QUALITY OF POWDER EGG STORED IN DIFFERENT CONDITIONS

Roxana Nicoleta Raţu[1], M.G. Usturoi[1], Aida Albu[1]

[1]*University of Agricultural Sciences and Veterinary Medicine from Iasi, Romania*

Abstract

The current paper aims with the powder egg quality (integral powder) stored in conditions imposed by producer (Lc powder egg packed in polyethylene bags, stored at temperature of +4°C and MC=80%) and powder egg stored in nonconforming conditions (Lexp-1 powder egg packed in polyethylene bags, stored at room temperature t=+22÷+32°C and MC=50÷70% and Lexp-2 powder egg packed in paper bags, stored at room temperature t=+22÷+32°C and MC=50÷70%), storage time being 150 days. The analysed parameters were pH value, solubility, content in water, dry matter, proteins and fats. pH values recorded for fresh product (day 0), in comparison with the ones determined at the end of those 150 storage days were higher with 0.99% at powder egg samples from lot Lc, with 7.18% at lot Lexp-1 and with 8.28% at lot Lexp-2. Regarding solubility of powder egg, obtained values at the end of those 150 storage days were lower with 4.20% at lot Lc, with 8.84% at lot Lexp-1 and with 25.55% at lot Lexp-2, in comparison with the specific levels of fresh product. Experimental factors affected only water content of product and the one in dry matter without inducing modifications at the level of analysed components (proteins, fats). Effectuated investigations lead to the conclusion that packing modality, and also the assured factors during storage influenced the quality indicators reaching to depreciate the product in a quite short time.

Key words: quality, raw milk, acidity, protein

INTRODUCTION

Eggs are appreciated both for their high nutritional value and very large range that can be prepared and consumed. The major problem of these foods is the relatively short period in which keeps shelf life, reason for having been put in place various methods of preservation.

So for example, keeping the eggs in the refrigeration system of maintaining their initial quality for a long period, but subject to specific storage factors. Another method is the conservation of eggs in the form of powder (or blend of components) that is based on the extraction of water content in various drying processes; egg powder has a very good stability during storage and high solubility capacity for use.

MATERIAL AND METHOD

pH value of egg powder was measured with a pH electronic oximeter, by immersing the electrode in an aqueous extract (10 g in 100 ml distilled water and allowed for 20 minutes at room temperature and then filtered).

Egg powder solubility (%) is the assessment of the residue by centrifugation after a certain amount of reconstituted egg powder (in a 10 cm^3 test tube inserted reconstituted egg powder, is closed by a stopper and is maintained for 5 minutes in a water bath heated to +65... + 70°C, after being removed from the sea bath, the tube is shaken vigorously and centrifuged 5 minutes at 1000 revolutions / minute. At the end of the tube and centrifuge it turns out upside down, then notes that there is division in residue limit; If the surface is horizontal, average between the highest and lowest. A residue volume of 0.1 ml corresponding to 1% solubilised substances).

The water content (%) was determined by oven drying method. *The dry matter content (%)* was determined by a calculation using the formula existing literature.

Regard to *protein content (%),* which was determined using Kjeldahl method which is based on the following principle: the combination of organic nitrogen by heating

*Corresponding author: roxana.ratu@gmail.com
The manuscript was received: 17.01.2015
Accepted for publication: 20.01.2015

with concentrated sulphuric acid in the presence of a catalyst, is converted to ammonium sulphate.

Fat content (%) was determined using the method Soxhlet and the extraction was made with a device model Scientific Velp - SER 148.

The data were statistically interpreted, differences between groups were calculated using Fisher's exact test, following the identification of differences to be determined by the test STUDENTS.

RESULTS AND DISCUSSIONS

The dynamic analysis of pH for whole egg powder studied revealed its growth from one stage to the next control, under the influence of microclimate insured, and the type of packaging used.

