Diversity in Population Size and Production Parameters of Selected Varieties of Plymouth Rock Chicken Breed

Peter Hric[1], Cyril Hrnčár[2], Jozef Bujko[3]

[1] *Slovak Agricultural University in Nitra, Faculty of Agrobiology and Food Resources, Deparment of Grassland Ecosystems and Forage Crops, 949 76-Nitra, A. Hlinku, 2, Slovak Republic*
[2] *Slovak Agricultural University in Nitra, Faculty of Agrobiology and Food Resources, Department of Poultry Science and Small Animal Husbandry, 949 76-Nitra, A. Hlinku, 2, Slovak Republic*
[3] *Slovak Agricultural University in Nitra, Faculty of Agrobiology and Food Resources, Department of Genetic and Breeding Biology, 949 76-Nitra, A. Hlinku, 2, Slovak Republic*

Abstract
Objective of the research was to compare population size, eggs and meat production of the locally adapted chicken breed – Plymouth Rock of different varieties (white, barred and buff) in Slovakia reared in extensive system.
From the view of population size in conditions of Slovak Republic, most numerous of Plymouth Rock variety is white (average effective population size 118.96), while the lowest numerous we recorded for buff variety (21.62).
The highest eggs and meat production we noted in case of White Plymouth. For this reason, this variety of Plymouth Rock was used in hybridisation for development of modern hybrid combination for production of broiler chickens.

Keywords: eggs production, meat production, population size, Plymouth Rock

1. Introduction

The local breeds are an evidence of great achievement of many generations of breeding. For centuries farmers have been adapting chickens to local conditions, cultural needs and preferences. Unfortunately, over last decades, as a result of the industrialization of agriculture, the old local breeds of Europe mostly suffered a graduate decrease in members [1].
Specimens of the barred Plymouth Rock were first exhibited in America in 1869, and stock reached here in 1871. The white and black varieties came as sports. About 1890, the buff was exhibited in America and in England. The barred Rock came to us as a dual-purpose breed, but was developed to an exhibition ideal in which body size and frontal development were neglected in order to secure long narrow finely barred feathers [2].
Plymouth Rock is locally adapted breed of farm animal species are used in Slovakia [3].
The aim of this study h was compared population size, egg and meat production of Plymouth Rock in White, Barred and Buff varieties in Slovakia reared in extensive system.

2. Materials and methods

For evaluation of population size of White, Barred and Buff Plymouth Rocks we used certificates about acceptation of Plymouth Rock controlled flocks of Slovak Union of Breeders.
We analyzed total number of birds, number of breeding males, and number of breeding females and effective population size (*Ne*), calculated according to the formula given by [4].

*Corresponding author: Peter Hric, Tel: +421 37 641 4209, Email: Hric.Peter@post.sk

$$Ne = 4*M*F/(M+F)$$

where: *M* is the number of males, *F* is the number of females

The comparison of egg production of White, Barred and Buff Plymouth Rocks was realized in special poultry house for controlled breeds of poultry at University Experimental Farm in Kolíňany.

Birds were placed in breeding pen with deep litter. Feeding and watering were *ad libitum*. Feeding of poultry was providing by commercial feed mixture with identical content during analyzed period. Nutritional value of diet is shown in Table 1.

Birds were exposed to natural light as a practiced in rural areas of South-West Slovakia.

The egg production we evaluated as average number of eggs for accelerated 7-month laying period (1 month - 30 days).

The eggs were weighed individually from every hen for period 10 days in each month.

The slaughter analysis of 10 hens after laying period realized in laboratory of Department of Poultry Science and Small Animal Husbandry of SUA in Nitra.

The hens were weighed before slaughter and then were slaughtered, bled, plucked and weighed to determine blood and feather losses. The carcass was separated into breast, legs, back, wings, head and giblets (liver, heart, gizzard and neck).

