lachrymal glands in broiler chickens aged between 1-56 days. Bulgarian Journal of Veterinary Medicine, 4, 3, 131-140.

Dimitrov DS, 2005. Age weight, morphometrical parameters and structural peculiarities in the comersial broiler-chickens lachrymal gland. Thesis for PhD, Trakia University, Stara Zagora, 247 pp. (Bg).

Dimitrov DS, 2009. The gland of the third eyelid (*Harderian gland*) and lachrymal gland in the turkey broiler weight, some morphometrical and structural investigations. Bulgarian Journal of Veterinary Medicine, 12, 1, 41-46.

Dimitrov D and Savov S, 2009. Weight, some morphometrical and structural investigations of pheasant's (*Phasianus Colchicus*

Mongolicus) intraorbital glands. Journal of Mountain Agriculture on the Balkans, 12, 2, 277-290.

Dimitrov DS, 2010. The lachrymal gland in the pheasant (*Phasianus colchicus mongolicus*). III. Histometrical investigation. Jubilee Scientific Conference "15 years Trakia University – Stara Zagora", 21.05.2010, Stara Zagora.

Dimitrov DS, 2011. Intraorbital glands in turkey broilers. III. Lacrimal gland histometry. Agricultural Science and Technology, 3, 4, 327-331.

Dimitrov DS, 2012. Histometric investigation of the third eyelid gland in Mongolian pheasants (*Phasianus Colchicus Mongolicus*). Bulgarian Journal of Veterinary Medicine, 15, 3, 160-165.

Khan M, Jahan M, Islam M, Haque Z and Kon Y, 2007. Immunoglobulin containing plasma cells in the Harderian and lachrymal glands in broiler and native chickens of Bangladesh. Tissue and Cell, 93, 3, 141-149.

Kim I, **and Yang H,** 2001. Seasonal changes of testicular weight, sperm production, serum testosterone, and *in vitro* testosterone release in Korean ring-necked pheasants (*Phasianus colchicus Karpovi*). Journal of Veterinary Medical Science**,** 63, 151-156.

Kozlu T and Altunay H, 2010. The structure and functions of Haderian gland. Atatürk Universitesi Veteriner Bilimleri Dergisi, 5 (2**)**, 89-96 (TUR).

Madge S, **McGowan Ph and Kirwan G**, 2002. Pheasants, Partridges, and Grouse: A Guide to the Pheasants, Partridges, Quails, Grouse, Guinea fowl, Buttonquails, and Sandgrouse of the World.Cloth, Princeton University Press (USA).

McLelland J, 1975. Aves sense organs. In: Sisson and Grosman's Anatomy of Domestic Animals, Saunders, 5th edn., 2, Philadelphia, 2064-2066.

Mueller A, **Sato K and Glick B**, 1971.The chicken lachrymal gland, gland of Harder, caecal tonsil, and accessory spleens as sources of antibody-producing cells. Cellular Immunology, 2, 140-152.

Petkov P and Kanakov D, 2007. Biology and diseases of the game, Enijovche, Sofia, 43-44 (Bg).

Popivanov R, **Botev B, Nakov L and Kirov K**, 1995.Comparative Anatomy of the Vertebrates. Meditcina i Fiscultura,Sofia, 99-101 (Bg).

Survache D and Aitken I, 1998. Immunocompetent cells in avian paraocular glands. Research in Veterinary Science, 24, 182-190.

Tae H, **Jang B, Ahn D, Choi E, Kang H, Kim N and Lee J,** 2005. Morphometric studies on the testis of Korean Ring-necked pheasant (*Phasianus colchicus Karpovi*) during the breeding and non breeding season. Veterinary Research Communication, 29, 629-643.

CONTENTS 1 / 2

CONTENTS 2 / 2

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 e.g.: (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:

Simm G, Lewis RM, Grundy B and Dingwall WS, 2002. Responses to selection for lean growth in sheep. Animal Science, 74, 39-50

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

Oldenbroek JK, 1999. Genebanks and the conservation of farm animal genetic resources, Second edition. DLO Institute for Animal Science and Health, Netherlands.

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:

Mauff G, Pulverer G, Operkuch W, Hummel K and Hidden C, 1995. C3-variants and diverse phenotypes of unconverted and converted C3. In: Provides of the Biological Fluids (ed. H. Peters), vol. 22, 143-165, Pergamon Press. Oxford, UK.

Todorov N and Mitev J, 1995. Effect of level of feeding during dry period, and body condition score on reproductive performance in dairy cows,IXth International Conference on Production Diseases in Farm Animals, Sept.11 – 14, Berlin, Germany, p. 302 (Abstr.).

Thesis:

Penkov D, 2008. Estimation of metabolic energy and true digestibility of amino acids of some feeds in experiments with muscus duck (Carina moshata, L). Thesis for DSc. Agrarian University, Plovdiv, 314 pp.

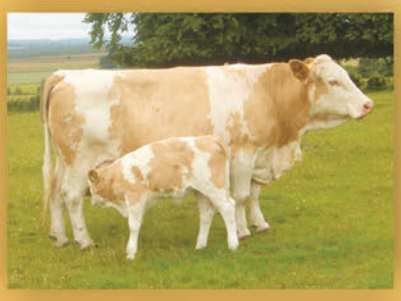
The Editorial Board of the Journal is not responsible for incorrect quotes of reference sources and the relevant violations of copyrights.

Ethics

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”.

AGRICULTURAL SCIENCE AND TECHNOLOGY

Volume 6, Number 1
March 2014



Journal web site:
www.uni-sz.bg/ascitech/

Publisher:
www.alfamarket.biz