6th HUNGARIAN-VIETNAMESE INTERNATIONAL CONFERENCE

on

Cooperation in Sustainable Animal Production and Aquaculture:
Future trends in cooperation

Organized by

Research Institute for Animal Breeding and Nutrition

Research Institute for Fisheries, Aquaculture and Irrigation

Association of Hungarian Small Animal Breeders for Gene Conservation

PROCEEDINGS OF THE CONFERENCE

Godollo
Hungary
2 July, 2009

SCIENTIFIC PROGRAMME OF THE CONFERENCE

6th HUNGARIAN – VIETNAMESE INTERNATIONAL CONFERENCE
on Cooperation in Sustainable Animal Production and Aquaculture:
Future trends in cooperation

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Venue: Baldy Hall
Division of Small Animal Research
Research Institute for Animal Breeding And Nutrition (ATK)
Isaszegi ut 200, H-2100 Godollo, Hungary

SCIENTIFIC PROGRAMME OF THE CONFERENCE

2 July, 2009 (Thursday)

08.30-09.00 Opening ceremony

Miklos MEZES Professor of SZIE, chairman of the Conference

Opening remarks by:
Ferenc Sirman State Secretary, Ministry of Agriculture and Rural Development
Nguyen Quoc Dzung, ambassador of Vietnam
Jozsef RATKY, general director of ATK
Zsigmond JENEY, Deputy DG of HAKI
Istvan SZALAY, Chairman of MGE, Deputy DG of ATK

09.00-09.45 Plenary session

Kisne Do thi DONG XUAN, senior researcher of ATK, international coordinator of MGE
Overview of the Hungarian-Vietnamese poultry research for development – An outlook to Southeast-Asia
Nguyen Dang VANG, vice president of the Scientific Committee, Parliament of Vietnam
Livestock production in Vietnam: opportunities and threats
Miklos MEZES, Professor of SZIE
Quality assurance for future animal production

09.45-10.45 Section 1: Sustainability and development

Istvan SZALAY, chairman of MGE, deputy DG of ATK
The role of gene conservation and functional in situ gene banks in sustainable poultry production
Phung DUC TIEN, Director of NIAH-POREC
Scientific co-operation, research co-ordination and development of hungarian old breeds in Vietnam
Gyorgyi VIRAG, senior researcher of ATK
Hungarian rabbit breeds with focus on the potential sustainable utilisation in cooperation with Southeast-Asian countries
Pham Thi MINH THU, senior researcher of POREC
Hungarian poultry breeds in Vietnam: main results of adaptation studies

Szilard KONRAD, associate professor, UWH
The results of crossing Hungarian yellow hens with different meat type cocks
Laszlo RADICS, Professor of BCE
ORGANIC.EDUNET network for the enhancement of organic farming education

10.45-11.15 Coffee break

11.15-12.30 Section 2: Animal breeding and research

Andras KOVACS, senior researcher of ATK
Hairsheep in Hungary
Gyorgy LENCSES, associate professor, SZIE, scientific consultant, MGE
Investigations of the eggshell-strength in old Hungarian chicken populations
Judit BARNA, senior researcher of ATK
Gander sperm cryopreservation, a possible tool for gene conservation
Zsuzsa SZOKE, researcher of ATK
Oestrogen pollution in drinking water (pilot study)
Andrea KOROSI MOLNAR, senior researcher of ATK
Effects of housing and diet on the carcass and meat quality of meat-type chicken
Nora BODZSAR, researcher of ATK
The origin and genetic diversity of Hungarian indigenous chicken breeds based on molecular markers
Edit ZAJACZ, researcher of ATK
First results of the monitoring program on the health status of the Hungarian honeybee colonies

12.30-13.15 Section 3: Aquaculture research

Zsigmond JENEY, senior researcher, deputy DG of HAKI
Family based selection programs of common carp in Vietnam and Hungary
Tibor FELEDI researcher of HAKI
Intensive carp production in ponds
Laszlo ARDO, researcher of HAKI
Immunostimulants of natural origin in prevention of fish diseases
Balazs KUCSKA, researcher of HAKI
Climbing perch production in Vietnam, possibilities for European introduction in intensive aquaculture

13.15-13.35 Presentations of the economic operators; representatives of EXIMBANK and MEGATREND

13.35-13.45 Closing remarks by Prof. Miklos MEZES, chairman of the Conference

13.45-15.15 Lunch (snack of traditional HU-BA chicken)

Posters on display during the conference

Csilla EIBEN, senior researcher of ATK
Feed additives as they affect the fattening performance of rabbits
Andrea KOROSI MOLNAR, senior researcher of ATK
Influence of Bacillus subtilis on immune-response of broiler chickens
Zsuzsa SZABO, researcher of ATK
Effect of early age thermal conditioning on production parameters in broilers
Bela PODMANICZKY, researcher of ATK
Effect of Bacillus subtilis on the gut microflora of broiler chickens
Bela PODMANICZKY, researcher of ATK
The effect of mannan oligosacharides on growth performance of challenged broilers
Bela PODMANICZKY, researcher of ATK
Effect Enterococcus faecium 2nf8001 administered in water on the rearing performances and the gut microflora in free range chickens

ABSTRACTS OF PAPERS AND POSTERS

OVERVIEW OF THE HUNGARIAN-VIETNAMESE POULTRY RESEARCH FOR DEVELOPMENT – AN OUTLOOK TO SOUTHEAST-ASIA

K.D.T. DONG XUAN[1,2,*] and I.T. SZALAY[1,2]

[1]Association of Hungarian Small Animal Breeders for Gene Conservation (MGE),
2100 Godollo, Isaszegi ut 208, Hungary
[2]Division of Small Animal Research, Research Institute for Animal Breeding and Nutrition (ATK),
2100 Godollo, Isaszegi ut 200, Hungary

*Corresponding author: dothidongxuan@gmail.com

For the last ten years we have collaborated with the National Institute for Animal Husbandry-Hanoi in an unprecedented and continuing effort to save and expand rare Old Hungarian poultry breeds in Southeast-Asia. Poultry Research for Development (PRD) play the crucial role in our joint effort, so far, with its ability to reduce poverty in rural areas, to provide high quality protein in their diet, and to generate additional income to small farmers in the traditional family farming in Southeast Asian countries. A sustainable use and management of these natural resources can guarantee long-term success of the PRD, contributing to a better life in the countryside and remote regions. Analysis of the local conditions is crucial for planning and designing the genetic resources for animal breeding development. For instance, the study of PRD in Vietnam over the last decade has generated a trilateral Hungarian-Vietnamese-Lao network that will help to reduce poverty by breeding poultry in SEA.

Conditions of Hungarian PRD in Southeast Asia: Hungary possesses a rich variety of old poultry breeds (HUBA poultry gene bank, which are of high quality and low maintenance production in Hungary. Since the late 1990's, KATKI and MGE have sent to Vietnam (NIAH- Hanoi) old Hungarian poultry breeds for studying their reproductive and productive parameters under tropical conditions. In 2002 KÁTKI exported the first guinea-fowl population, in 2006, MGE sent the first HUBA turkey breeds and crosses for adaptation experiments to the Thuy Phuong Poultry Research Centre (NIAH-POREC).

Arguments for Hungarian PRD in Southeast Asia: Before starting any type of breeding development programme the adaptation study is an indispensable procedure: thus, their ecology will determine the type of development. HUBA poultry breeding can be an inexpensive tool for many rural people to produce high quality meats, for their own consumption and for the market, without altering either their lifestyle or their agro-environment. Thus, as this process deliberately conserves all local breeds to preserve sustainability of local agriculture, introduction of Old Hungarian poultry breeds to Southeast-Asia will become a historic example of cooperation in enhancing and strengthening both economies.

Rules of Hungarian PRD in Southeast Asia: (1) Most important approach is the introduction of exotic landrace varieties to Vietnam while avoiding the crossing with local breeds (strict control: "physical isolation"). (2) If imported breeds have no relatives there, no crossings with local breeds can happen ("biological isolation", e.g. HU-BA guinea-fowl has no local varieties in Vietnam and Laos). (3) The following potential risks should be evaluated: response of HUBA poultry to climatic conditions, use of natural resources (fodder) by HU-BA poultry, its competition with "local users"; impact of HUBA poultry keeping on the environment and on local "food chain", conditions to develop organizations to control high quality production for the market.

Current status of Hungarian PRD in Vietnam and Laos: The HU-BA guinea-fowl has become the favorite domestic bird in Vietnam, either in small farms or on the table, because of its strong resistance to diseases (even the bird flu) and the high quality of its meat. Since 2007, the transmission of guinea-fowl technology to Laos (NAFRI LRC) through the trilateral collaboration of MGE-POREC-NAFRI has also succeeded; and we are studying the impact of the guinea-fowl on the local consumption in Lao countryside.

Planning for the future: Data obtained in Vietnam on HU-BA Poultry breeding under tropical conditions constitute the foundation of our significant experience in PRD in SEA. By 2010, when we introduce HUBA turkey breeds to Laos, this new phase will expand the existing technology of POREC. In the near future, it is entirely possible to export high quality poultry meat to the ASEAN (Association of Southeast Asian Nations) market, thereby reducing the poverty level in rural and remote areas of Southeast Asia.

Keywords: poultry research for development (PRD), Hungary, Southeast-Asia

LIVESTOCK PRODUCTION IN VIETNAM: OPPORTUNITIES AND THREATS

NGUYEN DANG VANG

MP, Vice president, Committee of Sciences of the Parliament of Vietnam

*Correspondence: vangnd.cn@mard.gov.vn

Vietnamese livestock production in figures: In 2001-2008 average livestock production showed an annual increase of 8.4% (in 2008 5.82%). Share of livestock in total agricultural production formed as 22,6%-25,5% (in 2008 24,1%). In 2008, pig population was 26.7 million heads, increasing only by 0,53%, while pork production was about 2.77 million tones, an increase by 4,07%. In 2008 poultry population increased by 9,4% with a total population of 247 million poultry. Total poultry meat produced was 416.9 million tons, an increase by 16,3%, and eggs 4,93 billions an increase by 10.5%. Average growth rate of cattle population exceeded 9,6%/year with a 25% increase of the number of dairy cow and 27% of milk production. In 2008 dairy cow population was 109 thousand heads, milk: 262 thousand tones. In 2008 buffalo population decreased to 2,89 million (-3,3%), while meat production increased by 71 thousand tons (5.98%). In 2007 goat and sheep population was 1,77 million heads showing a decrease in 2008 by 19% to 1,42 million heads. Majority of sheep is bred in Nam Thuận and Binh Thuận provinces, with the total population of more than 100 thousand heads, playing an important role in hunger reduction in those regions.

