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EMBRYONÁLNÍ MORTALITA SNÁŠKOVÝCH LINIÍ RIR A BPR V PRŮBĚHU INKUBACE

EMBRYONIC MORTALITY IN LAYING STRAINS RIR AND BPR DURING INCUBATION

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ABSTRACT: Fertility of hatching eggs, hatchability and embryonic mortality were investigated in three original strains (RIR, BPR-1 and BPR-2) during pedigree hatching in five periods – by the 3rd, 7th, 14th, 20th day and at the stage of breaking through the eggshell. Average hatchability of all three strains was 76.6%, the share of „clear" eggs made 13.3% and embryonic mortality amounted to 10.1%. The peaks of embryonic mortality of all three strains were recorded in two periods – on the seventh day and at the end of incubation. It was on average 18.4% out of the total embryonic mortality on the seventh day of incubation, 33.4% on the twentieth day of incubation and 37.1% at the moment of breaking through the eggshell. With respect to between-the-strains differentiation, the highest embryonic mortality was observed in the two strains with higher coefficients of inbreeding BPR-2 (12.8%) and RIR (12.6%) than in strain BPR-1 (4.7%). There was not however any marked difference between the strains in the distribution of dead embryos in the course of incubation. The embryonic mortality of all three strains is typical of inbredized strains by its pattern (increase at the moment of breaking through the eggshell).

hatching eggs; strains; embryonic mortality; inbredization

ABSTRAKT: U tří výchozích linií (RIR, BPR-1 a BPR-2) byla v průběhu rodokmenného líhnutí sledována fertilita násadových vajec, líhnivost a embryonální mortalita v pěti obdobích – do 3., 7., 14. a 20. dne a ve stadiu klubání. Průměrná líhnivost u všech tří linií činila 76,6 %, zastoupení „čistých" vajec bylo 13,3 % a embryonální mortalita 10,1 %. Embryonální mortalita u všech tří linií kulminovala ve dvou obdobích – v sedmém dni a na konci inkubace. Sedmý den inkubace dosahovala v průměru 18,4 % z celkové embryonální mortality, dvacátý den inkubace 33,4 % a při klubání 37,1 %. Z hlediska meziliniové diferenciace byl zjištěn nejvyšší embryonální úhyn u obou linií s vyšším koeficientem inbridingu BPR-2 (12,8 %) a RIR (12,6 %) než u linie BPR-1 (4,7 %). Nebyl však zjištěn výrazný rozdíl mezi liniemi v rozložení podílu odumřelých zárodků v průběhu inkubace. Svým průběhem (zvýšení v období klubání) je embryonální mortalita všech tří linií charakteristická pro inbredizované linie.

násadová vejce; linie; embryonální mortalita; inbredizace

ÚVOD

Mezi sledovaná kritéria plodnosti u drůbeže lze zařadit fertilitu násadových vajec, embryonální mortalitu a líhnivost. Reprodukční schopnost vyjádřená líhnivostí je ovlivňována mnoha genetickými a negenetickými činiteli, rozhodujícími i o embryonální mortalitě.

Líhnivost je multifaktoriální vlastnost, na jejíž realizaci se podílí velké množství faktorů vnějšího (technika líhnutí, věk zvířat, výživa a zdravotní stav) i vnitřního prostředí(genotyp líhnutých kuřat – přítomnost letálních a semiletálních faktorů, pleiotropní účinky, hmotnost vajec a poměr žloutku a bílku – Máchal et al., 1992). Pro kvalitu násadových vajec je důležitý geneticky determinovaný metabolismus rodičů. Závažným faktorem diferenciace embryonální životnosti může být projev genetické homeostázy, fenomén superdominance, manifestace některých genů vyvolávajících určité zvláštnosti metabolismu nebo činitele determinující jinou vlastnost, která modifikuje do určité míry i líhnivost. Je samozřejmé, že všechny tyto vlivy mohou působit ve vzájemné interakci a velmi často je těžké odlišit jednotlivé složky. Fyziologické hodnoty líhnivosti z vložených vajec u komerčně rozšířených snáškových hybridů jsou udávány v rozmezí 85 až 93 %. Např. Mauldin (1989) zjistil u oplozených vajec pocházejících z 18 500 hejn brojlerových slepic v USA průměrnou líhnivost 89,1 %. Nejvyšší líhnivost byla u vajec pocházejících od slepic ve věku mezi 34 až 42 týdny. Vztahem věku slepic a fertility vajec se zabývali Fasenko et al. (1992a), kteří sledovali vliv věku slepic a pořadí sneseného vejce v sérii na oplozenost, líhnivost, životnost a embryonální vývoj. V souladu s autory O'Sullivan et al. (1991) udávají, že fertilita

a líhnivost průkazně závisí na věku slepic – starší slepice redukovaly fertilitu i líhnivost. Rovněž embryonální vývoj souvisí s věkem slepic. Altabari a Kunodi (1989) poukazují na vliv délky skladování násadových vajec na líhnivost a embryonální mortalitu. Zatímco při skladování do 7 dnů nebyly zjištěny podstatné rozdíly (líhnivost se pohybovala nad 84 %, embryonální mortalita pod 5 %), při skladování delším než 11 dnů se snížila líhnivost pod 74 % a embryonální mortalita zvýšila nad 12 %. Např. Christensen et al. (1993) sledovali embryonální mortalitu u linií krůt selektovaných na snášku a rychlý růst. V prvním týdnu inkubace se mortalita mezi oběma selektovanými liniemi a kontrolou (randombrední populací) nelišila, ale výrazně se zvýšila v období klubání oproti kontrolní skupině. Vliv inbrední deprese na embryonální mortalitu bílých leghornek sledovali Brah et al. (1991). Embrya s koeficientem inbrídingu 25 %, 12,5 % a 0 % vykázala průkazně rozdílnou mortalitu – 24,8 %, 22,8 % a 9,5 %. Dunnington et al. (1990) zjistili pozitivní heterozní efekt u kříženců linií slepic 29 generací selektovaných na hmotnost těla pro pozdní embryonální mortalitu a líhnivost z oplozených vajec. Uvádějí názor, že dlouhotrvající selekce na hmotnost těla redukuje životaschopnost. Peebles a Marks (1991) udávají nižší líhnivost a vyšší embryonální mortalitu u linií křepelek selektovaných na růst než u linií neselektovaných.

MATERIÁL A METODA

Analýza embryonální mortality tří výchozích linií snáškového hybrida Moravia BSL (Integra a.s., Žabčice) probíhala v době rodokmenného líhnutí u klinicky zdravých slepic ve věku 52 až 56 týdnů. Od slepic všech tří linií bylo nasazeno celkem 6 764 vajec.

Líhnivost, zastoupení neoplozených vajec i embryonální mortalita byly hodnoceny uvnitř tří termínů líhnutí každé z výchozích linií snáškového hybrida Moravia BSL (BPR-2 a RIR) a dvou líhnutí linie BPR-1. Ke stanovení dne inkubace, ve kterém došlo k odumření zárodku, byla u všech nevylíhnutých vajec narušena skořápka a embryo bylo vizuálně posouzeno. Den odumření byl určen podle stadia vývoje embrya na základě „Časového přehledu embryonálního vývoje kuřete" (Hampl, 1987). Tzv. čistá vejce (tzn. skutečně neoplozená a odumřelé zárodky v počátcích vývoje) byla vyřazována po týdnu inkubace při první prohlídce.

Podle stadia vývoje byly odumřelé zárodky rozděleny do pěti období – do 3, do 7, do 14 a do 20 dnů. Zvláštní skupinu tvořily zárodky odumřelé v období klubání s narušenou skořápkou.

VÝSLEDKY A DISKUSE

Na rozdílnou líhnivost násadových vajec a embryonální mortalitu má vliv jak liniová příslušnost, tak i pořadí násady. Průměrná líhnivost slepic výchozích linií snáškového hybrida Moravia BSL (BPR-1, BPR-2 a RIR) ve třech po sobě následujících násadách dosáhla pouze 76,6 % (tab. I) a je výrazně nižší, než bývá u rodičovských kompletů:

- u jednotlivých násad je patrná sestupná tendence od první ke třetí – 80,7, 76,3 a 64,6 %;
- počet neoplozených, tzv. „čistých", vajec se naopak zvyšoval – 8,6, 16,7 a 21,8 %; příčinou je vysoké zatížení kohoutů v období rodokmenného líhnutí s následným vyčerpáním, zvlášť u jedinců s nižší produkcí ejakulátu, u kterých je prováděn každodenní odběr spermatu;
- embryonální mortalita kolísala v jednotlivých násadách v rozpětí 7,0 až 13,6 %.

Celkově nižší líhnivost výchozích linií ovlivňoval delší než týdenní sběr násadových vajec a doba skladování vajec (Altabari, Kunodi, 1989) v přípravnách snáškových hal v letních měsících, která se prodloužila až na několik dnů. Zvýšená teplota ve vejci umožňuje pokračování embryonálního vývoje (Wilson, 1990), jenž se však záhy definitivně zastaví a vejce je pak zařazeno mezi tzv. neoplozená, čistá.

Paralelně se také zvyšuje embryonální mortalita (Scott, MacKenzie, 1993). Její hodnota kolísala v jednotlivých násadách mezi 7,0 až 13,6 % a její výši ovlivňovala nejen délka (Mauldin, 1989; Fasenko et al., 1992b) a podmínky skladování vajec, ale i inbrední deprese (Brah et al., 1991; Ino, 1992), vy-

I. Oplozenost, embryonální mortalita a líhnivost výchozích linií snáškového hybrida Moravia BSL v jednotlivých násadách rodokmenného líhnutí – Fertility, embryonic mortality and hatchability of original strains of the laying hybrid Moravia BSL on the particular trays with eggs set for pedigree hatching

	Jednotka[6]	1. líhnutí[7]	2. líhnutí	3. líhnutí	Celkem[8]
Nasazeno[1]	ks	3 571	2 012	1 181	6 764
Neoplozeno[2]	ks	309	336	258	903
	%	**8,6**	**16,7**	**21,8**	**13,3**
Embryonální mortalita[3]	ks	381	141	161	683
	%	**10,7**	**7,0**	**13,6**	**10,1**
Vylíhnuto[4]	ks	2 881	1 535	762	5 178
Líhnivost[5]	%	**80,7**	**76,3**	**64,6**	**76,6**

[1]set eggs, [2]unfertilized eggs, [3]embryonic mortality, [4]hatched chicks, [5]hatchability, [6]unit, [7]1st hatching, [8]total

plývající z inbredizace výchozích linií a ze změn jejich metabolismu (Lerner, 1962).

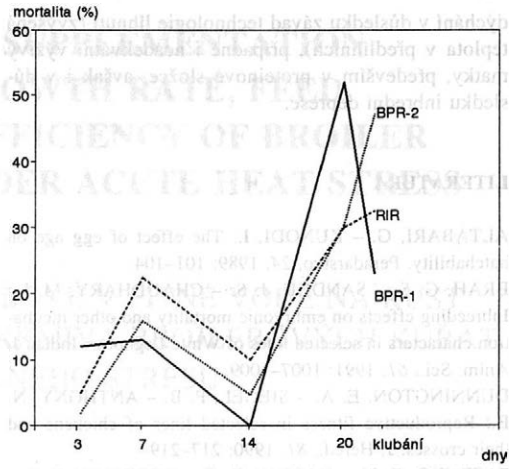
U mateřské linie BPR-1 byla zjištěna nejvyšší líhnivost – 82,4 % (tab. II) a zároveň i nejnižší embryonální mortalita (4,7 %). Naopak nejnižší líhnivost byla shledána u otcovské linie RIR – 72,1 %. Relativně nejvyšší embryonální mortalita byla zaznamenána u linií RIR (12,8 %) a BPR-2 (12,6 %).

Na vyšší líhnivosti linie BPR-1 se podílí i silný selekční tlak, kdy v uplynulých třech generacích byly množeny pouze mateřské a otcovské rodiny s nejvyšší líhnivostí. Negativní selekce byla provedena až 75% vyřazením mateřských rodin s nižší a průměrnou líhnivosti a hodnota F_x dosahovala maximálně 6,25 %.

Embryonální mortalita u všech tří výchozích linií (BPR-1, BPR-2 a RIR) kulminovala ve dvou obdobích inkubace (tab. III): sedmý den inkubace dosahovala v průměru 18,4 % z celkové embryonální mortality, dvacátý den inkubace 33,4 % a při klubání 37,1 %.

Pokud jde o meziliniovou diferenciaci, byl zjištěn nejvyšší embryonální úhyn u obou linií BPR-2 a RIR s vyšší hodnotou F_x (až 12,50 %) než u linie BPR-1.

Nebyl však zjištěn výrazný rozdíl mezi liniemi v rozložení podílu odumřelých zárodků v průběhu inkubace. Svým průběhem (obr. 1) a zvýšením v období klubání je embryonální mortalita všech tří linií charakteristická pro inbredizované linie (Christensen et al., 1993).



1. Embryonální mortalita (osa y) výchozích linií hybrida Moravia BSL v průběhu inkubace (osa x) – Embryonic mortality (y-axis) of original strains of the hybrid Moravia BSL during incubation (x-axis)

mortalita = mortality, klubání = breaking through the shell, dny = days

Příčinu první kulminace mortality lze vysvětlit zvýšenou teplotou v předlíhních. Druhou kulminaci lze přiřadit k poruchám přechodu od alantoidního k plícnímu

II. Oplozenost, embryonální mortalita a líhnivost výchozích linií BPR-1, BPR-2 a RIR – Fertility, embryonic mortality and hatchability of original strains BPR-1, BPR-2 and RIR

	Jednotka[6]	BPR-1	BPR-2	RIR
Nasazeno[1]	ks	2 158	2 154	2 452
Neoplozeno[2]	ks	279	248	376
	%	**12,9**	**11,5**	**15,3**
Embryonální mortalita[3]	ks	100	276	307
	%	**4,7**	**12,8**	**12,6**
Vylíhnuto[4]	ks	1 779	1 630	1 769
Líhnivost[5]	%	**82,4**	**75,7**	**72,1**

For 1–6 see Tab. I

III. Embryonální mortalita výchozích linií snáškového hybrida Moravia BSL v časových úsecích inkubace – Embryonic mortality of original strains of the laying hybrid Moravia BSL in the time segments of incubation

Věk odumřelých embryí[1]	BPR-1		BPR-2		RIR		Celkem[7]	
	ks	%	ks	%	ks	%	ks	%
Do 3 dnů[2]	12	12,0	5	1,8	15	4,9	32	4,7
Do 7 dnů[3]	13	13,0	44	15,9	69	22,5	126	**18,4**
Do 14 dnů[4]	0	0,0	13	4,7	31	10,1	44	6,4
Do 20 dnů[5]	52	52,0	84	30,4	92	30,0	228	**33,4**
Klubání[6]	23	23,0	130	47,2	100	32,5	253	37,1
Celkem[7]	100	100,0	276	100,0	307	100,0	683	100,0
Celkem z nasazených[8]	–	4,7	–	12,8	–	12,6	–	10,1

[1]age of dead embryos, [2]within 3 days, [3]within 7 days, [4]within 14 days, [5]within 20 days, [6]breaking through the shell, [7]total, [8]per cent total out of set eggs

dýchání v důsledku závad technologie líhnutí (zvýšená teplota v předlíhních), případně i neadekvátní výživy matky, především v proteinové složce, avšak i v důsledku inbrední deprese.

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EFFECT OF ASCORBIC ACID SUPPLEMENTATION IN DRINKING WATER ON GROWTH RATE, FEED CONSUMPTION AND FEED EFFICIENCY OF BROILER CHICKENS MAINTAINED UNDER ACUTE HEAT STRESS CONDITIONS

VLIV DOPLŇKU KYSELINY ASKORBOVÉ V PITNÉ VODĚ NA RŮST, SPOTŘEBU KRMIVA A KONVERZI KRMIVA BROJLEROVÝCH KUŘAT V PODMÍNKÁCH AKUTNÍHO TEPELNÉHO STRESU

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ABSTRACT: Experiments were designed to determine whether supplemental ascorbic acid (AA) would alleviate heat in growth rate, feed consumption and feed efficiency of broiler chicks. A total of 450-day-old chicks were reared at high ambient temperature ranging from 29 to 43 °C in both starter and finisher phases. The chicks were divided randomly into 3 equal groups (1, 2, 3). Group 1 was kept as control under normal required temperature (21–35 °C) with average relative humidity of 40–85%, whereas group 2 and 3 were subjected to acute heat stress, temperature ranging from 29 to 43.2 °C, with relative humidity of 40–85%. All the groups of birds were fed the same starter diet containing 12.6 MJ ME/kg and 22% crude protein (CP) and finisher diet comprising 12.6 MJ ME/kg with 20% crude protein (CP). Proper water supply was assured to each group of birds during the experiment. Normal water was supplied to Group 1 and 3 whereas, in Group 2 water was supplemented with ascorbic acid at the rate of 20 mg/bird/day. High ambient temperature decreased ($P < 0.01$) weight gain in G3 by 9.1% as compared to birds in G1. The chicks in group 2 increased ($P < 0.01$) weight gain by 1.68% and 10.9% when compared to G1 and G3. Birds in G2 consumed 8.3% and 7.03% less feed with 11.1% and 22.2% better feed efficiency than those of in G1 and G3 respectively, whereas broilers in G1 consumed 1.25% more feed with 10% better feed efficiency than chicks in G3. An increase of 3.6% and 4.0% in body temperature was recorded in G2 and G3 as compared to G1 when they were subjected to acute heat stress. Mortality was higher in G3 by 20% and 45% than that in G1 and G2. Birds in G2 recorded the best performance with lower mortality as compared to G1 and G3.

broiler chickens; heat stress; ascorbic acid; mortality

ABSTRAKT: V pokusech na brojlerových kuřatech byl zjišťován vliv doplňku kyseliny askorbové v dietě na růst, spotřebu a konverzi krmiva a na tělesnou teplotu během tepelného stresu. Brojlerová kuřata (kohoutci) byla ustájena při teplotě 29 až 43 °C, průměrná relativní vlhkost vzduchu se pohybovala mezi 40 až 85 %. Brojleři byli krmeni dietami s 12,6 MJ ME/kg a 22 % NL v první fázi výkrmu (do 21 dnů věku) a dietami s 12,6 MJ ME/kg a 20 % NL v druhé fázi výkrmu (do 42 dnů věku). Kyselina askorbová byla přidávána do pitné vody v dávce 20 mg na ks a den po celou dobu výkrmu. Kuřata, dostávající doplněk kyseliny askorbové, dosáhla vyššího přírůstku o 1,68 % oproti kontrolním kuřatům při obvyklé teplotě a o 10,9 % oproti kuřatům bez doplňku kyseliny askorbové během tepelného stresu. Konverze krmiva byla lepší u kuřat s doplňkem kyseliny askorbové o 22,2 % v porovnání s kuřaty bez doplňku při tepelném stresu a o 11,1 % v porovnání s kontrolou. Tělesná teplota u kuřat, vystavených tepelnému stresu a krmených dietou s přídavkem kyseliny askorbové, byla o 3,6 % a o 4,0 % vyšší oproti kontrolním kuřatům. Mortalita byla vyšší u kuřat bez doplňku kyseliny askorbové při tepelném stresu o 20 % ve srovnání s kontrolou v normálních podmínkách a o 45 % ve srovnání s kuřaty krmenými dietou s doplňkem kyseliny askorbové při tepelném stresu. Ukázalo se, že doplněk kyseliny askorbové u brojlerových kuřat ovlivnil pozitivně užitkovost i mortalitu během tepelného stresu.

brojlerová kuřata; tepelný stres; kyselina askorbová; mortalita

INTRODUCTION

High ambient temperature to which the birds are exposed affects their performance by depressing the feed intake, body growth, feed efficiency and causes high mortality. There are some evidences which indicate that under conditions of high ambient temperature birds are unable to synthetise sufficient ascorbic acid to replace the severe losses of this vitamin that occur during stress. Ascorbic acid reduces mortality in broilers during a heating episode (38 °C bird level) in the production facility (P a r d u e et al., 1985). Supplemental ascorbic acid has been reported to improve heat resistance, performance and reduce mortality associated with elevated ambient temperature in chickens (N j o k u , 1986). Deficiency of ascorbic acid occurs in stressful situations such as high temperature, high humidity, high production rate and parasitic infestation. These reports suggest that conditions may exist in which endogenous ascorbic acid synthesis by birds is insufficient to meet physiological needs and under such conditions supplementation with ascorbic acid could be beneficial.

It has been generally accepted, however, that supplementary ascorbic acid is unnecessary for poultry. Early work showed that chicks maintained on ascorbic acid free diets, which are otherwise nutritionally adequate, displayed no adverse effects and did not demonstrate any significant growth stimulation when ascorbic acid was added to poultry diets. However, growth stimulation was reported when ascorbic acid was added to the diets during heat stress in broilers (T a k a h a s h i et al., 1991).

Genetic selection for improved performance in birds, along with the enhanced record keeping methods of intensified production units emphasizes the importance of disease immunity and management practices which reduce the effect of acute heat stress. Modern production methods may have increased the requirement for ascorbic acid and improved production, via genetics may have reduced ascorbic acid synthesis capacity needed to meet requirements under all circumstances. Some scientists feel that rapid growth itself may be a stress.

Conflicting evidence has accumulated regarding the need or benefits of supplemental ascorbic acid for domestic poultry (P a r d u e , 1986). Because of the conflicting results on broiler growth performance observed in studies, the objectives of the present study were to determine whether the supplemental ascorbic acid would alleviate heat induced depression in the performance of broiler chicks up to 42 days of age under high ambient temperature through drinking water.

MATERIAL AND METHODS

A total of 450 days old broiler chicks (Hybrid Ross) were obtained from a local hatchary and divided into three equal groups and reared in the pens with deep litter of woodshavings.

The birds with average weight were evenly allocated at random to experimental treatments and assigned to individual environmental chambers which were thoroughly cleaned and disinfected. Group 1 was reared under an environmental temperature suitable for broiler production and acted as control, whereas, G2 and G3 were subjected to heat stress under temperature ranging from a minimum of 29 °C to a maximum of 43 °C each day throughout the period of the experiment. During heating period, the pen temperature was maintained by electric brooders and floor heating system. Extra electric radiators were used to achieve the desired pen temperature.

In each chamber minimum and maximum thermometers were allocated to record the highest and lowest pen temperature. The temperature and relative humidity were measured by keeping thermohigrographs in each pen. Body temperatures of 10 randomly selected birds were recorded daily during acute heat stress period. All the groups of birds were fed the same starter diet containing 12.6 MJ ME/kg with 22% crude protein (CP) and finisher diet containing 12.6 MJ ME/kg with 20% crude protein (CP) – Tab. I.

Birds in G1 and G3 received normal drinking water throughout experimental period whereas G2 were kept on ascorbic acid supplemented water at the rate of 20 mg/bird/day. The chicks were weighed regularly. Weight gain, feed consumption and feed efficiency were calculated for starter and finisher phases. Feed and water were supplied *ad libitum* throughout the experimental period. The temperature of drinking water was recorded during the hot period of the day. Mortality was recorded in individual groups of birds.

The data were subjected to statistical analysis. The weight gains of birds were calculated as group means and feed efficiency values as cumulative group feed intake divided by group weight gain. The data were then analysed by the methods of analysis of variance described by S t e e l and T o r r i e (1986). The difference between the groups was tested for significances by Duncan's multiple range test.