So for example, in the case of fresh powder egg (before being subjected to the storage process), the pH value of Lc-1 batch was 8.12 ± 0.04 (minimum 8.00 and maximum 8.20) in Lexp-1 batch was 8.08 ± 0.04 and in batch Lexp-2 8.09 ± 0.05 (calculated minimum is 8.00, and the maximum 8.24).

The study character showed a very good homogeneity in the batch, the proof being the coefficient of variation values of only 1.03 to 1.40% (fig. 1).

With space at the end of time for the experience (day 150), we find that the average pH - Lc-1 of the batch was 8.20 ± 0.01, a minimum of 8.18 and maximum of 8.22. Regarding the coefficient of variation, calculated value was 0.20%, which confirms a very good homogeneity within the batch.

At the batch Lexp-1, the pH was 8.66 ± 0.02 with a range of variation between 8.59 and 8.70; and for this batch, the character study showed a very good homogeneity, the coefficient of variation was 0.50%. The batch Lexp-2, the average pH value was 8.76 ± 0.02 with a range of variation ranging from 8.69 to 8.80; coefficient of variation was 0.49%, resulting a very good homogeneity. It should be mentioned that from the 30th day until the end control experience between groups were no significant differences (fig. 1).

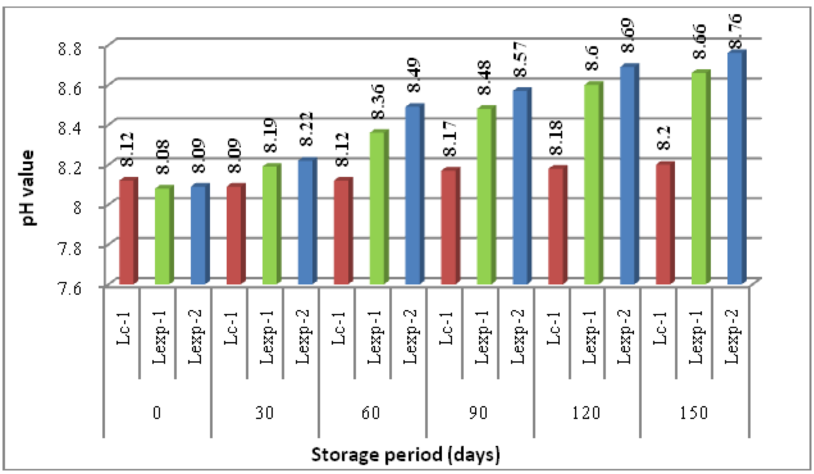

Fig. 1 pH evolution of powder egg

Egg powder solubility for our study decreased from a phase control to another, under the influence of storage conditions provided.

Thus, in the case of the fresh product, the solubility was 90.4 ± 0.51% in batch Lc-1, 90.4 ± 0.68% in batch Lexp-1 and 90.8 ± 0.58% for the last on.

The study character showed a very good homogeneity in the batch, the proof being the coefficient of variation values of only 1.26 to 1.68%. In statistical terms, this period was not shown statistically significant differences (Fig. 2). On day 90 of storage were determined average values of solubility of 90 ± 0.71% in batch Lc-1, 87.2 ± 1.16% in batch

Lexp-1 and only 80 ± 0.71% in Lexp-2 batch. At this time, the statistical differences between the groups were highly significant.

At the other controls found progressive reduction of solubility product analyzed so that at the end of investigations (day 150 of storage), the values set for this quality parameter ranged from 89.6 ± 0.81% levels in group Lc-1, 82.4 ± 0.51% in group Lexp-1 and 67.6 ± 0.51% only in group Lexp-2. The statistical differences between the three groups were highly significant.

Regarding the coefficient of variation, and the last stage of control were found very low values (V% = 1.38 to 2.03), which indicates homogeneity in each batch analyzed character.

