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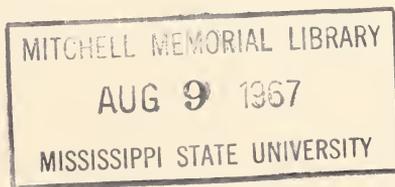
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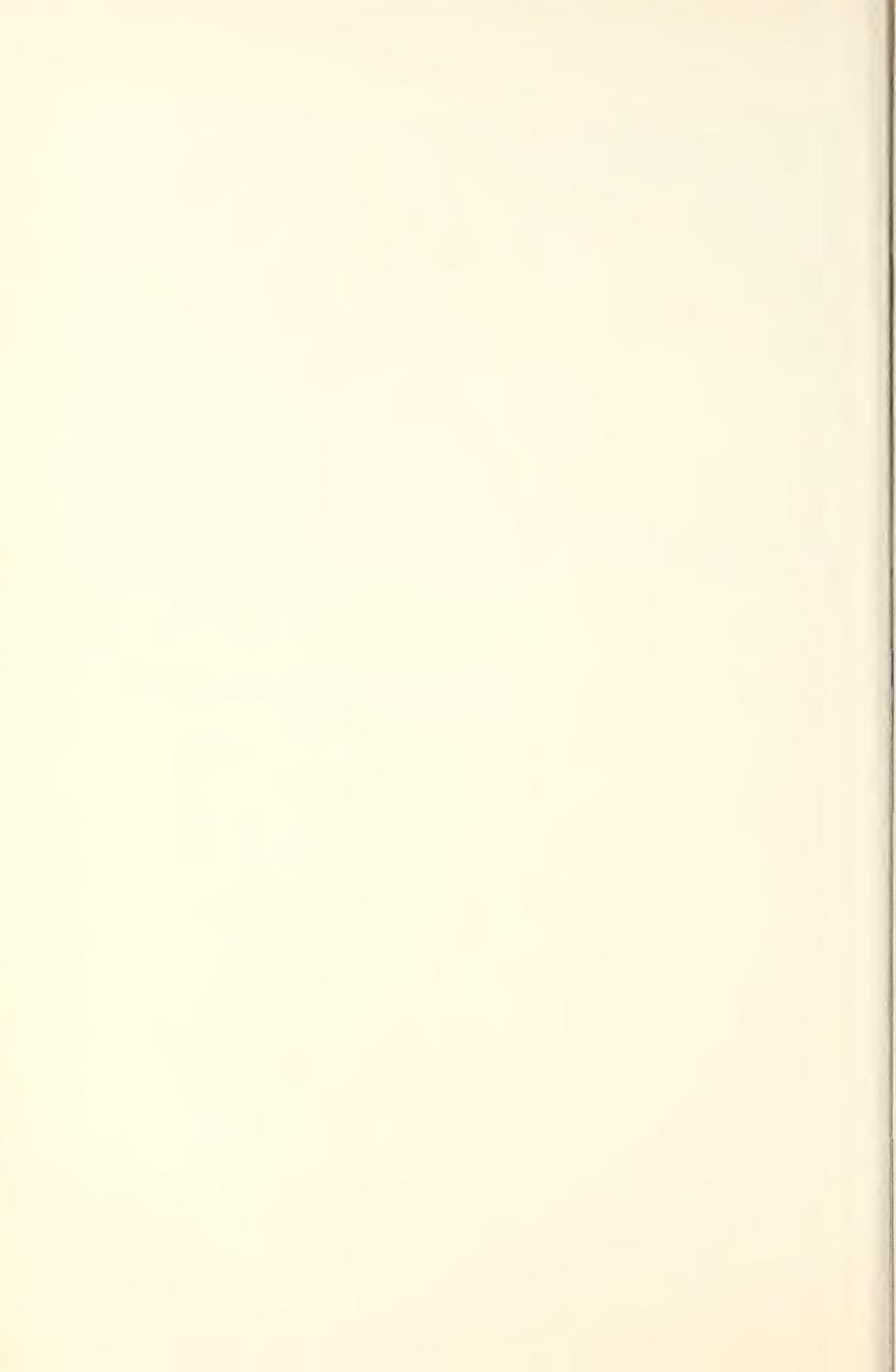
Head Lettuce Production

By DAN A. AULTMAN AND STEVE L. WINDHAM



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Copiah County has a total of 2035 farms of which 1055 are less than 80 acres in size. These conditions are also present in several other counties in the State. Diversification is absolutely essential for these farms. Lettuce will fit into such a program. It grows at a time of the year when very few other row crops are grown and harvested.

