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ASSESSMENT OF WELFARE AND EGG PRODUCTION OF LAYING HENS MORAVIA SSL IN SMALL-SCALE BREEDING

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ABSTRACT

The purpose of this study was to investigate the welfare of laying hens Moravia SSL housed in small-scale hen house with free range, behavior, egg production and selected physical indicators of eggs and chemical indicators of egg mass. The laying hens were kept in a hen house on deep litter. Breeding facility of hen house was within the meaning of recommendation for applying the principles of welfare, i.e. the space and breeding facility within the meaning of enriched breeding environment. Stocking density of the laying hens corresponded with recommendations for unrestricted movement and implementing natural activities. The hen house was equipped with the perch, nest, feeder and drinker. The commercial feed mixture was used for feeding, which is intended for laying hens. The kitchen remains were added to feed mixture, as are wet bread, the non-edible remains of foodstuffs. A feed mixture was served to laying hens 825 g per day. The laying hens had free access to drinking water, grazing, ground pecking, ground scratching and dust-bathing and in the free range. We focused investigation of on the egg laying intensity, selected parameters of physical egg quality and chemical egg contents. Time to relax of laying hens was adjusted according to the summer and winter breeding seasons. The main activities of free-range hens are grazing, ground pecking, ground scratching and dust-bathing. The main activities of free-range hens are grazing, ground pecking, ground scratching and dust-bathing. These activities were investigated in laying hens too in dependent of year period, more in the summer. Housing of the hens was equipped with the perch. The laying hens regularly used a perch. A beginning of occupation the perch was at the time of time growing dark, at the end of the light day. A nesting material was selected regular, monthly exchange. It was meadow hay of excellent quality for the collection of high quality and safe eggs from nests in the hen house. The laying hens had unlimited access to feed and water. The commercial feed mixture was available *ad libitum* and fresh kitchen remnants were added in a small amount, provided that they fed in the short term, so that not subject to harmful degradation process. The management of our experiment was scheduled at age of laying hens 30 to 90 weeks. The egg laying intensity was observed 50% in a moment of the experimental 1st week (age of laying hens 30 weeks). High egg laying intensity of laying hens was at their age between 39 to 63 weeks. At the end of the experiment, at age of laying hens 90 weeks was decreased egg laying intensity at 26.19%, which represents almost half of egg laying intensity recorded at the beginning of the experiment. An indicator of egg production in the our experiment was studied under defined conditions for small-scale breeding, i.e. in alternative production system with free range, under defined conditions of nutrition and timing of investigation more than one year, from the end of October to the end of December of the following year. The results of our experiment can be related to the season, months of the year. The laying hens laid the eggs by individual weeks 33-90 weeks of age about average weight from 57.5 to 75.0 g. The fat content of an egg mass was 11.3 g.100^{-1} and protein 12.39.g.100^{-1}. The table eggs from conditions of small-scale breeding are an important source of foodstuffs for the population, especially in rural areas. It must be given to this source of table eggs for human nutrition the highest quality and health safety too.

Keywords: Moravia SSL; small-scale breeding; welfare; production; table egg

INTRODUCTION

The European Commission has issued the **Council Directive 1999/74/EC**, which prohibits conventional the battery cages for laying hens from January 1, 2012 onward **(European Communities, 1999)**. This Directive relates to welfare of the laying hens. From then on, the furnished cages and the alternative non-cage systems, such as aviaries and the floor systems, the conventional cages housing was replaced for the purpose of to improve the welfare of layers **(Tauson, 2005)**. Yet, limited information is available about the consequences of alternative housing systems on transmission of zoonotic pathogens, such as *Salmonella enterica* serovar *Enteritidis*, in hens housed in these systems. Concerns were raised about the decreased hygienic status found in alternative housing systems, which could result in an easier spread of infectious agents **(Duncan, 2001; EFSA, 2005)**. Most epidemiological data showed a higher prevalence of *Salmonella* in layer flocks

housed in conventional cages compared with flocks housed in alternative systems **(Methner et al., 2006; EFSA, 2007; Snow et al., 2007, 2010; Namata et al., 2008; Huneau-Salaün et al., 2009; Van Hoorebeke et al., 2010)**, with some exceptions **(Schaar et al., 1997; Mollenhorst et al., 2005; Pieskus et al., 2008)**.