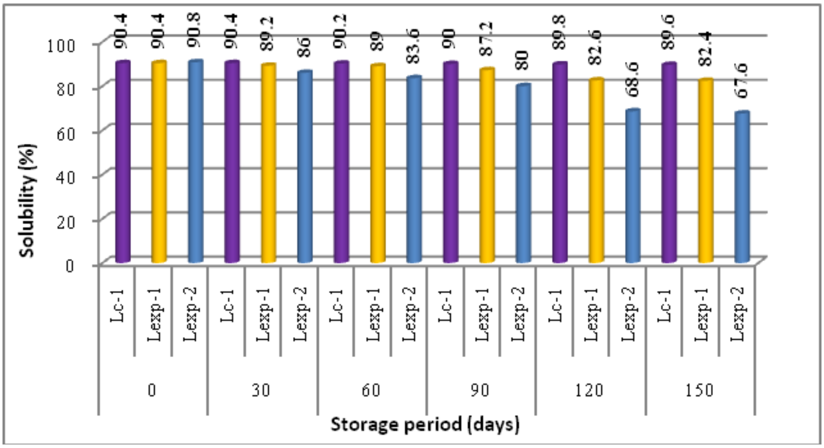

Fig. 2 Solubility (%) of powder egg

Regarding the water content determinations carried out on fresh whole egg powder, revealed the average values of 4.93 ± 0.07 in the group Lc-1 and 4.94 ± 0.07 in the groups Lexp-1 Lexp -2; character study showed a very good homogeneity for all three groups analyzed (V% = 0.65 to 0.82). Humidity egg powder increased from a control stage to another, more obvious in the case of Lexp-2 batch (packaging paper bags) (fig. 3).

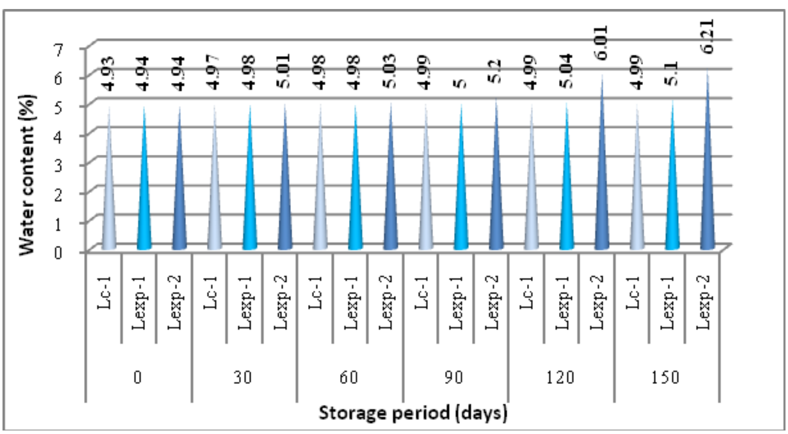

Fig. 3 Water content (%) in powder egg

Differences between groups were increased in parallel with storage so that the end experience (day 150 of storage), the water content of the product tested showed an average of 4.99 ± 0.07% in group Lc-1, 5.10 ± 0.07% in group Lexp-1 and 6.21 ± 0.03% in group Lexp-2 (Fig. 3).

At the end of this stage of control, uniformity of character within each group remained at good levels. The latter control were highlighted significant differences between the groups Lc-1 vs Lexp-1 and highly significant between groups Lc-1 vs Lexp-2.

Naturally, the dry matter content of whole egg powder studied by us showed a decreasing trend, while increasing water content in the product reaching the end of storage at average of 95.01 ± 0.07 % in group Lc-1, 94.90 ± 0.07% in group Lexp-1 and 93.79 ± 0.03% in group Lexp-2 (fig. 4).

Like in the case of water content, the differences were significant separate loads Lc-1 vs Lexp-1 very significant loads Lc-1 vs. Lexp 2.

