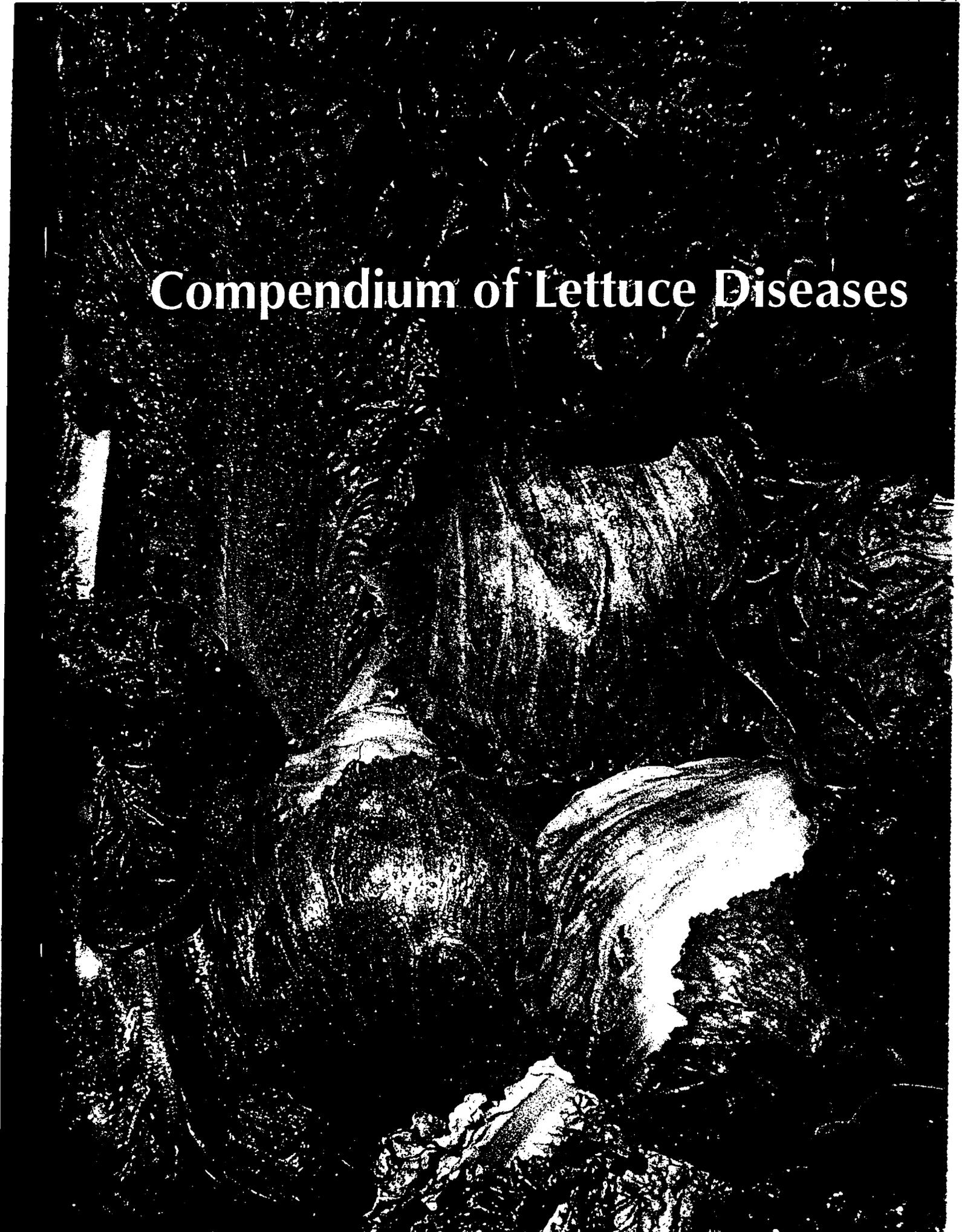


# Compendium of Lettuce Diseases



## Bird Damage

Bird damage to lettuce is a severe problem in several areas of California. The major damaging species is the horned lark, *Eremophila alpestris* (L.), which uproots seedlings, grazes seedling leaves (or cotyledons), and eats seeds. Although millions of dollars are believed to be lost annually from bird depredations on lettuce at various stages, statistics on the extent of bird damage are scarce. In 1974, a survey of 96 California lettuce growers estimated bird damage at \$650,000. In some cases, growers have reported entire crops destroyed by horned larks.

### Symptoms

Damage by horned larks usually begins by birds excavating seed and may continue until seedlings are about 8 cm in height. Horned larks nip off seedlings or, in some cases, pull up the entire plant. In any event, the seedling dies if nipped off below the crown. Persistent pruning by birds may permanently dwarf the plant, resulting in no production. Although the most severe attacks are usually on seedlings, horned larks may damage the outer leaves of head lettuce (Plate 76). In general, severe damage of lettuce by horned larks usually occurs first near the center of the field. If the number of birds is high, damage spreads rapidly until there is only a narrow fringe of undamaged plants remaining near the field border.

### Causal Organism

Bird damage to lettuce is primarily caused by horned larks. The male horned lark has distinctive black "horns," a white or yellowish face and throat with a broad black stripe under the eye, and a black bib (Plate 77). The female is duller than the male, and "horns" are less prominent. Conspicuous in flight is the mostly black tail with white outer feathers and brown central feathers.