RESULTS

The results of weight gain, feed consumption and feed efficiency of broilers are summarized in Tab. II. The broilers receiving normal drinking water and kept under environment of 21–28 °C with average relative humidity of 40–85% gained 9.1% more weight ($P < 0.01$). The feed consumption was 1.2% more with 10% better feed efficiency than those broilers fed the same diet under 29–43 °C ambient temperature with relative humidity of 40–85%.

Increasing ambient temperature (29–43 °C) with 40% to 85% relative humidity decreased weight gain with 10% lower feed efficiency in birds receiving nor-

I. Composition of basal diets and calculated nutrient contents (%)

Ingredients	Diets	
	starter	finisher
Maize	66.74	70.01
Soybean meal	21.31	21.85
Fish meal	6.3	2.24
Meat and bone meal	5.0	5.0
D.C.P	0.15	0.4
Vitamin and mineral premix	0.5[a]	0.5[b]
Calculated nutrient contents (%)		
Crude protein	22.0	20.0
ME (MJ/kg)	12.6	12.6
Crude fibre	3.1	3.2
Calcium	0.9	0.8
Phosphorus	0.7	0.7
Arginine	1.3	1.2
Lysine	1.1	1.0
Methionine	0.5	0.4
Threonine	0.8	0.7
Tryptophan	0.2	0.1
Methionine + cystine	0.8	0.7

Supplied per kg of feed:
[a]Starter period: vitamin A – 8 000 IU, D_3 – 1 500 IU, E – 15 mg, K_3 – 2 mg, B_1 – 1.5 mg, B_2 – 3 mg, B_6 – 2 mg, B_{12} – 0.02 mg, niacin – 15 mg, pantothenic acid – 5 mg, choline – 200 mg, Co – 0.33 mg, Cu – 7 mg, Fe – 34 mg, J – 0.28 mg, Mn – 72 mg, Zn – 49 mg, Se – 0.15 mg, DL-methionine – 1 800 mg, avoparcin – 15 mg
[b]Finisher period: vitamin A – 1 000 IU, D_3 – 2 000 IU, E – 15 mg, K_3 – 32 mg, B_1 – 2 mg, B_2 – 4 mg, B_6 – 4 mg, B_{12} – 0.02 mg, niacin – 2 mg, pantothenic acid – 10 mg, choline – 25 mg, Co – 0.33 mg, Cu – 7 mg, Fe – 34 mg, J – 0.28 mg, Mn – 72 mg, Zn – 49 mg, Se – 0.15 mg, DL-methionine – 2 100 mg, avoparcin – 15 mg

mal drinking water as compared to control group of birds. When ascorbic acid supplemented water was consumed by chickens reared under ambient temperature of 29–43 °C with average relative humidity of 40 to 85%, highly significant ($P < 0.01$) increases in weight gains were observed. This group (2) consumed 8.3% and 7.03% less feed and recorded 11.1% and 22.2% better feed efficiency and gained 1.68% and 10.9% more weight as compared to control and birds receiving normal drinking water under the same environmental conditions, respectively.

The average data on rectal temperature of randomly selected birds in the experiment is shown in Tab. III. The rectal temperatures of birds measured at 29 °C of the environment were similar for all groups of birds. Elevation of environmental temperature to 30 °C tended to increase body temperature of the experimental birds. An increase of 2% and 2.1% in rectal temperature was observed when the pen was heated to 35 °C. Birds showed an increase of 2.6% and 2.9% of body temperature when environmental temperature was 38 °C. The differences in rectal temperature of experimental groups (G2, G3) were 3.6% and 4.0%, respectively, when maximum environmental temperature was 43 °C as compared to that of the control group of birds. Heat exposure and average relative humidity during the experiment are shown in Tab. IV and daily broiler house temperature regulation by thermometer is presented in Tab. V. Drinking water temperature was recorded during the hot period of the experiment. There was an increase of 15.6% and 16.5% in drinking water when the environmental temperature was 38 °C. At maximum temperature of 43 °C the drinking water temperature was elevated by 19.3% and 19.5% as compared to the control group of birds.

II. Effect of heat stress on weight gain, feed consumption, feed efficiency and mortality in experimental and control broilers

Parameters	Group of birds		
	G1	G2	G3
Weight gain (g)			
1–21 days	435.60[a]	451.30[a]	409.50[b]
22–42 days	1 108.3[ab]	1 118.50[a]	1 005.60[ab]
1–42 days	1 543.9[a]	1 569.90[b]	1 415.10[c]
Feed consumption (g)			
1–21 days	925.0	942.0	995.0
22–42 days	2 218.0	1 958.0	2 109.0
1–42 days	3 143.0	2 900.0	3 104.0
Feed efficiency (g feed/g weight gain)			
1–21 days	2.10	2.00	2.42
22–42 days	2.00	1.80	2.10
1–42 days	2.00	1.85	2.20
Total number of birds	150	150	150
Mortality (%)	4.0	3.4	6.0

[a,b,c,d]Means within the same row not sharing a common superscript differ significantly ($P < 0.01$)
G1 = control birds, G2 = birds receiving unsupplemented water under heat stress, G3 = birds receiving ascorbic acid supplemented water under heat stress

III. Average body temperature of broilers in control and experimental groups during heat exposure

Ambient temperature (°C)	Body temperature (°C) of various bird groups		
	Group 1	Group 2	Group 3
28	40.6	41.0	41.1
30	–	41.2	41.6
35	–	41.8	41.9
38	–	42.1	42.0
40	–	42.8	42.6
43	–	43.2	43.1

receiving normal drinking water. As early as Thornton (1961) showed that blood ascorbic acid decreased with an increase in environmental temperature from 21 to 31 °C. This action was postulated to be a result of both partial exhaustion of the endogenous reserves and reduction in the amount of vitamin being synthesized. Ahmad et al. (1994) also showed that ascorbic acid limitation caused reduction in weight gain during heat stress up to 35 °C.

The results of the present study revealed that there were highly significant ($P < 0.01$) increases in weight gain in the birds receiving ascorbic acid supplemented

IV. Measurement of pen temperature (°C) with average relative humidity (%) during experiment

Weeks	Control group				Experimental group			
	temperature		humidity		temperature		humidity	
	min.	max.	min.	max.	min.	max.	min.	max.
1.	26	35	50	81	29	35.0	50	81
2.	26	30	28	75	31	39.0	28	80
3.	23	28	39	85	30	42.5	39	85
4.	22	29	40	83	32	43.0	40	83
5.	21	25	45	80	35	43.2	59	85
6.	21	24	61	85	34	43.1	62	85

V. Daily broiler house temperature (°C) regulation measured by (minimum and maximum) thermometers

Time	Different groups of birds		
	G1 (control)	G2	G3
7.00	21.0	30.2	30.3
9.00	21.8	35.6	35.8
11.00	23.0	39.5	39.3
12.00	25.0	42.0	42.1
14.00	27.3	43.0	42.9
16.00	24.0	43.1	43.0
17.00	23.6	42.9	43.0
18.00	22.8	39.6	39.6
19.00	21.4	36.2	35.8

Birds in G3 receiving unsupplemented water and reared under acute heat stress showed highest (6%) mortality. It was 20% more than those of in G1 (control). The mortality was 4% in G1 and 3.4% in G2. The birds receiving supplemental ascorbic acid in drinking water showed 20% and 45% lower mortality than those in G1 and G3, respectively.

DISCUSSION

The decrease of weight gain and feed intake were observed when birds was subjected to acute heat stress

drinking water. Supplemental drinking water has been reported to improve heat resistance and reduce mortality associated with elevated ambient temperature (Idrus Zulfkifli et al., 1995). Feeding ascorbic acid partly prevented the decrease in body weight, feed conversion (Takahashi et al., 1991). The divergence in feed efficiency between control and experimental birds revealed that controlled birds consumed more feed, with better feed efficiency and gained more weight than those receiving the same diet and water under acute heat stress. This divergence in feed consumption in relation to ambient temperature might be related to the difference in heat increment between control and experimental broilers.

The growth characteristics of broilers vary with environment (Leclercq et al., 1989). Indeed the chicks with normal feed and water under acute heat stress exhibited a slower growth rate and this could explain the lower sensitivity and resistance to hot climate (Leenstra, 1991). The results agree with the findings of Jaffar et al. (1996), who reported lower weight gain in broilers subjected to heat stress receiving the same diet as that of control birds.

Improved feed efficiency with supplemented ascorbic acid in the present experiment is consistent with the findings of Smith (1994) and Kutlu, Forbs (1993), who found that birds under acute heat stress can be protected by supplementing their diet with ascorbic acid. Kuenzel and Kuenzel (1977) reported that as environmental temperature increases, feed intake decreases with increasing water consumption. The birds

reduce feed intake as environmental temperature increases (Prince et al., 1981).

The rectal temperatures of experimental birds were higher ($P < 0.05$) than those in control birds during acute heat stress. At normal ambient temperature (28 °C) there were no significant differences ($P > 0.05$) in body temperature between control and experimental birds, when pen temperature was 38 °C there was a significant ($P < 0.05$) difference. Highly significant ($P < 0.01$) difference in rectal temperature of experimental and control birds was observed when ambient temperature was 43 °C. Similar findings were reported by Michael (1990) and Essam El Gendy, Kenneth (1995), who demonstrated a significant ($P < 0.05$) increase in body temperature during acute heat stress. Ascorbic acid had no effect on reduction of rectal temperature.

During hot season water consumption of birds increases (James et al., 1994), so the drinking water temperature also affects heat tolerance. Studies (Teeter, Smith, 1986; Teeter et al., 1987; Baley, Teeter, 1993) indicate that increased water consumption benefits the birds by acting as a heat receptor as well as increasing the amount of heat dissipated per breath. These thermobalance effects are principally observed when water temperature falls to or below 28 °C. The results of the present experiment showed that there was an increase of 16.5% in normal drinking water temperature whereas in ascorbic acid supplemented water the increase was only 15.6% higher than those of control birds. The data indicate that ascorbic acid drinking water fortification increased ($P < 0.01$) feed consumption and growth rate when the temperature of consumed water was lower than the bird's body temperature. Indeed the effects of lowering drinking water temperature and ascorbic acid supplementation were additive. Growth rate enhancement was due to the birds under the zone of normothermia.

Birds receiving the same diet and water under the same stress were subjected to high mortality as compared to control group of birds, whereas ascorbic acid supplementation reduced mortality by 45% at the same ambient temperature. The results of the present study were the same as those of Pardue et al. (1985). Ascorbic acid reduced mortality in both male and female broilers during heating episode (38 °C at chick level) in the production facility. The results are also supported by findings of Pardue, Thaxton (1984), who revealed that ascorbic acid improved heat resistance and reduced mortality associated with elevated ambient temperature. The results demonstrate that it is possible to protect broilers from acute heat stress with better feed efficiency, more weight gain and low mortality by ascorbic acid supplementation devices.

CONCLUSION AND RECOMMENDATIONS

Broilers subjected to a variety of stressors respond favourably to ascorbic acid supplementation. The key to successful and beneficial use of ascorbic acid is to administer ascorbic acid prior to the stress onset. As it became clear that ascorbic acid supplementation can reduce heat stress losses, means of measuring benefits of ascorbic acid supplementation need to be considered.

High environmental temperature not only depresses feed intake, but also causes drastic reduction in efficiency of utilizing feed for growth purposes. Research conducted so for on vitamin requirements as affected by temperature changes does not indicate any change in the absolute requirements. There is some more evidence in the literature and confirmation through the present experimental results that to improve birds performance at high temperature supplementation of ascorbic acid is recommended.

There are several factors and practices which can improve growth and feed efficiency of broilers in hot climate. Provision of *ad libitum* feed supply is essential so as birds could eat in the cooler part of the day, with intermittent lighting is potentially a sound practice for hot climates. The provision of cool drinking water plays an important role in reduction of heat stress. Increased consumption of cool drinking water is crucial to the survival of heat stressed broilers.

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RYBIE OSÍDLENIE STREDNEJ ČASTI RIEKY TURIEC

FISH DISTRIBUTION OF THE MIDDLE PART OF THE TURIEC RIVER

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ABSTRACT: During the last ten years specific changes occurred in the Turiec river, in particular those regarding the river hydrology (reduction of the stream flow due to drought lasting for several years and increase in the drawing of surface water directly from the river). The increased deposition of mud due to building activities on the drinking water reservoir Turček near the river source has had a significant adverse impact on the benthic fauna and flora and consequently also on the river ichthyofauna. This study is aimed to examine the composition of the Turiec fish population and tries to explain the reasons standing behind some of the structural changes. The Turiec river represents a IIIrd class stream, the left-side affluent of the Váh river. The river source is located at 1 200 meters above the sea level, its total length is 79 kilometers. The river has maintained its characteristics of a natural, meandering mountain stream (hyporitral and epipotamon). In 1965 Turiec was established a protected area in the huchen reserve for 22 kilometers of its length. Within this protected area we selected three typical localities where ichthyological monitoring was performed on August 13, 1994. The samples were taken using the electrofishing method. Two electrical aggregates were used – one equipped with common gasoline engine, the other was a portable tyristor device. The catch per unit efforts (CPUE) was defined as the number of catch (expressed in pieces or kilograms) calculated per 1 hectare of the area and 1 hour of electrofishing using two electric aggregates, each of them operated by five persons. The relative abundance values (CPUE-piece) varied from 612 to 1 299 pieces.ha^{-1}.hour^{-1}, depending on the specific locality. The catch expressed in kilograms (CPUE-kg) varied from 71.7 to 409.4 kg.ha^{-1}.hour^{-1} (see Chart 1). The average values for the fish species living in the area are shown on Chart 1 for each of the three localities. The average abundance is 902 pieces-CPUE, the average ichthyomass reaches 197.44 kg-CPUE. Tables II and IV report the important ecological parameters of the fish caught. In total we found 20 fish species, classified into 8 families. The classification performed on the basis of the environment in which the fish are living and the spawning substrate shows that the rheofil litofils (11) are the dominant species. If we base the assessment on the degree of threat to the fish (IUCN) we may find out that there are 2 species endangered (*Hucho hucho, Zingel zingel*), three species may be classified as rare or requiring special attention (*Vimba vimba, Leuciscus leuciscus, Leuciscus idus*). Two of the species are protected by the Slovak legislation (*Hucho hucho, Zingel streber*). As far as zoogeographical distinction is concerned, the Palearkt endemits (15) are dominant, 3 of the species are European endemits and one is imported. The fish that were most frequent within the local ichthyofauna was chub (33.8 %-ks 44.19%-kg). The less numerous fish species are barbel (11.38 %-ks 13.83 %-kg) and dace (16.2 %-ks 7.28 %-kg). The I and the II dominance category also includes grayling (10.90/7.3%). Tab. III shows the dominance of the unclassified fish species calculated for the total river segment subject to monitoring. If the catch of the sport fishermen is analyzed, a decrease is evident during the period between 1989 and 1990. As clearly shown on Chart 2 this development is mostly due to grayling, which represented the most frequently caught fish.

Turiec river; ichthyofauna; abundance; ichthyomass; CPUE; dominance; constancy; fishing pressure; fishing intensity; *Thymallus thymallus*

ABSTRAKT: Počas posledných 10 rokov došlo v rieke Turiec k špecifickým zmenám, najmä v oblasti hydrologickej. Táto práca skúma zloženie rybej obsádky Turca a snaží sa vysvetliť príčiny niektorých zmien jej štruktúry. V roku 1965 bolo na rieke Turiec vyhlásené chránené nálezisko hlavátky v dĺžke 22 km. V tejto oblasti sme vybrali tri typické lokality, v ktorých bol 13. 8. 1994 uskutočnený ichtyologický prieskum. Jednotka rybolovného úsilia (CPUE) bola definovaná ako úlovok v kusoch a kilogramoch prepočítaný na 1 ha plochy a 1 hodinu elektrolovu, s použitím dvoch elektrických agregátov, z ktorých každý obsluhovalo päť osôb. Relatívne hodnoty abundancie (CPUE-ks) sa pohybovali v jednotlivých lokalitách od 612 do 1 299 ks/ha/h, hmotnostný úlovok (CPUE-kg) kolísal od 71,7 do 409,4 kg/ha/h. Priemerná abundancia je 902,91 ks-CPUE, priemerná ichtyomasa predstavuje 197,44 kg-CPUE. Celkove bolo zistených 20 druhov patriacich do ôsmich čeľadí. Podľa stupňa ohrozenia (IUCN) patria dva druhy medzi kriticky ohrozené a tri druhy medzi vzácne, resp. vyžadujúce pozornosť. Najvýraznejšie zastúpenie v ichtyofaune všetkých sledovaných úsekov má jalec hlavatý – 33,8/44,19 %, za ním nasleduje mrena – 11,38/13,83 a jalec obyčajný – 16,2/7,28. Z analýzy úlovkov športových rybárov je zrejmý pokles od rokov 1989–1990. Najväčšiu zásluhu na tomto vývoji má lipeň, ktorý v sledovanom čase predstavoval najintenzívnejšie lovenú rybu.

rieka Turiec; abundancia; ichtyomasa; CPUE; dominancia; konštantnosť; rybársky tlak; intenzita rybolovu; *Thymallus thymallus*

ÚVOD

V období posledných desiatich rokov došlo v rieke Turiec k dosť špecifickým zmenám, vyplývajúcim z hydrologických, ale aj technických zásahov do celého povodia. Do úvahy prichádza najmä zníženie prietočnosti zásluhou niekoľkoročných suchých období, ako aj narastajúci objem odberov povrchovej vody zo samotnej rieky, ale aj zo všetkých jej prítokov. Zvýšené zabahňovanie dna v dôsledku stavebnej činnosti na budovanej vodárenskej vodnej nádrži Turček v pramennej oblasti Turca malo dosť výrazný vplyv na bentickú faunu i flóru a v konečnom dôsledku aj na ichtyofaunu rieky. Táto práca skúma zloženie rybej obsádky Turca a snaží sa vysvetliť príčiny niektorých zmien jej štruktúry, ktoré sa markantne prejavili vo výsledkoch sumarizácie úlovkov športových rybárov, najmä za uplynulé desaťročné obdobie. Na porovnanie slúži mnoho prác i priamo z chráneného náleziska, pretože Turiec bol podrobne skúmaný počas dvoch uplynulých dekád (Bastl et al., 1975; Holčík et al., 1990). Ich súhrnné štúdie nadväzujú na práce starších autorov (Novák, 1958; Nieslanik, 1959).

Charakteristika územia

Vyčerpávajúcu morfologickú charakteristiku Turca podáva Novák (1971).

Rieka Turiec predstavuje tok III. rádu. Je to ľavostranný prítok Váhu, do ktorého sa vlieva vo Vrútkach pod Martinom. Pramení v Kremnických vrchoch pod Flochovou vo výške 1 200 m. Prevažná časť 79km toku preteká širokým údolím so zamokrenými lúkami (podhorská zóna), kde si tok zachováva ráz prirodzenej, bohato meandrujúcej podhorskej rieky, ktorú možno charakterizovať ako hyporitral a epipotamon (Holčík, Hensel, 1972; Holčík et al., 1990). V roku 1965 bolo na Turci vyhlásené chránené nálezisko hlavátky v úseku od ústia Bystrického potoka po obec Moškovec v dĺžke 22 km.

V tejto oblasti sme vybrali tri typické lokality, v ktorých bol 13. 8. 1994 uskutočnený ichtyologický prieskum. Ich charakteristiky podáva tento prehľad:

MATERIÁL A METÓDA

Odbery vzoriek sme uskutočnili pomocou elektrolovu, dvoma elektrickými agregátmi. Prvý bol bežný typ s benzínovým motorom – RR 800, 2A, 100–300 V, druhé zariadenie predstavoval prenosný tyristorový prístroj s plynule voliteľnými elektrickými parametrami. Každý agregát obsluhovala lovná čata zložená z piatich osôb. Lovili sme súčasne so záberom približne 12 m, pričom prvý lovec, loviaci v strede toku, bol čiastočne vysunutý dopredu. Efektívnosť elektrolovu bola prijateľná ešte do hĺbky 0,5 až 1,0 m. S narastajúcou hĺbkou a silou prúdu účinnosť klesala a v hĺbkach nad 1,5 m sa už stal lov vysoko selektívny, ryby mali široké možnosti úniku po dne, resp. okrajom elektrického poľa. V každom úseku bola zmeraná dĺžka, šírka, plocha a doba lovu. Terénne spracovanie vyloveného materiálu spočívalo v určení druhu, individuálneho zmerania dĺžky tela (SL), celkovej dĺžky (TL) a zistení hmotnosti s presnosťou na 1 mm, resp. 1 g. U niektorých druhov (pstruh potočný, lipeň, kolok menší a šťuka) sa odoberali aj šupiny pre zistenie veku a rastu.

Jednotka rybolovného úsilia (CPUE) bola definovaná ako úlovok v kusoch a kilogramoch prepočítaný na 1 ha plochy a 1 hodinu elektrolovu, s použitím dvoch elektrických agregátov, z ktorých každý obsluhovalo päť osôb. Konštantnosť a dominanciu sme hodnotili podľa klasifikácie autorov Losos et al. (1984). Získané údaje sme súčasne využili na zistenie relatívnej početnosti a hmotnosti ulovených druhov pre každú lokalitu, a to použitím hodnoty CPUE (= catch per unit of effort).

VÝSLEDKY

Abundancia a ichtyomasa

Celkové hodnoty úlovku CPUE-kg v sledovaných lokalitách sa pohybovali od 71,7 do 409,4 kg, kusový úlovok CPUE kolísal od 612 do 1 299 kusov. Najvyššie hodnoty boli zistené v Príbovciach, najnižšie v Socovciach, čo poukazuje na klesajúcu veľkosť ichtyofauny v smere proti prúdu (tab. I). Priemerné hodnoty z troch sledovaných lokalít na rieke Turiec udáva obr. 1. Celkový priemerný CPUE-ks je 902,91, priemer CPUE-kg je 197,44.