Development orientation: Livestock production development has to meet the local meat consumption demands as well as future export of livestock products. Re-arrangement of livestock production systems has to be made according to the open market orientation with bio-security, animal health/hygiene, environmental protection and improvement of social living standard, recovering livestock productivity, quality, efficiency and food safety. Vietnam has to support the smallholder farmers with the traditional livestock farming step by step shipping to the modern production system. On the other hand, besides the development of exotic breeds and industrial animal production, breeding and keeping special local domestic animal breeds according to the ecological regions as well as cross-breeding are also important. Again, besides the intensive production of feed sources as corn and soya, Vietnam has to strengthen the production of local feed sources and better use of agricultural by-products for feed production. General objectives to 2020 are the changing of traditional livestock production into modern industrial farming systems.

Opportunities and threats: The difficulties of the Vietnamese livestock sector are: small farm size, poor technical and infrastructural bases, low productivity, poor food safety, disease outbreaks and poor animal health system, low rate of industrial slaughter and modern processing technology, low hygiene and food safety conditions from farm to table. Opportunities are: demand for livestock products will increase by 7-8% from 2007-2020, with the increase of the local market due to the high income. Therefore, livestock production represents one of the priority investment areas in all provinces of Vietnam, where natural conditions, manpower and local resources meet the main requirements for livestock development.

Keywords: animal husbandry, meat production, egg production, milk production, Vietnam

QUALITY ASSURANCE FOR FUTURE ANIMAL PRODUCTION

M. MEZES

Department of Nutrition, Faculty of Agricultural and Environmental Sciences, Szent Istvan University, Pater Karoly u. 1., Godollo, H-2103 Hungary

Correspondence: Mezes.Miklos@mkk.szie.hu

Quality assurance in animal production is a growing issue all around the world and concurrent with legislations in different countries focusing on this area a number of critical factors are converging. Globally, dietary patterns are changing, incidences of animal origin food safety and public health issues are increasing, consumers are becoming more aware of what they eat and how it is produced. Therefore requires quality assurance for the whole animal production chain, including genetic background, animal husbandry and nutrition of food producing animals. All these factors are increasing the pressure on animal breeders, technologists and feed manufacturers, requiring them to focus more intently on achieving higher standards of final products. Beside the above mentioned factors control of undesirable substances in feed and pathogens in feed and environment to reduce possibility of contamination of the animal products also has importance.

The retail sale of animal origin products have to meet general quality, hygiene and safety requirements. Compulsory quality and size classification of products requires even for imported products, and all food on the market must be safe, irrespective of origin. There is not a two-tier market of safe vs. unsafe food. However, animal welfare is not recognised as a legitimate trade issue, but ethical, social and environmental issues are also difficult issues in animal production. Several countries, especially in the European Union, consumers prefer those foods which are not only safe, but which are also produced in a sustainable, environmental and animal welfare friendly manner.

One of the main critical criteria for producing high quality animal products is the size of the farms. Large farms produce large and homogenous batches of animals and products with a clear supervision system and those follow superior standards and most of them have well organised quality assurance system. However, production of special quality, e.g. organic, animal products can be produce mainly in medium and small size farms, where keeping the general standards may arise difficulties, for that reason different quality assurance system has to establish.

Contamination of feed and feed ingredients with inorganic and/or organic undesirable substances, such as heavy metals, PAH, PCB, mycotoxins or bacterial contamination can cause significant productivity losses in poultry, livestock and fish, and may cause illness, even death, in susceptible humans who consume contaminated animal products such as egg, meat and milk. Heavy metal, PAH and PCB contamination can be eliminate with an accurate control system for the whole production chain, mycotoxin contamination can be partially eliminate by suitable agro-technique, feed processing and using mycotoxin binders or detoxifying enzymes or bacteria as feed additives. Bacterial contamination is often due to, or exacerbated by, economic issues. Long-term pressures on profit margins have meant that many feed mills and animal farms have underinvested over the years and use old or technologically poor quality machines, stores and buildings. Those are difficult to clean, chronically contaminated and provide a perfect habitat for bacteria. Otherwise, pest and rodent control and personal hygiene also have to take attention during the establishment of the quality assurance system.

The final steps of the production chain, such as processing of animal products, including transport and slaughtering may be arise contamination problems, therefore those also have to implement into the whole quality assurance system.

In conclusion, quality assurance of the whole animal production is a very complex system which requires accurate standards at international level.

Keywords: quality assurance, animal products, feed

THE ROLE OF GENE CONSERVATION AND FUNCTIONAL *IN SITU* GENE BANKS IN SUSTAINABLE POULTRY PRODUCTION

I.T. SZALAY[1,2,*] and K.D.T. DONG XUAN[1,2]

[1]Association of Hungarian Small Animal Breeders for Gene Conservation (MGE),
2100 Godollo, Isaszegi ut 208, Hungary
[2]Division of Small Animal Research, Research Institute for Animal Breeding and Nutrition (ATK),
2100 Godollo, Isaszegi ut 200, Hungary

*Corresponding author: it.szalay@gmail.com

Sustainability and conservation of animal genetic resources (AnGR) are interdependent concepts: sustainable use of agricultural resources can only be ensured if conservation of traditional local domestic animal breeds is managed as part of local agro-biodiversity, while only sustainable agriculture can handle animal genetic resources, as integrated part of local, nature-dependent farming systems to maintain agro-ecosystems.

Genetic basis of the present poultry sector is very thin. Majority of genetic resources are in threatened condition in developed countries. Biodiversity in poultry breeding depends mostly on the traditional, family poultry production of developing countries and the protection and improvement of alternative poultry breeding systems and gene conservation programmes of the developed world. Progress in primary poultry breeding and conservation programmes should also be improved, to make them able to serve as the basis for the subsequent development of sustainable, either traditional or new, production types in poultry sector.

As the expansion of poultry industry made traditional breeds gradually disappear from the countryside, Hungarian conservation programs started in the form of governmental subsidies in the beginning of 1970's to conserve original stocks of certain rare poultry breeds and varieties. Since 1997 conservation of traditional Hungarian poultry breeds is organized and controlled by an NGO: the Association of Hungarian Small Animal Breeders for Gene Conservation (MGE), which is the only official breeding organization for all poultry genetic resources in the country; while the leading in situ gene bank of traditional poultry breeds of the Carpathian Basin is preserved by the Research Institute for Animal Breeding and Nutrition in Godollo.

Conservation of local breeds (both plants and animals) through the development of different ecological type of production systems and products have real importance in maintaining agro-biodiversity and agro-ecosystems. In this process, local poultry breeds should play a significant role, even in the near future. First step in saving the breeds should be the proper execution of an official conservation program. On the other hand, additional, new approaches to conserving traditional, local breeds are needed for multifunctional use of poultry genetic resources, including: the maintenance of functional in situ gene banks, research to develop and elaborate sustainable production methods and marketable products, field studies and surveys of local breeds in marginal regions, reintroduction of the breeds to villages to develop family poultry, and adaptation of breeds in diverse environments. Based on the similarities and differences of the Carpathian Basin and Southeast-Asia in the above fields, significant achievements of co-operation programs as well as future possibilities in sustainable poultry production for the two regions are discussed in the paper.

Keywords: poultry genetic resources, conservation, sustainability, Carpathian Basin, Southeast-Asia

SCIENTIFIC CO-OPERATION, RESEARCH CO-ORDINATION AND DEVELOPMENT OF HUNGARIAN OLD BREEDS IN VIETNAM

P. DUC TIEN[1*], N. DANG VANG[2], P.T. MINH THU[1], N. NGOC DUNG[1], H. VAN LOC[1], and N. KIM OANH[1]

[1]Thuy Phuong Poultry Research Centre,National Institute of Animal Husbandry, Thuy Phuong, Tu Liem, Hanoi, Vietnam
[2]Committee of Sciences of the Parliament of Vietnam

*Corresponding author: pkhttncgctp@vnn.vn or ngathanh9096@gmail.com

Based on its long traditions poultry farming has developed quickly during the past 20 years in Vietnam. Poultry meat has paid a great contribution to the GNP and been in the second position after pig farming.

Household farming with locally special breeds makes a great part in the farming structure in general. However, the role of imported high-quality poultry into Vietnam is also of great importance. Thanks to the long-lasting relationship between Vietnam and Hungary since the 70s of the 20th century, various poultry were imported into Vietnam such as Rheinland geese in 1972; Szarvas ducks in 1991; HE-Ross 208 chickens in 1992; Godollo New-Hampshire chickens, Yellow Godollo chickens, Guinea fowls in 1999 and 2002; HU-BA turkeys in 2006 and 2008.

These are the old breeds of Hungary and delivered through scientific co-operation and agreements signed by the two governments.

Based upon the results of adaptation research by POREC, KATKI (now ATK as legal successor of KATKI), MGE and also the demand of Vietnam's market, Hungarian poultry from the original stock of the Godollo Gene Bank have been farmed in Northern Vietnam. POREC is in its efforts to improve this co-operation to develop under privileged areas and to develop the low input but environment friendly production. Hence, high-quality, highly resistant breeds are welcome by the Government and farmers.

