Bulletin 304-A March, 1930

# COMMON DISEASES OF ONIONS IN COLORADO

COLORADO AGRICULTURAL COLLEGE
EXTENSION SERVICE F. A. ANDERSON, DIRECTOR
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Cooperative Extension Work in Agriculture and Home Economics, Colorado Agricultural College and the United States Department of Agriculture Cooperating. Distributed in Furtherance of the Acts of Congress of May 8 and June 30, 1914.

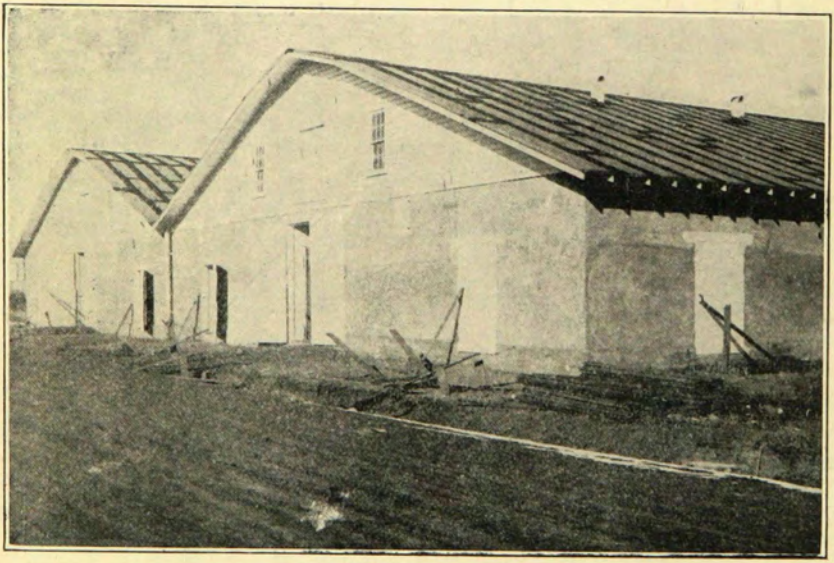

Fig. 11.—An adobe storage house which is equipped with roof ventilators.

# COMMON DISEASES OF ONIONS IN COLORADO

By E. L. LeClerg*

The onion industry of Colorado is widely distributed and of increasing importance. During the past season the acreage has been markedly increased in some sections and accompanying this development, diseases have made a pronounced appearance both in the field and in storage.

This bulletin discusses the prevalence, cause, and control of such diseases of onions as have been found in Colorado under field and storage conditions.

## Field Diseases

**Mildew (Blight)** is caused by a fungus and observations have shown that it is principally limited to the more humid, low-land, onion-growing section along the banks of the South Platte River near Littleton. Some years mildew has been a very serious factor in the growing of onions in this section.

This disease makes its appearance the latter part of July or the first part of August. Mildew can readily be recognized in its very young stages. Early in the morning, when there is moisture on the leaves, infected leaves have a peculiar, furry, violet tinge. Later on, they become covered with a white mildew-like growth, and finally collapse. New leaves that are produced may become infected since the disease spreads rapidly if the weather is moist.

The fungus causing mildew lives over winter in the old dead leaves, therefore care should be taken to rake and burn all tops after harvest. In case the disease has been serious for several years, it may be well to practice crop rotation, not going back to onions for 3 or 4 years. Making rows farther apart will aid in controlling mildew as this practice allows good circulation of air. Spraying with 4-4-50 bordeaux mixture shortly after plants have appeared above the ground and following with one or two subsequent applications of the same fungicide will often check the spread of this disease. Bordeaux mixture should be used with a sticker or spreader. Results of the experimental work in the state have proved that some casein products are very good stickers for this purpose.

**Pink Root** is caused by a fungus which lives and multiplies in the soil, hence the disease becomes more destructive the longer

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onions are grown in the same field. All varieties of onions are susceptible to this disease.