Číslo	Názov	Rkm	Prietok $m^3.s^{-1}$	Dĺžka m	Šírka m	Teplota – voda °C	Teplota – vzduch °C	Čas lovu min
1.	Košťany	11,2	4,1	300	15	16	22,5	65
2.	Príbovce	18,1	4,0	150	22	16	20	35
3.	Socovce	27,7	3,2	300	12	17	20	58

Ekologické charakteristiky

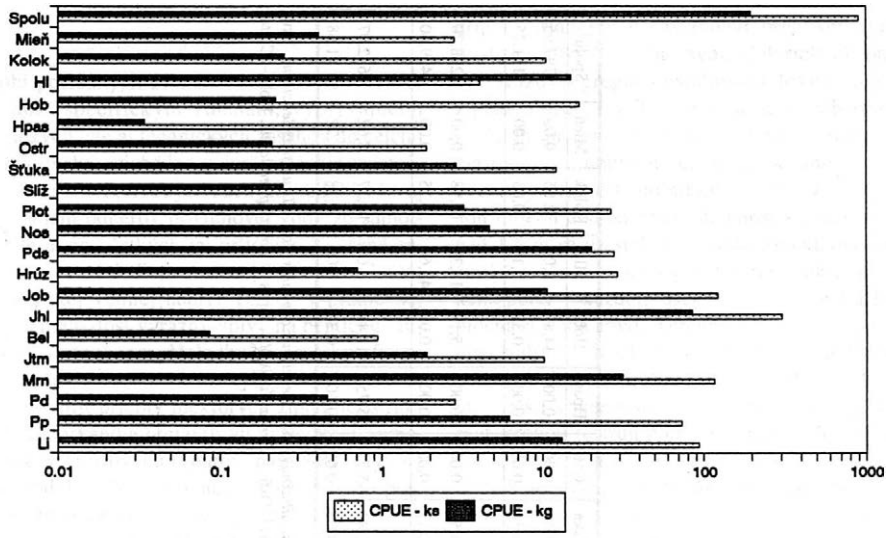
V tab. II a IV sú uvedené dôležité ekologické parametre ulovených rýb. Celkove bolo zistených 20 druhov patriacich do ôsmich čeľadí: *Salmonidae* (3), *Thy-*

I. Relatívne hodnoty početnosti a ichtyomasy rieky Turiec – Relative abundance values and ichthyomass in the Turiec river

Č. 1 KOŠŤANY	Li	Pp	Pd	Mrn	Jtm	Bel	Jhl	Job	Hrúz	Pds	Nos	Plot	Slíž	Šťuka	Ostr	Hpas	Hob	Hl	Kolok	Mieň	Spolu[1]
CPUE – ks/ha/h	28,72	127,18	0,00	71,79	0,00	0,00	272,82	184,62	22,56	10,26	8,21	0,00	14,36	18,46	0,00	0,00	34,87	2,05	2,05	0,00	797,95
CPUE – kg/ha/h	2,85	10,58	0,00	8,50	0,00	0,00	59,02	15,70	0,46	6,67	2,31	0,00	0,11	4,58	0,00	0,00	0,33	0,10	0,03	0,00	111,25
Č. 2 PRÍBOVCE																					
CPUE – ks/ha/h	109,09	93,51	0,00	233,77	31,17	0,00	446,75	98,70	57,14	62,34	46,75	57,14	15,58	15,58	0,00	0,00	5,19	10,39	15,58	0,00	1 298,70
CPUE – kg/ha/h	17,24	8,30	0,00	79,90	5,79	0,00	170,93	12,49	1,46	50,16	11,97	4,73	0,12	0,23	0,00	0,00	0,09	45,64	0,35	0,00	409,40
Č. 3 SOCOVCE																					
CPUE – ks/ha/h	146,55	0,00	8,62	48,85	0,00	2,87	198,28	83,33	8,62	11,49	0,00	22,99	31,61	2,87	5,75	5,75	11,49	0,00	14,37	8,62	612,07
CPUE – kg/ha/h	19,61	0,00	1,39	6,69	0,00	0,26	23,40	4,17	0,22	3,79	0,00	5,04	0,51	4,02	0,63	0,10	0,24	0,00	0,38	1,22	71,68

Li – *Thymallus thymallus*, Pp – *Salmo trutta m. fario*, Pd – *Oncorhynchus mykiss*, Mrn – *Barbus barbus*, Jtm – *Leuciscus idus*, Bel – *Alburnus alburnus*, Jhl – *Leuciscus cephalus*, Job – *Leuciscus leuciscus*, Hrúz – *Gobio gobio*, Pds – *Chondrostoma nasus*, Nos – *Vimba vimba*, Plot – *Rutilus rutilus*, Slíž – *Noemacheilus barbatulus*, Šťuka – *Esox lucius*, Ostr – *Perca fluviatilis*, Hpas – *Cottus poecilopus*, Hob – *Cottus gobio*, Hl – *Hucho hucho*, Kolok – *Zingel streber*, Mieň – *Lota lota*

[1]total



1. Priemerný úlovok z troch sledovaných lokalít rieky Turiec – Average catch from three localities under observation in the Turiec river

spolu = total

mallidae (1), *Esocidae* (1), *Cyprinidae* (9), *Cobitidae* (1), *Percidae* (2), *Gadidae* (1) a *Cottidae* (2). Podľa vzťahu k prostrediu a neresovému substrátu výrazne prevládajú reofilné litofily (11 druhov). Ostatné skupiny sa vyskytujú sporadicky a väčšinou tvoria prechodné typy k limnofilným fytofilom. Podľa stupňa ohrozenia (IUCN) patria dva druhy medzi kriticky ohrozené – hlavátka a kolok menší, dva druhy možno zadeliť medzi vzácne, resp. vyžadujúce pozornosť – nosáľ a jalec obyčajný (Holčík, 1994). Dva druhy sú na Slovensku chránené zákonom – hlavátka a kolok menší. Zoogeograficky prevládajú endemity palearktu (15), tri druhy sú endemitmi Európy a jeden druh je alochtónny.

Dominancia a konštantnosť

Najvýraznejšie zastúpenie v ichtyofaune všetkých sledovaných úsekov má jalec hlavatý – 33,8 %-ks a 44,19 %-kg. Za ním nasleduje mrena – 11,38 %-ks a 13,83 %-kg a jalec obyčajný – 16,2 %-ks a 7,28 %-kg. Do I., resp. II. triedy dominancie patrí tiež lipeň – 10,09 %-ks a 7,3 %-kg. V tab. III je uvedená dominancia

II. Dominancia a ekologické charakteristiky zistených druhov rýb – Dominance and ecological characteristics of the fish species observed in the Turiec river

Druh ryby[2]		Lokalita[1]		
		č. 1 Košťany	č. 2 Príbovce	č. 3 Socovce
Pstruh potočný[3] *Salmo trutta m. fario*	A-ks	62	18,00	–
	B-kg	5,159	1,60	–
	D-ks	15,94	7,20	–
	D-kg	9,51	2,03	–
	E-ch	R-Lt	R-Lt	R-Lt
Pstruh dúhový[4] *Oncorhynchus mykiss*	A-ks	–	–	3,00
	B-kg	–	–	0,48
	D-ks	–	–	1,41
	D-kg	–	–	1,94
	E-ch	–	–	R-Lt
Hlavátka[5] *Hucho hucho*	A-ks	1,00	2,00	–
	B-kg	0,05	8,79	–
	D-ks	0,26	0,80	–
	D-kg	0,09	11,15	–
	E-ch	R-Lt	R-Lt	–

Pokračování tab. II – Continuation of Tab. II

Druh ryby[2]		Lokalita[1]		
		č. 1 Košťany	č. 2 Príbovce	č. 3 Socovce
Lipeň[6] *Thymallus thymallus*	A-ks	14	21,00	51,00
	B-kg	1,389	3,32	6,82
	D-ks	3,60	8,40	23,94
	D-kg	2,56	4,21	27,35
	E-ch	R-Lt	R-Lt	R-Lt
Štuka[7] *Esox lucius*	A-ks	9,00	3,00	1,00
	B-kg	2,23	0,05	1,40
	D-ks	2,31	1,20	0,47
	D-kg	4,11	0,06	5,61
	E-ch	L-Fy	L-Fy	L-Fy
Belička[8] *Alburnus alburnus*	A-ks	0,00	0,00	1,00
	B-kg	0,00	0,00	0,09
	D-ks	0,00	0,00	0,47
	D-kg	0,00	0,00	0,36
	E-ch			N-[Fy-Li]
Hrúz obyčajný[9] *Gobio gobio*	A-ks	11,00	11,00	3,00
	B-kg	0,23	0,28	0,08
	D-ks	2,83	4,40	1,41
	D-kg	0,41	0,36	0,30
	E-ch	L-Ps	L-Ps	L-Ps
Jalec hlavatý[10] *Leuciscus cephalus*	A-ks	133,00	86,00	69,00
	B-kg	28,77	32,90	8,14
	D-ks	34,19	34,40	32,39
	D-kg	53,05	41,75	32,64
	E-ch	R-Lt	R-Lt	R-Lt
Jalec obyčajný[11] *Leuciscus leuciscus*	A-ks	90,00	19,00	29,00
	B-kg	7,66	2,40	1,45
	D-ks	23,14	7,60	13,62
	D-kg	14,12	3,05	5,81
	E-ch	R-[Fy-Li]	R-[Fy-Li]	R-[Fy-Li]
Jalec tmavý[12] *Leuciscus idus*	A-ks	0,00	6,00	0,00
	B-kg	0,00	1,12	0,00
	D-ks	0,00	2,40	0,00
	D-kg	0,00	1,41	0,00
	E-ch		N-[Fy-Li]	
Mrena[13] *Barbus barbus*	A-ks	35,00	45,00	17,00
	B-kg	4,15	15,38	2,33
	D-ks	9,00	18,00	7,96
	D-kg	7,64	19,52	9,34
	E-ch	R-Lt	R-Lt	R-Lt
Nosáľ[14] *Vimba vimba*	A-ks	4,00	9,00	–
	B-kg	1,13	2,31	–
	D-ks	1,03	3,60	–
	D-kg	2,07	2,92	–
	E-ch	R-Lt	R-Lt	–
Plotica[15] *Rutilus rutilus*	A-ks	–	11,00	8,00
	B-kg	–	0,91	1,75
	D-ks	–	4,40	3,76

Pokračování tab. II – Continuation of Tab. II

Druh ryby[2]		Lokalita[1]		
		č. 1 Košťany	č. 2 Príbovce	č. 3 Socovce
Plotica[15] *Rutilus rutilus*	D-kg	–	1,16	7,03
	E-ch	–	N-[Fy-Lt]	N-[Fy-Lt]
Podustva[16] *Chondrostoma nasus*	A-ks	5,00	12,00	4,00
	B-kg	3,25	9,66	1,32
	D-ks	1,29	4,80	1,88
	D-kg	6,00	12,25	5,29
	E-ch	R-Lt	R-Lt	R-Lt
Slíž[17] *Noemacheilus barbatulus*	A-ks	7,00	3,00	11,00
	B-kg	0,05	0,02	0,18
	D-ks	1,80	1,20	5,16
	D-kg	0,10	0,03	0,71
	E-ch	N-Ps	N-Ps	N-Ps
Mieň[18] *Lota lota*	A-ks	–	–	3,00
	B-kg	–	–	0,43
	D-ks	–	–	1,41
	D-kg	–	–	1,70
	E-ch	–	–	R-[Č-Pg]
Kolok menší[19] *Zingel streber*	A-ks	1,00	3,00	5,00
	B-kg	0,01	0,07	0,13
	D-ks	0,26	1,20	2,35
	D-kg	0,02	0,09	0,53
	E-ch	R-Lt	R-Lt	R-Lt
Ostriež[20] *Perca fluviatilis*	A-ks	–	–	2,00
	B-kg	–	–	0,22
	D-ks	–	–	0,94
	D-kg	–	–	0,88
	E-ch	–	–	N-[Fy-Lt]
Hlaváč obyčajný[21] *Cottus gobio*	A-ks	17,00	1,00	4,00
	B-kg	0,16	0,02	0,08
	D-ks	4,37	0,40	1,863
	D-kg	0,30	0,02	0,34
	E-ch	R-Lt	R-Lt	R-Lt
Hlaváč pásoplutvý[22] *Cottus poecilopus*	A-ks	–	–	2,00
	B-kg	–	–	0,04
	D-ks	–	–	0,94
	D-kg	–	–	0,14
	E-ch	–	–	R-Lt
Celkom[23]	A-ks	389,00	250,00	213,00
	B-kg	54,23	78,81	24,94
	D-ks	100,00	100,00	100,00
	D-kg	100,00	100,00	100,00
	E-ch			

Vysvetlivky: A-ks – abundancia, B-ks – biomasa, D-ks – dominancia početnostná, _ D-kg – dominancia hmotnostná, E-ch – ekologická charakteristika, R-Lt – reofilný litofil, L-Fy – limnofilný fytofil, R-[Fy-Lt] – reofilný fyto-litofil, N-[Fy-Lt] – neutrálny fyto-litofil, L-Ps – limnofilný psamofil, N-Ps – neutrálny psamofil

Explanatory notes: A-ks – abundance, fish number, B-ks – biomass, fish number, D-ks – numerical dominance, D-kg – mass dominance, E-ch – ecological characteristics, R-Lt – rheofil litofil, L-Fy – limnofil phytofil, R-[Fy-Lt] – rheofil phyto-litofil, N-[Fy-Lt] – neutral phyto-litofil, L-Ps – limnofil psamofil, N-Ps – neutral psamofil

[1]locality, [2]fish species, [3]brown trout, [4]rainbow trout, [5]huchen, [6]grayling, [7]pike, [8]white fish, [9]gudgeon, [10]chub, [11]dace, [12]ide, [13]barbel, [14]vimba bream, [15]roach, [16]nase, [17]bearded stone loach, [18]burbot, [19]little chop, [20]perch, [21]bullhead, [22]Sibirian sculpine, [23]total

III. Dominancia jednotlivých druhov rýb v rieke Turiec – Dominance of the particular fish species in the Turiec river

Lokalita[1]	Tuuriec			
	domin-ks		domin-kg	
Druh ryby[2]	%	T	%	T
Pstruh potočný[3]	9,39	II.	4,28	III.
Pstruh dúhový[4]	0,35	V.	0,31	V.
Hlavátka[5]	0,35	V.	5,59	II.
Lipeň[6]	10,09	I.	7,30	II.
Šťuka[7]	1,53	IV.	2,33	III.
Belička[8]	0,12	V.	0,06	V.
Hrúz obyčajný[9]	2,93	III.	0,37	V.
Jalec hlavatý[10]	33,80	I.	44,19	I.
Jalec obyčajný[11]	16,20	I.	7,28	II.
Jalec tmavý[12]	0,70	V.	0,71	V.
Mrena[13]	11,38	I.	13,83	I.
Nosáľ[14]	1,53	IV.	2,17	III.
Plotica[15]	2,23	III.	1,69	IV.
Podustva[16]	2,46	III.	9,01	II.
Slíž[17]	2,46	III.	0,16	V.
Mieň[18]	0,35	V.	0,27	V.
Kolok menší[19]	1,06	IV.	0,13	V.
Ostriež[20]	0,23	V.	0,14	V.
Hlaváč obyčajný[21]	2,58	III.	0,17	V.
Hlaváč pásoplutvý[22]	0,23	V.	0,02	V.

Vysvetlivky – Explanatory notes:
domin-ks – početnostná dominancia – numerical dominance
domin-kg – hmotnostná dominancia – weight dominance
T – trieda dominancie – dominance class
I. – eudominant (> 10%)
II. – dominant (5–10%)
III. – subdominant (2–5%)
IV. – recedent (1–2%)
V. – subrecedent (< 1%)

For 1–22 see Tab. II

IV. Konštantnosť výskytu a stupeň ohrozenia zistených druhov rýb v rieke Turiec – Constancy of occurrence and degree of threat to the fish species in the Turiec river

Druh ryby[2]	Konštantnosť[23]		Stupeň ohrozenia[24]	
	%	trieda[25]	Turiec	SR
Pstruh potočný[3]	100,00	V.	–	–
Pstruh dúhový[4]	33,33	II.	–	–
Lipeň[6]	100,00	V.	–	–
Šťuka[7]	100,00	V.	In	–
Podustva[16]	100,00	V.	–	–
Mrena[13]	100,00	V.	–	–
Nosáľ[14]	66,67	IV.	–	In-R
Jalec hlavatý[10]	100,00	V.	–	–
Jalec obyčajný[11]	100,00	V.	In	In-R
Belička[8]	33,33	II.	–	–
Hrúz obyčajný[9]	100,00	V.	–	–
Plotica[15]	66,67	IV.	–	–
Slíž[17]	100,00	V.	–	–
Ostriež[20]	33,33	II.	–	–
Jalec tmavý[12]	33,33	II.	In	R-In
Hlaváč pásoplutvý[21]	33,33	II.	–	–
Hlaváč obyčajný[22]	100,00	V.	–	–
Hlavátka[5]	66,67	IV.	E	E
Kolok menší[19]	100,00	V.	E	E
Mieň[18]	33,33	II.	–	–

Trieda – Class:
I – druh vzácny – rare species (0–20%)
II – druh zriedkavo sa vyskytujúci – scarcely occurring species (20–40%)
III – druh často sa vyskytujúci – frequently occurring species (40–60%)
IV – druh prevažne sa vyskytujúci – mostly occurring species (60–80%)
V – druh takmer vždy prítomný – almost always occurring species (80–100%)
Stupeň ohrozenia – Degree of threat:
E – druhy kriticky ohrozené – endangered species
V – druhy ohrozené (zraniteľné) – vulnerable species
R – druhy vzácne – rare species
In – druhy vyžadujúce pozornosť – species requiring attention

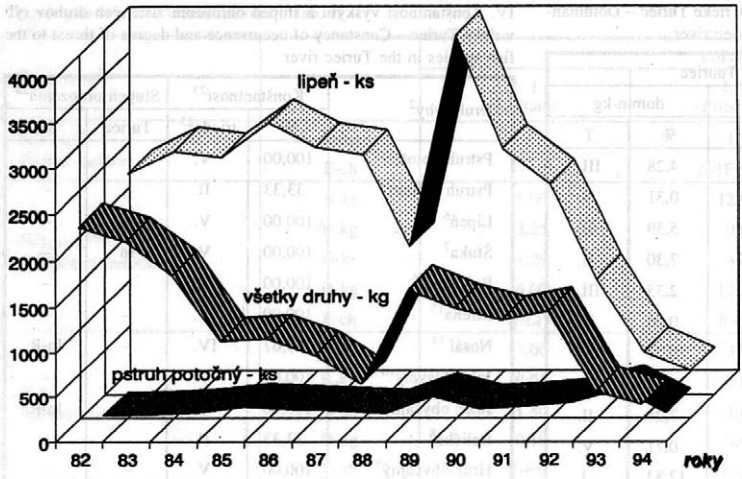
For 2–22 see Tab. II; [23]constancy, [24]degree of threat, [25]class

zistených druhov rýb, prepočítaná na celý sledovaný úsek rieky. Je zaujímavé, že do I. triedy podľa hmotnostnej dominancie patrí v Príbovciach hlavátka (11,1 %), ktorá v predchádzajúcich prieskumoch (Bastl et al., 1975; Holčík et al., 1990) mala výrazný zostupný trend.

Z aspektu konštantnosti výskytu (tab. IV) patrí medzi zriedkavé druhy pstruh dúhový, belička, ostrież, jalec tmavý, hlaváč pásoplutvý a mieň. Medzi druhy prevažne sa vyskytujúce alebo takmer vždy prítomné možno zaradiť pstruha potočného, lipňa, šťuku, podustvu, mrenu, nosáľa, jalca hlavatého a obyčajného, hrúza, slíža a hlaváča obyčajného, ale taktiež oba na Slovensku kriticky ohrozené druhy rýb – hlavátku a kolka menšieho.

DISKUSIA A ZÁVER

Ichtyofauna Turca si zachováva vysokú diverzitu. V porovnaní so zistením, ktoré urobil Holčík (1990), došlo k miernym posunom, tie však môžu prameniť z kratšieho časového horizontu výskumov a menšieho počtu lokalít. Celkove bolo zistených 20 druhov rýb. V porovnaní s predchádzajúcim obdobím 1987–1989 sme nenašli mihuľu, čerebľu, sivoňa, kapra, lieňa, plosku, pĺža obyčajného a úhora, zaznamenal sa však úlovok nosáľa a jalca tmavého, ktoré Holčík (1990) neuvádza. Z hľadiska konštantnosti výskytu je situácia bez podstatnejších zmien. U niektorých salmonidov došlo k posunu do vyššej triedy – pstruh potočný z III. do IV. a hlavátka z II. do IV. triedy. Porovnanie konštantnosti zistených druhov s predchádzajúcimi nálezmi však mohol ovplyvniť menší počet sledovaných lokalít. V dominancii podľa početnosti sme nezistili podstatné



2. Úlovky na udicu z rezervácie hlavátky; vývojový trend za 13ročné obdobie – Angled fish from the huchen reserve; developmental trend over 13-year period lipeň – ks = grayling – fish number; všetky druhy – kg = all species – kg; pstruh potočný – ks = brown trout – fish number; roky = years

odchýlky od obdobia 1987–1989. Mierny vzostup má podustva a mrena z triedy subdominant do triedy dominant.

I keď naše výsledky nedemonštrujú vážnejšie výkyvy v štruktúre ichtyofauny Turca, z analýzy úlovkov športových rybárov je zrejmý pokles od rokov 1989–1990, s nepretržite zostupnou tendenciou. Ako je zrejmé z obr. 2, najväčšiu zásluhu na tomto vývoji má lipeň, ktorý v sledovanom čase predstavoval najintenzívnejšie lovenú rybu. Príčiny zníženia stavov lipňa sa nedajú vysvetliť jednoznačne. Na základe súčasných poznatkov o ichtyofaune Turca (táto práca a predchádzajúce výskumy) môžeme predpokladať tieto vplyvy:

1. Celková denaturácia vodného ekosystému Turca, úzko súvisiaca s dlhoročnou absenciou povodňových prietokov.
2. Prehrievanie vody, zapríčinené otepľovaním klímy a znižovaním prietokov počas suchých období za poslednú dekádu.
3. Zvýšená sedimentácia plavenín a s tým súvisiace zabahnenie dna.
4. Úpravy a obmedzenia športového rybolovu, kde približne od roku 1988 došlo ku koncentrácii rybárskeho tlaku lovom na umelú mušku najmä pstruha a lipňa. Zákazy ostatných spôsobov športového rybolovu zapríčinili nerovnomerné rozdelenie intenzity lovu. Preto mohlo dôjsť k zvyšovaniu populácií jalca hlavatého, mreny a podustvy.
5. Zvýšenie pomeru dravých druhov – šťuky a jalca hlavatého (nad 250 mm), ktoré sú schopné účinne eliminovať len čiastočne aklimatizované jesienky a ročky lipňa z rybničných chovov.
6. Gradačné cykly živočíšnych druhov (O d u m , 1977).

Faktory v bode 1 až 3 mohli viesť za obdobie posledných siedmich rokov k zhoršovaniu neresových možností lipňa, vplyvy uvedené v bode 3 až 5 zároveň znižovali jeho produkčný potenciál. Spolupôsobenie uvedených negatív sa prejavilo na prudkom znížení populačnej hustoty lipňa v strednom a dolnom toku rieky, čo malo tiež za následok výrazné zníženie športových úlovkov. Časť populácie lipňov mohla odmigrovať z kriticky postihnutých úsekov. Nemožno vylúčiť ani vplyv periodických zmien veľkosti populácie druhu v určitých časových intervaloch, ktorý je charakteristický pre mnohé živočíchy. Dôsledné preskúmanie tohto javu u lipňa by si však vyžiadalo dlhšie časové obdobie.

Zároveň možno navrhnúť takéto reálne opatrenia :

a) Zachovať doterajšiu úroveň zarybňovania chráneného náleziska, pričom na posilnenie populačnej hustoty hlavátky preferovať staršie násady Hl > 2 (dvoj- a viacročné).
b) Ročné násady lipňa vysadzovať z dôvodov aklimatizácie najmä do zlovených prítokov.
c) Dôrazne sa vyvarovať zarybňovaniu jalcom hlavatým.
d) Zabezpečiť pravidelný ročný odlov šťuky a jalca hlavatého pomocou športového rybolovu.
e) V záujme znižovania piscivorných jalcov hlavatých (nad 25 cm Sl) vykonávať jeho pravidelný ročný výlov elektrickým agregátom, čo je pre dané podmienky najúčinnejší spôsob regulácie jeho stavov, vzhľadom na pomerne nízky vyžierací tlak zo strany hlavného predátora – hlavátky.
f) Domáci rybolovný poriadok upraviť tak, aby bolo rybolovné úsilie rovnomerne rozdelené medzi všetky zložky ichtyofauny Turca, s reguláciou intenzity rybolovu a rybárskeho tlaku.

