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FACT SHEET

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PRODUCTION PRACTICES AFFECT EGGSHELL QUALITY

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Maintenance of eggshell quality is a real problem for the egg industry. Avoidable shell damage is estimated to cost most producers the equivalent of 12 or more marketable eggs per hen housed.

Strain, age, nutrition, disease and environment are major factors affecting shell quality. However, management problems, often compounded by one or more of these factors, are the major cause of broken eggs and checks. Producers with shell breakage problems often relate them to these factors without considering management practices. It is easier to blame the breeder, the nutritionist or the weather than to blame management. Too many producers react to or treat a symptom instead of the real cause of a particular shell problem.

Strain differences in shell characteristics and strength are evident but probably are not as great as many believe. The age of the flock certainly has a dramatic effect on shell quality and is intensified by high environmental temperature and even calcium source.

Shell Quality Declines as Hen Ages

Probable causes of decline in shell quality as the hen ages include a declining efficiency in calcium assimilation and utilization. Some scientists contend, however, that the real cause may be a continued increase in egg size with no corresponding increase in the amount of calcium assimilated. The same amount of calcium is utilized in covering an increasingly greater surface area, resulting in a weaker shell. Based on this assumption, reducing egg size without affecting production during the late periods of lay could improve shell thickness and strength. Data indicate this may be achieved by reducing dietary protein during the last 4 to 8 weeks of lay.

Adequate levels of calcium, phosphorus, manganese, zinc and vitamin D_3 are essential for proper shell development. An imbalance of any one of these can cause shell problems. Researchers have shown oyster shell to be superior to most limestone sources as a calcium source for older, high-producing hens. Aragonite appears to fall between oyster shell and most limestones in its effectiveness in maintaining shell quality. It is not unusual to fail to obtain a response to dietary oyster shell when hens are young and other factors are ideal. However, a positive response to oyster shell usually can be expected when a decline in shell quality is associated with age and length of lay or heat stress.

Particle size of the calcium source apparently has a definite effect on the shell quality of older, high-producing hens. Research has shown that the calcium content in the intestine of a layer decreases from 1.15 grams at 8:00 p.m. to 0.11 gram at 6:00 a.m. Percent of calcium in the contents of the small intestine drops

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from 1.56 percent to 0.91 percent during that time. "Hen size" shell particles in the feed will remain in the gut and provide a more constant supply of calcium during shell formation at night.

Disease Causes Shell Problems

Bronchitis and Newcastle disease will cause permanent shell and interior quality problems. Replacement pullets and laying flocks must be rigidly protected against both diseases. This can be done by following a vaccination program recommended by a competent poultry veterinarian familiar with disease problems in an area. Enteritis also can affect calcium absorption and shell quality. Beneficial effect of intermittent feeding of antibiotics to older layers probably is derived from the control of low level intestinal infections. Certain toxins are reported to affect shell strength and quality for a short time. However, layers apparently develop a resistance and quality returns to normal after a 2- or 3-week period.

Shells are essentially 40 percent calcium and 60 percent bicarbonate. Optimum temperature for shell formation is about 60°F. High environmental temperatures have a detrimental effect on shell strength and quality. In hot weather, a rapid loss of CO_2, via panting, lowers blood pH and reduces the amount of carbonate ion available for shell formation. Feed intake also declines. An improved environment in extremely warm weather can materially reduce shell problems.

Good Management Reduces Quality Problems

While shell quality problems contribute to shell breakage, real causes of shell damage in the laying house include a number of people-related factors, most of which can be alleviated. These include bird density, cage design, adjustment and maintenance of equipment and general management practices. Any one of the following can intensify an eggshell quality problem or increase checks and loss eggs.

Bird numbers influence shell damage. More layers per cage increase chances of impact damage, which represents more than 50 percent of shell damage during the final months of lay. Reducing bird numbers per cage generally increases the number of eggs harvested per layer housed. It is doubtful that the number of eggs laid per hen is significantly increased. Rather, more eggs formerly going into manure pits are harvested.