The purpose of this study was to investigate the welfare of laying hens Moravia SSL housed in small-scale hen house with free range, behavior, egg production and selected physical indicators of eggs and chemical indicators of egg mass.

MATERIAL AND METHODOLOGY

Object investigation

As a material were used the laying hens Moravia SSL to investigation. The laying hens were housed in alternative production system with free range in the small-scale conditions. Laying hen Moravia SSL is interlineal hybrid Rodajlenky with low proportion of Leghorn.

Picture 1 Laying hens Moravia SSL in hen house **(Polačková, 2012)**.

Housing conditions

The laying hens Moravia SSL were kept in a hen house on deep litter. Breeding facility of hen house was within the meaning of recommendation for applying the principles of welfare, i.e. the space and breeding facility within the meaning of enriched breeding environment. Stocking density of the laying hens corresponded with recommendations for unrestricted movement and implementing natural activities. The hen house was equipped with the perch, nest, feeder and drinker. As litter material was used a wheat straw. The commercial feed mixture was used for feeding, which is intended for laying hens. The kitchen remains were added to feed mixture, as are wet bread, the non-edible remains of foodstuffs (fresh: potato peel, peel of carrots etc.). Water was exchanged in the summer three times daily and in the winter once daily.

The experiment lasted from October 29, 2011 to December 31, 2012. There were six birds in the experiment. We served a feed mixture to laying hens 825 g per day. The laying hens had free access to drinking water, grazing, ground pecking, ground scratching and dust-bathing and in the free range. We focused investigation of on the egg laying intensity, selected parameters of physical egg quality and chemical egg contents.

Picture 2 Free range next to hen house **(Polačková, 2012)**.

Picture 3 Natural sctivity of laying hens – dust-bathing **(Polačková, 2012)**.

Picture 4 Laid eggs in the nest box **(Polačková, 2012)**.

Egg collection was carried each day at 9.00 am, to determine the egg weight, regular one day per week (Saturday) and to chemical analysis of the egg contents, once (n = 10 pcs of eggs) at age of laying hens 60 weeks.

Indicators of production

The following indicators were observed in the production of laying hens type Moravia:

- the number of laid eggs every day, at age of laying hens 30 to 90 weeks, which was the basis for the computation of the intensity of egg production (the number of laid eggs, the number of laying hens and the number of days of investigation),

- selected physical characteristics of the eggs: egg weight, egg albumen weight, egg yolk weight and egg shell weight of the egg samples collected weekly (Saturday) and weighted on the instrument type Kern 440-49N ECB with an accuracy of ± 0.1 d = g, the weight of the albumen was calculated based on the weight of the egg, reduced by the sum of the weight of yolk and shell,
- selected chemical parameters egg content:
• dry matter content in the JR Selecta oven, at 105 °C,
• protein content by the Kjeldahl method on a laboratory instrument KjeltecTM 8200,
• fat extraction method for an agent petroleum ether to a laboratory instrument type DET-GRAS N,
- the average body weight of laying hens aged between 30 and 90 weeks on the instrument type Kern ECB 20K20 with an accuracy of ± d = 0.1 g.

Raw data were evaluated according to the elementary of statistical characteristics.