Poďakovanie

Túto prácu venujem Ing. Dušanovi Tomekovi, Mariánovi Kuriškovi a celému hospodárskemu aktívu MsO SRZ v Martine, ktorí sa najviac zaslúžili o zachovanie a rozvoj rybného bohatstva tejto prekrásnej rieky.

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Z VĚDECKÉHO ŽIVOTA

Životní jubileum prof. Ing. Václava Karáska, DrSc.

V letošním roce se dožil v plném fyzickém a psychickém zdraví 70. narozenin prof. Ing. Václav Karásek, DrSc., profesor pro obecnou zootechniku na České zemědělské univerzitě v Praze-Suchdole, toho času v důchodu. Ve vědeckém časopisu Živočišná výroba byla v roce 1991 při příležitosti jeho 65. narozenin zhodnocena jeho celoživotní práce na úseku vědy a pedagogiky. S odstupem doby pěti let je možné znovu poukázat na význam jubilanta pro rozvoj fyziologického přístupu k řešení problému zvyšování užitkovosti a kvality živočišných produktů u hospodářských zvířat, a to zejména u skotu a prasat, během jeho působení ve funkci vedoucího Oddělení typologie a konstituce hospodářských ve Výzkumném ústavu živočišné výroby v Praze-Uhříněvsi v letech 1959 až 1971. Od roku 1973 až do roku 1993 působil zprvu jako docent a později jako profesor na katedře genetiky a obecné zootechniky Agronomické fakulty VŠZ v Praze. Zejména v tomto období spolupracoval se zahraničními výzkumnými ústavy a univerzitami, z nichž nejvýznamnějšími byly Zemský výzkumný ústav živočišné výroby v Grubu u Mnichova a Timirjazevova zemědělská akademie v Moskvě.

Za zmínku také stojí jeho vědecké práce, které byly zaměřeny na problémy čistokrevné plemenitby českého strakatého skotu. Tyto práce se týkaly velmi širokého okruhu otázek souvisejících se sledováním užitkových typů, s využitím živin při různé užitkovosti dojnic, se sledováním různých metod výkrmu telat a mladého skotu, včetně jatečných a technologických rozborů. Kromě teoretického dopadu jejich výsledků měly tyto práce značný význam pro šlechtění a chov skotu v praktických podmínkách. Své zkušenosti a poznatky uplatnil v četných vědeckých radách a komisích výzkumných ústavů a vysokých škol. V letech 1976 až 1981 byl předsedou Výběrové komise pro skot v ČSR a členem Ústřední výběrové komise MZVž České republiky. V letech 1981 až 1988 pracoval v Mezinárodním ústavu normalizace na úseku standardů v živočišné výrobě v Moskvě.

Jeho rozsáhlá vědecko-pedagogicko-odborná činnost byla oceněna řadou vyznamenání. Jubilant je stále v úzkém kontaktu s Českou zemědělskou univerzitou v Praze, kde je ještě v současné době školitelem aspirantů, oponentem různých vědecko-výzkumných prací a členem státnicové komise a komisí pro jmenování docentů a profesorů.

K významnému životnímu jubileu blahopřejeme a do dalších let přejeme jubilantovi pevné zdraví, spokojenost a ještě mnoho tvůrčích sil a elánu.

Za spolupracovníky z ČZU v Praze prof. Ing. Václav Jakubec, DrSc.

FROM THE SPHERE OF SCIENCE

XVII GENETICAL DAYS, BRNO 1996

The international scientific conference on genetics of farm animals was held on 1–3 July 1996 at the Mendel University of Agriculture and Forestry in Brno. This meeting of geneticists of farm animals was organized by the Commission for Genetics and Animal Breeding of the Czech Academy of Agricultural Sciences and the Section of Genetics, Animal Breeding, of the Slovak Academy of Agricultural Sciences. Geneticists of the Czech and Slovak Republics meet on an almost regular basis, every other year, with experts and breeders from abroad to exchange opinions on genetic information and the application of this information in farm animal breeding.

The meeting included requested plenary lectures in the area of applications of molecular genetics and population genetics in animal breeding, followed by issues associated with genetics of farm animal health and the importance of gene reserves for maintaining the biodiversity. The plenary session also included papers on molecular genetics and theoretical foundations of breeding. Papers dealing with genetics in the breeding of the respective species of farm animals were selected for the working sessions. Authors of articles published here are responsible for their content.

This year's conference was actively attended by more than 25 students of postgradual doctorandi studies. Their participation was important for the continuation of genetical research in the next years.

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PLENARY REPORTS

THE APPLICATION OF MOLECULAR GENETICS IN ANIMAL BREEDING

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Animal breeding is based on the existing or intentionally created genetic variability. Finding out the variability on the level of genetic information enabled to develop the methodology and methods of molecular genetics. In the 1990s many genetic markers were discovered (Ist and IInd types). Some of them can be applied in breeding as markers for quantitative loci (QTL, ETL). In cattle there are particularly genes of milk proteins and their 5° region, microsatellites on the 1st, 6th, 9th, 10th and 20th chromosomes or the growth hormone gene. In pigs, best known is the gene of the ryanodine receptor and the gene of the estrogen receptor, microsatellites on the 4th, 13th and 14th chromosomes.

The possible application of transgenic technologies in farm animals was discussed. The authors of the present paper also substantiated the necessity of developing research in molecular genetics in the Czech Republic.

POPULATION GENETICS IN ANIMAL BREEDING

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The review of the subject of population and quantitative genetics. The subject is the optimal application of new knowledge in the genetics of all branches involving molecular technology and others specializations (economy, statistics, programming, reproduction and biotechnology, animal husbandry...) to the selection and breeding. Today activities are very different. Each part is becoming its own specialization, having its own working tools, the goals, and the theoretical background. The principal subdivisions are: Modelling of genetic principles; Evaluation of economy values for traits under selection; Evaluation of population-genetics parameters; Discover-

ing and test of new selection criteria; Estimation of breeding values; Marker-assisted selection; Selection general; Genetic trend; Evaluation of crossbred parameters; Optimization of selection plans; Optimization of hybridization programmes.

GENETICS AND HEALTH IN DOMESTIC ANIMALS

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Improvement of productivity in farm animals by selection must respect the physiological needs of the living organism expressed by their health. Occurrence of disease in a population impairs the efficiency of selection within this population. Elimination of hereditary diseases and birth defects is complicated by the existence of phenocopies, by heterozygous carriers in recessive monogeneic hereditary diseases and by complex nonmendelian inheritance. Selection for resistance to disease is one of approaches of disease control. The mechanisms and practical use of this approach are discussed. The potential role of Nramp and MHC genes in this context is mentioned. The health of animals may also be influenced by environmental mutagenic factors. Their effects and methods of detection and monitoring are outlined. The use of molecular genetic techniques (PCR, recombinant products, transgenic animals, site-directed mutagenesis) and their potential use in veterinary medicine are briefly summarized.

IMPORTANCE OF FARM ANIMAL GENETIC RESOURCES FOR PRESERVING OF BIODIVERSITY

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The article consists of two parts. It includes the general explanation of the term biodiversity, its classification, parameters of biodiversity and fields of its study in the first part. The current state of global biodiversity and alarming information about its evolution has been presented. Basic causes of biodiversity reduction in general, and also in a specific level for farm animals were described. Special attention was focused on the problem of genetic diversity, importance, needs and methods of its study.

Basic factors of origin of genetic diversity erosion and methods of its reduction by protection of rare farm animal breeds, that are bred as genetic resources, described in the second part of the article were analysed. 2 719 breeds of seven kinds of farm animals are endangered, which make 68% of all breeds from all over the world at the present time. Reasons, importance and methods of genetic resources protection, including national and international activities, were evaluated at the end.

MOLECULAR GENETICS

METHODOLOGICAL ASPECTS OF QTL MAPPING ON THE PORCINE CHROMOSOME 4

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The use of genetic maps based upon molecular markers allows dissection of some quantitative traits to genes with Mendelian type of inheritance (QTL). The aim of this paper is to describe an experimental design for our mapping of QTLs on porcine chromosome 4 on which QTLs for abdominal fat, back fat and intestine length has already been localized (A n d e r s s o n et al.: Science, *263*, 1995: 1771–1774). For our mapping 3 three-generation pedigrees (Wild Boar x Meishan, Meishan x Pietrain, Wild Boar x Meishan) each with approximately 320 F_2 animals with 100 parameters measured (2 parameters of stress reaction, 6 fattening parameters, 19 carcass parameters, 6 parameters of meat quality, 3 morphological traits and 64 additional traits) from Hohenheim University are being used. For this purpose 6 microsatellites (Sw489, Sw835, S0145, S0073, S0067, and S0097), which are on average approximately 34 cM apart will be separated on 7% denaturing polyacrylamide gel and stained with silver. Linkage between MLs and QTLs will be computed using the least square method (H a l e y et al.: Genetics, *136*, 1994: 1195–1207).

MAPPING OF PIG GENOME BY MEANS OF *IN SITU* HYBRIDIZATION

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Two genes – α_1-antichymotrypsin and IκBα – were mapped by means of *in situ* hybridization in pig. A probe for α_1-antichymotrypsin was labelled radioactively. Of 281 grains, detected on 94 analyzed metaphase cells, 71 grains (25.3%) were localized on chromosome 7. Of these grains 61 (85.9%) were found in the terminal region of the chromosome 7 q-arm. The α_1-antichymotrypsin gene was mapped to the swine chromosome region 7q23–26. A probe for IκBα was labelled fluorescently. Of 40 metaphase cells analyzed, 27 cells (67.5%) showed symmetrical double spots on at least one copy and 10 cells (25.0%) showed symmetrical double spots on both copies of chromosome 7 in position q15-q21. No paired signal was repeatedly detected in any other chromosomal region. The IκBα gene was mapped in the swine chromosome region 7q15–21.

POLYMORPHISM OF RESTRICTION FRAGMENTS OF ANTICHYMOTRYPSIN (AACT) AND ANTITRYPSIN (AT) GENES OF THE PIG

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The variability of antichymotrypsin (AACT) and antitrypsin (AT) genes of the pig was studied by RFLP techniques. DNA samples of pigs of different breeds (LW, BPP, D, H, L, Pn, Meishan) were digested with *Rsa*I, *Pvu*II, *Bgl*II and *Pst*I. As probes pig AACT cDNA (650 bp – see Musilová et al.: Mammal. Genome, *6*, 1995: 445) and pig AT cDNA (1.4 kb – provided by Dr. A. L. Archibald) were used. Polymorphism of AACT was observed after restriction with *Rsa*I, *Pvu*II and *Bgl*II (*Rsa*I – two restriction sites – 7 kb and 6.6 kb; 6 kb and 5.7 kb. *Pvu*II – three sets of fragments: P1 – 3 kb + 2.9 kb + 2 kb; P2 – 1.9 kb; P1-2 – fragments of P1 + P2. *Bgl*II – of 10 fragments present five exhibit variability). Meishan is different from other pigs in all cases. Polymorphism in AT was studied after restriction with *Rsa*I, and *Pst*I. Great variability was observed with *Rsa*I. After *Pst*I digestion some animals lacked 0.9 kb fragment.

THE GENETIC BASIS OF ANTIBODY PRODUCTION

J. Golian

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Both immunoglobulins and T-cell antigen receptor protein are constructed through the use of multiple gene segments. Each peptide chain is coded for by three or four gene segments. These are variable gene segment (V), jointing gene segment (J), and constant gene segment (C). Some peptide chains also employ a fourth gene segment. The V, D and J gene segments are selected at random from a large population of these segments in the genome. Diversity at CDR 1 and CDR 2 is generated in immunoglobulins through somatic mutation. Somatic mutation is not employed in the TCRs because of the risk of generating autoimmune response. The immunoglobulin class produced by a B cell is determined by selection of one of a family of heavy-chain genes.

A NEW ROBERTSONIAN TRANSLOCATION IN CATTLE, rob (16; 21)

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A new centric fusion translocation, rob (16; 21), was discovered in a bull which was a descendant of a German Red Pied bull and a Czech Red Pied cow. The bull was phenotypically normal. C-banding revealed the dicentric nature of this centric fusion. Neither dam nor any of 26 half-brothers of the translocated bull showed any abnormal karyotype.

POSSIBILITIES IN CONSTRUCTION OF TRANSGENIC POULTRY

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Interest in developing transgenic birds is widespread but the progress is relatively low. During the last several years it has been developed without bigger success several techniques of incorporation foreign DNA into chicken genome-like transfection of spermatozoa, or direct microinjection into germinal disc of egg. Although exogenous DNA is transported into fertilised eggs it is present episomally and disappears during embryonic development. To get transgenic chicken via construction of germinal line chimera it looks to be prospective only in the case of cultivation and transfection of primordial gonocytes cells, transmission of transfected blastodermal cells is still limited to low hatchability of recipient eggs. New promising way looks to be spermatogonia cells.

This study was supported by GA CR 514/94/1300.

POLYMORPHISM OF MICROSATELLITES WITHIN GENES CODING FOR APOLIPOPROTEIN A-I (APOA1) AND APOLIPOPROTEIN B (APOB) IN PIGS

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Polymorphism of two microsatellites identified in genes coding for apolipoproteins A-I (APOA1) and B (APOB) was analyzed in presented studies. Genotyping with the locus-specific PCR primers was carried out according to Ellegren et al. (1993, 1994). Amplified fragments were separated in standard 6% sequencing gels and detected by overnight exposure of the gel to X-ray film. The polymorphism of both microsatellite loci was typed in 7 F2 families comprising 7 sows, 4 boars and their 44 offspring (Zlotnicka Spotted and Polish Large White were chosen as the parental breeds). Two genetic variants and three genotypes of APOA1 microsatellite were identified among tested animals, whereas APOB microsatellite appeared to be monomorphic.

DETECTION OF THE POINT MUTATION IN CATTLE BY AUTOMATED SOLID-PHASE SEQUENCING OF PCR PRODUCTS

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Sequencing of the PCR products is of great use in all applications aiming to detect a mutation in a particular fragment of DNA. We have applied a solid-phase sequencing strategy to detect the known point mutation in two bovine genes: CD18 (BLAD) and uridine monophosphate synthase (DUMPS). The detection of cattle heterozygous for this mutation (carriers) is of great importance for animal breeding. PCR reaction was performed using 20–30 ng of template in a 50 µl reaction volume comprising 1 x Promega PCR Buffer, 1.5 mM $MgCl_2$, 200 µM of each dNTP (Promega), 0.5 U of Taq polymerase (Promega) and 0.1 µM (CD18) or 0.2 µM (DUMPS) of each primer. The primer sequences were used according to Mirck et al., 1995 (CD18) and Schwenger et al., 1993 (DUMPS). One of the primers in each pair was labelled with biotin. The PCR products were sequenced using the AutoLoad Solid Phase Sequencing Kit (Pharmacia). Sequencing products were loaded on 0.5 mm denaturing PAA gel (ReadyMix, Pharmacia). Electrophoresis was carried out using the A.L.F. DNA sequencer (Pharmacia). The collected data were processed using the ALF Manager v 2.6 software. The effectiveness of genotyping of the CD18 and UMPS loci was very high.

SEX IDENTIFICATION IN CATTLE ON THE BASIS OF AMELOGENIN POLYMORPHISM

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The investigations aimed at elaborating an effective method of sex determination in cattle embryos necessary in breeding work and of interest for forensic veterinary medicine. The work was conducted on genomic DNA extracted from blood, hair roots and embryos. For the PCR the SE 47 and SE 48 primers were used according to Ennis and Gallagher (1994). The analysis was based on sequences bovine class I and class II amelogenin (GeneBank, accession M63499 and M63500). Two thermal profiles were elaborated which render possible to obtain a highly effective, specific amplification of product 280 bp, characteristic for the gene of amelogenin, placed on chromosome X and for product 217 bp, characteristic for chromosome Y. The phenotypic differentiation between the genetic sex XX and XY was very clear and was manifested by the occurrence of a one band and two bands phenotype. The results indicate, that the described method of sex identification is effective and may be

quickly implemented. For instance, when using hair roots, the total time needed, together with DNA extraction, does not exceed 3 hours.

PREVALENCE AND GENEALOGY OF THE D128G MUTATION (BLAD) IN THE POPULATION OF POLISH CATTLE

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The investigations aimed at determining the degree of burdening of the gene contingent of cattle bred in Poland with the BLAD mutation. The work was conducted over 1993–1995 on 1 487 bulls from Artificial Insemination Stations throughout the whole country. The genotype identification was performed according to the PCR-RFLP method on the genomic DNA extracted from blood, semen and hair roots. It was ascertained that 68 sires are carriers of the BLAD mutation (about 5% of the animals examined). Among them 66 are pure-bred HF or with a considerable share of the blood of this breed. The remaining two bulls were Red-and-White. The carrier genealogy was elaborated for most bulls, i.e. the trail of transmission of the mutated gene from the protoplast – bull Osborndale Ivanhoe 1189870. In Poland three principal lines burdened by the BLAD mutation exist, originating from famous sires: Penstate Ivanhoe Star (lic. no. 01041-4-7), Provin MTN Ivanhoe Jewel (lic. no. 21116-4-5) and Paclamar Ivanhoe B. Eug (lic. no. 1417390). Since 1993 the testing of pedigree male and female material for the presence of defect D128G is obligatory.

SISTER CHROMATID EXCHANGES INDUCED BY EMISSION *IN VIVO* AND *IN VITRO*

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The effect of *in vivo* and *in vitro* exposure to metal-containing emissions on the induction of sister-chromatid exchanges (SCE) was investigated in cultured sheep peripheral lymphocytes. *In vivo* experiments were aimed at induction of chronic fluorosis under clinical conditions. The experimental animals were given a daily dose of industrial emissions (mostly aluminum and fluoride) of either 0.75 g or 1.5 g/animal, for 1 year. The occurrence of SCEs in the experimental groups was higher (with statistical significance at a dose of 1.5 g/animal) than that seen in the controls.

Peripheral lymphocytes for *in vitro* experiments were exposed to emissions at doses of 15, 30, 60 and 90 μg/ml medium. A significant increase of SCEs was obtained with doses ranged from 30 to 90 μg/ml medium. A clear dose-dependence was also seen.

POLYMORPHISMS OF RESTRICTION FRAGMENTS DETECTED WITH PORCINE RYR DNA PROBE

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Genetic polymorphisms at the DNA sequence level are exceedingly numerous and distributed throughout the genome. Genetic linkage relationship between such markers and quantitative trait loci (QTL) enables identification of QTL alleles. DNA polymorphisms can be detected after hybridization of denaturated complementary DNA strands (probes) to homologous strand of denaturated DNA.

In this paper the possibility of using of 659 bp porcine sequence of RYR1 gene as a probe was studied. Non-radioactive (enzymatically) labelled DNA probe was prepared by polymerase chain reaction (PCR) with DIG dUTP. Genomic DNA was digested with restriction enzymes (EcoRI, BsuRI, HindIII, HhaI, HinfI) and the resulting fragments were separated according to the size by agarose gel electrophoresis. The DNA was then denaturated *in situ*, transferred to a nylon membrane, hybridized to labelled DNA probe (16 hrs, 68 °C) and detected with the Colorimetric Detection Kit (Boehringer Mannheim, Germany). Only after HhaI and HinfI digestion restriction fragment patterns were observed, but in these preliminary studies only monomorphic results were obtained. For that reason DNA of other individuals have to be tested.

This study was supported by GA CR 1282.

USE OF SILVER STAINING METHOD FOR MICROSATELLITE SCORING IN PORCINE GENOME MAPPING

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This analysis showed that silver staining can be used as a method for simple, rapid and reliable band detection. In accordance with published sequences of primers the microsatellite S0097 was amplified using the PCR method. Allele scoring was performed on 7% polyacrylamide denaturation gels. Fragments were visualized by (non-radioactive) silver staining. After optimization this method led to good results by typing of microsatellites (high sensitivity and low background). Silver staining appears to be more advantageous for this purposes than autoradiography. This work was a part of project of QTL mapping on chromosome 4.

This study was supported by GA CR 523/96/0597 and GA CR 1282.

GENOTYPING BOVINE BETA-LACTOGLOBULIN GENE USING AS-PCR

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Animal breeding programmes employing genetic markers have been very successful in increasing the genetic progress of economically important traits in farm animals. Direct selection of the individual genotypes would be of particular value regarding sex-limited traits related to milk production.

An A/G transition in exon III making variability of alleles A and B of the bovine beta-lactoglobulin gene was detected using AS-PCR in bulls from AI stations. Using the AS-PCR method, rapid analysis of the beta-lactoglobulin genotype of bulls is now possible. In addition, kappa-kasein genotypes can be determined from the same PCR reaction using RFLP analysis.

This study was supported by a grant from FR VŠ MŠMT no. 0712.

VARIABILITY OF BOVINE GROWTH HORMONE GENE IN BULLS OF CZECH PIED BREED

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The use of detectable markers, such as genetic polymorphisms, in breeding programmes could render the selection of animals more accurate and efficient. Direct information on the underlying genetic variation could contribute significantly to genetic gain, especially regarding traits controlled by a few major genes. Bovine growth hormone gene can be one of these markers.

Mutation in the exon V of the bovine growth hormone gene making a leucine/valine substitution at amino acid position 127 was identified by the polymerase chain reaction and restriction fragment length polymorphism. Genotyping was performed in 73 AI bulls of the Czech Pied breed. Gene frequencies of variants L (leucine) and V (valine) were 0.68 and 0.32, respectively.

This study was supported by a grant from FR VŠ MŠMT no. 0712.

VARIABILITY OF BOVINE SERUM ALBUMIN

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Bovine serum albumin belongs to the group of whey proteins. Physically and immunologically it is identical with bovine serum albumin of the blood serum. The variability of bovine serum albumin was studied in 101 dairy cows of the Czech Pied breed, 85 Montbéliard dairy cows, 24 Limousin dairy cows and 24 dairy cows of the Polish Red cattle. The individual genes were identified by electrophoresis on polyacrylamide gel. All genes had the Alb^A allele.

The frequency of the Alb^B allele in the studied breeds was as follows: Czech Pied – Alb^B – 0.085; Limousin – Alb^B – 0.040; Polish Red – Alb^B – 0.035; Montbéliard – Alb^B – 0.005.

The study was supported by grant no. 0712 from the FR VŠ.

SUPEROVULATION RESPONSE OF FARM ANIMAL DONORS TO pFSH ADMINISTERED IN PROTRACTED FORM

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The commercial preparation pFSH Folicotropin, Spofa Praha, was diluted with injection water-aqueous application form applied in two doses per day (morning, evening) for 4 days as follows: 80, 120; 120, 80; 40, 40; 40, 40 I.U. in cows (n = 75) and 80, 80; 40, 40; 40, 40; 40, 40 I.U. in heifers (n = 223) and with Vehiculum II – evolutionary preparation tested as a diluent of Folicotropin Spofa; it protracts pFSH activity – vehicular application form – application on day 1 and day 2 of the treatment (in the morning) as follows: 320 I.U. and 240 I.U. in cows (n = 83); 240 I.U. and 160 I.U. in heifers (n = 161). Prostaglandin F2 alpha was administered on day 3 of the superovulation treatment (in the morning). Insemination and repeated insemination were performed on day 5 and day 6 of the treatment. Results confirm high qualitative parameters and applicability of the vehicular form. The mentioned trend was found also in goat and sheep superovulation studies.