The results of rearing and reproduction periods of adaptation experiments of Hungarian poultry breeds (chicken, duck, guinea fowl and turkey), it was concluded that genotypes studied can be reared in Vietnam with real success. Hatching results of breeding eggs shipped to Vietnam indicate that good. As regards body weight gain, better results can be obtained in Vietnam than in Hungary. As regards reproduction characteristics, Hungarian poultry breeds start egg production much earlier in Vietnam, and produce more but due to early start of laying and longer production somewhat smaller eggs. Adaptation studies also demonstrate Hungarian poultry breeds can provide premium quality products for consumers. Based on the results of adaptation experiments, further development of breeding Hungarian poultry in Vietnam and in Southeast Asia mainly in closed systems is a reality in the near future.

Keywords: Hungary, Vietnam, poultry production, HU-BA turkey, Guinea fowl, Szarvas ducks

HUNGARIAN RABBIT BREEDS WITH FOCUS ON THE POTENTIAL SUSTAINABLE UTILISATION IN COOPERATION WITH S.E.A. COUNTRIES

GY. VIRAG[1]* and CS. EIBENI[1]

[1]Division of Small Animal Research, Research Institute for Animal Breeding and Nutrition (ATK), 2100 Godollo, Isaszegi ut 200, Hungary

*Corresponding author: virag@katki.hu

Hungarian rabbit breeding research had started in 1952 at Godollo to improve rabbit breeds adapted to the local conditions and producing good quality fur and high quantity meat. In that work genetic improvement of the Hungarian Giant rabbit was in the focus. From 1960 the aim changed to gain basic knowledge of intensive rabbit breeding for meat production. For this New Zealand White and Californian pure breed rabbits, and their crosses have been evaluated. Breeds genetically improved and maintained recently at authorized breeding organizations in Hungary, namely Pannon White rabbit and Debrecen White rabbit had been built up on the base provided by the progenies of those primary New Zealand White and Californian herds as starting material. Furthermore, breeding rabbits of the New Zealand White breed improved and maintained at Godollo have been exported into Egypt (in 1988) and into Vietnam (in 2001). These rabbits adapted and performed well within the new and very much different environment either as purebreds or as crosses with the local breeds.

Since the growing competition between the meat rabbit producers in Europe the exploitation of the animals and the environmental pollution have raised up in the last years. That led to animal welfare and environmental concerns and therefore raising popularity of the eco- and organic production what means to some extent a turn back to the small units and extensive conditions. However this is not an easy way in countries where agriculture has greatly intensified as in Hungary and the knowledge of the traditional animal production and the intention to participate in it has been almost annulled. Countries where a more natural way of animal breeding is maintained can take a better start of eco- or organic production of meat rabbit, and the breeds mentioned above can play an important role in that with the improvement of the performance of local breeds by crossing.

Keywords: meat rabbit, eco farming, crossing, local breeds, New Zealand White, Pannon White

HUNGARIAN POULTRY BREEDS IN VIETNAM: MAIN RESULTS OF ADAPTATION STUDIES

P. DUC TIEN[1*], P.T. MINH THU [1], K.D.T. DONG XUAN[2,3], I.T. SZALAY[2,3], N. NGOC DUNG[1], N. DANG VANG[4], B.T. THANH DAN[1], H. VAN LOC[1], N. KIM OANH[1], and K.T. TUYEN[1]

[1]Thuy Phuong Poultry Research Centre, National Institute of Animal Husbandry, Thuy Phuong, Tu Liem, Hanoi, Vietnam
[2]Association of Hungarian Small Animal Breeders for Gene Conservation (MGE), 2100 Godollo, Isaszegi ut 208, Hungary
[3]Division of Small Animal Research, Research Institute for Animal Breeding and Nutrition (ATK), 2100 Godollo, Isaszegi ut 200, Hungary
[4] Rcommittee of Sciences of the Parliament of Vietnam

*Corresponding author: ngathanh9096@gmail.com

Adaption studies of Hungarian poultry breeds (guinea-fowl and turkey) show that Hungarian poultry can be reared in Thuy Phuong Poultry Research Centre – National Institute of Animal Husbandry in Vietnam with real success. They also demonstrate that Hungarian poultry breeds can provide premium quality products for consumers. This type of development, however, should consider the conservation approaches of local breeds as well as the maintenance of sustainable ways of production. Based on the results of adaptation experiments, further development of breeding Hungarian poultry in Vietnam mainly in closed systems is a reality in the near future.

The Thuy Phuong Poultry Research Centre (POREC) imported 3 Guinea fowl lines of Large, Middle and Small body weight in April, 2002, to conserve and improve the production of this genetic basis as well as to ensure the supply of chicks. These are specialties in the world with high-quality meat and delicious eggs. The egg production/hen/1st cycle is 85-98 eggs with the feed consumption of 1.9-2.5 kg/10 breeding eggs. At 12 weeks of age, broilers are 1,300-1,800 g/bird in weight with the feed consumption of 2.34-2.53 kg/kg of weight.

Turkeys *(Meleagris gallopavo)* which originated from Central America in the middle ages have a fast growth rate, big body shape and weight of 6-16 kg/male and 4-9 kg/female at the maturity age. Turkey is delicious with the protein level of 19.2-21.6%, fat of 1.2-2.2% , and ashes of 0.9-1%.

Turkey farming has been developing speedily in France, Germany, the USA, Hungary, Poland, Czech Republic, Russia and Bulgaria.

Turkey farming has been popular in Vietnam for a long time, however small-scale, dispersed, unclearly originated, limited in production, extensive and low in economics. To step by step restore and enhance Turkey farming in Vietnam, it is, in addition to present ones, necessary to import suitable breeds, research, select and work out technical measures for an appropriate farming procedures.

In May, 2006 and 2008, POREC received from the National Institute of Animal Husbandry (NIAH) - Ministry of Agriculture and Rural Development 990 and 1589 HU-BA turkey eggs imported from MGE. Thus, the research was undertaken to acknowledge biological features, keep for adaptation, observe and determine their production for later selection, determine economic efficiency, based upon which to give proposal for turkey farming development in Vietnam.

Keywords: Hungary, Vietnam, poultry production, HU-BA turkey, Guinea fowl

THE RESULTS OF CROSSING HUNGARIAN YELLOW HENS WITH DIFFERENT MEAT TYPE COCKS

SZ. KONRAD* and K. KOVACSNE GAAL

University of West Hungary, Faculty of Agricultural and Food Sciences, Institute of Animal Sciences
Var 2., Mosonmagyarovar, H-9200 Hungary

*Corresponding author: konradsz@mtk.nyme.hu

The aim of the examinations mentioned in the study was to establish whether the end products created by crossing the Hungarian Yellow (HY) hens with different meat type cocks were suitable for alternative keeping technology.

During the experiment examinations were carried out on five crossing partners (S 77, Foxy Chick, Redbro, Hubbard Flex, Shaver Farm), and as control pure bred HY and Ross 308 broiler were examined. The end product stocks created with crossing and the pure bred HY stock were fattened in free-range technology at the Animal Breeding and Feeding Research Station of the University of West Hungary. Individual weighing was carried out on day one, day 21, 56 and 84, and the feed conversion capacity of the different genotypes was also examined. The breeding period for the intensively fattened Ross 308 broilers lasted 42 days. At the end of fattening for each repeated tests three pullets and cocks each were selected for test slaughter on the basis of average weight from the genotypes. Data processing was evaluated using Microsoft Excel 2003 and Statistica Statsoft 7.1 programs.

The production parameters showed that the end products stocks created with the crossing of HY hens and meat type cocks can reach even twice the live weigh of pure bred HY stocks within an 84 day period in mixed sexes. The live weight for pure bred HY was an average of 1031 grams, while for the genotype of HY x Hubbard Flex it reached 2193 grams. It should, however, be mentioned that for the crossed stocks considering the live weight a far wider coefficient of variation showed, which means that the growth of the live weight has a disadvantageous effect on the uniformity, which could be a disadvantage from the point of slaughter.

As far as feed conversion capacity was concerned a significant diversion showed among the different genotypes. For the pure bred HY 3.31, for the F_1 population a rate between 2.65-3.63 kilograms/kilograms was measured.

When examining the slaughter parameters the influence of keeping technology and genotype could be shown in the ratio of the weight of de-bleeding and plucking to that of the live weight, however, no significant difference was measured. For the ready to cook weigh as a ratio of the live weight and the ratio of the breast weight to the ready to cook weight a value of 10-12 % points higher was calculated for the Ross 308 broilers than for the end products kept in free-range, and the pure bred HY, while the thigh weight ready to cook weight was 2.5-5.6 % points lower. The differences in the ratio of the ready to cook weight vs. live weight and the breast weight vs. ready to cook weight are mainly attributed to the genotype, while the differences manifested in the ratio of the thigh weight vs. ready to cook weight are clearly attributed to the keeping technology.

The examination of the proportion of the valuable internal organs (liver, heart, gizzard) to the live weight showed significant differences in case of the ratio of gizzard vs. live weight between the free-range and the intensively fattened Ross 308 stocks (0.76 % vs. 2.20 %). This could also be a result of the difference in feeding which comes from the free-range keeping technology.

Genotype and keeping technology clearly had an influence on the abdominal fat content. For the free-range technology in case of the pure bred HY no, or insignificant amount of abdominal fat was found, while for the F_1 end products the proportion of abdominal fat to the live weight was between 0.19-0.54 %, while for the Ross 308 broilers kept under intensive conditions it reached 1.12 % for mixed sexes.

Keywords: Hungarian Yellow, indigenous breeds, crossing, free-range, test slaughter

ORGANIC.EDUNET NETWORK FOR THE ENHANCEMENT OF ORGANIC FARMING EDUCATION

L. RADICS, Z. SZALAI, P. PUSZTAI, L. CSAMBALIK*, D. MIKOHAZY and A. TOBIAS[1]

[1]Corvinus University Budapest, Department of Ecological and Sustainable Production Systems
Villanyi ut 29-43., Budapest, H-1118 Hungary

*Corresponding author: laszlo.csambalik@uni-corvinus.hu

Justification/objectives: Organic.Edunet (ECP-2006-EDU-410012 Organic.Edunet) aims to facilitate access, usage and exploitation of digital educational content related to Organic Agriculture (OA) and Agroecology. It will deploy a multilingual online federation of learning repositories, populated with quality content from various content producers. In addition, it will deploy a multilingual online environment (the Organic.Edunet Web portal) that will facilitate end-users' search, retrieval, access and use of the content in the learning repositories.

