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OBSERVATIONS ON THE CAUSE OF WINDOWED EGGS[1]

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ABSTRACT Experiments were conducted to study factors associated with the incidence of windowed eggs. Breaking strength and specific gravity of severely windowed eggs were lower than those of control eggs. When pressure was applied to windowed eggs 66.3° broke directly along the window, indicating that the windows were weaker than other parts of the shell. Windows are artificially produced on eggs with a cuticle and on eggs in which the cuticle had been previously removed. The results also indicate that cracked eggs with windows along the edge of the crack were cracked within minutes after the egg was laid.

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INTRODUCTION

TRANSLUCENT streaks or windows in eggs are causing concern to the poultry egg producer. Translucent streaks were first described by Denison (1967). However, it has been known for years that eggs often show translucent areas on the shell when candled (Holst *et al.*, 1932). These translucent areas range in size from pin points to areas covering the entire shell, giving the eggshell a speckled appearance (Holst *et al.*, 1932). Denison (1967) also observed that eggs from cage hens exhibited translucent streaks which were often found to be one inch apart, suggesting that they were produced by contact with the wires of the cage floor. He postulated that when a freshly laid egg, with its cuticle still liquid or sticky, is moved along the wire floor a portion of the cuticle is disturbed or partially removed; this allowed water from within the egg to enter the shell structure immediately beneath the disturbed portion of the cuticle, causing it to become translucent or mottled.

The following studies were conducted to determine if eggs with windows were inferior to eggs without windows, the percentage of windowed eggs which crack under pressure directly along windows, the role of the cuticle in window development and to determine which occurs first, a crack or a window.

PROCEDURE

Experiment 1. Twenty-four-hundred eggs were obtained from a commercial egg producer-processor, who was experiencing a high incidence of windowed eggs. These eggs were held in a cooler (15.5° C.) for 12 days. Fifty-six of the most severely windowed eggs (windows approximately 3 cm. or more in length) were selected along with 56 control eggs without windows and specific gravity was determined. Pressure was slowly applied to the egg with a Food Technology Corporation Texture System (Model #TP1) sheer press until the first noticeable crack was observed. The location of the crack was noted.

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Experiment 2. One-hundred and fifty eggs obtained directly from the uterus of spent hens were divided into six groups of 25 eggs each and submitted to each of the following treatments:

1) Unwashed eggs
2) Unwashed eggs marked for window development
3) Washed eggs
4) Washed eggs marked for window development
5) Washed eggs placed in 5% EDTA
6) Washed eggs placed in 5% EDTA and marked for window development

Eggs were held only on the ends and were washed by holding the egg under running water for approximately 30 seconds. Eggs were marked for window development by gently sliding the egg along the top of a metal trash can. Five percent EDTA (Ethylenediamine tetra acetic acid, sodium salt) solution was used to remove the cuticle (Vadehra *et al.*, 1970). Twenty-five eggs laid normally were also obtained. All eggs were placed in a cooler in flats and examined for windows the next day and at various intervals for three weeks.

Experiment 3. Pressure was applied to 12 three-day old eggs to produce superficial cracks. They were placed in a cooler and examined for windows at the end of 10 and 21 days.

Experiment 4. Pressure was applied to 12 eggs at each of the following ages to produce superficial cracks: 3 minutes, 24 hours and 48 hours. The eggs were placed in a cooler and examined for windows after 24 hours.

RESULTS AND DISCUSSION

Severely windowed eggs have a lower breaking strength and specific gravity than non-windowed eggs (Exp. 1, Table 1). A large percentage (63.3%) of the windowed eggs also cracked directly along the window, suggesting that the shells were weaker at the window.

TABLE 1.—*Breaking strength, specific gravity and percentage of eggs with windows which crack directly along windows of eggs (Exp. 1)*

Treatment	Breaking strength lbs.	Specific gravity	Eggs cracked along window (%)
Control eggs	47.79 ± 1.76[1]	1.068 ± 0.0007[1]	—
Windowed eggs	44.95 ± 1.97	1.065 ± 0.0008	63.3%

[1] SEM.

Within 24 hours translucent streaks or windows (Exp. 2) developed on every egg marked for window development regardless of treatment. All eggs removed directly from the uterus developed varying degrees of shell mottling (the speckled type) which appeared to increase with the passage of time greater than that of control eggs. The results, in part, tend to agree with Denison (1967) who found that the removal of the cuticle while it was still liquid or sticky produced windows. Factors other than the removal of the cuticle appear to be involved in shell mottling since translucent streaks were artificially produced on all eggs, including the EDTA treated eggs, removed from the uterus and marked for window development.

On eggs from a commercial egg processing plant it was noted that cracked eggs may or may not have a window along the edge of a crack. The question arose as to why this was true and, in eggs with windows along cracks, which occurred first, the window or the crack? When three-day-old eggs were cracked essentially no windows developed along cracks within the first 24 hours (Exp 3). After 10 days, some windows developed, with more of the windows occurring along the jagged edge of a crack than along straight line cracks.

In Experiment 4, no windows developed along cracks within 24 hours after one-day-old

or twenty-day-old eggs were cracked. However, windows developed along all cracks of eggs broken within three minutes after oviposition. This suggests that the window occurs before the crack or that the crack occurs within minutes after the egg is laid. In some instances in which eggs were cracked within three minutes after oviposition, windows would develop on the opposite side of the egg on which the crack occurred or within one to two inches from the crack. This would suggest that if, for example, a hen lays an egg in a standing position, the egg may not break when it hits the cage, but it may place sufficient pressure on the egg shell, perhaps at its weakest point or at a location other than the place of contact, disrupting the egg shell and causing a window to develop. These data tend to agree in part with the results of Talbot and Tyler (1974) which indicated that windows may be associated with a system of internal cracks. They reported that it is through the crack(s), and from the interior of the egg, that the water moves to form an area of translucence.

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REPRODUCTIVE RESPONSE OF GEESE TO A COOL ENVIRONMENT

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ABSTRACT Geese kept at 4.5° C. trended toward greater fertility than geese housed but subjected to natural temperature variations. This trend became highly significant after April 3.

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INTRODUCTION

GEESE are notably poor at reproduction when compared to chickens, ducks and turkeys. Mean egg production, fertility, hatchability and goslings per goose from several sources is given in Table 1.

If geese are to compete strongly with other poultry, reproduction must be increased. By nature, true geese are of cool climates. It has been commonly observed that the onset of hot weather curtails egg production and fertility. It was therefore of interest to find out how geese responded to a cool environment.

MATERIALS AND METHOD

Twenty year old related geese from a large local goose farm were divided into 4 pens,