The study was granted by Czech Ministery of Agriculture – projects no. NAZV 2413, GA CR 507/94/0343 and 507/95/0717.

PREVALENCE OF GENETIC DEFECT THAT CAUSES DUMPS IN HOLSTEIN CATTLE IN SLOVAKIA

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Deficiency of uridine-5'-monophosphate synthase (DUMPS) is a monogenic autosomal recessive disorder in cattle, resulting in early embryonic death of homozygous offspring. A mutation (C→T) with the loss of an AvaI site at codon 405, resulting in a premature stop codon with a truncated C-terminal catalytic subunit of the protein. For rapid screening cattle of the mutation allele was used PCR-RFLP. For genomic DNA amplification were used sequence – specific primers 5'-GCA AAT GGC TGA AGA ACA TTC TG-3' and 5'-GCT TCT AAC TGA ACT CCT CGA GT-3'. PCR product (108 bp) was digested with AvaI. 225 Holstein cattle from nucleus were analysed. No animal was diagnosed as a carrier for mutant UMPS allele at this time.

PREVALENCE OF THE D128G MUTATION (BLAD) IN HOLSTEIN CATTLE IN SLOVAKIA

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Bovine leukocyte adhesion deficiency is a suspected autosomal recessive disease characterized by impaired CD18 expression, severe deficits in neutrophil function, and consequently a high susceptibility to bacterial infection. One mutation replaced A at nucleotide 383 with G and causes an aspartic acid to glycine substitution at amino acid 128 (D128G) in highly conserved extracellular region of adhesion glycoprotein. For rapid screening cattle of the D128G allele was used PCR-RFLP. Genomic DNA was amplified with primers 5'-TTG CGT TCA ACG TGA CCT TCC G-3' and 5'-CAT TGA GGG CCC GGA GCA GG-3'. PCR product (137 bp) was digested with TaqI to specificaly cut the normal allele. With this technique 200 animals had been diagnosed from Holstein nucleus herds in Slovakia. No carrier animal of the D128G allele had been detected at this time.

LOW PROBABILITY OF THE OCCURRENCE OF BOVINE CITRULLINEMIA IN HOLSTEIN CATTLE IN SLOVAKIA

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Bovine citrullinemia is a urea cycle disorder inherited as autosomal recessive. Homozygous recessive calves lack the enzyme argininosuccinate synthetase and are unable to dispose of amonia and die of neurological disfunction within 5 days of birth. A single base substitution (C→T) in the gene for this enzyme results in a truncated protein that lacks activity. The loss of the AvaII restriction site can be used for rapid, economical detection of the heterozygotes for bovine citrullinemia. For PCR-RFLP were used forward primer 5'-GTG TTC ATT GAG GAC ATC-3' and reverse primer 5'-CCG TGA GAC ACA TAC TTG-3'. PCR produced a 177 bp DNA fragment which contains codon 86. PCR product was digested with AvaII. To date 230 animals from Holstein nucleus herds have been analysed. All animals tested have proven to be normal.

DETERMINATION GENOTYPE OF GROWTH HORMONE GENE IN SLOVAKIAN PIED CATTLE

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Growth hormone (GH) belongs to a group of somatolactogenic hormones. It has the major impact on growth, lactation and mammary gland development in cattle. Therefore, the GH gene is a potential target for studies of molecular variation in connection with milk performance and growth traits in cattle. Combination of the polymerase chain reaction (PCR) and restriction fragment length polymorphism (RFLP) allowed us to detect a leucine (L)-(CTG), valine (V)-(GTG) substitution at amino acid position 127 of the gene for growth hormone. PCR products (223 bp), corresponding with 2089–2312 genome sequence, were digested with AluI (AG/CT). Genotyping was performed in 75 bulls of Slovakian Pied breed. The heterozygous genotype LV (70%) was more frequent than LL or VV genotypes.

THEORETICAL AND APPLIED BREEDING

THE STRATEGY OF CATTLE BREEDING

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The important parts of selection programme are discussed. The alternatives of bulls policy (one versus groups, young versus proven) are shown. An expected breeding value and reliability are derived. The reliability of individual breeding value of progeny varied in practical situations from 0 to 30%. The same standard error of average breeding value of progeny was possible to obtain with high reliability of one sire or with group of sires with a low ones. Standard errors of production of one progeny varied from 2.00 to 1.92 of genetic standard deviation. The groups of 5 progeny have standard errors of production from 0.89 to 0.86. The variability of the herd practically is not influenced by parents selection. Important is the generation interval which influenced the minimum requirements for proven bulls to be better than average of young ones. The basic selection criterion is a complex expression in money units.

THE FACTORS INFLUENCING ESTIMATION OF BREEDING VALUE

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The main goal of this article is to analyze estimation breeding value and estimation of component variance with respect to selection. The question is which method is invariant to selection. REML gives the unbiased estimation of component variance even in presence of selection.

REGRESSION ANALYSIS METHODS FOR DETERMINATION AND ESTIMATION OF NON-ADDITIVE GENETIC EFFECTS

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The strategy of genetic improvement of animal populations is based on estimates of genetic parameters which are dependent on knowing and exploitation of genetic variability and its basic components. For estimation of genetic parameters various methods of estimation are used, in animal breeding mostly LSQ method with its modification WLSQ and GLSQ, and maximum likelihood method by the solution of linear models of specifically mixed linear model. Principally all the methods of estimation are based on linear regression methods. For this reason the estimation form of heredity, i. e. additive or non-additive/crossbreeding effects are postulated on determination linearity and deviation from linearity of analysed traits on the share of additive gene effects of one parental breed in crossbreds and then in own estimation of crossbreeding effects and their statistical significance.

SELECTION PROGRAMMES IN SHEEP BREEDING

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A selection programme with a selection for the meat production is described. The organization scheme included an active population and production commercial herds. Application of the ultrasonic measurements for the evaluation of carcass quality on live animals, breeding value estimation by the animal model, and an artificial

insemination of the top animals is expected. The breeding value was calculated before each culling from a herd. A ram selection is practiced on the level of total active population cross of the herds. The pattern of breeding scheme covered 18 groups of animals according to selection and culling at different age and transfer of breeding stock from an active population to the commercial herds. For a model active population of 2 000 females, the expected genetic trend is 2.82 g of average daily gain for the finished animals for the year.

ECONOMIC ASPECTS OF PIG BREEDING

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The aim of the study was to show the possibility of evaluation of pig breeding herd and economic efficiency by means of bioeconomic model (program EPOS). The program makes possible to decide, which production characteristic or breeding strategy influences total profit in a herd in a highest degree. These are primarily reproduction traits, mainly litter size and litter weight, to a lesser degree average daily gain. From the point of view of breeding strategy, profit in a highest degree is influenced by percentage of classified young breeding boars of total reared.

CONTINUOUS BREEDING VALUE ESTIMATION AND SELECTION IN THE FOX POPULATION

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The basic goal of carnivorous fur animal breeding is to achieve pelts of proper size, quality and colour types and the best merit of animal is a price which we have got from sale of its or its relative pelt. Thus, a fundamental for an increasing of genetic gain would be a stable connection of alive animal identification and pelts received from them. The proposed model of breeding scheme contains the continuous and multistage selection according to a fundamental animal selection on the base of their relative pelt values. The multistage selection consists in taking a decision several times during animal life period. Animals preselected in result of earlier decision are selected once again to classify the future breeding. The first decision was based on the ground of alive animals evaluation and information about pelt quality of their relatives used in the previous years. Essential selection decisions should be undertaken on the basis of present pelt prices. As pelts are disposed on several auctions, data about sale results are collected successively. In this stage we can use the continuous selection, i.e. take a decision about an animal after each new information. The inclusion in breeding programs objective criterions of pelt evaluation (size, quality class, colour of coat in lots) or worth of pelt disposed in international auctions requires to solve a problem of stable and easy to reading identificators of alive animal pelt. It is possible by: implantation of electronic marker, labelling and ear clippering.

SELECTION CRITERIA OF CZECH PIED-BREEDING PROGRAMME IMPLEMENTATION – TOP BULL-DAMS

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Czech Pied Breeders' Association is a body responsible for the breeding programme and the co-ordination of its implementation. The important part of the programme is the utilisation of the best cows in population for production of further generation of breeding bulls. Criteria for selection of bull-dams were processed by the Breeding Committee in 1995. Dual-purpose utility type, correct body frame and conformation without defects are required with resulting exterior classification: good or better.

In young top bull-dams (1st lactation) at least 180 kg milk proteins are required for C1 breeding group with protein content at least 3.3%. In top bull-dams (3rd lactation and higher) at least 230 kg proteins are required with content of 3.4% and more.

In 1992, 6 718 kg milk were achieved in 1 259 bull-dams at 4.42% milk fat and 3.37% protein. In 1994, the Association registered 139 young bulls with the following performance of dam in the best lactation: 7 224 kg milk, 4.42% (318 kg) milk fat and 3.48% (253 kg) proteins content. In 1995, 122 young bulls were registered. The performance of their dams was 7 368 kg milk with fat 4.3% (324 kg) and protein content 3.45% (253 kg).

The above-mentioned results show the significant growing trend in milk production and milk components' content in bull-dams.

GENETIC CORRELATIONS BETWEEN PRODUCTION TRAITS FOR CZECH PIED AND HOLSTEIN BULLS

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The genetic correlations were calculated for 17 traits of reproduction, milk and beef production on the basis of the correlations between the breeding values (BLUP). The breeding values were adjusted with GLM procedure (SAS) for systematic effect of the years and groups of tested bulls. The expressions for calculation of the genetic correlations are derived. The derivation depends on reliability of breeding values and on the source of information (own performance of the bull or performance of the progeny) and if two correlated traits are measured on the same animal or each trait on a different one. The database covers only bulls with higher reliability (3 999 Czech Pied – Simmental type, and 948 Holstein bulls).

SELECTION PROGRAMME IN GOATS BREEDING

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The selection programme for dairy goats is suggested. The scheme included the active population and transfer of genetic superiority to the commercial production herds. Utilization of the animal model techniques for breeding value estimation and the artificial insemination for top animals is expected. The multistage selection according the age and amount of available information is used. Animals are divided into 14 groups according culling practice, selection policy and organization of paaring. Rank and categorization of animals are according breeding value. For a active population of 1 000 females the model calculation of expected selection progress is done by a deterministic approach. The genetic gain in milk production reaches 13.52 kg/year.

COMPARISON OF ECONOMIC VALUES OF PRODUCTION TRAITS IN BREEDING HERDS AND WITHIN THE FRAMEWORK OF WHOLE PRODUCTION SYSTEM IN SHEEP

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The economic values of production traits in sheep were computed by simulations for top breeding herds of the sire and the dam breeds on the basis of economic of whole production system in sheep. The theoretical working tool for calculation is the profit function. The results show that in sire breed are higher economic values (e.v.) for average daily gain of lambs (e.v. of 1 g/day = 72.2 Czech Crown – Kc) and for carcass quality (e.v. of genetic improvement of carcass quality by 1 Kc/kg of live weight of lambs = 467.5 Kc) than in dam breeds (8.5 Kc and 52.3 Kc, resp.). On the contrary the reproduction traits show higher economic values in the dam breed than in the sire one (e.v. of % prolificacy = 15.2 Kc and 25.0 Kc, resp.)

GENETIC PROGRESS IN EGG PRODUCTION

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When comparing the results of tests of laying performance in the laying type of hens it is possible to conclude that egg production, egg weight and production of egg mass increase gradually due to the selection and breeding work. Breeding shows a similar effect also on the decrease in feed consumption per 1 kg of egg mass. For instance, in the case of brown samples, the egg production was 224.7 and 278.6 eggs in years 1984–1985 and 1994–1995, respectively. Within the same period, consumption of feed per 1 kg of egg mass decreased from 2.96 kg to 2.34 kg only. After the World War II, the average mass of eggs was 52 g, in 1960 and 1970 it increased to 56–58 g, and in years 1993–1994 it reached as much as 63.67 g. In a laying test which was carried out at the Mendel University of Agriculture and Forestry in 1995, the hybrid combination ISA BROWN showed the following performance parameters: up to the 469th day of age the egg production was 292.75 eggs per hen and average values of egg production, egg mass, production of whole egg mass and feed consumption per 1 kg of egg mass were 90.91%, 63.06 g, 18.46 kg and 2.36 kg, respectively.

INTERACTIONS BETWEEN GENOTYPES AND DIFFERENT DIETS IN THE MEAT TYPE OF FOWL

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Formulae of feeding mashes were proposed and tested for the chicken, goose, duck and turkey broilers production in which extracted soybean and maize meals were fully or partially replaced by rapeseed meal, pea, wheat and barley. In each experiment two genotypes and 3 or 4 mashes were tested. The live body weight, breast and leg muscles and abdominal fat percentage, feed conversion and mortality were monitored. All interactions (between genotypes, sexes and diets) were of a low importance. Using native sources of nutritients reduced the production costs.

CATTLE AND HORSES GENETICS AND BREEDING

POLYMORPHISMS OF LACTOPROTEIN GENES IN DAMS OF BULLS OF HOLSTEIN CATTLE SELECTED FOR THE BREEDING PROGRAMME IN THE CZECH REPUBLIC IN THE YEAR 1995

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Milk and blood samples were collected from 74 first lactation heifers of Holstein cattle. Lactation yields for milk, fat and protein were available. The analyses of milk protein were performed by the method of PAGE of whey proteins and caseins in nondissociating, continuous buffer system according to Medrano and Sharrow (1989). Genomic DNA was prepared from 5 ml of blood (Schlieben et al., 1991). Some allelic variants were detected directly by examination into the differences among the lengths in restriction fragments of DNA after its amplification in PCR (Alexander et al., 1988; Agrawala et al., 1992). Allelic frequencies of κ-casein and β-lactoglobulin genes were determined by gene counting. The genotype distribution within codominant systems was examined for Hardy-Weinberg equilibrium. The relationship between milk protein genotypes and production parameters (milk, fat and protein yield, fat and protein percentage) was investigated. The Harvey-LSML programme (analysis of variance) was used for statistical analysis.

POLYMORPHISM OF BLOOD PROTEINS OF CZECH RED CATTLE AND CROSSBREDS WITH CZECH PIED CATTLE

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Genotype of polymorphous blood proteins (transferin, amylase, ceruloplasmin and haemoglobin) and their gene frequencies were determined as a contribution to the characterization of genome of the population of Czech Red cattle (group A) and crossbreds with Czech Pied cattle (group B).

Considerably different genotypes had only nonsignificant different allele frequencies. The highest homozygosity was found in group of Czech Red cattle in transferin (0.592 in group A, 0,391 in group B) and amylase (0.588 in group A, 0.364 in group B). In others polymorphous blood protein systems was homozygosity similar. It is concluded that closed population of Bohemian Red cattle is relatively more homogeneity group.

THE HETEROGENEITY OF POLYMORPHIC MARKERS ANALYSE IN POPULATION OF SLOVAKIAN PIED CATTLE

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For heterogeneity the polymorphic markers in milk were found the highest frequency of allele $\alpha\text{-}s_1CN^B$ = 0.9590, $\beta\text{-}Cn^A$ = 0.8160, $\kappa\text{-}Cn^A$ = 0.5940 and $\beta\text{-}Lg^B$ = 0.5290. Genetic similarity of herds was proved and statistically nonsignificant intrapopulation genetic distances were found. Between the breeds of Slovakian Pied cattle and Slovakian Pinzgau cattle very high index of genetic similarity was found. Higher genetic distance exists between Slovakian Pied and Black and White Lowland cattle. Statistically significant differences in genotypic structure were proved between Slovakian Pied and Holstein as well as Slovakian Pinzgau and Holstein breeds. Genetic distance is 1.391 and 0.641, respectively.

Slovakian Pied breed is characterised by high homozygosity in the locus of α-s_1CN, by high level of polymorphism in the locus of κ-Cn and high frequency of alelles type "B".

THE OPPORTUNITIES OF SELECTION FOR INCREASING THE PERCENTAGE AND PRODUCTION OF MILK PROTEINS

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The main procedures in the process of increasing the percentage and production of proteins are as follows:

1. In all populations of dairy cows (regardless of the breed) it is important to reduce the difference between the percentage of milk fat and protein. This difference can be reduced particularly through the dams of bulls and can be maintained (improved) by applying the results of progeny testing. This procedure can be taken especially for the production of market milk.
2. Within the protein programme, which will link up with specialized processors, herds with a higher percentage of protein can be produced. These herds can be established with the support of processors applying strict selection and using the results of progeny testing. The MOET system can be used to accelerate the establishment of such herds. Some herds already reach this level.
3. Important for the protein programme is the selection of the breed, namely of the breeding bull. A genetically stable average percentage of proteins is known to exist in the various breeds.

IS A PERCENTAGE OF MILK PROTEIN SUPPOSED TO BE A SELECTION CRITERION?

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The protein content contributes significantly to the gain from processing of the milk. In cattle breeding it is therefore necessary to follow changes in content of milk components during the individual stages of the breeding programme by an analysis of attributes of milk efficiency and their relations.

A calculation was made for the South-Moravian (n = 16 384) and North-Moravian (n = 8 909) regions. The animals of the Czech Pied cattle with the content of the breed 51% and more (C1 and C2) were analysed. Calculated values of the relation between the percentage of protein and the percentage of fat for South-Moravian region and North-Moravian region, respectively, were: correlation coefficient r = 0.417 (0.422) and regression coefficient b_{yx} = 0.824 (0.879). The relation between kilograms of milk and kilograms of protein (r = 0.922, b_{yx} = 0.032, resp. r = 0.959, b_{yx} = 0.033) confirms a high relation between these two attributes. Through the selection for kilograms of protein a breeder can increase kilograms of milk.

It can be therefore recommended to take into account also percentage of milk protein in addition to kilograms of protein in milk.

MILK PERFORMANCE AND FERTILITY OF FIRST-CALF COWS PRODUCED BY EMBRYO TRANSFER

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The aim of this work was to compare milk performance and reproductive parameters of first-calf cows originating from embryo transfer (ET) with their contemporaries. The animals studied were divided into the following groups: the 1st consisted of 15 ET + sister pairs, the 2nd consisted of 20 ET + half-sister pairs having the same father and the 3rd group consisted of 47 ET + half-sisters having 10 different fathers. Basic statistical methods were used (parametric and nonparametric tests). Milk performance of the ET-offspring within the 1st group was significantly ($P < 0.01$) lower than in their sisters. Similar results were obtained for the milk production of the ET-offspring ($P < 0.05$) within the 2nd group. Insignificant differences were found in the third group. Differences in reproductive parameters were insignificant except for the length of the pregnancy which was significantly higher ($P < 0.05$) in the ET-offspring. Our results did not show any significant positive effect of the ET offspring on milk performance and reproductive parameters under the conditions analyzed .

THE EFFECT OF SELECTION OF BREEDING BULLS ON MEAT PRODUCTION OF IMPROVEMENT POPULATION OF CZECH PIED CATTLE

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Meat production is considered less important from the viewpoint of positive evaluation traits of fattening performance and carcass value from view of breeding of native population of Czech Pied cattle. It was performed a more detailed analysis of results of the male progeny testing of the improved population of Czech Pied cattle. The significance of effects of genotype selection and sires selection on 48 traits of fattening performance and carcass value was calculated using tested analysis of variance. The end of bulls fattening was at 500 ± 15 days of age (the age is determined with methodology of bulls testing), when slaughter weights among groups ranged from 493 kg to 569 kg.

The results of this study took the high importance of bulls selection and their mating in herds. Bulls had significant effect on most traits of meat production. The effect of genotype of bulls on evaluation traits of meat production was not statistically significant. The results showed the possibility of the continuation of the test period to 530 days of age or 550 days of age and increase of the requirements on growth intensity in the test period. Shorter period of fattening reduces the accuracy of estimation of meat production in the higher weights and the accuracy of bulls selection.

LIVESTOCK BREEDING USING GROWTH CURVE PARAMETERS

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This study assesses the suitability of using Gompertz's and Richard's functions for values of weight growth and selected dimensions for a set of calves of the beef, utility type of cattle, generally descendants of Czech Pied cattle and bulls of beef breed – Charolais, F. Aquitaine and Limousine. The weights as well as the dimensions were found for calves at intervals of 30 to 45 days from birth to an age of 380 d. The study resulted in several other possibilities for the use of growth curves to select suitable genotypes.

- The values can be used to compare the growth intensity in relation to the degree of maturity of the fattened-up populations of beef cattle.
- Assessment of the feeding technology in relation to the shape of the growth curve for the monitored period.

SELECTION CRITERIA OF CZECH PIED-BREEDING PROGRAMME IMPLEMENTATION – BULLS

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Czech Pied Breeders' Association is a body responsible for the programme and the co-ordination of its implementation. The programme is processed, updated and controlled by the Breeding Board of the Association. All the changes must be approved by the General Meeting, which is the highest body of the Association.

The programme is implemented by breeders together with authorised organizations, which are responsible for the objective control of milk performance and other commercial abilities.

In 1995 475 626 breeding cows were inseminated for the first time by Czech Pied bulls, i.e. 52.7% of 1st inseminations in total. Of it, 88.3% breeding cows were inseminated by completely tested improvers.

In 1995 379 bulls were presented and 155 (40.9%) of them were chosen for artificial insemination. The gains of bulls in test period (111–420 days) were 1 261 g and by bulls, chosen for breeding, 1 318 g (+57 g). In 1995, 32 bulls, i.e. 9.5% of tested bulls, were declared as improvers by the Breeding Board of the Association. RBV average values of protein kg are 118, RBV of net gain 101.2 and RBV of milk +435 kg. All bulls meet the termined limits as to fertility, health inheritance control and linear description principles exterior evaluation.

THE GENOTYPE x ENVIRONMENT INTERACTION IN FERTILITY TRAITS OF DAIRY COWS

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The linear model with fixed effects and two concomitant variables was used to analyse fertility traits in dairy cows of Slovakian Pied and Black and White (purebred and crosses with genetic share Black and White under 75%) breeds. This two genotypes were reared in three herds in the different production conditions. Statistically

significant influence of the genotype x herd interaction was found in gestation length ($P < 0.01$) and days to first service ($P < 0.05$). The variability of service period, days open, calving interval, number of services and conception rate was not influenced by genotype x herd interaction.

THE SMALL IMPORTED POPULATION OF THE BRAUNVIEH CATTLE IN SLOVAKIA, ITS PRODUCTION QUALITIES AND POSSIBILITY OF BREEDING

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About 500 head of pregnant heifers have been imported to Slovakia from Bavaria until 1994. The target of this paper is to compare milk performance of imported Braunvieh cows with the contemporaries of Slovakian dual purpose breeds – Slovakian Pied cattle (with genetic share of Red Holstein < 50%) and Pinzgauer. The least square means method was used for data analysis. The differences in milk production between Braunvieh and Slovakian Pied cattle were not statistically significant. The cows of Braunwieh cattle achieved higher fat and lactose percentage: fat 4.52 and 3.99%, lactose 4.74 and 4.62%). These differences were statistically highly significant ($P < 0.01$). The Braunvieh cows achieved higher milk production about 850 kg than Pinzgauer contemporaries, with higher fat and lactose percentage in milk.