Materials/methods: The project studies educational scenarios that introduce the use of the Organic.Edunet portal and content to support teaching of topics related to organic agriculture (OA) and Agroecology (AE) in formal educational systems.

Contents are uploaded to Confolio tool with the mandatory metadata and ontology. After a quality control procedure, they are available for users to search them and use by Organic.Edunet Web portal.

The extension of the project is to fit the system to any fields of OA i.e. research or administration activities.

Results/discussion: Organic.Edunet focuses on achieving interoperability between the digital collections of OA and AE content that producers in various EU countries have developed, as well as facilitating publication, access, and use of this content in multilingual learning and research database contexts through a single European reference point. In this way, digital content that can be used to educate different groups of learners and provide database for OA research about the benefits of OA and AE, will become easily accessible, usable and exploitable.

Conclusion: Affiliated organisations and user groups may search and use the digital contents. The database can help the research work with providing the existing results of different fields of OA and AE, giving the scientific background and minimise the parallel research activities to make the studies more effective and cost efficient.

Keywords: digital, learning, network, agroecology, organic agriculture

HAIRSHEEP IN HUNGARY

A. KOVACS[1*], S. KUKOVICS[2], Z. UJLAKI[1], I. EGERSZEGI[2], J. OLAH[1], G. GYIMOTHY[1], N. VASS[1], B. STEFANOVICZ[1], S. HARANGI[1], A. JAVOR[1]

[1]The University of Debrecen, Centre of Agricultural Sciences, Department of Animal Science, H-4032 Debrecen, Boszormenyi ut 138.
[2]Research Institute for Animal Breeding and Nutrition, H-2053 Herceghalom, Gesztenyes ut 1.

*Corresponding author: kovacs_cyto@hotmail.com

About 95% of the income of our sheep industry originates from mutton, predominantly lamb, 5% from milk and manure. At present 85% of our sheep are Merinos, but their main product, the wool is not economical for decades. The Merinos and all of the dairy and mutton breeds present in Hungary are seasonal breeders. Hormonal manipulations of limited efficacy are expensive and criticized from the aspects of human consumption and animal welfare. The lambing and milking of seasonal breeder ewes are also seasonal, while the national and export demand for sheep products (cheeses, kefir, yogurt, lamb, etc.) would be unrestricted in winter, too. Due to seasonality, the milking parlors and milking machines are unutilized for about 4 months and the employment of milkers is also not continuous. The lambs and sheep slaughtered at different weights can be sold throughout the year, but before certain Christian (the orthodox and western Christmas and Eastern, the Italian Feragosto) and Islamic (Sacrificial Day, end of Ramadan) holidays in significant quantities and at outstanding prize. Islamic sacrificial animals have to be males and intact, so they cannot be castrated or tail-docked. Due to seasonality, we cannot meet the demands of some of these markets. The global warming results in further decrease of wool demand, simultaneously greatly increasing the physiological last of the animals. The tropical hairsheep are aseasonal breeders in their homelands and have long breeding season in temperate zones. Shedding wool breeds (Phan Rang, Dorper, Katahdin, Royal White etc.) are originated from spontaneous or planned hair- x woolsheep crossings. The woolly x hairy crossbreds show significant positive heterosis effects, like the outstanding lamb viability. Dewooling programmes started world-wide by crossing and repeated backcrossing the traditional breeds with hairy or shedding wool type rams. Besides the shedding wool Dorper and Wiltshire Horn breeds, there are already also 250,000 Damara hairsheep in Australia. The “Nolana Program” is continued in Germany by Wiltshire Horn, Dorper and Barbados Blackbelly (BBB) rams. The number of such crossbreds is also growing in the U.S., where two new shedding wool breeds, the Katahdin and the Royal White, were registered in the last decades. Recently White Dorper sheep were imported to Vietnam. We got the first Somali sheep in 2005, and in the next year 23 BBBs were taken from Germany, later 14 Dorpers from France and 31 from Switzerland. This autumn 300 White Dorper embryos and 1,000 doses of semen will be imported from Canada. Dewooling programmes started by crossing of Hungarian Merino, Prolific (Booroola) Merino, British Milksheep, Lacaune and Tsigai sheep with Somali, BBB and Dorper rams. Another goal is augmenting our population of Somali, BBB, Dorper and White Dorper sheep. We would like to improve the shedding of the Dorpers by import and selection, and our first Dorper x BBB lambs look also promising. Up-to-date genetical and biotechnical methods are applied for the improvement and growing of our stocks existing and to be acquired, as well as in the crossing experiments. Our population consists of 62 Dorper, 25 BBB, 20 Somali and 145 crossbred sheep and their numbers are rapidly growing.

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Keywords: hairsheep, aseasonality

THE EGGSHELL OF HEN STRENGTH IN DIFFERENT HUNGARIAN LOCAL POULTRY STOCKS

GY. LENCSES[2*], K. MAKAI[1], L. BODI[1], and I. SZALAY[1]

[1]Division of Small Animal Research, Research Institute for Animal Breeding and Nutrition (ATK), 2100 Godollo, Isaszegi ut 200, Hungary
[2]Department of Animal Physiology and Hygiene, Szent Istvan University, Pater Karoly u. 1., Godollo, H-2103 Hungary

*Corresponding author: lengy@freemail.hu

Although the eggshell has no real importance as food, still it is very important from the viewpoint of biological economy, because it is the continuity between the hen's and chicken's mineral metabolism. Eggshell-strength is also very important feature for the economy loss caused by shell damages.

In the present study a new method was worked out, which is named as "puncture-method". It means, that at the pointed end of the egg – where the shell is the thickest – the shell is pressed until breaking by a special plastic pin. The results are read in N (Newton). For the measurements seven different Hungarian local chicken breeds were used: White Transylvanian Naked-neck, Black Transylvanian Naked-neck, Speckled Transylvanian Naked-neck, Yellow Hungarian, White Hungarian, Speckled Hungarian and Partridge-colour Hungarian.

Results show, that:

– the eggshell-strength is much higher in all local chicken breeds than in the laying hybrids;
– among the different local stocks there are many differences, and some of these are significant;
– as the nutritional and keeping conditions were the same for each groups, differences are believed to be caused mostly by genetic background;
– in many cases there were very close correlation between the eggshell strength and shell thickness, which would be a suitable basis for further selection.

Conclusions are as follows:

– for alternative poultry keeping local traditional local breeds seem much better than any hybrids;
– for the special geographical and climatic conditions the most suitable local breeds can be chosen and selected.

Acknowledgement: Special thanks are expressed to Ildiko Barta, Ilona Stompne Molnar and Katalin Agnes Szentes for technical assistance.

Keywords: *eggshell-strength, Hungarian local chicken breeds, alternative keeping, genetic selection*

GANDER SPERM CRYOPRESERVATION, A POSSIBLE TOOL FOR GENE CONSERVATION

J. BARNA*, B. VEGI, E.VARADI and ZS. FERENCZI SZOKE

Division of Small Animal Research, Research Institute for Animal Breeding and Nutrition (ATK), 2100 Godollo, Isaszegi ut 200, Hungary

*Corresponding author: barna@katki.hu

Efficiency of semen freezing of Emden ganders was evaluated *in vitro*. The aim of the study is the support of the *ex situ* gene conservation efforts on indigenous Hungarian poultry breeds.

Semen of 20 individually placed ganders were collected twice weekly for 10 weeks. The pooled samples were diluted in 1:1 ratio with *Lukaszewicz'* extender at 4°C and divided into two equal parts, then equilibrated for 20 minutes. During the equilibration at 15th minutes 7 and 9% DMF cryoprotectant was added to the samples, respectively. The cryopreservation protocols differed in the rates of cryoprotectant (7 and 9% DMF), the rates of cooling (slow, programmable and fast in nitrogen vapour) and the type of cryo-containers (straw or cryovial). The slow cooling, using programmable freezer (Planer, Kryo 10, UK), was carried out according to modified *Lukaszewicz's* method *(1997*). The fast protocol in nitrogen vapour is a simple, quick and inexpensive, practical way for long term preservation of spermatozoa.

For assessment of the effectiveness of protocols *in vitro* determination of the survived*, morphologically intact sperm ratio* was the main goal. Testing the damaging effect of cryopreservation procedures 4 qualifications per sample were performed at each steps of the protocols: 1. fresh undiluted semen; 2. diluted semen during equilibration without cryoprotectants; 3. diluted semen at finishing of equilibration with cryoprotectants; 4. semen after freeze-thaw cycle. In semen samples the concentrations spectrophotometrically (Accucell, IMV, France) and the motility by subjective scoring were measured. On the basis of membrane permeability the live/dead cell ratios and the sperm anomalies were determined using aniline-eosin stained smears by counting 200 spermatozoa/samples. Only those samples were frozen which had a concentration characteristic of breed, motility with maximum score and a live, morphologically normal cell ratio around 70%. For statistical analysis ANOVA test was used.

On the effects of simple dilution and cooling the samples to +4°C the number of live, intact spermatozoa decreased by 10 % and the live, abnormal spermatozoa by 2%, while the dead cell ratio increased by 12 %. Adding the cryoprotectant to the samples at the end of equilibration increased the dead cell ratio by further 1-2%. In the case of slow, programmable protocol - after freeze-thaw cycle - 70 and 60% of intact spermatozoa survived in cryo vials, while only 40 and 25% in straws in the presence of 7 and 9% DMF, respectively. In the case of nitrogen vapour protocol the survival rate of intact spermatozoa was around 40% both with 7 or 9% DMF either in straw or cryo vial, except of cryo vials with 9% DMF where a higher (52%) survival was detected.