RESULTS AND DISCUSSION

Behaviour of laying hens

Welfare of the laying hens can be threatened by many external breeding factors. It is important to know the cause of their possible occurrence and action to their prevention. Laying hens can develop several kinds of foot injuries related to the surfaces on which they stand and walk **(Lay et al., 2011)**. Ulcerative pododermatitis is seen most often in hens housed in litter based systems because of the presence of wet litter and feces. Environments can further compromise animal welfare if they promote the multiplication and spread of pathogens and parasites. Pathogens can be in litter, feed and soil of range area **(Fraser et al., 2013)**. Production efficiency is often compromised when air quality is poor; for example, feed efficiency of chickens decreases at ammonia levels of 25-60 parts per million (ppm) **(Quarles and Kling, 1974; Beker et al., 2004)**. Parasites were not observed in laying hens Moravia SSL during the experimental period. There was not a disease and mortality there. The hen house was opened daily at 7:30 am and closed in the summer at 9:00 pm, in winter after dusk, i.e. 5:00 pm. Time to relax of laying hens was adjusted according to the summer and winter breeding seasons. The main activities of free-range hens are grazing, ground pecking, ground scratching and dust-bathing. The extent of these is weather-dependent **(Hughes and Dun, 1983)**. These activities were investigated in laying hens Moravia SSL too in dependent of year period, more in the summer. Domestic fowl kept in non-cage systems prefer to roost on high perches at night if these are provided **(Blokhuis, 1983, 1984)**, but standard cages prevent this behaviour. Housing of the hens Moravia SSL was equipped with the perch. The laying hens regularly used a perch. A beginning of occupation the perch was at the time of time growing dark, at the end of the light day. The laying hens show strong motivation to gain access to perches for roosting, and the hens accustomed to roosting show signs of frustration when they are denied access to perches **(Olsson and Keeling, 2002)**. Hence, prevention of roosting is likely to be another cause of frustration. On the basis of such research, there is a growing trend for animal welfare standards to require that hens be allowed to perch and nest **(Fraser et al., 2013)**. According to **Peter et al. (1986)**, light regime is an important factor that significantly affects the development, growth and production, as well as indirectly viability of laying hens. This information was important for us to investigation of the behaviour of laying hens Moravia SSL in the hen house during the night and during the day especially in the free range. The laying hens rested in the hen house during the night, and during day had unlimited space in free range for move not only to feed and water, but also to dust-bath and scratching. The laying hens well acclimatized to temperature of external environment, which manifested to the viability and health of these laying hens. **Hrnčár and Civáň (2005)** underlined in their study that at high ambient temperatures fail in the laying hen thermoregulatory system, it means that failed heat release. A body overheats, i.e. hyperthermia. In this case, there is water intake increased and feed intake decreased in the laying hens. This negative effect is reflected in the reduction to stop egg production. In our experiment, the laying hens Moravia SSL was not affected by these variables feed intake, or egg production. A frequent source of infection is the dustiness of environment and non-compliance with hygiene of the drinkers and feeders **(Peter et al., 1986; Tittl, 2010)**. We addressed more attention to investigation of breeding environment hygiene on the basis of literary knowledge, in the hen house as well as in the free range. Housing space was regularly was regularly cleaned and litter exchanged. For non-compliance of hygiene and the welfare principles in the breeding of laying hens in relation to the reduction in egg production also reminded **O'Connor et al., (2011)**. Even, **Musgrove et al.,** (2012) state that failure to comply with environmental hygiene breeding of hens, namely the nest, is a reservoir for Salmonella. Red mite (*Dermanyssus gallinae*), a nest-dwelling parasite of chickens that can cause anemia and deaths, resides in cracks and crevices in the bird's environment is especially common in non-cage systems (**Chauve, 1998; Lay et al., 2011**). We selected regular, monthly exchange nesting material, meadow hay of excellent quality for the collection of high quality and safe eggs from nests in the hen house. The hay corresponded with organoleptic indicators of compliance with the terms of excellent hay, i.e. a smell, a color and the impurities. In domestic fowl, a strong motivation to perform 'nest-building' behaviour is triggered by hormonal events at ovulation, 24 h earlier **(Wood-Gush and Gilbert, 1973)**. Under natural conditions, the hen separates from the flock 60-90 min before an egg is laid, seeks and enters a nesting site, and then performs nest-building activity **(Duncan and Kite, 1989)**. The laying hens Moravia SSL had unlimited access to feed and water. **Zelenka et al., (2006)** in their study indicated that the animal receives enough food to satisfy their need for energy content. The feed mixture of laying hens Moravia SSL was available *ad libitum* and fresh kitchen remnants were added in a small amount, provided that they fed in the short term, so that not subject to harmful degradation process. Even **Hrnčár (2006)** notes if egg production is intensifying, egg protein production is increased proportionally. The author explains the important of protein need in feed mixture of laying hens. Therefore, the crude protein content 160 $g.kg^{-1}$ is important in feed