LINEAR ASSESSMENT AND EVALUATION SYSTEM FOR CONFORMATION OF OLD-KLADRUB HORSES

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A new general linear assessment and evaluation system for conformation of horses was developed and introduced into the Old-Kladrub horse breed. The integral part of this system are another three parts, which are not the objective of the presented paper:

1. Identification and description of the colour.
2. List and characterization of conformation defects.
3. Aggregate evaluation of type and sex expression, stature, bulkiness, body conformation, nobleness and harmony and gait.

In the preliminary system 42 linear type traits on 14 body parts are included. In 1995 151 mares at the National stud at Kladruby were linearly described. The age of the mares was 3 to 25 years. The statistical parameters were estimated for the breed, grey and black variety, sire lines and sire progeny groups. The results of the linear type traits classification will be used for the objective judgement of the conformation, estimation of breeding values, selection and mating programmes and differentiation between sire lines and sire progeny groups.

REASONS FOR A NEGATIVE SELECTION IN DIFFERENT GENOTYPES OF COWS

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A genotype of cows has a significant influence on the negative selection extent. In the test year 1995, 110 078 cows were analysed in the East Bohemian region. An increasing rate of genes of single-purpose milk efficiency breeds (Holstein and Ayrshire = 100% genes) comparing with the Czech Pied cattle (0% of single-purpose milk efficiency breeds) has a statistically significant influence on decreasing of a negative selection caused by the low milk yield (coefficient of correlation on the 1st lactation -0.90^{++}, on the 2nd lactation -0.85^{++}, on the 3rd and other lactations -0.70^{++}) and on the contrary, on increasing of negative selection caused by health problems (coefficients of correlation: 0.38, 0.65^{++}, 0.87^{++}).

GENETIC VARIANTS OF MILK PROTEINS AND CHEESE PROPERTIES OF MILK

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Genotypes β-LG and κ-CN were determined in 135 dairy cows of the Czech Pied breed using the method of starch gel electrophoresis and the PCR method. The frequency was β-LG A – 0.53, β-LG B – 0.47; κ-CN A – 0.667, κ-CN B – 0.318, κ-CN E – 0.015. In laboratory conditions, the effect of genetical polymorphism of β-LG and κ-CN on technological properties of milk was studied. Milk from dairy cows with the genotype β-LG AB / κ-CN AB – 75.4 was the quickest to curdle. This combination also gave the best quality rennet curd – I. Milk

from dairy cows with the genotype β-LG AA / κ-CN AA took the longest time to curdle. The quality of the rennet curd was classified as class III.

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RELATIONSHIP OF MILK PROTEIN GENETIC POLYMORPHISM ON MILK COMPOSITION AND ITS PROPERTIES

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Milk composition and properties according to genotypes of polymorphic milk protein systems was investigated in this study. Milk samples were collected from 41 cows of the Czech Black Pied breed in first 100 days of lactation stage (10–30 day, 31–60 day and 61–100 day) from December to the end of March. Milk protein genotypes were determined by electrophoresis in starch gel (SGE). Milk samples of individual cows were analysed on milk composition and physico-chemical and technological properties. The following parameters were controlled: total protein, true protein, whey protein, casein value, non-protein nitrogen, urea, acetone, lactose, fat, non-fat milk solids, SCC, pH, conductivity, alcohol stability, active acidity, titric acidity of milk and whey, renneting time, curd quality (consistency) and curd sort (grade).

Results obtained were evaluated using linear model by PROC GLM SAS. This model included fixed effects of year – season, lactation stage, lactation number and genotypes (α_{S1}-, β- and κ-casein and β-lactoglobulin).

Results interpreting the relations of genotypes with either milk composition or physico-chemical and technological properties were tabulated.

GENETIC PARAMETERS OF SOME MILK TRAITS OF BLACK AND WHITE COWS IN THE LUBLIN REGION OF POLAND

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Calculated were coefficients of heritability and genetic and phenotypic correlations of some milk traits from 11 236 Black and White heifers utilized in the private sector of the Lublin region of Poland in the years 1975–1992. The studied cows originated from 120 sires. It was found that h^2 for milk yield, fat yield and fat percentage in milk was low and similar: 0.18, 0.16 and 0,20, respectively. Genetic correlations were very differential: positive for milk and fat yield – $r_G = 0.90$ and for fat yield and fat content – $r_G = 0.32$ as well as negative for milk yield and fat percentage in milk – $r_G = -0.11$. Phenotypic correlations were also different but all positive, though r_P between milk yield and fat content approximated to 0.

RELATIONSHIP BETWEEN MILK PRODUCTION AND COMPOSITION IN CZECH PIED DAIRY COWS AT DIFFERENT LACTATIONS

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Relationship between total milk production per lactation period, milk fat percentage and milk protein content in Czech Pied dairy cows (genotype C1–C3) with one (193 cows), two (194 cows), three (174 cows) and four (165 cows) finished lactations was examined. Average milk production per lactation period was 3 616–5 019 kg with average milk fat percentage of 4.32–4.87% and average protein content of 3.42–3.53%. Correlation coefficients calculated for the relationship between milk production and milk fat content ranged from –0.26 to +0.17, for milk production and milk protein content from –0.49 to –0.04 and for milk protein content and milk fat content from +0.07 to +0.35.

RELATIONSHIP BETWEEN BODY CONFORMATION AND MILK PERFORMANCE OF THE CZECH PIED CATTLE FIRST-CALF HEIFERS

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The influence of body measurements and body conformation upon milk performance was observed in a herd of 251 first-calf heifers of Czech Pied cattle. 16 body measurements were taken and linear description and body conformation evaluation were made at the same time. Milk yield, yield of protein and protein + fat yield were recorded after finishing the 1st lactation.

A positive significant relations between body measurements and milk production were observed for body length ($r = 0.19^{++}$ to 0.30^{++}), heart girth ($r = 0.12$ to 0.14^{++}) and circumference of cannon bone ($r = 0.17^{++}$ to 0.22^{++}).

The highest positive significant correlations between milk production and body conformation were found for form of udder forequarters, udder hindquarters ($r = 0.07$ to 0.21^{++}) and for mammary system ($r = 0.09$ to 0.24).

RELATION OF TYPE TO MILK PROTEIN PRODUCTION IN HOLSTEIN COWS

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A relation of type traits at the beginning of lactation to the further yield of milk protein at a normal lactation (305 days) is evaluated for 28 Holstein cows (H100) after the first calving (group A) and for 23 cows-crossbreds of the Czech Pied cattle and Holstein (H75-100) after the second calving (group B).

In both groups a significant positive relation between a height at withers (group A 0.46; group B 0.58), height at hips (0.56; 0.58), linear assessment of milk production (0.49; 0.71), stature (0.38; 0.59), rump width (0.38; 0.43), conformation summary of dairy character (0.67; 0.75), capacity (0.65; 0.60), udder (0.68; 0.74) and final rating (0.79; 0.81) and further milk protein yield at a normal lactation (305 days) (A: $\bar{x} = 219.75$ kg, $s = 62.33$ kg, B: $\bar{x} = 237.43$ kg, $s = 60.86$ kg) was found.

INFLUENCE OF COMMERCIAL CROSSING WITH BEEF BREEDS ON THE CARCASS COMPOSITION OF THE BULLS

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Carcass evaluation of the bulls, crossbreds of F1 generation of Czech Pied cattle with the French Meat bulls was made in group of 19 crossbreds with Charolais breed, 34 crossbreds with Limousin breed and 19 crossbreds with Blonde d'Aquitaine. The control group included 47 bulls of Czech Pied cattle. Bulls was fattened at the same conditions and slaughtered at average age of 500 ± 8 days. Carcass evaluation was made according to the separate parts weight. In the dressing percentage evaluation, there were higher values (58.0–59.6%) in all of groups of crossbreds compared to the control group (57.6%). Carcass weight was highest in the group of Charolais crossbreds (358.4 kg). The results of technological analysis indicated in group of Charolais crossbreds, compared to the control group, higher meat yield in right carcass half by 5.9%, higher proportions of bones by 10% and by 17.7% more separable fat.

INTERACTIONS OF INFLUENCES OF BULL AND ENVIRONMENT ON LIVE WEIGHT GAINS OF BREEDING HEIFERS

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Effects of bull (sire) and two markedly different breeding techniques (extensive grazing without supplementary feeding and optimized nutrition in barn) on live weight gains of 69 breeding heifers of Czech Pied breed (genotype C1) were investigated. During the whole period of extensive grazing average daily gain was 0.797 kg per animal corresponding to only 80% of gain of the second group. Statistically significant interaction of influences of bull and breeding technique was found in daughters of bull reg. Zel 045. In extensive breeding conditions these heifers showed significantly lowest average daily gain (0.698 kg per animal) while in barn breeding conditions they reached the significantly highest average daily gain (1.035 kg per animal). No interaction was found in daughters of other bulls.

COMPARISON OF CALVES GROWTH OF DIFFERENT GENOTYPES BORN AFTER ABERDEEN ANGUS BULLS

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In the issue, native of sucler cows breeding, growth parameters in 4 groups of genotypes (AA100, AA75NH, AA50CA and AA50LiC) after Aberdeen Angus sires were evaluated.

There was significantly highest average weight at birth (39.75 kg and 37.09 kg) and at 120 days of age, too (150.87 and 147.48 kg) in groups of crossbreds of Czech Pied cattle of different blood sharing ($P \leq 0.01$, resp.

0.05). The smallest birth weight was in group AA75NH (30.87 kg) and at 120 days of age in the group AA100 (124.46 kg). The weight at 210 days of age was in all of groups on comparable level (from 221.61 kg to 231.57 kg) and the differences were statistically insignificant. The significant differences ($P \leq 0.01$) in growth intensity between groups were found out only in daily gains from 120 to 210 days of age, when the higher values were in groups AA75 and more blood sharing, what was connected with higher early maturing of this breed.

INFLUENCE OF SIRE ON THE ISSUE GROWTH OF ABERDEEN ANGUS BREED

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The growth parameters were evaluated in two herds of Aberdeen Angus beef cattle in the group of calves born after 5 sires operating in artificial insemination and in natural mating.

By the hard birth evaluation it was classified together 96.25% of birth without help. It was found out in herd 1 the significant differences ($P \leq 0.01$) in live weight of calves by birth, 120 and 210 days of age profiting the issue from natural mating in comparison with artificial insemination issue. The growth intensity from birth to 210 days of age ranged from 760 to 990 g in group of calves born after artificial insemination and 1 010 to 1 022 g in group of calves born after natural mating ($P \leq 0.01$). These were in herd two, where the calves were all the time additionally fed, the differences (according to sires) in live weight and growth intensity to 210 days of age insignificant. It followed from the results that all advantages of artificial insemination were not utilised.

LINEAR DESCRIPTION AND BODY CONFORMATION EVALUATION OF WARM-BLOOD HORSES

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73 mares of Czech Warm-blood of three to four years of age were evaluated in 1996. 15 body conformation traits and movement traits of walk and trot were described by linear description. Body defects, movement traits defects and character defects were registered. Comprehensive characteristics comprised utility type, body conformation, limbs and movement traits.

Body conformation parameters had on average from 3.95 to 5.80 points. The whole scale from 1 to 9 points was used in description. Comprehensive characteristics had average values from 6.43 to 6.68 points. The most frequent defects were deer neck, clasp posture of forelimbs and cow posture hind limbs (narrow of hock joints).

EXPLOITATION OPEN-FIELD METHOD IN BREEDING PROCESS OF SLOVAKIAN SPORT PONY

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Individual differences in the dynamics of habituation of spontaneous reaction to a new environment (testing chamber 6 x 4,5 m) were studied in 8 Slovak sport pony (6 mares and 2 stallions). The following behaviours were registered: horizontal motor activity, acoustic signals (snorting and neighing), sniffing, defecation and urination, the activity towards the exit or one-way window, standing without moving. The horses were tested 40 minutes between 9 a.m. and 12 a.m. Individual differences of excitability SCN summarised in frequency of indicators are criteria for the classification of animals into categories of low, medium and high SCN excitability.

ETHOLOGY AND HABITUATION OF IDENTICAL TWINS OF CALF

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The purpose of this work was to reconsider the level of the agreement of the ethological at identical pairs of calves. There were included 3 identical pairs of calf to the experiment which were obtained by transfer of bisectional embryos.

The comparation of ethological characteristics was based on 60min test of the habituation and on 24hours etograms in three repetitions.

The identical calves-twins which were obtained by bisection of the early embryos correspond statistically by in habitual characteristics. More significant agreement is at movement activity as at vocal demonstrations in point of view of the length of the habitual phase and of the decomponing of the movement activity during the day.

The level of the agreement of the individual identical pairs at the movement activity and at the vocal demonstrations is different during the 60min test. It follows from that reality that it is a test of the neuroreflexion which is very unstable to the environmental factors.

MAJOR GENES AND THEIR INFLUENCES ON TECHNOLOGICAL MEAT QUALITY IN PIGS

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There are mainly two major genes known influencing the technological meat quality in pigs. Gene for halothane sensitivity and calcium channel (ryanodine receptor) of skeletal muscle sarcoplasmic reticulum influences the occurrence of PSE-meat quality. Gene RN (Rendement Napole) influences the technological yield in Hampshire pigs. In connection to the experimental results the possibilities of solving problems with meat quality of pigs are introduced.

MEAT QUALITY IN PIGS OF DIFFERENT GENOTYPES

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Several selected parameters of pork quality were evaluated in two interbreed combinations of final slaughter hybrids of pig with 25% of genes of the Pn breed. Both the general and the special combining ability were evaluated within the framework of this experiment. When evaluating phenotype levels of the parameter pH_1, a significant difference between groups was found out as well as in case of the parameter pH_{24}. Using the apparatus Göfo, higher values of meat colour (58.38) were measured in hybrid pigs of combination (LW x L) x (CMP x Pn) than in (LW x L) x (SL x Pn). In the latter group the average value of meat colour was 56.29. This observation correspond with values of drip losses which were higher in meat of final hybrids (LW x L) x (SL x Pn). Differences in absolute values were found out also in evaluating phenotype levels of the parameter of intramuscular fat. In progenies of individual boars of the interbreed combination (LW x L) x (SL x Pn), this difference was 0.4%. The observed differences in levels of individual parameters can be used for selection of pigs for a required quality of pork.

PRODUCTION OF FINAL HYBRIDS AND EUROP-SYSTEM PIG EVALUATION

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Comparison of two batches in the all-in and all-out system (n_1 = 114, n_2 = 172) showed differences between final hybrids in EUROP-system classification. For example, in the batch with the proportion of lean meat $\bar{x}$ = 49.89 ± 0.529% in the first two classes 55.3% animals were fitted and in the batch with $\bar{x}$ = 54.61 ± 0.298% it was 89.0% animals. On the other hand, both groups showed negative correlation between proportion of lean meat in carcass and average daily gain (form birth to slaughter). In the first batch the correlation coefficient was r = –0.47 ± 0.083 and in the second one r = –0,46 ± 0.068.

EVALUATION OF GROWING–FINISHING PERIOD IN PIGS BY MEANS OF PROFIT FUNCTION

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The relations between the particular input characteristics and profit for pig produced were simulated by means of profit function. Much more expressive influence of price per kg of meat than of ADG level on the profit per pig sold was found. Profit, at used levels of input characteristics, can be reached, if ADG level is higher than 850 g and price per kg of meat higher than 35.5 Czech crowns (Cc). The levels of other tested characteristics, i.e. cost per kg of feed mixture, cost of piglet, consumption of ME/kg of live weight gain and fixed costs/pig/day must not exceed 5.40 Cc, 1 280.00 Cc, 37 MJ and 4.70 Cc, resp.

FEED AND CARCASS VALUE OF PIGS IN ŠPP-Ž PROGRAMME

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Feed and carcass value of White Fullblood breed and hybrids after boars of synthetic line SL and Pietrain x Hampshire (Pn x Ha) combination were tested in programme of pork, meat production with use of commercial OS-03 and OS-06 fodder mixture.

The best results in fattening achieved hybrids after boars SL but differences between groups were small ($P < 0.05$).

The best results in carcass value achieved hybrids after boars (Pn x Ha).

In both combinations of crossing BU x SL and BU x (Pn x Ha) should be expected better classification in comparison with White Fullblood breed.

USE OF INSTRUMENTAL PREDICTION FOR MEATINESS EVALUATION IN PIGS

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The objective of the paper was to evaluate opportunities for instrumental assessment of pigs at a progeny testing station, 216 pigs of five genotypes were used. These characteristics were determined by an instrument PIGLOG 105 a day before slaughter. The percentage of valuable lean cuts (VLC) was 49.15% in the whole set, while the lean meat cuts determined instrumentally *in vivo* made 50.98%. On the basis of these experiments it should be predicted that *in vivo* muscle percentage out of the 100 kg weight should amount to 52–54% in dam populations while it should be above 55–56% in sire lines. The percentage of VLCs and/or of lean meat content, determined with a UNIFOM S-89 instrument for the whole set (n = 1 040), made 50.47 and/or 49.25%. The results of this study document that the original equation of the UNIFOM S-89 instrument did not reflect the meatiness of the pigs tested accurately.

CRYOPRESERVATION OF PORCINE EMBRYOS

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Experimental cryopreservation of porcine embryos has been unsuccessful until recently. In our experiment, donors were treated with Evertas-P combined PMSG-HCG-LHRH. Recovery term was specified experimentally (4 days and 17 hours post 1st insemination); 83% embryos characterized with optimum evolution stage (peri-hatching blastocysts) were recovered. Three vitrification media were tested (Říha et al., 1996). Results demonstrated satisfactory morphological condition of embryos after thawing and washing. Intensity of nuclear RNA synthesis corresponds with good morphological conditions of thawed embryos. Five recipients (2 non-inseminated and 3 inseminated) were used for ET. Transfer of 13–16 embryos was favourable in 1 non-inseminated and 1 inseminated recipient. The inseminated one gave birth to 7 piglets (6 live-born), non-inseminated recipient aborted. Three piglets born from cryopreserved embryos are characterized with different phenotypes; so our experiment can be considered as "successful".

The research were supported by Ministry of Agriculture CR no. 3111.

PRODUCTION EFFICIENCY OF SOME FOREIGN HYBRIDS IN THE CONDITIONS OF SLOVAK REPUBLIC

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The carcass value and meat quality of two types of foreign hybrids were compared. Hybrid A (n = 35) and hybrid B (n = 37) on average pre-slaughter weight approx. 105 kg achieved daily gain during tested period 831.5 and 897.6 g, respectively, feed conversion 3.07 and 2.64 kg, resp., valuable lean cuts 51.75 and 51.92%, resp., average backfat thickness 21.31 and 19.66 mm, resp., and lean meat content 56.55 and 56.24%, respectively. No statistically significant differences in the evaluated slaughter parameters between the studied groups of hybrids were found. Statistically significant differences were determined in parameters of meat quality, i.e. in meat colour by GÖFO (55.26 and 60.49, resp.) and by the Japanese scale (3.06 and 3.45, resp.), pH_1 in *m.s.m.* (6.33 and 6.46, resp.) as well as in electrical conductivity in *m.s.m.* measured 24 hrs *post mortem* (5.41 and 4.22 μS, resp.). The occurrence of PSE meat achieved the level of 28.6 and 13.5%, resp., in the studied hybrids.

INFLUENCE OF MORE INTENSIVE SELECTION ON IMPROVEMENT OF CHOSEN PERFORMANCE TRAITS IN WHITE MEATY BREED

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Nucleus herd of White Meat breed was intensively selected first of all for basic own performance traits (DG – daily gain from birth to 100 kg and BF – average backfat thickness in 100 kg weight) since 1994. Besides stronger selection limits of own performance (OP) negative selection was used, too.

By the order of OP was evaluated the offspring (gilts) of all father lines in the herd. The best lines achieved DG 566–567 g, BF 1.37–1.39 cm and the worst 540–529 g and 1.71–1.74 cm. Boars and lines of sows were evaluated from the point of the various combining ability, too. Significant effects of general and specific combining ability of lines were found mainly in BF. Use of intensive selection brought decrease of BF from 1.61 cm (year 1994) to 1.46 cm (1995) and DG increase from 541 g to 557 g. Differences between the years in both traits were statistically confirmed ($P < 0.001$).

ANALYSIS OF PRODUCTION PARAMETERS OF FATHER SYNTHETICAL LINES OF PIGS IN SLOVAK REPUBLIC

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For analysis of production parameters of sire synthetical meat lines and combinations pigs were evaluated. The results were processed from all test stations in the Slovak Republic from 1991 to 1995.

In the evaluation of synthetical meat lines on average daily weight gain the best value had the combination LB x DU 922 g, in spending of 3.08 kg of feed mixtures or 2.04 for 1 kg increase of live weight. Of the single combination SL x PN (894 g, 2.91 kg, 2.05) and DU x PN (888 g, 2.88 kg, 2.04).

In the evaluation of slaughtering value the single of sire synthetical meat lines the best results reached the combination of SL x PN reached the best level CMČ 56.8%, the area of MLT 49,1 cm^2, at the lowest thickness of bacon 1.83 cm. Next combination was DU x PN and DU x PN – CMČ 52–54%, MLT 47–48 cm^2.

EVALUATION OF THE SELECTION PROGRAMME OF CZECH MEAT PIG BREED

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An analysis of the selection programme was carried out in the most numerous paternal population of pigs of the Czech Meat breed which most contributes to the production of final slaughter hybrids in the Czech Republic. The following parameters were evaluated: degree of selection progress within the framework of pure breeding, effects of immigration of genes from one of the initial populations and effects of immigration of genes from the population of Pietrain breed when producing hybrid boars for the hybridization programme according to the scheme (LW x L) x (CMP x Pn). All tests were carried out in accordance with the requirements of the Czech Standard ČSN 46 6164. Results of testing of final hybrids (LW x L) x (CMP x Pn) are characterized by high capacity of growth, low values of feed conversion, economically advantageous carcass value and high meat quality (average phenotypical values pH_1 –6.17, protein content 22.86% and fat content in dry matter 2.09%).

INFLUENCE OF MAJOR HISTOCOMPATIBILITY COMPLEX ON REPRODUCTION TRAITS IN SWINE

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The purpose of contribution is to refer an influence of SLA on reproduction traits of sows and sires as described by other authors. Significant associations were observed between some SLA class I haplotypes and genital tract development in males, ovulation rate, piglet survival rate, litter size and piglet weight at birth and at weaning. Avoidance of mating sires and dams carrying identical haplotypes can prove to be of benefit in improving litter size at weaning.

GENETIC PARAMETERS OF TESTES SIZE OF YOUNG BOARS

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The studies included 2 321 young boars of the 990 Polish synthetic line. Live measurements of the height and width of the both testes were taken at the age of 70, 120, 150 and 180 days. Genetic parameters (that is the heritability coefficient and genetic correlation) were estimated.