Although, the programmable freezing could produce higher survival rate in cryo vials in the presence of 7% DMF, the further perfection of the simple method in nitrogen vapour using 9% DMF and cryo vial seems to be also promising.

Keywords: sperm, cryopreservation, goose, programmable freezing, nitrogen vapour

OESTROGEN POLLUTION IN DRINKING WATER (PILOT STUDY)

ZS. SZOKE[1]*, H. SER[2], E. VARADI[1] P. PECZELY[2] and J. BARNA[1]

[1]Division of Small Animal Research, Research Institute for Animal Breeding and Nutrition (ATK), 2100 Godollo, Isaszegi ut 200, Hungary
[2]Laboratory of Reproductive Biology, Szent Istvan University, Godollo, Pater K. u. 1. H-2100 Hungary

*Corresponding author: szokezsuzsanna@yahoo.de

The aim of the study was to make a survey about the oestrogen pollution of drinking water in some part of Hungary. One of the resources of the environmental (and water) oestrogen pollution is the human and animal metabolism. The huge quantity of the urinal and faecal oestrogen hormones appear mostly in the densely populated area or nearby the animal farms. The two-component contraceptive pills for human and some pet species contribute considerably to the pollution as well. The wastewater steroids can get both into the surface and subsurface water and by this way into the drinking water bases as well.

The oestrogen content of drinking water was analyzed in 5 Hungarian settlements by the method of *Radio Immuno Assay*. Four divisions of Budapest (II., V. XI., XVII.), 3 small towns (Gödöllő, Gyömrő, Budakeszi) and one small village (Fony) in the west part of Zemplén mountain have been monitored, and the oestrogen content of the purified wastewater in Gyömrő was also tested. In Budapest and its suburbia high levels of oestrogen content (154±104 pg/ml) were detected, which could damage the live organisms such as fish-, bird- and mammalian species and the human as well. In Fony, only a low amount was detectable (37±23 pg/ml), which – according to the present knowledge - is under the threshold level. However, in Gyömrő, the purified wastewater had very high oestrogen content 671±136 pg/ml, which gets into the river Danube.

The study has to draw attention to necessity of the immediately alterations. Introduction continuous hormones analyses are necessary both in waste- and drinking water. It is important and urgent to elaborate new, fast hormone-kits. Selective wastewater collection, treatment modern filtration techniques have to be introduced as soon as possible, which can filtrate 98 % of the steroids.

Keywords: oestrogen pollution, drinking water, purified wastewater

EFFECTS OF HOUSING AND DIET ON THE CARCASS AND MEAT QUALITY OF MEAT-TYPE CHICKEN

A. KOROSI MOLNAR*, B. PODMANICZKY and I. BARTA

Division of Small Animal Research, Research Institute for Animal Breeding and Nutrition (ATK), 2100 Godollo, Isaszegi ut 200, Hungary

*Corresponding author: amolnar@katki.hu

Four hundreds cross-bred chickens from two experimental slow growing meat type chicken participated in the experiment. The chickens were kept on deep litter and free-range. Two types (low and high density) of four-phase diets were used: *starter* (12.8 MJ/kg, 21% crude protein, 0-3 weeks), *grower* (12.5 MJ/kg, 18 % crude protein, 4-8 weeks), *finisher-I* (9-12 weeks) and *finisher-II* (13-14 weeks). Diet-I had higher energy and protein content in the finisher I (13.1 MJ/kg, 17 % CP) and in the finisher II (13.2 MJ/kg, 16 % CP) phases, than Diet-II (12.8 MJ/kg, 15.5 % CP and 12.8 MJ/kg, 15 CP respectively). The experiment lasted up to 98 days. At 14 weeks old of age ten birds were sacrificed from every group and the carcass conformation and the meat composition were examined

Concerning the housing system, the higher activity and bigger space in the free-range keeping did not alter negatively the slaughtering weight of the birds. Average live weight of cocks and pullets was 2458 and 1818 g in the poultry house and it was 2481 and 1803 g in free range. The diet did not influence the live weight of 14 weeks old birds.

The housing system and the applied diet did not influence significantly the feed conversion ratio. The values of the feed conversion were on deep litter + Diet-I: 3.82, on deep litter + Diet-II: 3.56 on free-range + Diet-I: 3.68 and on free-range + Diet-II: 3.65 kg feed/kg weight gain.

In the experiment neither the housing systems nor the applied diets influenced the dressing percentage (79-80%) and the proportion of breast and thigh. The experimental chicken strains had genetically bigger thigh yield (26-29 %) and smaller breast yield (18-23 %) than the conventional broilers, where the portion of thigh is 25-26 % and of breast is 26-28 %. The influence of sex was significant regarding the breast and thigh ratio. Comparing to the cocks, the pullets had the relative bigger breast (21.2 %, 19.4% resp.).The thigh of the cocks was relative bigger than thigh of pullets (29.2 %, 26.5 % resp.)

The carcass composition was highly influenced by the housing system and the sex. The birds from the free range system produced meat with higher dry matter and protein and less fat content than the chickens kept on deep litter. The dry matter content of the leg and breast muscle of chickens reared in free-range management was 1–2% higher than that of birds reared in indoor housing system. The two rearing systems resulted significant difference in the fattiness of chickens expressed as the percentage of meat fat content. The breast and thigh meat of free range chickens contained 1.5 % less fat and 2-2.5 % more protein than the meat from indoor raised chickens. The used diets did not influence significantly the chemical composition of the breast and the thigh meat. In all groups, cockerels produced drier meat of higher protein and lower fat content than pullets.

Keywords: free range, indoor, chicken, carcass, meat

THE ORIGIN AND GENETIC DIVERSITY OF HUNGARIAN INDIGENOUS CHICKEN BREEDS BASED ON MOLECULAR MARKERS

N. BODZSAR[1*], T. REVAY[1], H. EDING[2], O. HANOTTE[3], S. WEIGEND[2] and A. HIDAS[1]

[1]Division of Small Animal Research, Research Institute for Animal Breeding and Nutrition (ATK), 2100 Godollo, Isaszegi ut 200, Hungary
[2]Institute of Farm Animal Genetics, Friedrich-Loeffler-Institute, 31535 Neustadt-Mariensee, Germany
[3]The School of Biology, Biology Building, The University of Nottingham, University Park Nottingham NG7 2RD, UK

*Corresponding author: bodzsar@katki.hu

In current study, six native chicken breeds were investigated which are regarded as Hungarian national treasures: Hungarian White, Yellow and Speckled, and Transylvanian Naked Neck White, Black and Speckled. Three Hungarian academic institutes have maintained these genetic resources for more than 30 years. The Hungarian Yellow, the Hungarian Speckled, and the Transylvanian Naked Neck Speckled breeds were kept as duplicate in two separate subpopulations since time of formation of conservation flocks at different institutes.

We assessed the maternal origin of these local chickens using mitochondrial DNA (mtDNA) D-loop sequences information, which is a commonly used molecular marker for investigating phylogenetic relationships among and within species due to its maternal inheritance and no recombination. The first 530 bases of mtDNA D-loop region were sequenced in 74 chickens of 9 Hungarian populations and compared to reference sequences. Eleven haplotypes were observed from 17 variable sites. Network analysis indicated that Hungarian native chickens grouped into 3 clades, the majority of our sequences originates on the Indian subcontinent, while the other two haplogroups likely originate from South-East China.

Furthermore, we established genetic diversity of these nine Hungarian chicken populations using microsatellite markers. In total, 270 individuals were analyzed with 29 microsatellite markers to get information about the degree of polymorphism and kinships within and between Hungarian breeds. The Hungarian native chickens were compared to commercial lines and European local breeds. In the nine Hungarian populations 168 alleles were observed. STRUCTURE clustering showed clear separation between the Hungarian stocks. The most frequent solutions were found at K=5 and K=6, respectively, classifying the Transylvanian Naked Neck breeds as a separate group of populations. To identify genetic resources unique to Hungary, marker estimated kinships were estimated and a safe set analysis was performed. We show the contribution of all Hungarian breeds together to the total diversity of a given set of populations (commercial and European sets), where the Hungarian stocks were clearly different from others.

Keywords: Hungarian native chickens, mitochondrial DNA, maternal origin, microsatellite, genetic diversity

FIRST RESULTS OF THE MONITORING PROGRAM ON THE HEALTH STATUS OF THE HUNGARIAN HONEYBEE COLONIES

E. ZAJACZ, L. HARKA, E. SZ. MATRAY and L. BEKESI*

COST Action FA0803 - Prevention of honeybee COlony LOSSes

Division of Small Animal Research, Research Institute for Animal Breeding and Nutrition (ATK), 2100 Godollo, Isaszegi ut 200, Hungary

*Corresponding author: bekesi@katki.hu

Apiculture has deep-rooted traditions in Hungary for centuries. More than 15,000 beekeepers work with over 800,000 colonies at present, and the colony density reaches 8-9 per km^2, one of the highest in the EU. Hungarian beekeepers have been observing with great concern the rise in infectious and parasitic diseases and the lack of reliable disease control. Under the sponsorship of the EU financed National Program of Apiculture coordinated by the Association of Hungarian Beekeepers (OMME), a diagnostic program was initiated in 2007: Samples have been regularly analyzed for nosema, varroa and viral infections; in toto 170 apiaries, with 850 samples, free of charge. Toxicological analyses were carried out on several honeybee and plant samples also, from time to time. The results of the analyses confirmed that mass disorder or mortality with characteristic symptoms, the so-called colony collapse disorder (CCD) is not yet present in Hungary. On the other hand, it was also established that incidences of nosema (particularly *N. ceranae*) and infections of five honeybee viruses (acute bee paralysis virus, chronic bee paralysis virus, black queen cell virus, deformed wing virus and sack brood virus) had become more and more frequent. The feedback from the questionnaires shows that amitraz is the most frequently applied compound in varroa control, although the use of thimol, formic acid and oxalic acid have also been spreading. Pollen shortage due to the dry summer prevented adequate preparation of the colonies for wintering in 2007, thus in some apiaries winter losses reached 30% by the spring.