mixture of laying hens. The feed mixture in our experiment was obtained from the official commercial feed companies. The feed mixture was in accordance with the requirements of with the Code of feed. The feed mixture was composed of suitable feed raw material and fulfils the conditions to ensure saturation with essential nutrients and energy of laying hens Moravia SSL. Nutrition is an important factor that influences not only the egg production of laying hens, but also their health. Similarly, as feed and water quality, the role of mineral element supply should not be overlooked **(Anyanwu et al., 2008)**. Calcium and phosphorus are essential macro minerals. They are forming a significant component of the egg shell and phosphorus playing an important role in skeletal calcium deposition **(Frost and Roland, 1991)** and subsequent availability of calcium for egg shell formation **(Boorman et al., 1989)**. According to many literary knowledge is known that to feed of laying hens are used biologically active materials such as the enzymes **(Hůrka, 2010)**, to prevent the growth depression in terms of additional fat oxidation, or the antioxidants **(Kočí and Kočiová, 1999)**. Even **Mazzuca et al., (2011)** recommend adding to a feed mixture an alternative feed containing soybean hulls to increase egg production. With this in mind, our experiment was carried out in conditions of small scale breeding and available fresh kitchen remains were available, these were used in addition to the feed mixture.

Egg production

Sexual maturity means the age of the poultry in laying the first egg or the average age of the population in the achievement of 50% lay eggs. Already in 1981, was published study **(Ledeč, 1981)**, according to which sexual maturity of laying hens can be affected especially nutrition, but also by other factors.

Light breeds of hens begin egg laying at age 150 to 170 days, combined breeds aged 160 to 180 days. **Halaj and Chmelničná (1983)** reported that after reaching sexual maturity, the egg laying weekly doubles and the laying hens reach a peak (90 to 92%) between weeks 27 to 34 their age. Then the egg laying decreases to 55 to 65%, at age of the laying hens 72 to 82 weeks. The management of our experiment was scheduled at age of laying hens Moravia SSL 30 to 90 weeks. The egg laying intensity was observed 50% in a moment of the experimental 1st week (age of laying hens 30 weeks). Egg laying intensity 90 to 92% was not reached in the small-scale breeding conditions. In contrast, there are more data on egg laying hens with a statement **Halaj and Chmelničná (1983)**. High egg laying intensity of laying hens Moravia SSL was at their age between 39 to 63 weeks. At the end of the experiment, at age of laying hens Moravia SSL 90 weeks was decreased egg laying intensity at 26.19%, which represents almost half of egg laying intensity recorded at the beginning of the experiment. **Roubalová (2011)** characterized an egg laying intensity as very variable

Table 1 Egg laying intensity % according to weeks and for total experimental period.

Age of laying hens, weeks	Egg laying intensity, %	Age of laying hens, weeks	Egg laying intensity, %	Age of laying hens, weeks	Egg laying intensity, %	Age of laying hens, weeks	Egg laying intensity, %
30	50.00	**46**	54.76	**62**	45.24	**78**	23.81
31	66.67	**47**	59.52	**63**	73.81	**79**	21.43
32	61.90	**48**	61.90	**64**	59.52	**80**	23.81
33	59.52	**49**	64.28	**65**	50.00	**81**	23.81
34	71.43	**50**	73.81	**66**	50.00	**82**	21.43
35	59.52	**51**	64.28	**67**	54.76	**83**	21.43
36	64.,28	**52**	66.67	**68**	54.76	**84**	23.81
37	64.28	**53**	61.90	**69**	50.00	**85**	23.81
38	61.90	**54**	71.43	**70**	33.33	**86**	19.05
39	73.81	**55**	69.04	**71**	23.81	**87**	26.19
40	54.76	**56**	69.04	**72**	26.19	**88**	19.05
41	59.52	**57**	61.90	**73**	30.95	**89**	19.05
42	69.04	**58**	64.28	**74**	26.19	**90**	26.19
43	57.14	**59**	64.28	**75**	26.19		
44	50.00	**60**	61.90	**76**	30.95		
45	45.24	**61**	50.00	**77**	26.19		
						$\bar{x}$	48.24