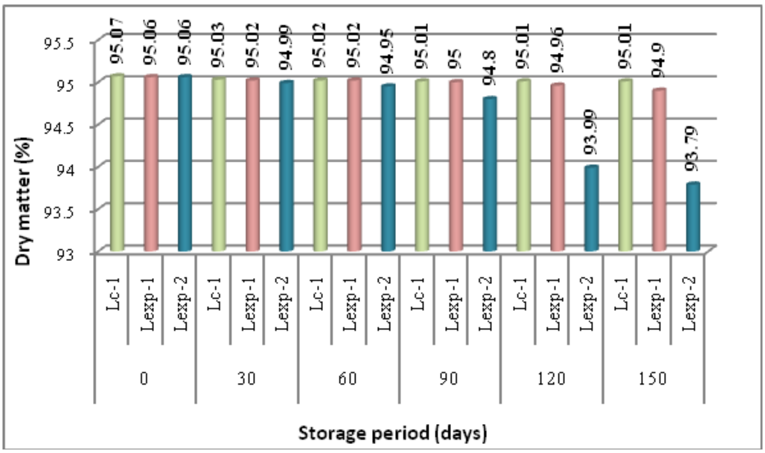

Fig. 4 Dry matter content (%) in powder egg

Egg protein powder analysis revealed maintain them at a constant level throughout the period of determination.

So for example, in the case of fresh egg powder, protein content was 47.62 ± 0.09% in batch Lc-1 (V% = 0.08), 47.62 ± 0.08% in batch Lexp-1 (V = 0.08%) and 47.62 ± 0.07% in batch Lexp-2 (V% = 0.07). Between experimental groups there were no statistically significant differences (fig. 5).

The situation has remained similar to the following controls so that the 150th day of storage were determined protein levels of 47.64 ± 0.06% in group Lc-1, 47.63 ± 0.07% Lexp-1 batch and 47.64 ± 0.07% in batch Lexp-2 batch Lexp-2 34.10 ± 0.07% (V% = 0.09%). Character analyzed showed a very good homogeneity within batch coefficient of variation was from 0.06 to 0.07%. Statistical analysis of the data revealed no statistically significant differences between groups at any of the testing during product storage study.

For the fat content, as a result of the determination made by fresh egg powder found a mean of 33.99 ± 0.05% in batch Lc-1, of 34.01 ± 0.04% in batch Lexp-1 and 34.02 ± 0.02% in group Lexp-2 (Fig. 6). After 150 days of storage, as well as in the earlier controls, there were no statistically significant differences between the mean of the three groups studied. Thus, the batch mean value Lc-1 was 34.06 ± 0.05% (V% = 0.07%) in group Lexp-1 34.09 ± 0.07% (V% = 0.09%), and in Lexp-2 batch the mean value was 34.10±0.11%.

