

Yellowing in Lettuce

Good Soil Management Has No Substitute

By W. D. Pew

Because the market quality of Arizona head lettuce is determined in part by its natural rich green color anything which tends to interfere with color development is of great economic importance.

During the past 2 years, much attention has been focused on fields of lettuce that have turned yellow and remained so, despite efforts of the grower to correct the condition.

Once affected with this abnormal yellowing, the greater portion of the affected crop is lost because of the inability of the plants to regain a

normal color and develop and mature properly. This unusual discoloration begins with the older frame leaves and gradually progresses upward into the outer wrapper leaves that enclose the developing heads.

Cause and Effect

Poor physical structure in soil results in poor aeration, impaired water percolation, faster salt accumulation, undesirable soil temperatures, and restricted root growth and activity.

Percolation capabilities of a soil with a fairly shallow compacted layer follow those represented graphically in figure 1. (See graphs and photos on next page.) Note the constriction at a soil depth of 15 inches. The rate at this point is approximately 1/12 as rapid as in the surface 3 inches. This constriction represents a seriously compacted layer which is extremely impervious to the downward move-

ment of water. Below this point the percolation rate improves sharply. The effects of such a compacted area represented by this constriction are like a funnel. It is an easy matter to fill a funnel faster than it can be emptied. No matter how fast the water from frequent irrigations passes through the upper zones, the speed at which it will move to the lower sub-surface areas will be controlled by the layer having the slowest rate.

Water Drives Out Air

If water is applied at frequent intervals a serious build-up of moisture will occur above the zone of restricted water movement. When this happens, water drives air from the soil, creating an improper balance between soil, air and water. This brings about the unfavorable condition for root growth and activity shown in figure 2.

Furthermore, as the water is lost largely by surface evaporation a deposition of soluble salts occurs in the zone where root activity is greatest. Soil temperature also is associated with this water-logged condition. The temperature in this case remains cold for long periods even though the air temperature became rather high after an extended cold period.

Contrast this condition with the one in figure 3 where no water restricting zone is present. Under these conditions it is virtually impossible, under normal irrigation practices, to create a water-logged condition. When this situation exists, the soil air and moisture relationship will remain in good balance, root growth and activity will proceed normally (figure 4), the tendency for surface salt accumulation will be minimized, and the soil temperature will warm more rapidly after an extended cold period. Under these circumstances the described type of lettuce yellowing will be eliminated.

Report Available

This is a summary of Arizona Agricultural Experiment Station Report No. 104 which may be obtained by request from the College of Agriculture, Tucson, Arizona.

—W. D. Pew is Superintendent of the Salt River Valley Vegetable Research Farm.

Prevention Practices

After the plants have become yellow there seems to be little that can be done to correct the disturbance. Therefore, it appears that preventive measures will provide a better chance for eliminating or reducing the disease than will control procedures initiated after the disease symptoms are observed. Suggested practices are:

1. Destroy all shallow impervious zones (water retarding areas) by deep plowing, knifing, or similar method, and allow soil to air out before cropping.
2. Don't overwork the soil where lettuce is to be grown.
3. Select light, well-drained soils in the warmer areas for very early spring lettuce.
4. Do not over-irrigate, especially when plants are young or when soil temperatures are low.
5. Apply side-dressing fertilizers only when temperatures are warm enough for the plant to absorb and utilize the nitrogen.
6. When pre-irrigating, use the flooding method rather than the deep corrugation or furrow practice.
7. The use of heavy green manure crops and the incorporation of all plant refuse into the soil are definite aids in bringing about and maintaining good soil tilth.