$\bar{x}$ - mean

indicator that can be influenced by various factors. An indicator of egg production in the our experiment was studied under defined conditions for small-scale breeding, i.e. in alternative production system with free range, under defined conditions of nutrition and timing of investigation more than one year, from the end of October to the end of December of the following year. The beginning of the experiment was scheduled from age of laying hens Moravia SSL 30 weeks and winter feeding period. Thereby that has been extended investigation of egg laying intensity at laying hens Moravia SSL, our interest was concentrated to quality of this indicator in relation to breeding of the laying hens in the small-scale conditions. Typically, the egg production in the large-scale farms by **Halaj et al., (2002)** is described as the laying cycle 12 months for effective hybrids. The egg laying cycle by **Verhoef-Verhallen and Rijs (2003)** is finished with molting and after this period follows a phase of natural physiological rest. After molting, i.e. exchange of the feathers, the laying hen begins to lay the eggs and started the second a laying cycle. This laying cycle is characterized by lower egg production but egg weight is higher. In our experiment, we observed only the first laying cycle, nevertheless that investigation continued until the age of laying hens 90 weeks. There are the molting at these hybrids Moravia SSL was not observed. There was not molting process carried out. What was interesting in the investigation of egg production, sharply their number was decreased in the 70th week of age laying hens Moravia SSL. This age of laying hens falls into the autumn period. The results of our experiment can be related to the season, months of the year. Because the laying hens were daily in the free range, the influence of the season could also manifests in the egg production. And of course, a hybrid of hens and nutrition are important. **Pospišilová (2011)** reported that poultry has several specifications of the digestive tract. One of these characteristics is the crop, which is used for the collection of feed. Specificity is also the gizzard, which mechanically processed feed by small stones. Respecting of specifics of laying hens Moravia SSL and enabling of free movement in the free range, there was created the conditions for the implementation of natural activities, such as scratching, pecking and dust-bathing. **Verhoef-Verhallen and Rijs (2003)** emphasize a need of grit addition or egg shell. They must be separately in a dish. These additions to feed facilitate of mechanical processing of the feed and subsequent enzymatic utilization of nutrients. The authors also recommend the use of green fodder to feed mixture for laying hens. They also state that the laying hens can intake the green feed in the free range. The laying hens can rake and search small insects, such as earthworms, snails, larvae, and etc. Commercial brown-egg laying hens have the genetic potential to produce 26.5 kg egg mass per hen (405 eggs with average weight of 65.5 g) in a prolonged laying period of 16 months, with a feed conversion ratio of

Table 2 Average egg weight according to weeks of laying hens during experimental period.

Age of laying hens, weeks	$\bar{x}$, g	Age of laying hens, weeks	$\bar{x}$, g	Age of laying hens, weeks	$\bar{x}$, g	Age of laying hens, weeks	$\bar{x}$, g
33	70.00	**49**	65.00	**65**	65.00	**81**	75.00
34	72.00	**50**	65.00	**66**	66.66	**82**	-
35	61.25	**51**	68.00	**67**	71.25	**83**	70.00
36	63.33	**52**	71.25	**68**	67.50	**84**	65.00
37	66.25	**53**	75.00	**69**	65.00	**85**	72.50
38	71.25	**54**	65.00	**70**	72.50	**86**	70.00
39	71.25	**55**	69.00	**71**	70.00	**87**	70.00
40	60.00	**56**	62.50	**72**	72.50	**88**	70.00
41	63.75	**57**	72.50	**73**	75.00	**89**	70.00
42	65.00	**58**	65.00	**74**	67.50	**90**	70.00
43	63.33	**59**	66.25	**75**	70.00		
44	57.50	**60**	67.00	**76**	72.50		
45	62.50	**61**	61.66	**77**	75.00		
46	65.00	**62**	71.25	**78**	67.50		
47	60.00	**63**	68.33	**79**	-		
48	60.00	**64**	70.00	**80**	70.00		
						$\bar{x}$	65.44

$\bar{x}$ - mean

2.1 kg feed per kg egg mass **(Lohmann Tierzucht, 2011)**. The genetic potential of birds to efficiently convert feed nutrients into eggs and poultry meat for human consumption can be fully exploited when birds are well managed, remain healthy and receive highly digestible, concentrated and well-balanced feed rations **(Jeroch et al., 2013)**. The challenges for commercial poultry diets formulation are to optimize feed composition based on limited choice of raw materials and limited inclusion rates, and to eliminate antinutritional factors. In our experiment, fresh kitchen remnants were added to feed mixture on the basis of literary knowledge by **Malík (1995)**. Such regulation of feed ration increases a tastiness and utilization of the nutrients from feed. The laying hens take feed from two longitudinal, wooden feeders on the floor in the hen house. Width feeders allowed simultaneously to intake of feed from feeders for all laying hens.