Keywords: honeybee, colony loss, monitoring, Hungary

FAMILY BASED SELECTION PROGRAMS OF COMMON CARP IN VIETNAM AND HUNGARY

H.N. NINH[1] and Z. JENEY[2]

[1]Research Institute for Aquaculture N[0] 1, Bac Ninh, Ha Bac, Vietnam
[2]Research Institute for Fisheries, Aquaculture and Irrigation (HAKI), H-5540, Anna liget 8., Szarvas, Hungary

*Corresponding author: jeneyz@haki.hu

There is an increasing interest in further genetic improvement of common carp, the most widely cultured freshwater fish species in the world. In-spite of the successfull hybridization programs joined by mass selection, most of the carp production is carried out by unselected carp varieties.

In this joint presentation we report about an Asian and European initiation into the direction of familiy selection programs of common carp.

1. Comparison of communal early rearing and separate early rearing methods.

The genetic improvement programme for growth-related traits in common carp in Vietnam started to synthesize base population from six carp stocks following a single pair mating scheme. The next two selected generations were produced using a partial factorial mating scheme, with each family being split and reared using communal early rearing (CER) or separate early rearing (SER) methods. The estimated heritability values were from 0.20 ± 0.04 to 0.29 ± 0.05 for both weight and length at final harvest using CER. Similar heritability estimates were obtained in the SER groups, ranging from 0.20 ± 0.07 to 0.31 ± 0.08 at final measurement. The maternal and common environmental effects were consistently close to zero in CER, and ranged from 0.05 to 0.22 in SER. Direct response to selection for body weight in CER (15.0% per generation) was greater than that in SER (8.1% per generation).

2. Disease resistance of genetically different common carp families against *Aeromonas hydrophila*.

The largest –up to now- diallele cross of common carp was done, 96 families of carp were produced. Four strains have been selected: two inbred and two wild strains. A diallel mating structure was used to allow assessment of genetic variation within and between these stocks for a variety of traits. The technology of growing the 96 families up to the marking size was developed through a series of modifications. The 96 families were used in different experimental set-ups including challenge tests with A. hydrophila, as a model bacterial pathogen. Two trials of challenge were implemented. The 10 most resistant and the 10 most sensitive families against A. hydrophila were indentified from the results of these two challenges. The crosses that produced the most resistant families were mainly those having parents from Tata and Szarvas 15 domesticated strains, while the most susceptible families from the wild strains Duna and Amur.

Due to the common interest of Vietnam and Hungary in genetic improvement of common carp there is a need to continue the R and D cooperation in the field of carp genetics.

Keywords: common carp, Aeromonas hydrophila, disease resistance, genetically different crosses

INTENSIVE CARP PRODUCTION IN PONDS

T. FELEDI*, A. RONYAI, I. CSENGERI and A. PETERI

Research Institute for Fisheries, Aquaculture and Irrigation,
Anna liget 8., Szarvas, H-5541 Hungary

*Corresponding author: feledit@haki.hu

The common carp (*Cyprinus carpio*) is the dominant species of the Central European aquaculture production and the demands of customers are relatively high for it. In Hungary majority of the fish production (about 93 %) is originating from traditional extensive fishpond farming and just only about 7% comes from intensive systems. The fish growing season is about 150 days, when the temperature of the surface waters is above 20 °C. In such conditions common carp reach marketable size during two – three years. Economic considerations of the traditional technology (high price of the water, energy and feed) and the increasing demand for fish bigger than 2.0 kg forced the producer to further apply extensive technologies.

However, losses of fish in the first two years (below 400 g) are very high (as high as 60-80 %) from ponds, as a consequence of bird predation, large pond sizes (water quality problems), fish diseases (first of all the increasing emergency of KHV). Intensive production of stocking material can be the solution for avoiding the losses. In intensive systems the out-of season propagation can offer advantages not only of controlled conditions, but also allows earlier obtainments of advanced fry, which latter can be stocked into outdoor ponds. As a result of this "combined" production technology the carps can achieve body weight higher than 400 g by the end of first production season.

The use of a simple water recirculation system adapted to the economic conditions of the region could be another solution. By the calculations and by the results of preliminary trials a 600-1000 m^3 intensive system is enough for production of stocking material for 100 ha of traditional (extensive) fish farm. In this system the fingerlings can be produced in winter period and also can be immunized in against the KHV. At a density of 30-40 kg/m^3 fish can reach a body weight of 400 g within one production season and could be not consumed during further outdoor rearing.

The intensification of carp production technology can be achieved also by applying adequate artificial diets instead of grains. In the frame of the Aquamax-project a feeding experiment was carried out in four experimental ponds from the beginning of April till the middle of November 2007. The carps were reared in polyculture with grass carp, Chinese carps hybrid and European catfish in the proportion of 67 : 22 : 9 : 2 %, respectively. However, the stocking density for ponds fed by artificial diet was higher (805 ± 8 kg/ha) than that in ponds fed with wheat (653 ± 40 kg/ha). Until the end of June all ponds were supplied with wheat and then during one week feed in two ponds was gradually changed to diet Nutreco. The production performance of fish per treatment was evaluated by survival, yield, specific growth rate, average weight, feed conversion rate, protein efficiency ratio and productive protein value.

Harvesting data and production performance parameters revealed that there were significant differences neither in the daily growth of carp biomass, nor in carp individual average weight. However significant differences were observed in the harvested fish biomass and feed and protein utilisation efficiency. This phenomenon can be explained by the lower stocking density in the wheat fed pond, where the natural feed could partly compensate the high protein content of NUTRECO diet.

Based on the above results it can be stated that the intensification of carp producing methods is effective included the out-of season propagation and pre-nursing period in a recirculation system and also the rearing in small pond fed with artificial diet in addition.

Keywords: common carp, out-of season propagation, intensive production, artificial diet

IMMUNOSTIMULANTS OF NATURAL ORIGIN IN PREVENTION OF FISH DISEASES

L. ARDO[1*], D. T. H. OANH[2] and G. JENEY[1]

[1]Research Institute for Fisheries, Aquaculture and Irrigation (HAKI), H-5540, Anna liget 8., Szarvas, Hungary
[2]College of Aquaculture and Fisheries, Can Tho University, 3/2 street, Ninh Kieu district, Can Tho, Vietnam

*Corresponding author: ardol@haki.hu

Antibiotics and vaccines against pathogen bacteria are the most commonly used agents in prevention of infectious fish diseases. Excessive use of antibiotics can lead to selection of resistant bacteria and causes environmental pollution. Vaccination helps in prevention of diseases, but enhances only the specific immune response against one pathogen. Innate (non-specific) immune system also has an important role in protection of fish against diseases. Agents stimulating non-specific immune response are called immunostimulants. They are compounds of various structure, there are polysaccharides, flavonoids and alkaloids among them. Recent results of research demonstrate that they can be applied to prevent infectious fish diseases in practice.

Research group of immunology in the Research Institute for Fisheries, Aquaculture and Irrigation (HAKI, Szarvas, Hungary) has been studying the immunomodulatory effect of herbal extracts for already five years, in cooperation with Chinese, Vietnamese and South African research partners. During the years, a series of laboratory and half-industrial scale experiments were carried out on various fish species, e.g. common carp, Nile tilapia and African catfish. Herbal medicine extracts used for our experiments are well known immunostimulants in traditional Chinese human medicine. This effect has been demonstrated in many experimental animals, e. g. mouse or chicken, but we have much less experimental data of their effect on the fish immune system.

In one of our experiments we studied the effect of two medicinal herbs, *Astragalus membranaceus* and *Lonicera japonica* in combination with two trace elements, boron and selenium on the non-specific immune response of common carp. Herbal extracts and trace elements were mixed to the fish feed in various combinations. The control feed did not contain herbal extracts or trace elements. Fish were being fed with these feeds for four weeks and blood samples were taken once a week. Phagocytic cells and blood plasma were isolated from blood by centrifugation, and non-specific immune response was determined. Phagocytic activity of white blood cells and lysozyme activity of blood plasma were measured. Results were evaluated by statistic methods. At the end of feeding experiments, fish were challenged with the bacterium *Aeromonas hydrophila*, then mortality was being registered during one week and survival rates were calculated.

Phagocytic activity of white blood cells was significantly higher in groups treated with herbs and boron than in the control group. In contrast, this parameter was significantly lower in groups treated with herbs and selenium than in the control group. Lysozyme activity of blood plasma was significantly higher in treated groups than in the control group, or did not change. Mortality after *Aeromonas hydrophila* infection decreased in groups fed with herbs and boron, but increased in groups fed with herbs and selenium, compared to the control. These results show that both *Astragalus* and *Lonicera* extracts can be used as immunostimulants together with boron, but their supplement with selenium has a negative effect on non-specific immune response.

Keywords: non-specific immunity, common carp, Astragalus membranaceus, Lonicera japonica

CLIMBING PERCH PRODUCTION IN VIETNAM, POSSIBILITIES FOR EUROPEAN INTRODUCTION IN INTENSIVE AQUACULTURE

***B. KUCSKA[1*], B. M. TAM[2], and T. C. TAM[2]**

[1] Research Institute of Fisheries Aquaculture and Irrigation Szarvas, Anna-liget 8 Hungary
2 College of Aquaculture and Fisheries Can Tho University, 3/2 street, Can Tho City, VietNam

*Corresponding author: kucskab@haki.hu

Climbing perch (*Anabas testudineus*) belong to Order P*erciformes*, Family *Anabantidae* (C*limbing guoramies*). It is a small freshwater fish species native in south Asian region (China, Vietnam, Laos, Cambodia, Thailand, Myanmar, India, Philippines). Climbing perch can adapt to the extreme tropical conditions (high temperature, low dissolved oxygen and lack of water in dry season). They have special air breathing organs and are able to migrate long distance without water. The name “climbing” originated from this behavior. It is an omnivorous species that matures in half a year to a size of 12-15 cm, has a very good meat quality and also could be important as an ornamental fish.