Pink root was first observed in the onion-growing section near Littleton in 1928 where it caused about 90 percent loss in yield in a 5-acre field. This field was planted late to avoid mildew while an adjoining field was planted early and only a few diseased plants could be found in the latter. It appears from this instance and from experience in other states, that late planting is favorable for the rapid growth of the fungus causing pink root, due to the fact that it grows best at the higher soil temperature of late spring. In 1929 this disease was found as early as August 1 near Rocky Ford. It was also observed in the vicinity of Fort Lyons and Canon City.

The symptoms of pink root are striking and easy to identify in the field. The disease is limited in its attack to the growing roots, bulb plate and crown. Diseased roots are dry, dead and pinkish in color, hence the name "pink root." Plants in all stages of growth can be affected, but the disease becomes most serious at the time of bulbing. At this time growth is markedly checked and only small bulbs are produced. Affected plants produce new roots to replace those killed by the disease and altho the plants are seldom entirely killed, the reduced root area results in scallions or small bulbs. During the growing season there is little evidence of the disease above ground except stunting of the plants.

The control of pink root is a very difficult problem once the soil becomes infested. Since the pink-root organism lives over in the soil for several years, onions should not be planted in soil known to be infested with the causal fungus. Infested soils should be given a rest from onions and other crops should be planted in them for a period of 4 to 6 years. It is especially advisable, wherever possible, to plant early so the plants can make good growth before the soil temperature becomes favorable for the vigorous growth of the organism. Since the disease is carried on onion sets and plants, shipments should be closely examined for diseased plants. Care should be taken to obtain sets and plants grown on disease-free soil (See Colorado Extension Circular 57).

**Purple Blotch.**—During the summer of 1929 purple blotch was observed to be limited in its severe form to the locality of Rocky Ford. This was the first time the disease had been seen in Colorado and was interesting since onions have been grown around Rocky Ford for a long time and much of the land has produced several successive onion crops. The disease was

found in a lesser degree of severity near Fort Lyons, La Junta and Pueblo. Infection ranged from 20 to 95 percent of the plants in the fields. It was estimated in one field where infection was very severe that the loss amounted to 10,000 pounds of bulbs per acre.

Purple blotch attacks the leaves (Fig. 1), stalks and bulbs. The relation of the disease under field conditions will be discussed here while the effect of the fungus on bulbs will be considered under "Storage Diseases."

This disease is characterized at first by small, white, sunken spots with purple centers. These spots rapidly increase in size and girdle the stem or leaf. After girdling the plant the foliage above the point of infection dries up and turns brown due to the action of the heat from the sun. Affected stalks usually fall over after several weeks. Due to the killing of the foliage by this disease, the bulbs do not attain as large a size as they would were the plants healthy.

No control measures have yet been found for the disease under field conditions.

Fig. 1.—Onion plant showing typical drying of leaves and lesions due to purple blotch.

**Bulb Rot** is caused by one or more species of soil fungi which often gain entrance into the bulb following injury.

This disease has been very common in past years in the district of Uncompahgre, Colorado, and was found during the past two seasons at Rocky Ford and Fort Collins. Most of the organisms causing bulb rot are more destructive at comparatively high soil temperatures.

The first symptom of the disease is a rapid dying back of the leaves from the tips. This condition usually appears at about maturity of the plants. The roots begin to rot about the time the first signs of the disease appear above the ground. Very often the entire root system may disappear leaving the bulb plate

Fig. 2.—Onion affected with bulb rot, showing entire destruction of roots due to the disease.

devoid of roots (Fig. 2) and later a mass of white moldy growth of the organism is often produced in its place. On cutting a diseased bulb one finds a light brown, semi-watery decay affecting the succulent scales which begins at the base and progresses upward (Fig. 3).

