ABSTRACT

Keywords: guineafowl, hatching, quality, proteins

The demographic explosion expected for the third millennium will raise issues related to providing food for the entire population.

In this context, animal husbandry will gain new value, given the importance of animal products in human nutrition (Popova et al., 2017).

Among the products provided by the livestock sector, poultry is in the preferences of consumers around the world, poultry and poultry eggs being appreciated for their high nutritional value, but also for the affordable prices at which they can be purchased (Popova et al., 2017).

Ensuring the need for commercial hybrids to obtain the two types of production requires well-developed breeding sectors, in which to integrate high-performance incubation stations, capable of providing applicants or day-old chicks of the best quality (Popova et al., 2017).

Currently, meat and eggs obtained from birds are made in industrial systems of high productivity, but their quality is increasingly challenged by modern consumers (Popova et al., 2017).

For this reason, there are more and more demands for meat or eggs from other bird species than the classic ones, or from other breeding systems than the superintensive ones (Popova et al., 2017).

Guinea fowls, along with quails and partridges, have only recently been exploited on intensive principles, both for meat and egg production (Popova et al., 2017).

The intensive exploitation of guinea fowls has wide development prospects, due to the growing consumer demand for meat and eggs obtained from this species, but also for a number of valuable biological properties (Popova et al., 2017).

Compared to those presented, through this doctoral thesis we aimed to study the external and internal quality indicators specific to gray guinea fowl eggs (Numida meleagris), as well as the technical performance obtained when using artificial incubation for this category of eggs.

In order to achieve the proposed purpose, respectively, of elaborating a general package with information regarding the gray guinea fowl eggs, both eggs obtained from extensively bred specimens (predominantly in our country) and guinea fowl eggs reared under intensive systems.

The egg quality was assessed in terms of physical and morphological indicators (weight, size index, density, specific gravity, shell thickness, shell resistance to breakage, egg white index, yolk index, Haugh index, yolk color and carotenoid content of the yolk) , as well as those relating to the chemical composition of egg whites and yolks (water content, dry matter, proteins, fats, total minerals, trace elements, macroelements, fatty acids, omega 3 and omega 6 fatty acids, as well as cholesterol) .

Physico-morphological quality indicators of gray guinea fowl eggs (Numida meleagris)

The weight of the eggs laid by the guinea fowl reared in an extensive system was 44.84 g (43.04-46.54 g), and those obtained from the intensively reared specimens were 48.68 g (48.34-49.22 g).), resulting for the studied population an average weight of 46.76 g.

The egg size index recorded values between 75.36% (74.58-76.11%) as it was for eggs from the extensive system and 76.13% (75.77-76.62%) for those from the intensive system, the average for the study population being 75.75%.

The density of eggs was, on average, 1,091 with limits between 1,089 as determined in the eggs of extensively system (1,085-1,095) and 1,093 in those exploited in the intensive system (1,087-1,097), while the specific weight was average of 1.0935 with limits between 1.094 in the guinea fowl reared in the extensive system (1,086-1,101) and 1,093 in those in the intensive system (1,090-1,097).

For the gray guinea fowl grown in the studied area, an average mineral shell thickness of 0.35 mm resulted, with better values than those exploited in an extensive system (0.37 mm vs. 0.33 mm) and a resistance to shell cracking of 0.335 kg f/cm^2, with higher levels also in the extensively reared specimens (0.36 kg f/cm^2 vs. 0.31 kg f/cm2).

In contrast, the eggs of intensively reared guinea fowls were determined to have a better egg white index (0.143) than those of extensively reared (0.139), the average value being 0.141, which is also true for the yolk index (0.50 for eggs from the intensive system and 0.44 for those from the extensive system), the average value in this case being 0.47.

A similar situation was found for the Haugh index, whose values were 81.48 U.H. (78.63-83.87 U.H.) in eggs laid by extensively rearead guinea fowls and 83.66 U.H. (82.85-84.17 U.H.) to those obtained from intensively reared guinea fowls, the average value established for the studied population being 82.57 U.H.

The color of the yolk was more intense in the guinea fowls rearead under extensive system (12.47 units of La Roche) than in those exploited on intensive principles (11.33 units of La Roche), so that the carotenoid content of the yolk was higher in eggs from the extensive system (25.93 µg vs. 23.67 µg); the average values of the two resulting parameters for the studied population were 11.90 La Roche units and 24.80 µg, respectively.

The chemical composition of egg white in gray guinea fowl eggs (Numida meleagris).

Egg whites harvested from guinea fowl grown in extensive system were characterized by a higher dry matter content (15.06% vs. 14.81%), hence a higher level of protein (10.56% vs. 9.55%), lipids (1.43% vs. 1.17%) and total minerals (0.69% vs. 0.55%); intensively reared guinea fowls eggs had a higher content only in non-nitrogenous extractive substances (3.14% vs. 2.38%).

For the egg whites obtained from the gray guinea fowls population, the average contents were 85.07% for water, 14.93% for dry matter, 10.05% for protein, 1.30% for lipids, 2,76% for non-nitrogenous extractive substances and 0,62% for total mineral substances.

The macroelements in egg whites were at average levels of 0.117% for calcium (0.120%-eggs from the extensive rearing system; 0.113%-eggs from the intensive system), 0.152% for phosphorus (0.157% and 0.147% respectively), 0.127% for magnesium (0.130% and 0.123% respectively), 1.50% for sodium (1.523% and 1.477% respectively) and 1.207% for potassium (1.217% and 1.196%).

The dosage of microelements in the egg white harvested from the studied guinea fowls population showed average contents of 0.210 mg/100 g in the case of copper, 18.377 mg/100 g in the case of iron and 2.635 mg/100 g for zinc.