Table 1. Nutritional value of complete feed mixture

Nutrient	Unit	HYD-10
Crude protein	g/kg	158.06
ME	MJ/kg	11.32
Lysine	g/kg	8.07
Methionine and cistine	g/kg	7.02
– from that methionine	g/kg	3.87
Calcium	g/kg	35.13
Phosphorus	g/kg	5.48
Sodium	g/kg	2.17
Manganese	mg/kg	148.79
Selenium	mg/kg	0.38
Copper	mg/kg	18.74
Zinc	mg/kg	102.27
Vitamin A	i.u./kg	10000
Vitamin D3	i.u./kg	2500
Vitamin K	mg/kg	21.27

3. Results and discussion

The effective population size of White, Barred and Buff Plymouth Rocks in years 2008 - 2011 is presented in tables 2. The highest number of birds we recorded at White Plymouth Rock. Average total number of animals in period of year 2008 - 2011 was 384.25 birds with average effective population size 118.96. However, we noted tendency of decrease in number of white variety poultry from 487 in year 2008 to 287 in year 2011, which manifested in achieved value of effective population size (140.14 in year 2008, respectively 94.58 in year 2011).

By contrast, the smallest number of animals was detected at Buff Plymouth Rock with average total number 61.50 birds in period of year 2008 - 2011 and average effective population size 21.62.

For part Barred Poultry Rock, the average total number in period of year 2008 - 2011 was 97.00 birds with average effective population size 29.34.

In comparison with Slovak autochthonous chicken breed Oravka, [5] recorded in period of year 2003 - 2010 average effective population size 183 pc, in interval from 119 pc (year 2010) to 266 pc (year 2005).

As shown in Figure 1, highest egg production we found at White Plymouth Rock (181.29 eggs per hens) and was statistically significant ($P<0.05$) highest in comparison with Barred Plymouth Rock (171.24 eggs per hen) and Buff Plymouth Rock (169.84 eggs per hens).

From Figure 2 resulted that average egg weight we recorded statistically no significant (P>0.05) differences between varieties of Plymouth Rock (white 61.74 g, barred 61.55 g and buff 61.08 g).

For Oravka, [6] reported egg production from 150.80 to 153.90 eggs per hen at 210-days observed period with average egg weight from 52.40 g to 55.70 g.

Table 2. Population size of White, Barred and Buff Plymouth Rocks in years 2008-2011

Variety of Plymouth Rock	2008	2009	2010	2011	Average
White					
number of males	38	33	33	26	32.50
number of females	449	364	333	261	351.75
total number	487	397	366	287	384.25
effective population size	140.14	121.03	120.10	94.58	118.96
Barred					
number of males	9	8	8	7	8.00
number of females	108	80	82	86	89.00
total number	117	88	90	93	97.00
effective population size	33.23	29.09	29.16	25.89	29.34
Buff					
number of males	5	5	9	5	6.00
number of females	39	50	76	57	55.50
total number	44	55	85	62	61.50
effective population size	17.73	18.18	32.19	18.39	21.62

As shown in Figure 3, in carcass yield we recorded higher value in White Plymouth Rock (72.68%), following Barred Plymouth Rock (72.29%) and Buff Plymouth Rock (71.84%). Differences between varieties was statistically no significant (P>0.05).

Plymouth Rock hens in White, Barred and Buff varieties achieved higher values of the carcass yield 71.84-72.68%) in comparison with normed value of STN (Slovak Technical Norm) 46 64 15 (70.00%).

Hrnčár et al., (2010) [7] noted average carcass yield of Oravka hens after laying period on value of 71.02%. Similarly, Uhrín et al., (1993) [8] recorded carcass yield of after laying hens Hisex White 70.46% and Shaver Starcross 288 71.93%.

