RELATIONSHIP BETWEEN ORGANIC MATRIX COMPOSITION AND ULTRASTRUCTURE OF EGGSHELL IN SOME LOCAL BREEDS OF CHICKENS

By

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B.Sc. Agric. Sc. (Poultry Production), Ain Shams University, 2003

M.Sc. Agric. Sc. (Poultry Breeding), Ain Shams University, 2007

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ABSTRACT

Lamiaa Mostafa Abd El- Monam Radwan: Relationship between Organic Matrix Composition and Ultrastructure of Eggshell in Some Local Breeds of Chickens. Unpublished Ph.D., Department of Poultry Production, Faculty of Agriculture, Ain Shams University, 2010.

The main goal of this study was to examine the relationship between ultrastructural and organic matrix in Fayoumi and Dandarawi chicken breeds. This study was to assess mechanical properties at different age (24, 30, 36 and 42 weeks of age, ultrastructure and organic matrix estimated at 30 weeks of age. The results showed that the Fayoumi eggs had significantly higher specific gravity and mechanical properties values (thickness and breaking strength of eggshell) than that of Dandarawi ones. With respect to ultrastructural traits, it could be noticed that the relative palisade layer (effective thickness) of Fayoumi eggs was significantly higher than that of Dandarawi ones. Opposite trend was noticed for relative cap layer. Concerning ultrastructural variants, the Fayoumi eggs owned shells with significantly higher values of confluence and cuffing traits. Conversely, the Dandarawi eggs have superior values of fusion, alignment and type B's traits than Fayoumi ones. The Fayoumi breeds benefit good structure properties and organic component compared to Dandarawi ones so the Fayoumi breed had a high resistance broke shell than Dandarawi breeds.

Fayoumi eggs noticed that the ovocleidin 116 osteopontin and ovocleidin-17 high intensity compared to Dandarawi eggs. While, both ovotransferrin and ovalbumin was increase intensity from Dandarawi than Fayoumi eggs. Conclusion that ovocleidin 116 and osteopontin may be relationship with good ultrastructure of eggshell. While, ovotransferrin and ovalbumin may be

relationshiped whit low ultrastructure of eggshell. The Fayoumi breeds benefit good structure properties and organic component compared to Dandarawi ones

Key Words:

Eggshell quality traits, eggshell ultrastructural, organic matrix, Fayoumi breed, Dandarawi breed.

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INTRODCTION

The eggshell is essential for propagation of all avian species; it is a sophisticated structure, whose properties reflect perfectly their crucial functions in reproduction. These functions are basically: (a) to protect the contents of the egg from the microbial and physical environment; (b) to control the exchange of water and gases through pores during the extra-uterine development of the chick embryo; (c) to provide calcium for embryonic development once the yolk stores are depleted. In order to meet these requirements, the eggshell must be a porous ceramic material. It must be as light as possible, and balances the requirement for strength to resist the impact of predators while permitting the hatching embryo to break through from the inner side to escape. For the same reasons, it must be of low chemical and biological activity on the outer surface, but easy to dissolve at the inner surface. This eggshell is rapidly formed at physiological temperatures. All these features are simultaneously present in the remarkable eggshell, which seems to be designed ad hoc, but is certainly the result of an evolutionary process. All avian eggshells share the same mineral component, namely the trigonal phase of calcium carbonate (CaCO3), known as calcite, which is the more stable polymorph at room temperature. The avian eggshell forms in a confined space, the distal segment of the hen oviduct, in an acellular uterine fluid that is supersaturated with respect to calcium and bicarbonate and contains the organic precursors of the shell matrix. Its distinctive features, as compared to bone or teeth, are the nature of the mineral deposit-calcium carbonate in the form of calcite, as well as the absence of cell- directed assembly during its fabrication upon organic cores present on the outer surface of the eggshell membranes. The thickness of the eggshell, the form and size of the whole

eggshell and its structural elements, as well as features of the porous system varies among different species; however, the general structure of the eggshell is basically the same in all birds. The main goal of this study was to examine the relationship between ultrastructural and organic matrix in Fayoumi and Dandarawi chicken breeds.