In the studied guinea fowl population, the total fatty acid content of egg white was 98.828 g/100 g (99.182 g/100 g for eggs in the extensive system and 98.474 g/100 g for eggs in the intensive system), of which 29.412 g FA/100 were saturated fatty acids (29.541 g/100 g and 29.282 g/100 g, respectively), and 68.914 g FA/100 g unsaturated acids (69.115 g/100 g and 68.712 g/100 g, respectively); the ratio of saturated fatty acids to total unsaturated fatty acids (SFA/UFA) averaged 0.427 (0.427 for extensively

farmed eggs and 0.426 for intensively farmed eggs) and the ratio of polyunsaturated to monounsaturated fatty acids (PUFA/MUFA) of 0.727 (0.717 and 0.737, respectively).

The content of omega 6 acids in egg whites was 26.538 g/100 g (26.731 g/100 g in eggs obtained in the extensive system and 26.344 g/100 g in those from the intensive system), and that of omega 3 acids in 1.687 g/100 g (1.731 g/100 g and 1.642 g/100 g, respectively), so that the ratio between them was 15.741 (15.440 and 16.041, respectively).

The chemical composition of the yolk at gray guinea fowl eggs (Numida meleagris).

For the eggs from the studied guinea fowls, an average content of 51.89% for the dry matter of the yolk (51.98%-eggs in the extensive system; 51.80%-eggs in the intensive system), of 17.32% for protein (17.47%-extensive system; 17.17%-intensive system), 31.49% for lipids (32.04%-extensive system; 30.94%-intensive system), 1.88% for non-nitrogenous extractive substances (1.23%-extensive system; 2.52% -intensive system) and 1.21% for mineral substances (1.24%-extensive system; 1.17%-intensive system).

The macroelements were determined in proportions of 0.048% (magnesium), 0.122% (sodium), 0.263% (potassium), 0.275% (calcium) and 1.30% (phosphorus), while for the microelements they were determined amounts of 1,822 mg / 100 g (copper), 93,589 mg / 100 g (zinc) and 133.70 mg / 100 g (iron).

The total content of fatty acids was higher in the eggs of guinea fowls reared extensively than in those intensively exploited (100.533 g/100 g vs. 98.871 g/100 g), but also that of saturated fatty acids (42.71 g/100 g vs 41.96 g/100 g). For guinea fowl eggs from the two rearing systems, an average fatty acid content of 99.702 g/100 g yolk resulted, of which 42.335 g/100 g yolk were saturated acids; the SFA/UFA ratio was 0.744 and the PUFA/MUFA ratio was 0.695.

Omega 6 fatty acids were determined in average amounts of 19.305 g / 100 g yolk (19.520 g / 100 g-eggs in the extensive system; 19.090 g / 100 g-eggs in the intensive system), those of omega 3 in quantities of 3.687 g / 100 g yolk (3,913 g / 100 g-extensive system; 3,461 g / 100 g-intensive system), the ratio between them being very good, 5,255 (4,993-eggs in the extensive system; 5,516-eggs in the intensive system) .

Cholesterol was determined in quantities of 2,284 g / 100 g yolk, with limits between 2,336 g / 100 g in the eggs of extensively bred guinea fowl and 2,232 g / 100 g in those in the intensive system.

Incubation performance of gray guinea fowl eggs (Numida meleagris).

At the level of the studied gray guinea fowls population, the fertility of the eggs registered an average value of 78.73%, but with limits between 74.25% as it was for the guinea fowls reared in extensive system and 83.20% for those intensively reared; There were also differences between the farms where the eggs came from, higher for those with an extensive regime (the minimum was 72.35% and the maximum was 76.42%) and smaller for those with intensive system (the minimum was 82.12%, and a maximum of 84.55%).

In the eggs obtained from the extensive rearing system, an embryonic mortality of 22.22% was registered, compared to only 14.90% as it was in those deposited by the guinea fowls reared in the intensive system; the average embryonic mortality established for eggs from the studied guinea fowls population was 18.56%.

More importantly, the 2nd incubation regimen resulted in the lowest embryonic mortality, at only 17.08% (20.33%-for eggs from the extensive system; 13.82%-for eggs from the intensive system), and the

regime no. 1 incubation the highest proportion of eggs with dead embryos, 20.33% (24.39%-eggs from the extensive system; 16.26% -eggs from the intensive system).

This state of affairs also affected the share of total losses during incubation, which was only 32.84% for eggs to which the regime no. 2 of incubation, of 42.68% for those incubated according to the regime no. 3 and 46.75% for eggs subject to the regime no. 1 of incubation.

The best hatching percentage (75.13%), but also the highest hatchability percentage (60.16%) was recorded for eggs incubated according to regime no. 2 of incubation, although there were large differences between eggs obtained in the extensive system (hatching = 67.74%; hatchability = 51.21%) and those from the intensive system (hatching = 82.52%; hatchability = 69.11%).

The incubation regime highlighted above (no. 2) also led to the obtaining of the highest proportion of chickens classified in quality class I, of 89.43%, with limits between 87.3% as it was for the eggs laid by the guinea fowls reared under extensive system and 91.56% to those exploited in an intensive system.

Afore head mentioned informations regarding the quality parameters and incubation performances of the eggs provided by the gray guinea fowl (Numida meleagris) reared under our country's conditions we recomand:

- intensive rearing of reproduction guinea fowl in order to obtaine eggs with superior quality prameters
- the second incubation regimen elaborated by us has proved its efficency due the hatching capacity and quality of the obtained keets, therefore we propose the application of it in artificial incubation of guinea fowl eggs
- the continuation of the research regarding the nutritional value of guinea fowl eggs with long term view to integrate them in human daily in take as an alternative to hen eggs