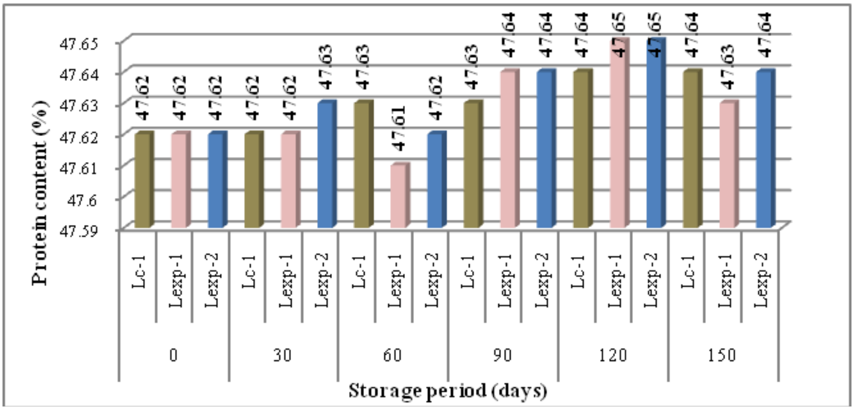

Fig. 5 Protein content (%) in powder egg

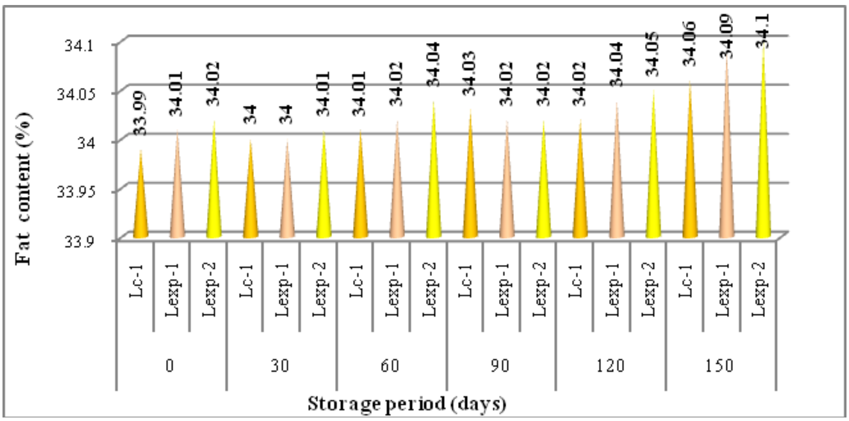

Fig. 6 Fat content (%) evolution in powder egg

CONCLUSIONS

Following research on whole egg powder was concluded that he had performed some changes in physical and chemical indicators of quality, depending on experimental factors insured (how packaging and storage conditions has been achieved).

Compared with the pH values registered on the fresh product determined at the end of the 150 days of storage was 0.98% higher in samples which comprises powdered egg batch Lc-1 (packing in polyethylene bags and storage under refrigeration) with 7.17% in group Lexp-1 (polyethylene packaging and storage bags in the environment) and 8.28% in group Lexp-2 (packaging paper bags and storage room temperature).

Regarding the solubility of the egg powder, the values obtained at the end of the 150 days of storage showed changes more or less pronounced under the influence of the experimental factors, which is less than 0.88% in batch Lc-1, 8.85% in group Lexp-1 and 25.55% in group Lexp-2 levels compared to fresh product specific

Experimental factors (type of packaging and storage conditions) only affected the water content of the product and hence on the dry matter, without inducing changes in the components (proteins, fats).

ACKNOWLEDGEMENTS

This paper was *published under the frame of* European Social Fund, *Human Resources Development Operational Programme 2007-2013, project no.* POSDRU/159/1.5/S/132765.

REFERENCES

[1] Baron, F. et all., Effect of dry heating on the microbiological quality, functional properties, and natural bacteriostatic ability of egg white after reconstitution, J Food Protect, (66), 852-835, 2003.
[2] Baron, F., Jan, S. and Jeanter R., Qualité microbiologique des ovoproduits, Science et technologie de l'oeuf et des ovoproduits: de l'oeuf aux ovoproduits, Lavoisier, Paris, pp. 319 – 345, 2010.
[3] Cherian, G. and Sim, J. Egg yolk vitamine, polyunsaturated fatty acids and supplement dietary fat alters the tocopherol status of posthatch chicks. Poultry Science, no. 76, pg. 1753-1759, 1997.
[4] Cotterill, O.J., and Glauert, J.,L,. Nutrient values for shell, liquid/frozen and dehydrated eggs. J Food Protec, 63 940-944, 1979.
[5] Nys, Y. Dietary carotenoids and egg yolk coloration. A review. Arch. Geflugelk., 64, 45 – 54, 2000.
[6] Sauveur, B. Structure, composition et valeur nutritionnelle de l'oeuf, 347-374; Qualité de l'oeuf, 377-433. In: Reproduction des volailles et production d'oeuf,. INRA (eds), 449p., Paris, 1988.
[7] Usturoi, M.G. Dynamics of comsumption eggs quality, according to the storage period. Lucrări Ştiinţifice, Seria Zootehnie, vol. 51, pg. 1004-1011. Editura Ion Ionescu de la Brad Iaşi. ISSN: 1454-7368, 2009.