Where the disease becomes serious a long crop rotation should be practiced which will give no chance for the organism to develop and multiply

## Storage Diseases

**Neck Rot** is one of the most important diseases of onions in Colorado and has been present for a number of years. During the storage season of 1928 an unusual amount of this disease appeared in some sections of the state. In some storage houses the loss amounted to 20 to 30 percent.

Neck rot in this region is caused by a fungus which lives in the soil on trash and organic matter. The spores of the fungus form in patches, often covering the entire bulb, giving it a

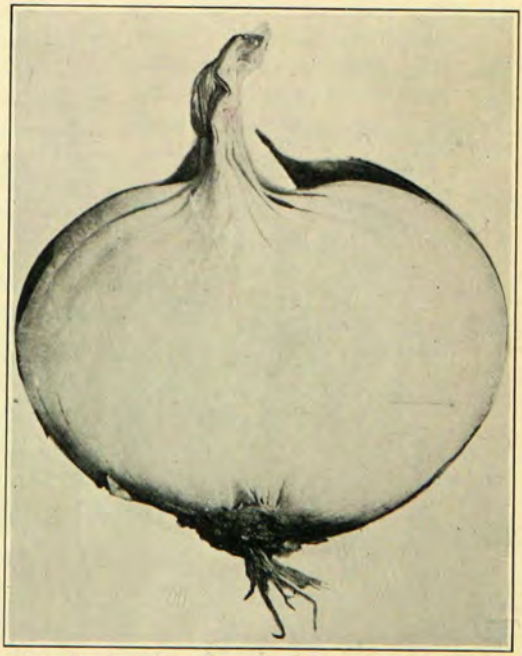

Fig. 3.—Section of onion showing progress of bulb rot from the bottom of the bulb upward with destruction of feeder roots.

greyish appearance (Fig. 4). Black, hard bodies, known as sclerotia, are generally produced at the neck of the bulb (Fig. 5). This is one way that the fungus lives over winter and causes infection of the succeeding crop.

It has been demonstrated that the white varieties are most susceptible to neck rot. Investigations have shown that the disease seldom gains entrance into the colored varieties, which is due to the presence of a toxin in the dry outer scales of these varieties.

In the field this disease seldom causes damage, but considerable losses result in storage and transit. Diseased bulbs appear to be normal at harvest, but after 2 or 3 weeks in storage the first signs of the disease become manifest. At this time the neck becomes soft and discolored and slight pressure applied at the neck forces out a watery liquid. The base of the neck generally becomes sunken and spongy. Decay rapidly breaks down the underlying tissues about the neck (Fig. 6).

Fig. 4.—Diseased onion in final stage of decay and covered with a thick mass of loose, grey spores of the neck-rot fungus.

Fig. 5.—Diseased onion bulb showing Sclerotia at the neck.

The fungus can gain entrance into the onions thru surface wounds and rapidly progress thruout the scales of the bulb. Infection, however, generally takes place thru the neck. No