### Epidemiology

The severity of damage varies with season, field topography, crop production methods, availability of natural foods, and the density of horned lark populations. Most bird damage to lettuce occurs between September and March, when natural seed production in surrounding areas is scarce and horned lark numbers are at a peak. Vegetation such as lettuce, beet, wheat, and oats represents about 91% of their diet. In arid growing areas, irrigation helps to promote rapid plant growth, which shortens the period during which seedlings are vulnerable to bird damage. However, the availability of water and green vegetation may attract a greater concentration of birds.

### Control

Horned larks are protected under federal law, and special permits are required to haze or kill them. Several control methods can be used to reduce horned lark damage to

lettuce, but the effectiveness of each depends on the persistence of the grower. Frightening birds from lettuce fields by patrolling with rifles or using propane exploders and pyrotechnics (shellcrackers, firecrackers, etc.) requires several hours of hazing each day. However, since lettuce has a relatively short vulnerability stage compared to other crops, intense hazing with these control tools can be effective. Amplification of recorded tapes of distress and alarm calls of horned larks, calls of their natural enemies (falcons), and electronically generated sounds have been used without much success. The equipment to broadcast calls is expensive, and several units may be required per acre. Scarecrows of different varieties show limited success when distributed at high densities within the field since birds acclimate to their presence within 2–3 days. Mylar flagging or plastic strips of tape positioned over lettuce rows can be effective when coupled with hazing. Chemical seed repellents that repel other bird species are now being evaluated as potential horned lark repellents for lettuce.

### Selected References

- DeHaven, R. W. 1974. Bird damage to seeds and seedling crops in California—A questionnaire survey. Tech. Rep. no. 75. Denver Wildl. Res. Ctr. Rep.
- Scott, S. L. 1992. Birds of North America. National Geographic Society, Washington DC.

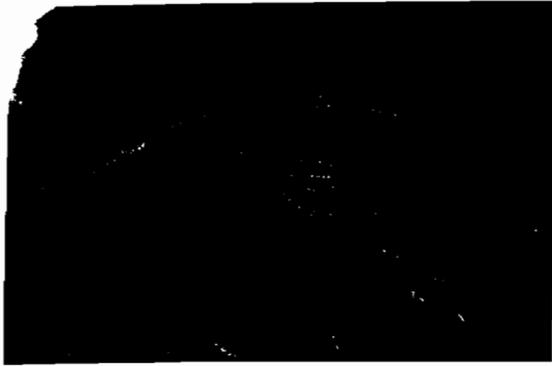
(Prepared by J. L. Cummings)

## Bolting

Bolting is the premature elongation of the lettuce stem. It is the first part of the reproductive process and is followed by flowering and seed formation. Lettuce cultivars fall into two classes in regard to the flowering process. One group, called the long-day cultivars, requires long periods of light, such as occur in summer, for stem elongation to begin. The other group includes day-neutral cultivars, which can initiate the reproductive process in the winter, when daylengths are short. A single gene differentiates these two groups.

If the reproductive process begins prematurely, head formation may be prevented and the plant will not be harvested (Plate 78). If stem elongation begins at or near the formation of the head, quality is reduced because the plant develops a bitter taste resulting from the formation of increased latex coincident with the reproductive process. The presence of the elongated stem inside the head may also affect quality and price.

Resistance to bolting is inherited. Although the specific genes are not known, resistance to bolting is probably based upon multiple or quantitative genes. Therefore, it is possible to select for bolting resistance appropriate to the season and location of production of specific cultivars. Selection is usually practiced by selecting plants with comparatively



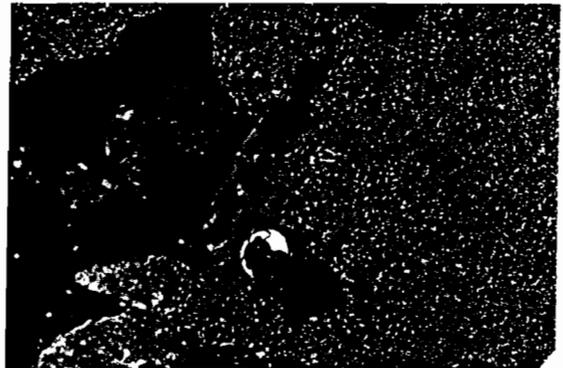
72. Russet spotting on crisphead lettuce (Courtesy E. J. Ryder)



73. Russet spotting (lower) compared with healthy lettuce leaves (upper). (Courtesy M.E. Saltveit)



74. Peroxyacetyl nitrate damage on romaine lettuce. (Courtesy P. J. Temple)



75. Harvester ant moving seed of crisphead lettuce. (Courtesy E. T. Natwick)



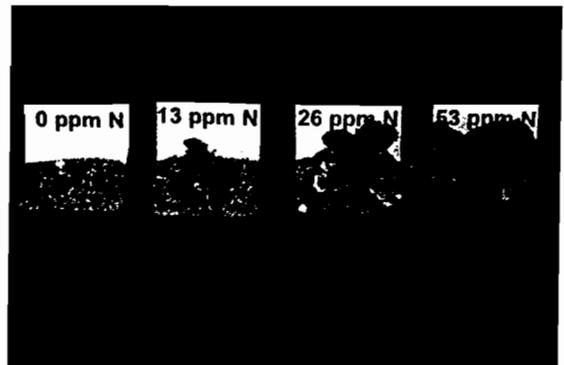
76. Bird damage to crisphead lettuce. (Courtesy E. J. Ryder)



77. Adult male horned lark. (Courtesy J. L. Cummings)



78. Premature stem elongation (left), leading to bolting of crisphead lettuce. (Courtesy E. J. Ryder)



79. Response of crisphead lettuce to varying levels of nitrogen. (Courtesy E. A. Kurtz and L. J. Wyland)