The estimated acreage planted to lettuce in the United States for 1959 was 233,000 acres, of which 6,700 acres were planted in Florida, Georgia, North Carolina, and South Carolina.

Tests at the Truck Crops Branch Experiment Station show that lettuce can be grown successfully during late winter and early spring. Lettuce grown on this Station and in the surrounding area has been well received by the local market. This crop provides an opportunity for the truck and market gardener to supply his local community with high quality lettuce during April.

This report sets forth the recommendations based on experiments and observations at the Truck Crops Branch Experiment Station for successful production of lettuce.

Climatic Requirements

Lettuce is a cool season crop that will withstand all frosts and most freezes which occur in Mississippi. However, temperatures below 16 degrees F. at certain critical stages of plant development will severely damage if not kill the plants. Plants are most likely to be killed when in the seedling stage or when they are succulent due to very favorable growing conditions. Cool temperatures are essential from the time head development begins through the harvest period. Erratic occurrences of high and low temperatures do not favor the development of high quality heads. The most ideal temperature for

head development is a mean of 52 to 62 degrees. A few days of temperatures above 80 degrees during April favor the development of tipburn, slime, and flower stalk formation.

Lettuce is sensitive to any great change in the availability of soil moisture. It needs a uniform supply throughout its growth to insure uninterrupted development. This is particularly true during head development and extends throughout the harvest period.

Varieties

Until 1942 it was almost impossible to produce high quality lettuce in many parts of the South because of poor varietal adaptation. At this time a new variety was released under the name of Great Lakes. This variety had good resistance to tipburn and a high degree of resistance to flower stalk formation which is initiated by high temperatures and long days. Today there are many strains of the Great Lakes which have largely replaced the original variety. The results of variety and observation tests show that Great Lakes strains 118, 200-A, 366-A, and A-36 are well adapted to normal late winter and early spring temperatures in Mississippi.

The above strains, as shown in Figure 1, produce good firm heads, maintain good tipburn resistance, and are slow to develop flower stalks inside the head. Normally a grower can expect to market 60 percent or more of the total planting and may expect an average head weight of 1.6 to 1.9 pounds.

Plant Production

Lettuce may be established in the field by direct seeding or grown in a plant bed and later transplanted into the field. However, tests and observations over a number of years point out that transplanting reduces the danger of crop failure during



Figure 1. A strain of Great Lakes just prior to harvest produced at the Truck Crops Branch Experiment Station.

winters when early freezes are severe enough to kill the young plants and is the most dependable method for establishing the planting.

There are two methods of producing transplants in this area: (1) in an unprotected plant bed, and (2) in a coldframe. The unprotected plant bed is similar to a coldframe except no provisions are made to protect the plants from frost or freezes during the time they are grown prior to transplanting.

The unprotected plant bed is a reliable method when normal temperatures prevail in November and December. It is the least expensive method and generally more uniform and healthier plants are produced in open beds than when grown in a coldframe (Figure 2). However, an early freeze may occur that is severe enough to injure the plants. Thus it is recommended that a portion of the total plants needed each year be grown in coldframes. This may prevent a total crop failure due to lack of plants.

When preparing the plant bed apply 15 pounds of 13-13-13 fertilizer per 500 square feet of area. Incorporate this fertilizer into the soil when shaping the bed.

To prevent diseases and weeds the beds may be sterilized with Vapam, Mylone, or Bedrench.¹ Follow the manufacturer's recommendations printed on the label for applying the material and observe the caution for handling and storing these chemicals.

The seed may be sown either broadcast or in rows. Three-inch row spacing is desirable in the coldframe and six inches in an unprotected plant bed. After 10 days it is necessary to thin to a single plant $2\frac{1}{2}$ to 3 inches apart in the coldframe so as to give each plant 6 to 9 square inches of bed area. Less thinning is required in the unprotected plant bed. Unless it is absolutely necessary, spindly or leggy plants should not be used as these plants require a longer period to establish a root system, have less tolerance to low temperatures, and head development is not as early as for well developed plants.

Soils and Fertilizer

Lettuce will grow on a wide range of soils. The best soil is a deep loamy soil that has good internal drainage and is well supplied with organic matter. Sandy soils that are low in organic matter and soils



Figure 2. Plants grown in outside bed (1) are stockier, larger, and have better root system than plants grown in protected coldframe (2).

¹Trade names of material manufactured by E. I. DuPont de Nemours and Company, Union Carbide Chemicals Company, and Food Machinery and Chemical Corporation.

that become too wet or too dry due to poor physical structure should not be used.