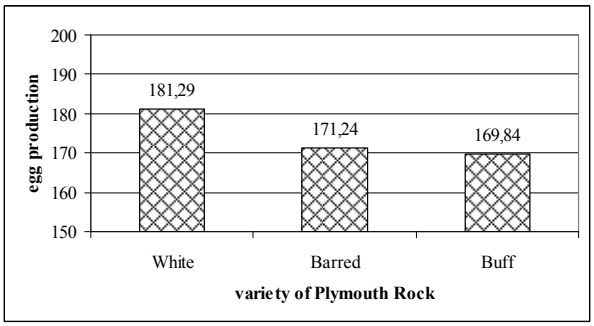

Figure 1. Egg production of White, Barred and Buff Plymouth Rock hens

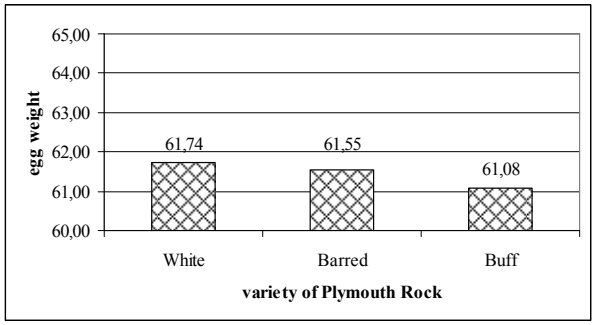

Figure 2. Egg weight of White, Barred and Buff Plymouth Rock hens

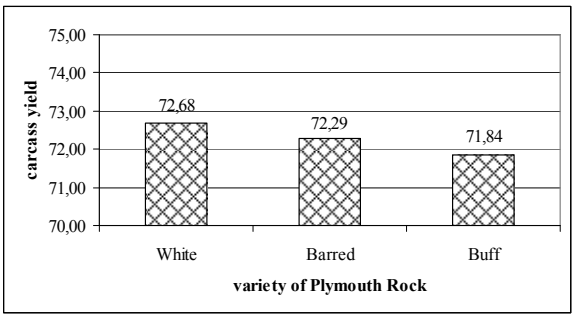

Figure 3. Carcass yield of White, Barred and Buff Plymouth Rock hens

4. Conclusions

From the view of results, White Plymouth Rock is the most common variety of Plymouth Rock in conditions of Slovak Republic. High egg and meat production White Plymouth Rock allows use of this variety in hybridisation for development of modern hybrid combination for production of broiler chickens.

Acknowledgements

This work was financially supported by the Scientific Grant Agency of Ministry of Education, Science, Research and Sport of the Slovak Republic and the Slovak Academy of Science under the contract VEGA 1/1101/11.

References

1. Gardini, G.C., Villa, E., Analysis of the cultural value of local livestock breeds: a methodology, J. Anim. Breed. Genet., 2003, 120, 1-11

2. Roberts, V., British Poultry Standards, John Wiley & Sons Ltd, Chichester, 2008, pp 237-243.

3. Weis, J., Hrnčár, C., Population size of autochthonous and locally adapted hen's breeds on area of the Slovak Republic, Scientific Papers. Animal Science and Biotechnologies, 2009, 42, 456-461

4. Simon, D. L., Buchenauer, D., Genetic diversity of European livestock breeds, Wageningen, 1993, 581 p.

5, Weis, J., Gardiánová, I., Hrnčár, C., Mindek, S., Svobodová, I., Bujko, J., Analýza početnosti autochtónnych plemien kúr na území Slovenskej republiky, Acta fytotechnica et zootechnica, 2010, 13, 31-33

6. Weis, J., Hrnčár, C., Production parameters of Slovak national hen's breed Oravka, Scientific Papers. Animal Science and Biotechnologies, 2009, 42, 452-455

7. Hrnčár, C., Weis, J., Pál, G., Baraňska, B., Bujko, J., Hanusová, E., Meat performance of the hen's breed Oravka after reproductive and laying period, Scientific Papers, Animal Science and Biotechnologies, 2010, 43, 284-286

8. Uhrín, V., Horvathová, V., Horniaková, E., Chmelničná, L., Bulla, J., Kvalita hydinového mäsa, Slovenská poľnohospodárska univerzita, Nitra, 1993, pp. 68-71.