The Sour Egg Problem

corrective measures now recommended may be modified as studies progress

F. W. Lorenz and Phoebe Betty Starr

Sour eggs have been found in increasingly large numbers among storage eggs during the past two or three years.

They are spoiled eggs with an unpleasant odor and are inedible. The yolk often appears as though it were partially cooked and may be covered with white and pink specks or it may appear quite normal.

The albumen is liquified and may be stringy; it is usually green in color and fluoresces in ultra-violet light due to the presence of a fluorescent pigment.

Early sour eggs are very difficult to detect by candling. Occasionally the green color of the albumen is noticeable through the shell. As deterioration advances, the albumen-stringiness shows up at the small end of the egg and the yolk shadow appears high, reddish and dark. None of these characteristics is entirely reliable, however, and normal storage eggs may have similar appearances before the candle.

Causes

Sour eggs are caused by members of the genus Pseudomonas, which is a widespread soil microörganism that generally develops well at low temperatures and might be expected to thrive in poultry house litter or in the soil of poultry yards. There is good evidence from several investigators that pseudomonads do not infect hen's oviducts and that eggs thus are not infected before they are laid. Infection must occur after the egg is laid and by organisms derived from the soil or litter.

Strains of Pseudomonas that have been investigated do not readily penetrate the shells of cold eggs.

In experiments performed at Davis eggs were treated with a culture of Pseudomonas in numerous ways. Cold eggs were:

One, soaked for five minutes in a cold or warm heavy suspension of the organism;

Two, abraded with sandpaper wetted with this bacterial suspension; or,

Three, rubbed with a cloth wetted with the suspension.

In addition, eggs warmed to 94° F were treated in the same way.

In most of the treatments, only a few sour eggs were obtained, but when warmed eggs were soaked in a cold suspension, over 80% of the eggs so treated became sour.

In laboratory experiments here, sour eggs could not be found—even by breakout—until the eggs had been stored at a low temperature for at least 35 days after contact with the infectious organisms. A few sour eggs appeared then and the number continued to increase thereafter.

It is believed that the suction developed due to contraction of the contents while eggs are cooling pulls microörganisms into the egg through the pores in the shell. Probably, eggs are most susceptible to infection immediately after they are laid, while they are still warm from the body heat of the bird. Thus, if eggs are dirtied in the nest, some at least may be expected to become infected.

In one experiment in which eggs from commercial sources were used, 5.2% of heavy dirties became sour in storage while none of the clean controls developed this type of spoilage.

The difficulty in detecting sour eggs is particularly well illustrated by the results of an experiment performed in Sonoma County.

Ten cases of eggs were withdrawn from storage and were candled repeatedly by an expert candler during 15 days. All eggs that appeared to be sour were broken out immediately to verify the candling appearance. On the first day 37 verified sour eggs were found, and 47 more were discovered during the following week. During the subsequent week 29 more appeared.

Meanwhile 424 good eggs were broken because of their suspicious appearance before the candle.

The reason sour eggs are so much more prevalent now than they were a few years ago is not known, but at least one practice has changed during this time that very likely may be responsible to a considerable extent. The change is in the method of handling soiled eggs.

Cleaning

Until recently many light dirties were delivered to the receiving station uncleaned, and most of those that were cleaned were hand-buffed.

Nearly all heavy dirties were delivered uncleaned; the cleaning was done in the receiving station and these eggs were not stored.

Today many poultrymen are washing all their eggs—heavy dirties, light dirties and cleans together—and all of these eggs are mixed in the storage packs.

Studies on the relation of washing eggs to the development of the sour condition are incomplete but much can be deduced from the few facts that are known.

In the experiment mentioned above, 5.2% of heavy dirties became sour in storage; eggs taken from the same cases and washed before storage soured to the extent of 5.9%. If the organism penetrates the shell as soon as the egg is dirtied—that is, while it is still warm—washing off the surface dirt will not clean the egg, it merely makes it look clean.

A common practice is to wash eggs as they are collected from the nests. Many of the eggs are thus washed while they are still warm, and penetration of Pseudomonas has been shown to occur readily under these conditions, especially if the wash water is cooler than the eggs or if it is cooling while the eggs are being washed. The organisms are present—in the wash water, on the machine, and on the egg shells; and infection of such eggs is to be expected whether standing or running water is used.

The old method of hand-buffing was so laborious that cleaning heavy dirty eggs usually was not attempted and heavy dirties consequently were kept from going into storage.

Modern machine-buffers clean heavy as well as light dirties, and from this standpoint they are no better than wet-cleaning methods. An infected egg will spoil whether or not the surface dirt has been removed, and regardless of the method used for cleaning.

Whether infection may be spread to uninfected eggs by dry-cleaning methods is not yet known. Such data as are available point out some possible dangers in the use even of these methods. Infection to the extent of 20% of experimental eggs has been obtained by abrading eggs with contaminated sandpaper in the presence of traces of moisture.