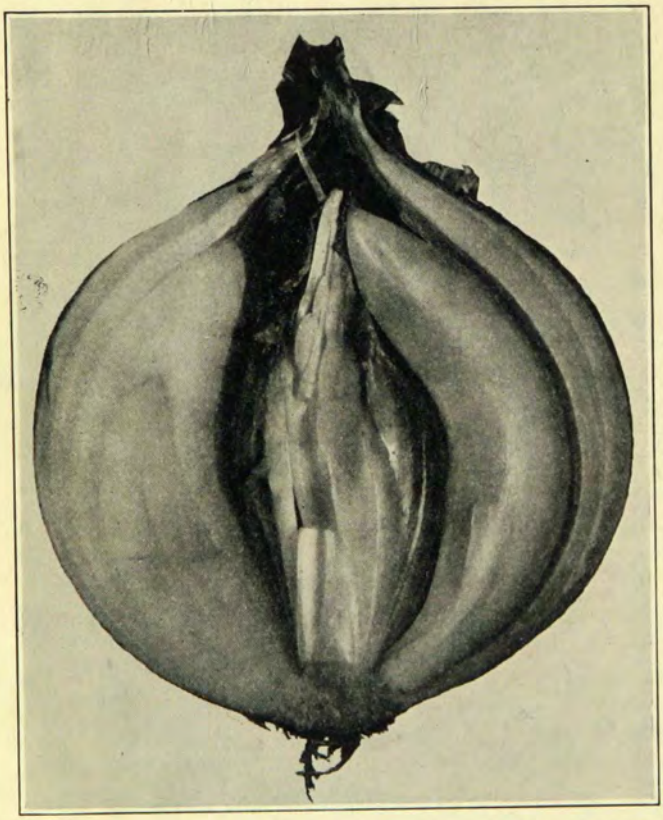

Fig. 6.—Section of diseased onion showing decayed tissue at neck which causes it to become sunken and spongy.

doubt severe hailstorms make infection possible in some instances by producing bruised areas thru which the fungus enters.

After the disease gets a start, the succulent tissue is rapidly broken down, giving the bulbs a water-soaked appearance. The diseased tissue is brown in color. In most instances the outer three or five scales are affected (Fig. 7), but occasionally the middle scales or heart are attacked (Fig. 8). This latter condition, however, is the least common. Sometimes the effects of the disease are not manifest in the entire onion.

Storage conditions are the most important of the various factors which affect the development of neck rot. High temperature, humidity and poor ventilation in storage favor the development of this disease. Onions should be left crated in the field (Fig. 9) to insure proper drying of the neck before storage.

Houses should be thoroly cleaned before the new crop is stored.

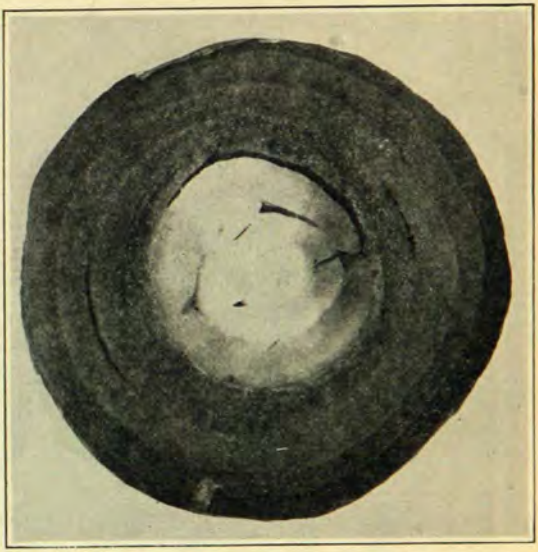

Fig. 7.—Section of diseased onion showing darkened rotting region limited to the outer scales.

Houses should be held as nearly as possible at a temperature of 34 to 36 degrees F. If weather permits, they should be opened at noon or early afternoon for at this time the air is drier and ventilation takes place more readily. Since all the onions are stored in crates (Fig. 10), it is advisable to leave a space of about 8 to 12 inches between the crates and the walls of the storage house. Also a space should be left between crates about every 5 or 6 tiers. This practice will insure good cross circulation of air when ventilating and aid materially in keeping the crop thruout the storage season.

Since ventilation is such an important factor in onion keeping, the more effectively the air can be changed in a house the easier it will be to maintain proper conditions. With this in mind it is recommended that ventilators be put in the roofs of the houses (Fig 11, page 2).

**Purple Blotch.**—Infection of the bulbs takes place at harvest under favorable weather conditions, and similarly to neck rot, the fungus enters thru the necks of the topped bulbs or thru wounds. A semi-watery decay is produced and the entire bulb becomes completely rotted in a few weeks. The affected area of red onions may be brown, but white and yellow varieties are distinctly reddish or yellowish.

Since neck rot and purple blotch develop so much alike, the methods practiced for the control of neck rot apply to purple blotch.