Cage system and design definitely affect shell damage. Flat-deck systems with one belt serving two cage rows generally have a higher incidence of damaged eggs than a stairstep system. Triple and four-deck systems also increase the potential for shell damage.

Slope of the cage bottom has a bearing on checked eggs. Studies have shown checks increase dramatically with each two- to three-degree slope increase over seven degrees. A reduction in checks occurring in the roll-out tray can be attained by installing a bump guard. A ¼-inch hemp rope will help and plastic guards are available. A bump guard can be made by folding and stapling a 4-inch-wide strip of heavy plastic over the upper part of the tray.

Minimize Heat Stress

Many producers utilize evaporative cooling systems and roof or ceiling insulation to minimize summer heat stress and improve shell quality. However, the effectiveness of many evaporative systems is reduced greatly by defective maintenance programs. Evaporative cooling systems must be maintained properly if relief from heat stress is to be achieved. Replace deteriorating pads. Check, clean and properly maintain fans and nozzles. Clean clogged protective screens on fan banks to maximize air movement. To maximize air movement through pads, minimize air leaks in houses. Control rodents to minimize damage to roof or ceiling insulation.

During hot weather, operate cooling systems at night to lower temperatures sufficiently to permit maximum shell deposition.

Frequency of collection has an important effect on shell damage. Texas Extension studies show that the percent of checked eggs steadily increases the longer eggs remain in the tray. This is extremely important with older layers in hot weather where percent checks before collection have been less than 1 percent at 9:00 a.m., more than 4 percent by noon and 7 percent by 3:00 p.m. Practically all are impact checks caused by one egg striking another. Collect eggs at least twice daily. In hot weather, three collections per day will pay off for older flocks and those with shell problems.

Proper Maintenance Pays Off

Collection systems that are inspected frequently and serviced and adjusted properly have a lower incidence of shell damage. In servicing field problems, Texas Extension poultry specialists have found some poorly adjusted row elevators checking as much as 40 percent of all eggs passing through them. These fresh line checks are quite difficult to detect by candlers when eggs are going directly to the packer. Such situations are alleviated drastically through a proper maintenance and monitoring program.

Points of directional change in the collection system also are an important source of shell damage. Check belt elevation and slope every 2 to 3 days and make necessary adjustments to minimize shell damage. Breakage problems at these points are often detected from egg residue beneath the turn or by listening to the tone of eggs impacting against each other.

Do not operate feeders during the major egg laying period from 9:00 a.m. to 1:00 p.m. Eggs laid while the hen is standing to eat may strike other eggs or

cage wire strands, causing an increased incidence of checks. Operate feeders just prior to and during the major feeding periods — from the time lights come on until 8:00 to 8:30 a.m. and again about 3:00 p.m.

Incorporation of large calcium particles in the diet and feeding oyster shell to meet a part of the calcium requirement often will improve shell quality in older flocks and in hot weather. Intermittent feeding of antibiotics often will improve shell quality and reduce checks. An increase in dietary calcium may be warranted if feed consumption of heat-stressed layers is not adequate. Producers with feed separation problems should consider oyster shell. Studies have shown feed containing oyster shell particles separate less than do more dense calcium sources such as ground limestone or marble. Utilize the services of a competent nutritionist and make formulation changes when necessary.

Improve Employee Performance

Inferior employee performance is a costly problem that has direct effect on egg shell damage. Often, an employee has not received sufficient instructions to know how to do his work properly or is unaware of the importance of detecting and alleviating causes of shell damage. Too many employees do not relate shell damage and lost eggs with money. Each employee should receive detailed instruction and frequent supervision during the first days of employment and periodic follow-up supervision thereafter. The employee should receive a written list of duties — i.e. job description — so that everyone concerned knows what is expected of the employee. Duties should be discussed in detail with the employee.

Supervisors must emphasize the economic importance of egg breakage and the need for proper handling to reduce breakage, detecting and repairing or reporting malfunctions and proper maintenance of equipment. Utilization of specific gravity measurements for older flocks can help supervisors spot potential shell quality problems before they occur and enable them to modify management practices to minimize breakage. A better understanding of what is expected, coupled with follow-up supervision, can do much to alleviate shell damage problems and improve returns.

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