How much obvious dirt must be on the shell to cause infection is not known. Light dirties may be or may not be safe; until more data are obtained they must remain suspect.

Several lines of investigation are now in progress to attempt to solve the question whether Pseudomonas organisms may be destroyed once they have penetrated the egg shells. So far no means have been found that would be applicable to ranch conditions. The various materials that are now being commonly added to wash water are apparently ineffective according to the results of last year's storage season.

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SAFFLOWER

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tinctly superior to the California strain. It is interesting to note that the spined materials have a higher oil content than those without spines. Weeds were never a problem in this test; the safflower grew ahead of them.

Cultural Practices

From the results presented in this report, safflower would appear to be a promising crop. However, more data must be obtained to properly evaluate it. Experience with the crop for one year in California and results obtained in other states would suggest that the crop should be grown under the following described conditions and cultural practices:

1. Climatic conditions should be the same as those required for barley. Dry weather after blossoming favors high seed-setting. The crop will stand frosts down to 10°F.

2. Soils should be fertile. Compared to other crops safflower makes poorer growth on soils lacking in fertility or moisture supplies.

3. Seed of this crop will be difficult to obtain. Processors of oil bearing seeds may have seed supplies. The only seed available on a commercial scale will be spined.

4. Before seeding the seed should be treated with a fungicide at the same rate used for barley.

5. The seeding date should be the same as for small grains. Weeds may be a problem with early seedings because of the slow growth of safflower in cool weather. Seedings after about the middle of January will not mature until August.

6. Rows may be spaced from six to 36 inches apart with little difference in yield. Wider spacings probably will require cultivation to control weeds.

7. For row-spacings up to 18 inches a seeding rate of 15 to 35 pounds per acre should be satisfactory. Above a row-spacing of 18 inches the rate should be eight to 20 pounds per acre.

8. Seed should be sown one to 1½ inches deep. Ordinary grain drills may be used.

9. Combine harvesting is preferred, and is essential with spined varieties. Because the crop will not shatter or lodge seriously, harvesting may be delayed 10 days to two weeks. If the straw is too brittle it will break up into small segments that are difficult to separate from the seed. Less cracking of the seed will occur if the cylinder speed is reduced to about 500 revolutions per minute. At this speed the clearance between the cylinder and concaves should be about one quarter inch.

A market for safflower has not been firmly established. Because of this, anyone interested in growing the crop should make previous arrangements for disposal of the seed. The entire crop in the past has been bought by processors of oil-bearing seeds. During the past two years safflower has sold for approximately three quarters of the price of flax seed on a poundage basis.

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The above progress report is based upon Research Project No. 1041.

EGGS

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For the present time all eggs that have ever been dirtied can be considered only as potential sour eggs and should be kept out of storage, and no washed eggs should be mixed with clean eggs during the storage season. All washed eggs should be cased and labeled separately, or better, washing should be discontinued entirely during the months that eggs are being stored.

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The above progress report is based upon Research Project No. 1356.

TURKEYS

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needed be included in the breeding mash. In some cases in which free choice supplements have been depended upon to supply the necessary vitamins, poor results have been observed. By including the necessary factors in the mash the variable intake of free choice supplements will not cause some hens in the flock to receive deficient amounts of the nutrients.

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The above progress report is based upon Research Project Nos. 677H4, and 677H3.

NEW PUBLICATIONS

A copy of the publications listed here may be obtained without charge from the local office of the Farm Advisor or by addressing a request to Publications Office, College of Agriculture, University of California, Berkeley 4, California.

WHAT ABOUT FISH? By Hilda Faust and Vera Greaves Mrak, Circular 144, November, 1948.

How to buy, to prepare and to cook fish are explained simply and adequately in this circular. Recipes for broiled, fried and baked fish are included, as well as recipes for sauces to be served with fish.

HOME VEGETABLE GARDENING. By John H. MacGillivray. Cir. 26, November, 1948.

It is not difficult to grow vegetables. It is all a matter of following a few simple rules which apply whether in a small city lot or a ranch garden. Differences in the gardening techniques will be mainly in the amount and kind of vegetables chosen.

The answer to many specific garden problems will be found in this revised circular. It explains what and when to plant, how to plant and what harvest may be expected if the rules given are followed.

Every step in home gardening is explained in detail—from location and arrangement of vegetables in the garden plot, through soil preparation, irrigation and temperature requirements, to harvesting and storage.

It contains pictorial illustrations of seeding and transplanting techniques, drawings concerning irrigation problems, comparative pictures of soils and photographs illustrating the appearance of healthy plants.

This circular includes a complete chart of planting dates for sections of California and a list of vegetables with special tips on on how to grow them successfully.

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