Selected physical indicators of egg quality

Average egg weight according to experimental weeks

In the production of table eggs attention is paid to physical variables in relation to their quality **(Halaj et al., 2002)**, which include the weight of the eggs. The laying hens Moravia SSL, according to the results of our experiment, laid the eggs by individual weeks 33-90 weeks of age about average weight from 57.5 to 75.0 g. At present, the farms are used types of hybrid combinations, such as the Isa Brown, in contrast to the SSL Moravia laying hens, which were used in our experiment. Isa Brown is hybrid combination of color sexing type with a lower live weight. In experiment of **Angelovičová et al. (2013)** these laying hens reached an average egg weight during whole cycle 62.30 g. A slight increase of eggs can be achieved adjusting the diet. The feed additives may be. **Arpášová et al. (2012), Angelovičová et al. (2013)**, found a tendency to increase egg weight after application of probiotics in the feed of laying hens compared to the control group. Differences between groups were not statistically significant ($p < 0.05$).

Average body weight of laying hens Moravia SSL

At the beginning of our experiment reached laying hens Moravia SSL aged 30 weeks on average body weight 1.92 kg and at the end of the experiment at age 90 weeks 3.08 kg. In hens were not observed in the incidence of parasites in the lips, disease and death.

Selected physical and chemical parameters of egg quality at age of laying hens 60 weeks

When laying hens Moravia SSL achieved 60 weeks of age, it was selected 10 pcs of eggs to determine the weight of the individual egg components and protein and fat of egg mass.

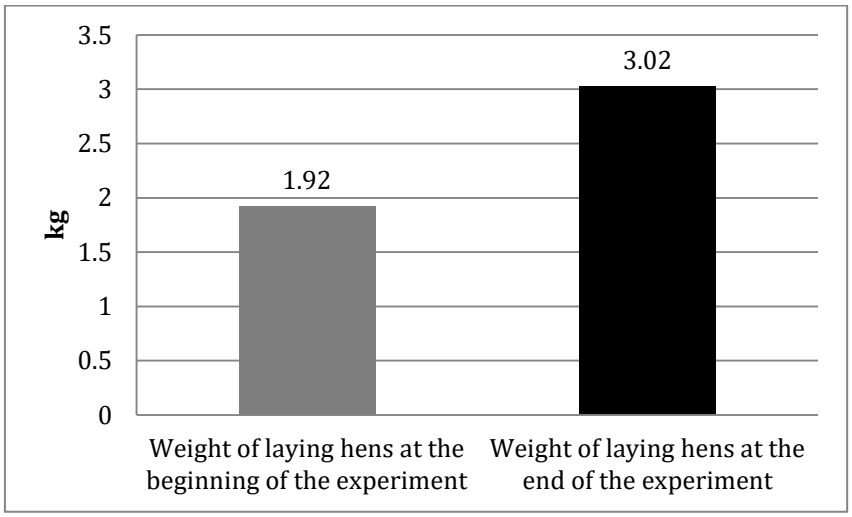

Figure 1 Average body weight of laying hens Moravia SSL.

Table 3 egg weight, albumin weight, yellow weight and eggshell weight of laying hens Moravia SSL at age 60 weeks.

Indicators	$\bar{x}$	SD	c_v, %
Egg weight, g	65.46	3.26	4.98
Albumin weight, g	41.21	2.12	5.14
Yellow weight, g	17.82	0.75	4.21
Eggshell weight, g	6.27	0.31	5.01

$\bar{x}$ - mean, SD - standard deviation, c_v - coefficient of variation

Table 4 Content of crude protein and fat in egg mass.

Indicators	$\bar{x}$, g.100^{-1}	SD, g.100^{-1}	c_v, %
Dry matter content	25.08	0.21	0.86
Fat content	11.30	0.31	2.75
Crude protein content	12.39	0.26	2.13