**Bulb Rot.**—After the fungus gains entrance in the bulb under field conditions, the rot progresses slowly and continues

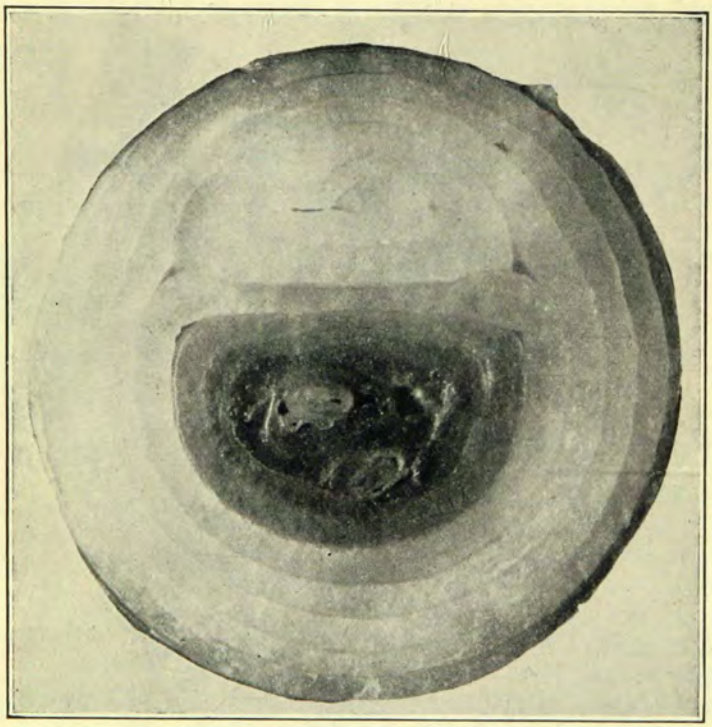

Fig. 8.—Section of diseased onion showing rotting region limited to inner scales or heart.

in storage until often the entire bulb becomes affected and finally dries up into a shrivelled mummy.

Moisture in the bulbs is conducive to bulb rot in storage; therefore, onions should be well cured before storing. Diseased bulbs should be discarded at harvest and good ventilation provided thruout the storage period.

### Diseases That Occasionally Occur in Colorado

**Smut** has been found by the writer only once in the state and that was at Littleton during the summer of 1927. Altho smut is rare, a discussion of the disease is given in the event it should become more prevalent.

This disease appears as dark streaks on the leaves, stems and bulbs of the onion and starts when the first leaf appears. The plants become stunted and the leaves twisted. The dark streaks break open, exposing a black smutty mass of spores of the fungus. Many of the seedlings die from the attack and soft rot often follows the smut injury.

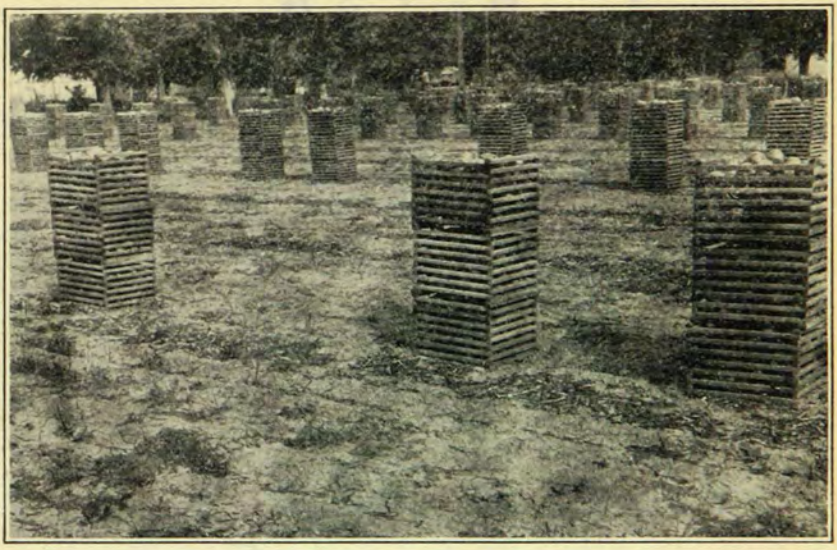

Fig. 9.—Onion field showing how bulbs should be left to thoroly dry before storing.