Climbing perch is very popular in Vietnam, and has a perspective niche market in Europe based on the non native Asian population. The lack of this species in natural water indicates the developing of its production technology. The intensive pond culture has already begun in Vietnam. This fish could be propagated artificially using different kinds of hormones (HCG, LH-RH dopamine antagonist, carp pituitary). The larvae can be reared in earthen ponds based on natural food sources (zooplankton). Fingerling and adult fish can be reared intensively using dry diet. After six or eight months they can reach the market size which is 150-180g (stocking densities: 30-50 fish/m^3 harvest 21-25 ton/ha)

The rearing technology in RAS or in geothermal water outflow system is not practiced yet. The Hungarian Research Institute of Fisheries Aquaculture and Irrigation and the Vietnamese Can Tho University work together in this topic. The aim of the project is to develop the rearing technology (study the reproduction and nutrition questions) based on geothermal water sources. As a result we can produce a high market price fresh filet or live fish and target the Asian ethnics in Europe.

Keywords: Climbing perch, intensive culture, niche market, geothermal water sources

FEED ADDITIVES AS THEY AFFECT THE FATTENING PERFORMANCE OF RABBITS

CS. EIBEN[1*], T. GIPPERT[2], K. GODOR-SURRMANN[1] and K. KUSTOS[3]

[1]Division of Small Animal Research, Research Institute for Animal Breeding and Nutrition (ATK), 2100 Godollo, Isaszegi ut 200, Hungary
[2]GBT PRESS Ltd., Sportfold u. 21/F, Veresegyhaz, H-2112, Hungary
[3]Lab-Nyul Ltd., Malomto u. 8., Godollo, H-2100, Hungary

*Corresponding author: eiben@katki.hu

This work compared the separate effect of probiotic, prebiotic, organic acids and herbal extract dietary supplementation on growth performance. Rabbits were fed a diet without additives in the Control group (C). This feed was supplemented with 1000 mg/kg of probiotic bacteria of *B. subtilis and B. licheniformis* (B group); 0.3% prebiotic inulin (I group); 0.3% organic acids (O group); or 0.3% tannin (T group). Each feed was antibiotic free but supplemented with anticoccidial robenidine. NZW rabbits aged 35 d were weighed, weaned and assigned to one of the five dietary groups. A fattening trial was carried out with 150 singly housed rabbits (n=30/group) and 360 housed collectively (3 rabbits/cage, n=72/group) and reared up to 63 d of age. Feed intake was not affected by the diets. The 63 d liveweight tended to be higher (*P*=0.081) both in the I and T groups (2043 and 2051 g), intermediate in the C and B groups (1990 and 1996 g) and lower in the O group (1964 g). The additives exerted a significant influence on 49-63 d growth rate (*P*=0.006) that was the best in the I and T groups, moderate in the O and C groups and poorer in the B group. The 35-63 d feed conversion was not affected (3.14, 2.99, 2.94, 3.02, 2.95 in the C, B, I, O, T groups, respectively, *P*=0.252). Health risk was the lowest in the C group and highest in the O group (33.3, 43.0, 37.9, 49.5, 39.8% in order of C, B, I, O, T groups, *P*=0.035). In conclusion, both herbal extract (tannin) and prebiotica (inulin) can be useful as natural additives in antibiotic-free rabbit diets because growth rate improved while health status was not adversely affected. The impact of probiotics (*B. subtilis* and *B. licheniformis*) is ambiguous. The supplemental blend of organic acids (formic, acetic, propionic) was not effective since it increased the health risk and reduced 63 d body weight.

Keywords: B. subtilis, B. Licheniformis, Inulin, Organic acid, Tannin

INFLUENCE OF *BACILLUS SUBTILIS* ON IMMUNE-RESPONSE OF BROILER CHICKENS

A. KOROSI MOLNAR[1]*, B. PODMANICZKY[1], P. KURTI[2], M. MOERK JENSEN[2], ZS. FARKAS[1] and ZS. SZABO[1]

[1]Division of Small Animal Research, Research Institute for Animal Breeding and Nutrition (ATK), 2100 Godollo, Isaszegi ut 200, Hungary
[2]Chr. Hansen S/A, Horsholm, Denmark

Corresponding author: amolnar@katki.hu

Probiotics have been administered to poultry to enhance production performance and immune responses. Probiotic supplementation can protect the host animal against pathogens by colonization in the gastrointestinal tract. The probiotics have positive effect on humoral and cellular immune responses too. Spores of various *Bacillus* species (e.g. *B.cereus, B.subtilis, B.clausii*) are used as probiotics for animals and humans. *B.subtilis* was described as member of mucosa-associated bacterial population in chicken caeca by molecular analysis. The orally administered spores of *B. subtilis* could germinate in the gastrointestinal tract of chicks. Commensal bacteria are known to pay an important role I the development of gut-associated lymphoid tissue (GALT). The GALT has evolved with specialized cytological features that reflect its role as the first line of defense.

Five hundred and sixty day-old Ross 308 broiler chickens were randomly assigned to two treatment groups with eight replicates. There were 35 birds in each pen. For the experiment antibiotic and coccidiostat-free one-phase diet (12.63MJ/kg ME and 20.0% crude protein) was used. Control group were fed with basal diet containing only the carrier whey powder (500g/t). The treated group received basal diet containing *Bacillus subtilis* at a dose of 500 g premix (3.6×10^5 CFU/g feed). At three weeks of age tissue samples were taken from the ileum and the bursa of Fabricius from five birds of each group. The samples were fixed in formaldehyde solution. The fixed samples were embedded in paraplast. Transverse sections were cut into 5 μm samples and every 10^{th} section was collected. New Castle Disease (ND) vaccination was carried out at day-old and three weeks of age. Blood samples were taken at 21 and 42 days of age for serological tests (10 samples/ treatment). The method of analysis was the haemmagglutination inhibition test for ND. At six weeks of age ten birds per treatments were randomly selected and germinating spores in the caecal content were enumerated.

Broilers fed *Bacillus subtilis* supplemented diet had significantly higher body weight (2271.9 and 2406.9 resp.) and better feed conversion ratio (1.94 and 1.86) than those of control.

In the bursa of Fabricius the number and dimension of the lymphoid follicles, the cell composition of the cortex and medulla, and the rate of lymphocyte colonization were not different either between the different groups or between individuals.

The thickness and morphological appearance of the different layers (mucosa, muscularius and serosa), the length of villi, and the depth of the crypts of Lieberkühn were similar in sections of small intestine samples taken from the control and treated groups.

As a result of *B. subtilis* supplementation of the diet a higher immunological activity was appeared in the ileal mucosa. A diffuse lympho-histiotyc infiltration appeared and the number of solitary lymphoid follicles occurring in the connective tissue layer of the mucosa increased in chickens fed *Bacillus subtilis* bacteria. The appearance of solitary lymphoid follicles, indicating lymphoblast cell production, indicates higher immunological activity of the mucosa.

The birds from supplemented groups consequently showed a statistically stronger response to New Castle Disease vaccination. Average NDV titre was at 21 days old 171 in the control and 524 in the treated chickens at 21 days old, and at 42 days old of age it was 662 and 723, respectively.

The viable spore count of the *Bacillus subtilis* in the caecal samples was significantly ($P \leq 0.05$) higher in the treated group than in the control group.

Keywords: *Bacillus subtilis*, chicken, immune response, lymphoid follicles, ND titre

EFFECT OF EARLY AGE THERMAL CONDITIONING ON PRODUCTION PARAMETERS IN BROILERS

ZS. SZABO*, B. PODMANICZKY, B. VEGI, K. HOREL and A. KOROSI MOLNAR

[1]Division of Small Animal Research, Research Institute for Animal Breeding and Nutrition (ATK), 2100 Godollo, Isaszegi ut 200, Hungary

*Corresponding author: szazsu@katki.hu

Early age heat treatment is a unique method that can improve the heat tolerance of broiler chickens. Some days old birds does not have entirely developed heat control feed back mechanisms. At this time a heat treatment can induce a kind of long distance „memory" development by which they react more favourable to heat stress in their later period of life. The purpose of the experiment was to examine the effect of early age heat treatment on the production parameters, on the cloaca and back surface temperature, the T3 level of serum and the content of the corticosterone equivalent in the faeces.

In the *first trial* 720 Cobb 500 broilers (mixed sex) were distributed to 9 treatments with 4 replicates/treatment.. The birds were allocated into 36 deep littered floor pens (20 birds/pen). One-phase broiler feed was used. Heat conditioning methods were: 2 or 4 days old chicks were kept on 37.2°C or 38.5°C during 24 or 12 hours. The treatments were the following: *A*-group is the control (without heat conditioning), *B*-group: 2 days old chicks were heat conditioned on 37.2°C room temperature during 12 hours, *C-group:*2 days old, 37.2°C, 24 hours, *D-group:* 2 days old, 38.5°C, 12 hours, *E*-group: 2 days old, 38.5°C, 24 hours, *F*-group: 4 days old, 37.2°C, 24 hours, *G*-group: 4 days old, 37.2°C, 12 hours, *H*-group: 4 days old, 38.5°C, 12 hours, *I-group*: 4 days old, 38.5°C, 24 hours. When the chickens reached the 3 and 5 weeks old of age they were heat stressed artificially with raising the room temperature to 34°C during 5 hours. At the end of the fattening period, carcass quality was examined too.

Among the treatment groups the group *D* reached the bigger live weight (2168 g) but significantly. In most of the heat conditioned treatments FCR was better than in control (1.75). *D* (1.64) and *H* (1.63) group showed the best FCR. The dressing percentage was significantly ($p \leq 0.01$) better in the *B*- (74.82) and in the *C-group* (75.06) than in the control (72.9). Because of the early age heat condition the abdominal fat content decreased. The abdominal fat content was significantly ($p \leq 0.05$) lower in group *D* (0.91%), *E* (0.95%), *F* (0.91%), *H* (0.79%) and *I* (0.7%) than in the control (1.27%). The early age thermal conditioning caused a decrease in the level of T3 hormone, which is responsible for heat-production of the organism.