As a result of the performed studies it was found, that the highest heritability coefficients were obtained for the boar testes' size at the age 120 days (from $h^2 = 0.262 \pm 0.020$ to $h^2 = 0.323 \pm 0.023$). Genetic correlations between the basic measurements of testes and their size obtained in these studies were high and ranged from $r_G = 0.702 \pm 0.139$ to $r_G = 1.00 \pm 0.032$. The higher correlation was obtained both in younger and older age groups between the volume of testes and their width than their height what indicates, that on the basis of the width measurement (mainly of the left testis) one can determine the size of testes in particular age stages studied.

Taking into account a positive correlation between the size of testes and the semen traits, as well as the results of genetic parameters of that feature presented above, it seems to be important to pay attention to the size of testes when selecting the boars.

CHARACTERISTICS OF THE GENETIC POOL OF PIGS WITH REGARD TO C→T MUTATION IN THE 1843rd NUCLEOTIDE OF GENE RYR 1

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Keen interest of researchers and breeders has recently been concentrated on genetical markers localized on the 6th chromosome of pigs. On it, within the 1.2. region, also the "stress" gene is localized, indicated as RYR 1 (CRC, HAL). In the DNA of the RYR 1 gene more point mutations were found, however, only mutation in the 1843rd nucleotide consisting in the substitution of base C to T, and leading to the change of the 615th amino acid arginine for cytosine in the ryanodine receptor, is the cause of sensitivity to stress. Due to the above substitution, the GCGCTC sequence cleaved by restriction enzymes HinPl and Hhal to the GTGCTC sequence cleaved by HgiAl restrictase takes place in the DNA. This fact was the basis for elaborating the "DNA test" enabling to determine the given point mutation by means of the polymerase chain reaction (PCR) and polymorphism of the lengths of restriction fragments (RFLP). This test determined the frequency of genotypes and alleles in 4 283 breeding boars and sows of the Large White, Landrace, ♂BU, Duroc, Hampshire, BL, ŠL, Pietrain and ČVM breeds. The frequency of alleles of the RYR "n" gene of the five most numerous breeds was: Large White – 0.05; Landrace – 0.22; ♂BU – 0.14; Duroc – 0.17; ŠL – 0.19 (♂BU – father line of LW; BL – Belgian Landrace; ŠL – Swedish Landrace; ČVM – Czech Meat breed).

The study was supported by grant no. 5081 of the Czech Academy of Agricultural Sciences, Ministry of Agriculture, Czech Republic.

THE QUALITY OF PORK FROM HYBRIDS WITH THE GENOTYPE N/N AND N/n OF THE RYR 1 LOCUS

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Final hybrids of the Large White, Landrace, Pietrain and Hampshire breeds were studied at the testing station of fattening capacity and carcass value. The feeding of the animals was uniform, and they were slaughtered at 100 kg live weight. The genotype of the RYR locus was determined by the DNA test. Using shot biopsy, samples were taken from the *musculus longissimus lumborum et thoracis* on the level of the last rib of the right carcass half. The meat quality was assessed for 45 minutes *post mortem* and was based on the pH_1 value and on the electric conductivity of the meat (EC). As normal was taken meat with $pH_1 \geq 5.81$ and EC ≤ 4.99 mS; in meat with a tendency to PSE the $pH_1 = 5.61–5.80$ and EC = 5.00–7.99 mS; in the PSE quality meat the $pH_1 \leq 5.60$ and EC ≥ 8.00 mS. The results indicated that, based on the pH_1 and EC values, subgroups could be identified in the heterozygous (Nn) genotypes with normal meat, meat with a tendency to PSE and typical PSE meat, among which the differences in average values were highly significant. Among the homozygous genotypes (NN) were animals with normal meat, but one animal was found with meat tending towards PSE and with meat where the pH1 and EC values were typical of PSE meat.

The research was supported by the Grant Agency of the Czech Republic, no. 1282.

ASSESSMENT OF THE EFFECT OF GENOTYPES OF THE RYR 1 LOCUS OF HYBRIDS ON THE pH_1 VALUES AND ELECTRIC CONDUCTIVITY (EC_{50}) *ANTE MORTEM* AND *POST MORTEM*

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A group of 41 slaughter pigs was studied, hybrids of the Large White and Landrace breeds from direct and reciprocal crossing. Bioptic meat samples were taken from the MLLT (*musculus longissimus lumborum et thoracis*) of live animals and after 50 minutes of incubation of the sample the pH_1 value and electric conductivity (EC_{50}) were determined. These values were also measured after slaughter.

The differences in these meat quality indicators were not at all affected by the hybrid combinations. The effect of the respective genotypes of the RYR 1 locus on pH_1 *ante mortem* and pH_1 *post mortem* was highly significant, the differences being significant between the N/N genotypes and the N/n and n/n genotypes. The *ante mortem* and *post mortem* values of pH_1 and EC_{50} showed highly significant differences. Significant correlations were found between the indicators of meat quality. Correlation coefficients between pH_1 *ante mortem* and pH_1 *post mortem* ($r = 0.73$) and EC_{50} *ante mortem* and EC_{50} *post mortem* ($r = 0.59$) were positive and high.

The research was funded by grant no. 1282 of the Grant Agency of the Czech Republic.

EVALUATION OF MEAT PROPERTIES OF PIGS WITH VARIOUS GENOTYPES

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The purpose of this paper is to show changes of slaughtering and qualitative meat properties of pigs genotypes NN, Nn a nn.

Gene RYR (HAL) had a negative influence on biophysical and biochemical signs of pork. Recessive homozygote and heterozygote individuals given expressive paler and more exudative meat with lower pH value.

The differences between averages of mentioned indices were statistically significant results. The pigs of these groups had a larger area of MLT and lower height of fat.

We have observed also several non-significant values, mainly in percent proportion of the meat part price and proportion of ham.

EVALUATION OF DAILY GAIN CHANGES DURING FATTENING PERIOD IN DIFFERENT PIG POPULATIONS

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Pigs of the following breeds were studied: Duroc (D), Belgian Landrace (BL), Czech Meat Pig (ČVM) and final hybrids of one cross breeding combination (FH). The daily gain was measured in ten days intervals from 80 to 180 days of age. The least squares estimates of regression of daily gain on age are following:

$y_D = -354.7 + 14.4708x - 0.042827x^2$
$y_{BL} = -281.8 + 14.5632x - 0.050150x^2$
$y_{ČVM} = -603.6 + 18.8931x - 0.061302x^2$
$y_{FH} = -259.3 + 14.3514x - 0.049835x^2$

These results show on the course of growth differences between considered populations and can affect the final fattening characteristics.

COMPARISON OF PIG CARCASS VALUE IN DIFFERENT FINAL HYBRIDS

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The observed hybrid combination was created by basic scheme of breed type (A x B) x C. The first part of experiment included Large White and Landrace gilts and the second one included Camborough gilts in the F_1 generation. The boars of Line-16 were used in the position C. The pig group with 50% of blood share "PIG" was killed in higher average weight (difference was 4.5 kg) than in pig group with 100% of blood share "PIG". Hybrids with 100% of blood share achieved more favourable results in backfat thickness (–4.7 mm) than in hybrids with 50% of blood share. Group with 100% of blood share achieved more favourable results in percentage of meat parts (52.49%), but percentage of lean cuts in group with 50% of blood share was very good. 36% of individuals

in group with 50% of blood share and 34.5 of individuals in group with 100% of blood share showed PSE meat. The percentage of lean meat was determined by ZP method (two-point method). The highest relation was determined between the percentage of lean meat (ZP method) and backfat thickness (ZP method) $r = -0.936^{+++}$ (50% PIG), $r = -0{,}930^{+++}$ (100% PIG). The backfat thickness had the higher importance for percentage of lean meat than the muscle height.

EFFECT OF POLYMORPHISM OF TRANSFERRIN (Tf) OF SOWS ON LITTER SIZE BORN ALIVE AND THEIR REPEATABILITY

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Crossbred sows (n = 855) and Polish Large White – PLW sows (n = 540) with the definite type of Tf: AA, AB, BB were investigated on the litter size born alive (2 545 and 2 667 litters, resp. from I to VII and VIII, inclusively). It was found that the most litter size came from the AA sows, less from AB and least from BB, both crossbred and PLW sows. The repeatability of the litter size born alive in PLW sows appeared highest for litters of AA sows, lower for BB litters and lowest for AB. Analysis of the distribution of Tf types in progeny of PLW parents mated in the AB x AB and AB x BB variants and of PLW sows AB x Polish Landrace boars BB (539 and 318 progeny, resp.) showed a considerable deficit of Tf BB piglets. It is assumed that the worse reproductive effects of AB and BB sows than AA sows are due to deficit of BB progeny when they are mated with boars – carriers of allele Tf^B.

HISTOLOGICAL AND HISTOCHEMICAL STRUCTURE OF *MUSCULUS LONGISSIMUS THORACIS* IN PIGS OF VARIOUS GENOTYPES

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The histological and histochemical structure of *musculus longissimus thoracis*, thickness and frequency of different muscle fibre types were compared in pigs of various genotypes (NN, Nn, nn). As found, pigs with genotypes (Nn and nn) have a larger proportions of white muscle fibres (49.83 and 52.36%), as compared with the group of NN pigs (46.10%). On the other hand, this group (NN) have a highest relative volume of muscle fibres (87.16%) and lowest relative volume of intramuscular connective tissue (12.84%). The lowest relative volume of muscle fibres (78.53%) and highest amount of connective tissue (21.47%) was found in pigs of nn genotype. The thickness of muscle fibres in pigs (Nn and nn) has higher values than in the dominantly homozygotic (NN) pigs. The highest differences were measured in thickness of white and red fibres between recessive homozygotic (nn) and dominantly homozygotic (NN) pigs.

SHEEP AND GOAT GENETICS AND BREEDING

GENETIC POLYMORPHISM IN RELATION TO PRODUCTION CHARACTERISTICS OF SHEEP IN THE PROCESS OF CROSSING AND SELECTION

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In the population of sheep, crosses of breed Merino x Lincoln, were analysed polymorphism of hemoglobin, malat dehydrogenase, carbonic anhydrase, X protein, ceruloplasmin, albumin, transferrin and prealbumin, separately, according to a genetic portion of Lincoln breed. Relations of genotype according to polymorphic markers to wool production, density of wool, length of wool and to the thickness of wool were evaluated. Our observations of this relation were not significantly proved. Relations of genotypes combinations to the productive parameters and the correlations were evaluated. Statistically significant correlations were found between wool production and length of wool in all tested genotypic combinations as well as negative correlation between wool production and fineness of wool. The best production was reached by the crosses with 50% of Lincoln portion and with heterozygosity in polymorphic markers.

GENETIC POLYMORPHISM IN RELATION TO REPRODUCTION IN SHEEP

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Analysis of genetic polymorphic markers in the blood in relation to reproduction was made in population of crosses Merino x Lincoln with 50%, 25% and 37.5% portion of the Lincoln breed. Significantly higher fertility

in homozygous genotypes according to systems Tf and MDH was found. The ewes with genotype Tf II and MDH AA had significantly higher fertility rate of 1.88 and 1.75, respectively, against others genotypic combinations according to tested systems, while variability of the fertility characters was low. According to a system of Hb, a tendency of increasing fertility when heterozygotic genotype of Hb AB was present (1.55) was found. On the basis of these results the specific combinations were evaluated according to homozygosity or heterozygosity in loci and the highest fertility rate of 1.97 with low variability having ewes with genotype Hb AB, MDH AA, X+, Ca Fs, Tf II, Cp AB, Pa BB and Al FS was found. Low fertility rate of 1.21 was recognized with combinations of Hb BB, MDH BB, X-, Ca SS, Tf CD, Cp AA, Pa BC and AC FF.

THE POSSIBILITY OF AN APPLICATION OF THE ULTRASONOGRAPHY FOR ESTIMATIONS OF THE CARCASS QUALITY

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The ultrasonic measurements were done behind the last thoracic vertebrae. The results gained on a set of total 208 ram lambs show a low accuracy of fat layer thickness measurements on the back due to the minimum fattiness of observed animals. The indicated eyemuscle area measured by ultrasound (UMLDA) proves to be applicable for prediction of some indicators of carcass quality; e.g. eyemuscle area on a carcass (r = 0.681), dressing percentage (r = 0.412), EUROP evaluation of carcass (r = 0.381), proportion of lean meat on legs (r = 0.298). The prediction equations for the estimation of carcass quality were calculated on the basis of information available from live animals. The estimations of most of the tested traits were significantly more accurate after including the UMLDA to the prediction equations.

DEPENDENCE BETWEEN MILK EFFICIENCY AND PROLIFICACY IN SHEEP OF TSIGAI AND IMPROVED VALACHIAN BREEDS

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The relations between milk production and prolificacy in sheep of Tsigai (T) and Improved Valachian (IV) breeds with regard to lactation order were evaluated during the years 1992–1995. The average standardized milk production was 70.41 l in T breed, and 73.58 l in IV breed. The highest milk production in sheep of T breed was during 4th lactation (74.08 l), and in IV breed during 3rd lactation (76.06 l) – $P > 0.05$. The prolificacy of sheep was expressed in the index of reproduction which was calculated as follows: total number of lambs/age of ewe minus 1. No dependence between milk production and prolificacy in sheep ($P > 0.05$) was found, and the values of correlation coefficients were low (r = –0.011 to 0.201).

MEAT EFFICIENCY IN TSIGAI X SUFFOLK CROSSES OF F_I AND F_{II} GENERATION

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The growth ability of lambs of the Tsigai breed (T), F_I and F_{II} generations of Tsigai x Suffolk (T x Sf) was evaluated on the basis of live weight at birth, at the age of 30, 60, and 70 days, and of average daily gains (ADG). The study was performed during the years 1991–1995. The influence of genotype on the weight at birth, and at the age of 30 days ($P \leq 0.05$) was observed when evaluating T and F_I. The study of T and F_{II} showed the influence of genotype on live weight and ADG at the age of 70 days ($P \leq 0.05$) only. The genotypes achieved following parameters during the years 1991–1995: live weight of T 4.52 kg, 11.73 kg, 19.51 kg, 21.32 kg; T x Sf – F_I 4.76 kg, 12.54 kg, 20.33 kg, 22.53 kg; T x Sf – F_I 4.60 kg, 12.16 kg, 19.66 kg, 22.60 kg, respectively, and ADG of lambs from the birth to the age of 30, 60 and 70 days of T 240 g, 240 g, 240 g; T x Sf – F_I 259 g, 261 g, 255 g;, T x Sf – F_I 250 g, 250 g, 256 g.

CLASTOGENIC EFFECT OF CHLORIDAZON HERBICIDE ON SHEEP PERIPHERAL LYMPHOCYTES

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Mutagenic property of new triazole herbicide has been estimated by two tests containing assay – chromosomal analysis (CA) and micronuclei (MN). The peripheral lymphocytes of sheep have been used by *in vitro* assay, because of first contact with animals. Herbicide was dissolved in DMSO and added to cultivated cells at final concentrations 7.10^{-6}, 7.10^{-5}, 7.10^{-4} and 7.10^{-3} or 1.6; 16; 160 and 1 600 mg/l. CA was performed by *in vitro*

conditions with presence and also absence of S-9 mix metabolic activation system. MN test was realized without metabolic activation. The positive clastogenic effect has been achieved at concentration $7x10^{-4}$ in both of tests without metabolic activation. The statistical significance was 0.1 for CA and 0.01 for MN. The lower concentrations were not clastogenic, the highest one almost totally cytotoxic. S-9 activation did not induce more significant results in CA.

COMPARISON OF SOME FATTENING AND MEATINESS CHARACTERISTICS OF THE SHEEP MEATY BREEDS IN SLOVAKIA

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Milk and meat production of the sheep is the main characteristics of the economic transformation in Slovakia. Production of the milk lambs is very important for foreign market. From this point of view Slovakia imported meaty breeds (Suffolk, Ille de France, Berichon, etc.).

The best meat quality and quantity and fattening capacity in the conditions of testing station at the University of Agriculture had Ille de France young rams. Berichon breed had poor results.

GENETIC STRUCTURE OF GOAT BREEDS KEPT IN SLOVAKIA

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The frequency of alleles of 4 genes which determined the exterior traits, and 4 biochemical polymorphic systems were determined in 5 breeds of goats kept in Slovakia (white and/or brown short-haired goat – WSG and/or BSG, Alpine goat – AG, Kashmir goat – KG, and Angora goat – ANG). The frequency of Ho^+ allele (horns) varied from 0.513 to 1.0; of WaW allele (wattles) from 0 to 0.567; BrB allele (beard) from 0.250 to 0.870; Elr allele (reduced ear length) was noticed only in WSG – 0.017. From biochemical polymorphous systems the polymorphism in Tf system (ANG and KG), and in X protein system (allele X^+ = 0.342 to 0.863) was noticed. The highest average heterozygosity (H) calculated on the basis of 8 studied loci was in WSG and AG – 0.207. The smallest genetic distance (D) was between KG and ANG (D = 0.0075) and BSG and AG (D = 0.0323); the greatest difference being between AG and KG (D = 0.1209).

COMPARISON OF THE RESULTS OF PERFORMANCE CONTROL IN GOATS

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In 1992 performance control in goats was initiated in the Czech Republic according to the new Standard for PC in Goats. The executed changes have influenced the level of goat performance. The reduction of absolute milk production was chiefly affected by the elaboration of the results of the first three lactations and by investigating 200 lactation days with subsequent calculation. Total result of 947 kg of milk containing 3.86% of fat and 2.44% of proteins in 1992 and 760 kg of milk containing 3.74% of fat and 2.81% of proteins in 1995 was also influenced by the considerable increase in goat numbers in the Czech Republic in 1995 to 2 843 heads of goats, which represent an index of 153.5% as compared to 1992. Of this number 1 252 heads of goats, i.e. 44%, are kept in herds. Results of individual breeders amounting to 1 050 kg of milk containing 3.89% of fat and 2.42% of proteins in 1992 and 887 kg of milk containing 3.71% of fat and 2.85% of proteins in 1995 link up to the results attained in the previous period, although even here absolute reduction of the level of milk production is perceptible. Total result, however, is markedly affected by the level of performance achieved in herds, forming 73.6% of the performance reached by individual breeders in 1995.

PERFORMANCE CONTROL IN HAIR GOATS IN THE CZECH REPUBLIC

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A two years' analysis was carried out of hair samples of 22 goats and 14 castrates of mohair goats and of 22 goats and 4 bocks of the cashmere breed in the Czech Republic. Mohair goats had an average hair production of 2.41 ± 0.38 and 2.46 ± 0.40 kg, with the fineness of 31.71 ± 2.90 and 31.98 ± 1.66 μm and the length of 79.84 ± 8.09 and 105.12 ± 9.56 mm. The proportion of wool fibres was 97.60 and 96.59%, heterotype hair constituted 0.50 and 1.09 % and kemp 1.90 and 2.32%. The hair production of castrates was higher by 39%, the length by 14%, the average fineness was 32 μm. No expressive differences in the proportion of fractions in the

hair of castrates and goats were found. Cashmere goats had an average cashmere production of 0.22 kg, fineness 16.02 μm and length 36.8 mm. Bocks had similar values, 0.28 kg, 16.96 μm and 42.7 mm.

POULTRY, FUR AND BEE GENETICS AND BREEDING

THE RESULTS OF THE PERFORMANCE IN LAYING TESTS

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Presented results of the performance in international laying tests are confirming the reality of continually increasing of main production parameters by brown egg hens (this fact is corroborated in laying test from Lelystad – 1994/1995). Parameters of performance by best of them coming near to limit 20 kg in egg mass (in fact 19.76 kg – ISA Brown) and 2.00 kg (in fact 2.03 kg) in food conversion.

THE POSSIBILITY OF THE USING THE LIPIDASE OF BLOOD PLASMA IN THE COURSE OF SELECTION IN THE LINES OF LAYING HYBRIDS

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The adaptability of the lines in conditions of environment and the depression owing to increase of subletal factors and increasing number of homozygous are changes in metabolism of organism and blood lipidase too. Higher concentration of blood lipids in high performance lines of laying hens is expressive in inbreded lines with specific modification of metabolism. After it is possible to use blood plasma lipidase as a criterion for evaluation of genetic potential in specific conditions of environment. It is possible that blood lipidase could be used for application in the selection programme in the laying lines.

PHENOTYPIC VARIABILITY OF BODY WEIGHT IN GENE RESOURCE OF JAPANESE QUAIL

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Growth of body weight was analysed in 9 lines of Japanese quail maintained as genetic resource at our Institute. Four of them are registered in the FAO Global Databank for Animal Genetic Resources: English White (wh/wh) – line 02, Tuxedo (Wh^+/wh) – line 04, British Range (E/E) – line 05 and Manchurian Golden (Y/y^+). The others population or lines were: line 07 Interkozmos (egg type, wild type feather colour) 08 (meat type, wild type) and 3 experimental cholesterol lines 11, 12 and 13 (wild type). In body weight significant differences were found between the morphological lines, between cholesterol lines differences were small and in general, not significant. The 7-week body weight (g) of above given lines were in males: 115a, 111a, 126b, 91c, 94c, 143d, 102e, 108f, 107f and for females 136a, 131a, 136a, 96b, 109c, 147d, 113e, 113e, and 115e. The differences of averages marked with different letters were statistically significant.

COMPARISON OF PREDICTED AND OBSERVED PERFORMANCE IN CROSSBRED RABBITS

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From the data of 2 full diallel designs (4 x 4) in rabbits these crossbreeding effects were estimated for the pre-slaughter weight, dressing percentage, pre-slaughter litter weight (design 1), litter carcass weight (design 2): direct, maternal, residual reciprocal effects; total, average, breed and specific heterosis. Breeds used in the design 1: Californian, New Zealand White, Danish White, Burgund and in the design 2: Chinchilla Large, Californian, New Zealand White and Large Light Silver. The performance of two breed crosses was predicted by combination of purebred and selected single crossbred parameters (breed means, average heterosis, maternal effect). The observed means of two breed crosses were compared with the expected means of the same type of crossbreds. The coincidence of observed and expected means was tested by the correlation and *t*-test. The best coincidence between the observed and expected means was found when the averages of parental means were combined with the average heterosis and maternal effect. The worst coincidence was found, when only the averages of parental means were used.

THE HEREDITY OF THE WHITE COAT COLOUR OF ARCTIC FOXES (*ALOPEX LAGOPUS* L.)

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In recent years a new mutational variation of white foxes has appeared of arctic fox breeding. In this mutation the gene of the white colour dominates over the dark colour. Foxes of this variety found on Polish farms are heterozygous.

The aim of the research was to determine the frequency of coloured varieties of offspring coming from different matings of blue and white foxes and to verify hypothesis concerning the heredity of the white coat colour of arctic foxes.

The analysis was carried on within years (1984–1994) and regardless of years. It included mating blue foxes with blue ones, blue ones with white ones and white ones with white ones. The frequency of particular colour varieties of foxes coming from the types of mating mentioned above and an average number of pups in a single litter were calculated.

An analysis of the frequency of white (W) and blue (B) pups among the offspring of white parents (W – 66.1%, B – 33.9%), blue parents (W – 0.1%, B – 99.9%) and parents of different colours: white female x blue male (W – 54.4%, B – 45.6%), white male x blue female (W – 50.9%, B – 49.1%) indicates that there are two kinds of not identical genes of the white colour: a recessive unlethal gene (common in the Polish breeding of the sixties) and a dominant white lethal gene (introduced in Polish farms in the seventies through the import of shadow foxes from Norway).