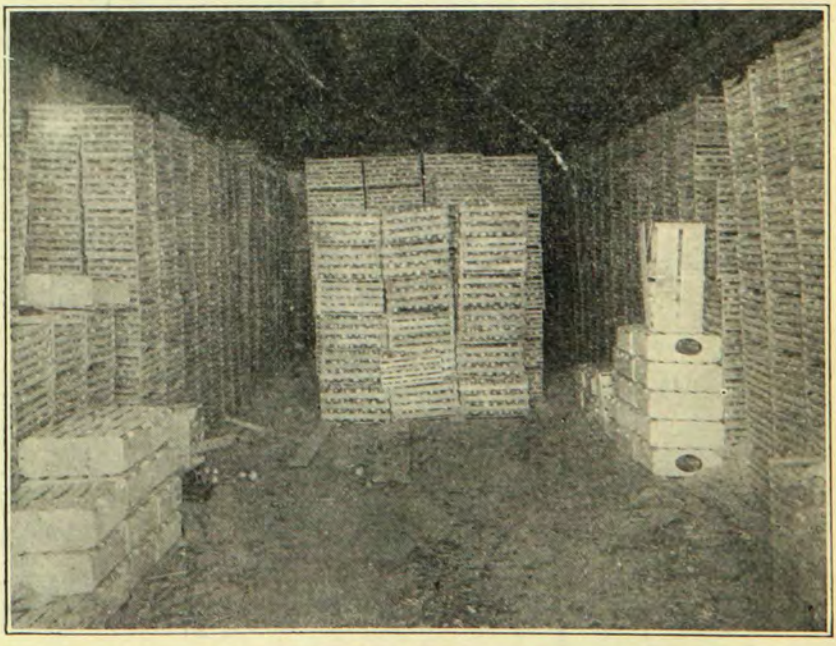

Fig. 10.—Interior view of a storage house showing how onions are stored in crates with space between for air circulation.

The smut fungus gains entrance to the plant in the seedling stage. Onion sets, however, are immune and in small plantings these may be used to insure freedom from smut.

In field plantings smut may be controlled by the use of a solution of formaldehyde, 1 pint to 16 gallons of water, dripped into the furrow with the seed when planted. About 200 gallons of this solution are required for an acre. Somewhat less than this is required if the soil is wet. A tank of one to several gallons capacity may be fastened to the seeder and the formaldehyde dripped into the furrow with the seed thru a small pipe of about 5/16-inch bore. The pipe should be fitted with a stopcock to shut off or regulate the flow.

**Black Mold** has been found occasionally on bulbs in storage houses in Colorado.

This disease is characterized by small, brown or black circular spots on the surface of the upper half of the bulb. These areas increase in size and coalesce until the entire bulb is often covered. The disease is limited to the outer scales of the onions, causing them to die and shrivel. Very often other organisms gain entrance thru the areas affected by the black-mold fungus and cause soft rots. Infection, however, is largely limited to bruises on the bulbs.

The black-mold disease lives over on almost any dead vegetable refuse and in the soil. Moisture is favorable to this disease; therefore, the bulbs should be thoroly dried before storing. The storage house should be kept dry and at a temperature of about 34 to 36 degrees F. All trash should be removed from storage houses before the new crop is stored.

The spores are carried on seeds and sets and where black mold is serious it is recommended to apply formaldehyde when drilling the seed as for control of onion smut. Treating the sets in a solution of 1 pint of formaldehyde to 30 gallons of water for 6 hours will kill the spores of the fungus.