$\bar{x}$ - mean, SD - standard deviation, c_v - coefficient of variation

Age of laying hens 60 weeks **Halaj et al. (2002)** indicate as the second phase of the laying cycle, namely, it is the second half of the second phase of the laying cycle. Eggs are classified as the "food protein group". Eggs contain high quality protein, with 100% of chemical score (essential amino acid level in a food protein divided by the level found in an "ideal" food protein), 97% of egg protein being digestible and 94% of biologic score (a measure of how efficiently dietary protein is turned into body tissue) **(McNamara and Thesmar 2005; WHO/FAO/UNU, 2007)**. The eggs are an important source of nutrients due to their high quality protein **(Samooel et al., 2011)**. The eggs are low in fat (5.3 g fat per egg). Overall, 50 g edible portion of a boiled egg has an energy value of 324 kJ (77.39 kcal) and the consumption of one egg daily would contribute only around 5% of the average energy requirement e.g. of a child aged 6 years in a 5.86-6.70MJ (1400 to 1600 kcal) diet **(Kliegman et al., 2011; USDA 2012)**. In terms of preservation of hygienically safe content egg, an egg mass, it is increasing attention paid to the egg shell quality as to natural packaging. Many factors have been found to affect eggshell quality, such as disease, nutritional status of the flock, heat stress and age **(Roberts, 2004)**. A decrease in eggshell quality of older hens has been reported by **Elaroussi et al., (1994)**. Egg production rate decreases and egg weight increases as age advances, also egg composition change and shell thickness decrease with production level and age of laying hens **(Summers and Leeson, 1983; Seeland et al., 1995; Machal and Simeonovova, 2002)**. An egg shell quality is affected by many factors. **Halaj et al., (2002)** divided into several groups, such as physiological, pathological, nutritive factors, and breeding environment. The quality of the egg shell plays an important role in the production of eggs in small scale conditions for the application of the principles of welfare. Laying hens Moravia SSL old 60 weeks in our experiment achieved an average weight of egg shells 6.27 g, with variation of the values expressed as a coefficient of variation 5.01%. **Halaj et al., (2002)** points out that the biggest effect on the egg shell quality has from environmental factors mainly mineral nutrition of laying hens (calcium, phosphorus), especially at the end of egg laying. Egg shell formation by these authors is formed 19 to 21 hours. Because the egg shell is a natural packaging of an egg contents, it plays an important role in maintaining its hygiene and health safety. An interesting knowledge of an egg whites indicate **Velíšek and Hajšlová (2009)**, that the fraction ovotransferin exhibits antimicrobial effects. The egg proteins consist, essentially, 40 different proteins, among which a significant antimicrobial activity has lysozyme **(Rao et al., 2012)**. The average weight of egg white is 41.21 g according to our measurements for whole experimental period. Egg yolk is an important source of highly nutritional and functional ingredients in a wide variety of food products **(Jaekel et al., 2008)**. The content of individual nutrients in egg yolk can be influenced by various factors Nutrition **(Kočí and Kočiová; 1999 Kotrbáček, 2010)**. When laying hens Moravia SSL achieved an age 60 weeks, a weight yolk their eggs was 17.82 g.

The fat content of an egg mass was 11.3 g.100^{-1} and protein 12.39.g.100^{-1}. These two indicators of the chemical composition of an egg masses are significant in terms of nutritional value of the egg. The aim of poultry nutrition is to convert feed protein to egg and poultry meat proteins. According to calculations, the conversion ratios of dietary protein to edible protein are 33% in eggs (opposite 26% in broiler meat) **(Jeroch et al., 2013)**. The ten 'General Principles for the Welfare of Animals in Livestock Production Systems' adopted by the World Organization for Animal Health provide a framework to guide the development of specific animal welfare standards for various animal species. The principles are based on decades of multi-disciplinary research relevant to animal welfare. Research on animal welfare complements work in traditional fields to provide a more comprehensive scientific basis for the care and management of animals **(Fraser et al., 2013)**. The table eggs from conditions of small-scale breeding are an important source of foodstuffs for the population, especially in rural areas. It must be given to this source of table eggs for human nutrition the highest quality and health safety too.

CONCLUSION

The table eggs from conditions of small-scale breeding are an important source of foodstuffs for the population, especially in rural areas. It must be given to this source of table eggs for human nutrition the highest quality and health safety too. The present study was a contribution of investigation the welfare of laying hens Moravia SSL housed in small-scale hen house with free range, behavior, egg production and selected physical indicators of eggs and chemical indicators of egg mass. The welfare principles were applied in the breeding conditions. An egg laying has been affected by the season of year. An egg weight, fat and protein content of egg mass were in accordance with the general requirements of the quality of table eggs.

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