PRINCIPAL AND MEASUREMENT OF THE HONEY BEE RESISTANCE TO SOME DISEASES

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The behavioral resistance to honey bee diseases is used by selecting resistant bee strains. Cleaning behaviour of bees is the principal of the hygienic test which measures the time needed by bees to completely clean killed pupae from comb cells in the nest. The correlation of the hygienic test with the intensity of chalk brood disease was found and the trait is highly heritable.

A good parameter of honey bee resistance to parasitic mite *Varroa jacobsoni* is the ability of bees to damage and kill live mites. A great variability of the percentage of bees-killed mites was found in the carniolan honey bee population in Slovakia. Some other biological mechanisms may help bees to reduce varroa mite population in the hives. Therefore the intensity of the varroasis is measured which covers all possible biological mechanisms of the bee resistance to varroasis. The percentage of bees-killed mites and the intensity of varroasis were found heritable.

THE ESTIMATION OF BREEDING VALUE ACCORDING TO AN ANIMAL MODEL FOR SEVERAL GENERATIONS OF MEAT POULTRY

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The breeding values for two lines and six generations of meat poultry were calculated with the Animal Model (Misztal, 1988). Estimates were made independently for each trait (number of eggs, body weight at 42 days and age at maturity). Line A with 19 928 individuals and line B with 20 871 individuals were evaluated. The average breeding values for two lines and six generations ranged from –0.0435 to 8.3014 eggs, body weight from –0.3716 to 131.50 g. The breeding values for age at maturity were analyzed only in last three generations with range from –0.0757 to 0.2482 days. The expected high significant negative correlations were found between number of eggs and age at maturity (r = –0.25 and –0.31). Differences between successive generations indicate desirable development. High variability of breeding values between individuals gives plenty of space for the effective selection.

SCOLIOTIC CHANGES IN ADULT BIRDS FROM FAMILIES SELECTED FOR LOW AND HIGH FREQUENCY OF EMBRYONAL SCOLIOSIS

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The objective of this study was to determine correlated responses in scoliosis (SC) of adult chickens selected divergently for embryonic skeletal defects of the scoliosis type (ESC). In consecutive generations of RIR popu-

lation 5.2, 17.6 and 20.2% of embryos with ESC were found in groups of full families selected for low (L), while in those selected for high response (H) 25.0, 32.4 and 37.9%. Correlated responses in SC of adult RIR, calculated as frequencies of this defect in groups of L families were 4.0, 9.3 and 15.4%, while in H 21.1, 21.3 and 31.3%. In the RIW population 9.4, 18.2 and 13.7% ESC embryos were found in groups L, and 25.0, 25.0 and 27.6% in H. Correlated responses in SC of adult RIW amounted to 7.8, 11.9 and 10.0% in L, and 22.5, 19.3 and 26.9% in H. Significant differences in scoliosis frequency between the adult birds from families selected for high and low embryonal scoliosis were observed in total generation of selection and total lines (L – 10.1%, H – 22.5%). An increasing number of clinical cases of ESC observed in adult individuals coming from the families which showed this defect during embryogenesis seems to point out to the fact that this axial skeletal defects are derived from embryogenesis.

THE INHERITANCE OF THE EGG YOLK PREALBUMIN (PA-F) IN HEN

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With horizontal electrophoresis on polyacrylamide gel proteins from egg yolk of Greenlage, Yellowlegs, Polber, Sussex, Leghorn, Rhode Island Red, Dominant White Cornish and White Rock hens were separated. At fast migrated prealbumins sub-region (Pa-F) fifteen different phenotypes were observed. It was stated that examined proteins are controlled by multiple alleles comprised of five genes Pa-F^A, Pa-F^B, Pa-F^C, Pa-F^D and Pa-F^E.

GROWTH OF PARENTAL LINES OF DWARF TYPE OF HENS

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The effect of the dwarfing gene (dw) on growth of young hemizygous hens (dw/–) and homozygous cockerels (dw/dw) is well known; the inhibiting effect of the "dw" gene is manifested in a lower growth intensity which is closely dependent on the age of chicks. It is referred in literature that in cockerels this growth depression represents with 30% to 40% while in young hens it is only 20% to 25%. In our experiments with chicks of ISA Vedette hybrid combination it was found out that the growth of cockerels and young hens was reduced by 14,5% and 8,5% as compared with standard chicks. As compared with the standard breeding material from the same parent flock, the growth inhibition of young hens was 32.8%.

INFLUENCE OF NITROSOMETHYLUREA (NMU) ON HATCHABILITY INDICES OF HENS

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The hatchability eggs of hybrid hens Shaver Starcross were used for this investigation. Prior to incubation the hatching eggs were intraovaly treated with NMU in the following manner: 0.01 M, 0.001 M and 0.0001 M solution of NMU, the 4th group was treated with aqua pro injectione and the 5th group acted as an intact control. The substances were applied in the amount of 0,1 ml vehicula per egg. The basic hatchability indices were investigated – non-fertile eggs, embryonal mortality, hatchability and sex ratio.

The results revealed that intraoval application of NMU and aqua pro injectione caused decreasing values of hatchability indices to compare with intact control. In embryonal mortality and hatchability the differences between groups were significant. There was a non-linear effect of NMU. Sex ratio was not significantly influenced. The highest embryonal mortality was to the 5th day and over the 15th day of incubation.

HATCHABILITY OF THE INBREDED LINES OF THE LAYING HYBRID MORAVIA BSL

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The analysis of the hatchability three breeding lines of laying hybrid Moravia BSL was made during the individual hatching of hens in age from 52 to 56 weeks. On the different percentage hatchability of the set eggs have influenced the competence to line and order of sets. The average hatchability of three lines RIR and BPR was only 76.6% and it is less, than is usually for parents stocks. Every set seems lower, from first to third – 80.7, 76.3 and 64.6%. Paralelly increased percentage of infertility eggs – 8.6, 16.7 and 21.8%. The highest hatchability (82.4%) was found out in the mother line BPR, in the father lines BPR and RIR was hatchability lower – 75.7 and 72.1%.

THE HEREDITY OF THE GOLD COAT COLOUR OF SILVER FOX (*VULPES VULPES*)

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Nowadays the fundamental variety of foxes (*Vulpes vulpes*) bred in Poland is silver fox. As a result of mating silver foxes with red ones the new variety of silver fox was produced – gold fox. Mating gold fox with silver ones the next variety of silver fox was obtained – silver cross fox.

There are several theories (Warwick, Hanson, 1937; Ilina, 1965; Jezewska, 1987) concerning the principles of the heredity of the red and black coat colour of silver foxes. On the basis of the analysis matings gold foxes (G) and silver foxes (S), an attempt has been made to verify hypotheses concerning the heredity of the coat colour and additional traits the red coat colour of silver foxes.

The analysis was carried on within 1993–1995. It included the following matings of silver foxes and percentage contribution of coat colour of offspring after parents of different colour: Gold x Gold (92.5% – Gold, 7.5% – Silver), Gold x Silver (45.7% – Gold, 30.6% – Silver, 23.7% – Silver Cross), Gold x Silver Cross (59.1% – Gold, 27.3% – Silver, 13.6% – Silver Cross). The frequency of particular colour varieties of foxes coming from above types of matings was calculated and additional traits of red coat colour were particularly characterized (colour type, throat colour, belly colour and amount of silver hairs).

VARIABILITY OF BODY SIZE TRAITS AND FUR QUALITY WITHIN CHINCHILLA POPULATION (*CHINCHILLA VELIGERA*)

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The work aimed at an evaluation of variability of chinchilla's body size and fur traits dealing parallel with a verification of basis which influenced this variability. Moreover, genetic parameters of fur traits were evaluated. Significant influence of sex was stated on body size, fur's paunch part and total value of scores. Year of birth influenced colour clearness, colour type and total value of scores. Heritabilities coefficients differentiated from 0.126 to 0.913. The lowest heritability coefficient was stated for fur's paunch part (0.126) while that of the highest was for fur structure (0.913).

VARIABILITY OF HERITABILITY COEFFICIENTS OF BODY SIZE AND FUR QUALITY IN POLAR BLUE FOX POPULATION

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The work deals with an evaluation of heritability coefficients for body size and fur quality traits during certain years. Sires component of variability was applied for evaluation. Heritability values of body size and fur quality traits varied with slightly decreased tendency during breeding period. Heritability coefficients of body size altered from 0.003 to 0.337, that of colour type from 0.001 to 0.337, colour purity from 0.022 to 0.346, fur density from 0.022 to 0.346, hair's length 0.099 to 0.322, general appearance 0.030 to 0.101, total number of scores 0.243 to 0.612, fur colour 0.125 to 0.643 and fur structure from 0.132 to 0.513.

THE COURSE OF THE GROWTH OF RABBIT BROILERS OF DIFFERENT GENOTYPES

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In the period of 36 to 91 days of age the course of the growth of rabbit broilers of different genotypes was studied. The following genotypes were evaluated: New Zealand White, Californian, reciprocal combinations of these breeds, commercial hybrids ZIKA and HYLA.

Using the least-square method, the values of the average daily weight gains determined at 7 days intervals were connected using curves which characterized the course of the growth changes in the above-mentioned period. A substantial difference in the course of the growth was found in the crossbreds ZIKA and HYLA. The line ZIKA was found to be especially suitable for fattening to a greater carcass weight, meanwhile the line HYLA can be regarded as more advantageous for lower carcass weights.

THE INFLUENCE OF GROWTH FACTORS AND REGULATORS OF INTRACELLULAR MESSENGERS ON OVARIAN STEROIDOGENESIS IN RABBIT AND HARE *IN VITRO*

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We studied the effects of growth factors and the possible mechanisms of their action on steroidogenesis in ovarian granulosa cells of domestic rabbits and wild hares. Progesterone and estradiol secretion by granulosa cells cultured with- and without EGF, IGF-I, IGF-II, stimulators and inhibitors of tyrosine kinase or protein kinase A was analyzed. It was found that all growth factors studied regulate steroidogenesis in both rabbit and hare ovarian cells. The effects of EGF and IGF-I are probably mediated by tyrosine kinase- and/or cAMP-dependent intracellular mechanisms. For IGF-II a tyrosine kinase-dependent mechanism of action is also suggested. Our findings indicate also the opposite effects of IGF-I and of its mediator (protein kinase A) on rabbit and hare ovaries: in rabbit cells these substances act as stimulators, whilst in hare ovaries they act as inhibitors of progesterone secretion.

HEREDITY OF FUR COLOUR AND BREEDING RESULTS OF WHITE HEDLUND VARIETY MINKS CROSSING WITH STANDARD MINKS

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The first part of research was carried out on 80 female minks in the second year of productive breeding. Half of the animals were standard variety minks (HH), while the second half were white Hedlund variety (hh) which were further divided into 4 sub-groups of 20 each. The females were mated 3 times in two different estrus periods with males of various fur colour. The results were calculated on the basis of the number of litters obtained and distributed with regard to the fur colour of the puppies and the number of litters on the basis of the amount of puppies delivered. The following part of research was performed on 60 F_1 generation females, composing two groups of 30 heads, each group being different in fur colour. The first group consisted of heterozygous (Hh) females with dark fur colour, the other group were homozygous (hh) females with white colour. The females in both groups were mated 3 times with white Hedlund (hh) males.

1. Regardless of the way of mating, heterozygotes (Hh) constituted the greatest numerosity and number of litters.
2. Better reproduction results were obtained in heterozygous (Hh) females, as compared to homozygous (hh) females.

GENETICS AND BIODIVERSITY

THE PRESENT SITUATION OF THE ENDANGERED SPECIES AND BREEDS IN EUROPE AND THE SITUATION IN THE CZECH REPUBLIC

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In 1995 a council of "Gene Resources of Farm Animals" was proposed in the Czech Republic which submitted a project for the preservation of the biodiversity in this region. Main attention was devoted to:

- Collecting documentation on the present situation of autochthonous species and breeds of farm animals in the Czech Republic.
- Analyses of their genotypical and phenotypical characteristics – specific properties and importance for their preservation.
- Creating a database (data bank) registering gene sources and their characteristics. The database will be connected with the international information system.
- Regeneration of selected autochthonous breeds and species of animals.
- Long-term preservation of gene sources for maintaining the national and regional biodiversity and breeding.
- Increasing the collection of animals according to the degree of endangering and total number of male and female animals.
- Applying and incorporating gene sources into natural conservation and environmentally-friendly agriculture.

For its implementation the project will require a good organizational and economic background, particularly the support of breeders of the endangered species and breeds. Even though a necessary system will have to be established for this purpose, decisive for the preservation of gene sources will be the breeder, and/or society or union, who will take care of their preservation.

GENE RESOURCES IN SLOVAKIA AND THEIR PROTECTION

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In Slovakia during last few years markedly reduced numbers of individuals in the populations of some species were recognized.

It was the reason to accept in Slovakia project of "Slovak National Strategy of Biodiversity" and this project anticipates the protection of existing or to disposal doomed populations of farm animals, they could be marked by considerable genetic characters, up to now non-utilized, but they could substantially contribute to the adaptation under changed environment, needs of market or in the process of crossing with other populations.

According to the proposal of FAO (1992) stock-taking of 21 breeds out of 6 species of farm animals in the year 1994 was made in Slovakia. 5 breeds were put on the World watch list for domestic animal diversity in 1995. European project of FAO included 7 breeds and the national project of protection comprised all 21 breeds (2 breeds of cattle, 2 breeds of pigs, 3 breeds of sheep, 2 breeds of goats, 7 breeds of horses and 5 breeds of poultry).

Another project "Strategy of Biological Services Development and Protection of Genetic Resources of Variability Domestic Existing Breeds of Farm Animals" anticipates with objective forms of genetic homogeneity determination, to establish genetic distances, mechanisms of adaptation and resistence to environment.

The problems will be solved by two basic ways – *ex situ* (through spermia and embrya freezing in sufficient amount) and *in situ* – to protect 1 800–2 000 dams for sires production.

PROBABILITY OF GENE ELIMINATION AT DIFFERENT PRESERVATION METHODS

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Creation of a genetic resource is connected with conservation of all genes representative for a population. The other important requirement is to keep stable genetic structure (with constant gene frequencies). Two model populations consisting of zygotes (embryos) and of gametes (sperms) with sufficiently large number were analysed. It was assumed that the samples are randomly completed from a population. On this assumption the minimum sample number guaranting that the gene will be not eliminated with the probability equal to 99.9, 99.5 and 99.0% were determined. A sample number needed to conserve of structure of foundation population was evaluated. It was assumed that this condition would be performed if the standard deviation of gene frequency had been less than 10% or 20% of initial gene frequency. The minimum sample number to gene saving depends on frequency of this gene in the foundation population and conservation method. If gene frequency is not very small (at least $p = 0.1$), the minimum sample number does not exceed 33 zygotes or 66 gametes to obtain very high probability ($p_n = 0.999$) of gene saving in the sample. More difficult is to satisfy a condition about keeping of population genetic structure in the sample. For probability as above the sample number should be 450 to standard deviation of gene frequency had been less than $0.1p$.

BREEDING OF PŘEŠTICE BLACK-PIED PIG BREED IN GENETIC RESOURCE

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Přeštice Black-Pied pig breed is endangered nowadays. In the study are analysed: level of feeding performance parameters and carcass value of F_1 generation and final hybrids and the results of instrumental classification in hybrid pig carcasses.

Combination of Přeštice Black-Pied x Landrace detected more favourable (but no significantly) results both in all and live-born piglets than combination of Large White x Landrace. There was a higher level of fattening performance traits and carcass value in F_1 generation of the pig originated from a reproduction herd and classed with position B in the hybridization program in combination of Large White x Landrace compared with combination of Přeštice Black-Pied x Landrace.

10% of individuals of Large White x Landrace and only 5% of individuals of Přeštice Black-Pied x Landrace contained PSE meat. The influence of PSE meat in Přeštice Black-Pied breed on lower occurrence was proved.

SYNTHETIC LINES AS A METHOD FOR CONSERVING THE DUCK GENETIC RESERVE

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The purpose of the investigations was to form a synthetic group based on 3 reserve groups of Pekin type ducks of common origin and similar utility, and to detect changes in the new group in successive 5 generations.

The method of mating aimed at retaining the pool of genes from all initial groups and enabling to reach during 5 generations a similar percentage of these groups (31.25 or 34.375%). High values of reproductive and meat traits in the parents, and utility traits in the progeny were found, as well as a considerable genetics variation.

Formation of a synthetic group made it possible to limit the number of reserve groups reared *in situ* and in this way to diminish the costs of their maintenance.

PROTECTION AND EXTENSION PROGRAM OF CZECH RED CATTLE BREED GENE RESOURCES

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The Department of Animal Breeding and Nutrition has started to realize absorptive crossing of Czech Red cattle breed in the Agricultural Cooperative Ločenice. The breeding dams of Czech Red Pied cattle breed are inseminated by sperm of the bulls of Czech Red cattle breed. The aim is regeneration of Czech Red cattle breed. The Czech Red cattle breed is very threaten breed of cattle. We have got first descendants of F_1 generation – 11 bulls and 10 heifers. Absorptive crossing is a long time process, about 20 years. There will be enough individuals of Czech Red cattle breed after this time and Czech Red cattle breed will be preserved.

METHODS OF MAINTAINING GEESE AT CONSERVATIVE AND RESERVE STOCK

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Preservation schedule of animals covers maintenance system which stands for genes safeguarding. A paper deals with presentation of conservation method for geese conservation. A collection of geese kept as a gene pool is placed at Waterfowl Farm Dworzyska of Poultry Research and Development Centre. The present collection comprises of eight native varieties and five foreign ones. The question discussed covers the level of inbreeding within groups raised as a consequence of the number of effective population size and maintaining scheme.

GENE RESOURCES OF THE FOWL

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In the Czech Republic there are only two gene resources of the fowl-native breeds "Czech (or Bohemian) Chicken" and "Czech (or Bohemian) Goose". Now only small populations of about 600 hens and cocks and about 160 geese and ganders exist. At the Research Institute of Animal Production in Praha-Uhříněves the programmes and the methods on protection and conservation of these gene resources of the fowl were elaborated. These programmes and methods require an individual production control, an individual hatching and a rotation of male individuals. It is necessary to give a financial subsidy to all breeders of these breeds.

POKYNY PRO AUTORY

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Rozsah vědeckých prací nemá přesáhnout 15 stran psaných na stroji včetně tabulek, obrázků a grafů. V práci je nutné používat jednotky odpovídající soustavě měrových jednotek SI (ČSN 01 1300).

Vlastní úprava rukopisu má odpovídat státní normě ČSN 88 0220 (formát A4, 30 řádek na stránku, 60 úhozů na řádku, mezi řádky dvojité mezery), k rukopisu je vhodné přiložit disketu s prací pořízenou na PC v některém textovém editoru, nejlépe v T602, a s grafickou dokumentací. Tabulky, grafy a fotografie se dodávají zvlášť, nepodlepují se. Na všechny přílohy musí být odkazy v textu.

Pokud autor používá v práci zkratek jakéhokoliv druhu, je nutné, aby byly alespoň jednou vysvětleny (vypsány), aby se předešlo omylům. V názvu práce a v souhrnu je vhodné zkratek nepoužívat.

Název práce (titul) nemá přesáhnout 85 úhozů. Jsou vyloučeny podtitulky článků.

Krátký souhrn (Abstrakt) je informačním výběrem obsahu a závěru článku, nikoliv však jeho pouhým popisem. Musí vyjádřit všechno podstatné, co je obsaženo ve vědecké práci, a má obsahovat základní číselné údaje včetně statistických hodnot. Musí obsahovat klíčová slova. Nemá překročit rozsah 170 slov. Je třeba, aby byl napsán celými větami, nikoliv heslovitě. Je uveřejňován a měl by být dodán ve stejném jazyce jako vědecká práce.

Rozšířený souhrn (Abstract) je uveřejňován v angličtině, měly by v něm být v rozsahu cca 1–2 strojopisných stran komentovány výsledky práce a uvedeny odkazy na tabulky a obrázky, popř. na nejdůležitější literární citace. Je vhodné jej (včetně názvu práce a klíčových slov) dodat v angličtině, popř. v češtině či slovenštině jako podklad pro překlad do angličtiny.

Úvod má obsahovat hlavní důvody, proč byla práce realizována a velmi stručnou formou má být popsán stav studované otázky.

Literární přehled má být krátký, je třeba uvádět pouze citace mající úzký vztah k problému.

Metoda se popisuje pouze tehdy, je-li původní, jinak postačuje citovat autora metody a uvádět jen případné odchylky. Ve stejné kapitole se popisuje také pokusný materiál.

Výsledky – při jejich popisu se k vyjádření kvantitativních hodnot dává přednost grafům před tabulkami. V tabulkách je třeba shrnout statistické hodnocení naměřených hodnot. Tato část by neměla obsahovat teoretické závěry ani dedukce, ale pouze faktické nálezy.

Diskuse obsahuje zhodnocení práce, diskutuje se o možných nedostatcích a práce se konfrontuje s výsledky dříve publikovanými (požaduje se citovat jen ty autory, jejichž práce mají k publikované práci bližší vztah). Je přípustné spojení v jednu kapitolu spolu s výsledky.

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Original scientific papers, short communications, and selectively reviews, that means papers based on the study of technical literature and reviewing recent knowledge in the given field, are published in this journal. Published papers are in Czech, Slovak or English. Each manuscript must contain a short and a longer summary (including the key words).

The author is fully responsible for the originality of his paper, for its subject and formal correctness. The author shall make a written declaration that his paper has not been published in any other information source.

The board of editors of this journal will decide on paper publication, with respect to expert opinions, scientific importance, contribution and quality of the paper.

The paper extent shall not exceed 15 typescript pages, including tables, figures and graphs.

Manuscript layout shall correspond to the State Standard ČSN 88 0220 (quarto, 30 lines per page, 60 strokes per line, double-spaced typescript). A PC diskette should be provided with the paper, written in an editor program, preferably T602, and with graphical documentation. Tables, figures and photos shall be enclosed separately. The text must contain references to all these annexes.

The **title** of the paper shall not exceed 85 strokes. Subtitles of the papers are not allowed either.

Abstract is an information selection of the contents and conclusions of the paper, it is not a mere description of the paper. It must present all substantial information contained in the paper. It shall not exceed 170 words. It shall be written in full sentences, not in form of keynotes, and comprise base numerical data including statistical data. It must contain key words. It should be submitted in English and if possible also in Czech or Slovak.

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Review of literature should be a short section, containing only literary citations with close relation to the treated problem.

Only original method shall be described, in other cases it is sufficient enough to cite the author of the used method and to mention modifications of this method. This section shall also contain a description of experimental material.

In the section **Results** figures and graphs should be used rather than tables for presentation of quantitative values. A statistical analysis of recorded values should be summarized in tables. This section should not contain either theoretical conclusions or deductions, but only factual data should be presented here.

Discussion contains an evaluation of the study, potential shortcomings are discussed, and the results of the study are confronted with previously published results (only those authors whose studies are in closer relation with the published paper should be cited). The sections Results and Discussion may be presented as one section only.

The citations are arranged alphabetically according to the surname of the first author. References in the text to these citations comprise the author's name and year of publication. Only the papers cited in the text of the study shall be included in the list of references. All citations shall be referred to in the text of the paper.

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