In the *second trial* two hundred Cobb 500 mixed sex broiler chickens were examined. Two experimental groups were created, a control group and a heat treated group (heat treated means: the 2 days old chicks were kept at 38.5°C room temperature during 12 hours). To show the effect of heat treatment, the chickens were stressed by high temperature (35°C during 6 hours) at three weeks old of age. During the artificial heat stress the body temperature was measured, the faeces were collected for analysis of its corticosterone level.

As in the first trial the broilers of the heat treated group consumed less feed during the growing period and from the third week of their life their feed conversion was better than the controls. During the heat stress period the cloaca and back-surface temperature of the heat treated group was lower comparing to the control broilers. On the effect of the elicited heat stress the corticosterone level of the faeces was increased in both groups. At the end of the heat stress the corticosterone level of the thermal conditioned chickens decreased immediately, but in the control group it lasted about three hours.

Keywords: early age heat exposure; broiler, stress, FCR, body temperature, corticosterone, T3

EFFECT OF BACILLUS SUBTILIS ON THE GUT MICROFLORA OF BROILER CHICKENS

B. PODMANICZKY[1], A. KOROSI MOLNAR[1*], I. TENK[3], M. MORK JENSEN[2], ZS. SZABO[1] and J. ZSOLT[1]

[1]Division of Small Animal Research, Research Institute for Animal Breeding and Nutrition (ATK), 2100 Godollo, Isaszegi ut 200, Hungary
[2]Chr. Hansen S/A, HØrsholm, Denmark,
[3]Mikrolab Kft, Dabas, Hungary

*Corresponding author:amolnar@katki.hu

Beneficial effect of probiotics can be explained with gut health modulating features of this natural growth promoter. The aim of this study was to examine the influence of *Bacillus subtilis* as a dietary probiotic supplementation on the gut microflora of broilers.

Ross 308 broiler chicks in mixed sex were assigned in 5 treatments with 7 replicates. Broilers were housed in deep litter floor pens (6.5 m^2/pen) 35 chicks per replicate. Antibiotic and coccidiostat-free one-phase diet (12.63MJ/kg ME and 20.0% crude protein) was used. Treatment A (control group) received basal diet with only whey carrier. *B. subtilis* spore content of control feed was >1 x 10^5 spores/g. In the treated groups the chicken received dietary *Bacillus subtilis* supplementation: Treatment B: 3.6 x 10^5 spores/g feed, Treatment C: 3.6 x 10^6 spores/g feed, Treatment D: 3.6 x 10^7 spores/g feed, Treatment E: 3.6 x 10^8 spores/g feed. At 3 weeks old of age caeca and ileum samples were taken from seven chicks of A and E groups for microbiological examination. At the end of fattening the caecae of ten broilers per each treatment were removed and microbiologically examined.

The average live weight of the broilers of the treated groups was significantly ($P \leq 0.01$) higher than of the control group. The feed conversion of Group B, C and D was better than in the control. Through the 6-week period the mortality of the experimental groups did not exceed the 4 %.

At 21 day *in the caeca* samples the number of *E. coli* was higher but not significantly in the control group than in the treated one. There were no significant differences between the groups regarding to the number of anaerobe all-living-germs, of *Lactobacillus* and of *Proteus*. The number of the vegetative forms of the aerobe spore bacteria was significantly higher in the treated group (7.88 x 10^6) than in the control (2.86 x 10^2). Because of the treatment, the number of *Clostridia* and other sulfit reducers decreased.

Results of the microbiological experiment of ***the ileum*** showed that *E.coli* bacteria number decreased with two orders of magnitude in the treated group. There were no significant differences between the groups regarding to the number of anaerobe all-living-germs, of *Lactobacillus*, of *Proteus* and of *Clostridia* and other sulfit reducers. The number of the vegetative forms of the aerobe spore bacteria was higher in the treated group (1.4 x 10^7) than in the control (7.1 x 10^5). The ratio of *Lactobacillus / E.coli* increased in treatment E (85) comparing to control group (33).

At 42 day the recovery of the spore count in the caecal samples clearly reflected the dietary content of *Bacillus subtilis*. The bacilli strains in caecal samples were A: 3.1 x 10^3, B: 1.3 x 10 x 10^4 , C: 6.7 x 1010^5 , D: 2.4 x 1010^6, E: 2,1 x 1010^7 CFU/g.

Keywords: Bacillus subtilis, broiler, microflora, ileum, caeca

THE EFFECT OF MANNAN OLIGOSACHARIDES ON GROWTH PERFORMANCE OF CHALLENGED BROILERS

B. PODMANICZKY[1], A. KOCHER[2], ZS. SZABO[1], B. VEGI[1], K. HOREL[1], L. KOROSI[3], and A. KOROSI MOLNAR[1*]

[1]Division of Small Animal Research, Research Institute for Animal Breeding and Nutrition (ATK), 2100 Godollo, Isaszegi ut 200, Hungary
[2]Alltech Biotechnology Centre, Dunboyne, Co.Meath, Ireland
[3]AgriAL Bt. Godollo, Hungary

*Corresponding author: amolnar@katki.hu

The role of natural growth promoters is rising continually in post-antibiotic era. Several trials showed the benefits of mannan oligosacharides (MOS) from the outer cell wall of a selected strain of *Saccharomyces cerevisiae* on the modulating effect of gut health based on pathogen inhibition.

Seven hundreds and twenty day old Ross 308 male broilers were distributed to 3 treatments with six replicates (40 chicks/floor pen). The stocking density was 9 chickens / m^2. The feed was applied in two phases. The diets in all feeding phases contained 40 % wheat. The following treatments were used: Treatment I: basal diet supplemented with a xylanase (Allzyme PT™) and a coccidiostatics (Maduramicin), Treatment II: basal diet (without enzyme and coccidiostatics), in addition birds were vaccinated with coccidiosis vaccine (Paracox ™-5, five times doses at 9 days of age), Treatment III: basal diet (without enzyme and coccidiostatics) and coccidiosis vaccination (Paracox ™-5, five times doses at 9 days of age) and MOS (Bio-Mos, Alltech Inc.) supplementation in the feed. Weight gain, feed intake, feed conversion ratio, health status, mortality and litter quality were examined.

The live weight at 35d of age, was within the expected weight of Ross standard in the Treatments I and III. The chickens from the Treatment II were backward significantly ($P \leq 0.05$) from the other groups (2088g and 1995g vs 1645g, respectively). The body weight of broilers in the Treatment III (1995 g) - although challenged but fed diets containing MOS – was close to the unchallenged Treatment I. The FCR values were best in Treatment I (1.74). In Treatment III where the challenged chickens were fed diets supplemented with MOS, feed conversion was marked improved compared to challenged chickens without MOS supplementation (FCR 1.84 vs 2.11, respectively). There was not significant difference among the groups regarding to the mortality. At the end of the fattening period the litter quality was similar in the pens of Treatment I and of Treatment III and it was worse in the pens of Treatment II. The parameters of production showed that MOS (Bio-Mos) supplementation had significantly favorable effect to the body weight and FCR of challenged broilers. Finding of this experiment would indicate that the addition of MOS could be a useful tool to maintain intestinal health and growth performance under challenged or sub-optimal production systems.

Keywords: mannan oligosacharides, broiler, wheat diet, coccidiosis vaccination

EFFECT ENTEROCOCCUS FAECIUM 2NF8001 ADMINISTERED IN WATER ON THE REARING PERFORMANCES AND THE GUT MICROFLORA IN FREE RANGE CHICKENS

B. PODMANICZKY*, ZS. SZABO, ZS. KOKAI TAKACS, K. HOREL and A. KOROSI MOLNAR

[1]Division of Small Animal Research, Research Institute for Animal Breeding and Nutrition (ATK), 2100 Godollo, Isaszegi ut 200, Hungary

*Corresponding author: podm@katki.hu

The effect of *Enterococcus faecium 2NF8001* as a probiotic supplement administered in water was studied on the rearing performances and gut microflora in two autochtonous free range chicken population, in the Hungarian Yellow and the Speckled Transylvanian Naked-neck breeds. The probiotic treatment was given through the water until 12 weeks of age. Chicks of mixed sex were assigned in 2 treatments with 5 replicates, 45 birds per each. Birds were housed in deep litter floor pens (7.5 m^2/pen) with chicken running. The feeding program was consisting of two phases. 0-4 weeks starter diet with 12.3 MJ/kg ME and 20% crude protein, 5-12 weeks grower diet with 11,9 MJ/kg ME and 19% crude protein level. The two treatments (A-control, B-treated) in each stock were fed the same diet. Birds from the treated groups (B) received 0.01g / l dietary water supplementation of dehydrated *Enterococcus faecium* preparate containing 4 x 10^{11}CFU/g. Body weight, weight gain, feed consumption and feed conversion of birds was measured and recorded individually. At the age of 1, 2, 3, 7 and 12 weeks ileum samples were taken for microbiological examination (5 birds per treatment) from each groups in order to assess changes in the microbial population of Lactobacilli (MRS), D-Streptococci (Slanezt.Bartley) as eubiotic microbiota and Coliforms (McConkey) as secondary flora.

In both breeds as average live weight, feed intake and conversion no significant difference could be found between treated and untreated groups. Important and statistically significant difference was found in the mortality over the whole trial. In the Speckled Transylvanian Naked-neck breed the mortality of the control group was 12.91% while it was 5.41% only in the treated group. As the analysis of the bacterial population in the ileum, there were no noticeable differences in the tendency of log CFU values of the Lactobacilli, D-Streptococci and in the log CFU Coliform/Lactobacillus ratio between the groups and treatments.

Keywords: Enterococcus, chicken, free range, mortality, microflora