On soils low in organic matter an application of 10 to 15 tons of barnyard manure per acre should be a yearly practice. Regardless of the type of manure used it should be turned under well in advance of transplanting in order that decomposition can take place.

A soil test should be made to determine the amount of fertilizer and lime required before buying any fertilizer. Lettuce requires a complete fertilizer and a soil reaction of pH 6.0 to 7.0. In the absence of a soil test 72 pounds of available nitrogen, 96 pounds of P_2O_5 , and 96 pounds of K_2O should be applied per acre prior to planting. Sidedress with 32 pounds of available nitrogen per acre at the time the leaves begin to cup in the first stage of head formation.

Land Preparation and Transplanting

Land preparation and fertilizer application should take place at least two to three weeks prior to transplanting. The soil should be pulverized as deep as possible without turning up raw subsoil with normal breaking equipment. Fertilizer is applied in single bands in the center of the row and bedded upon. Fertilizer placement should be at a depth of at least two to three inches below the root area of the plants at transplanting. The overall row height should be such that a height of at least 4 to 6 inches is maintained after the last harrowing prior to transplanting. If winter weeds or if soil crusts occur prior to transplanting the rows should be disced and harrowed, just prior to setting.

Plants should be spaced 12 inches apart on rows 36 to 42 inches wide. The width of row is generally determined by available equipment. Plants may be set by hand or by a special transplanter. In either case soil must be firmed around the roots and care taken to prevent coverage of the terminal bud with soil during transplant-



Figure 3. Setting lettuce by hand.

ing. If the soil is dry when the plants are set the field should be irrigated as soon as the farm operations permit.

Cultivation

Lettuce is grown during a time of the season when soil and air temperatures are not favorable for rapid weed germination or growth. Normally lettuce requires only two cultivations. The crust of the soil is broken and mulch maintained by shallow cultivation about three weeks after transplanting. The second cultivation is performed at the leaf cupping stage when additional nitrogen is applied as a sidedressing. The crusting of the soil by rain or conditions favorable for weed growth may result in a need for additional shallow cultivations.

Irrigation

Lettuce needs a uniform supply of soil moisture throughout its growth. It can be grown without irrigation but poor production may result because of low rainfall during critical periods of development. Young plants that are retarded because

of insufficient water will be late in maturing heads. If plant growth is not uniform throughout head development due to moisture fluctuation, maturity is delayed, heads may burst, and tipburn will be more severe, all of which result in poor quality heads.

From time of transplanting to sidedressing the plants should not be allowed to go more than 12 days without water. At the time head development begins and throughout harvest the plants should not be allowed to go longer than 8 days without water. Water should be applied at a rate of $1\frac{1}{2}$ to 2 acre inches per application. When water is applied just prior to and during the harvest season and temperatures exceed 80 to 85 degrees F. it should be applied early in the morning while the plants are cool and before wilting begins, otherwise an increase in tipburn and slime may result. Rains during hot weather may have the same effect.

Crop Rotation

Lettuce is susceptible to soil borne disease which can live over in the soil from year to year. If lettuce is grown continuously on the same location these diseases will build up in the soil to a point where the crop becomes unprofitable.

Several other advantages also justify this plan of rotation. When animal manure is not available using a green manure crop may fit well into a crop rotation program. However, crop rotation should be a standard practice in order to keep soil borne diseases under control.

The crops that may be used in a rotation program with lettuce are: alfalfa, clovers, wheat, soybeans, rye, vetch, cowpeas, beets, cucumbers, melons, onions, pumpkins, radishes, spinach, sweet corn, and tomatoes. These crops are not susceptible to the same diseases that attack lettuce and will not serve as a host plant for lettuce diseases.

Insects

Plant injury and loss from insects and diseases has not been a major problem at the Truck Crops Branch Experiment Station. However, the insects and diseases that have been observed attacking lettuce at this Station and their control are discussed briefly in this section.

Cutworms: The cutworm can become a problem after the plants have been transplanted to the field. An application of 10 to 20 pounds of 20 percent toxaphene per acre to the top of the row before setting or just after setting the plants will control this insect.

Aphids: One infestation of lettuce by aphids has been observed at this Station in the past eight years, but lettuce is susceptible to being attacked by aphids at any stage of plant growth.

To control aphids apply 1 percent parathion dust at the rate of 10 to 20 pounds per acre, or $\frac{1}{4}$ to $\frac{1}{2}$ pounds of active liquid formulation in 50 to 100 gallons of water per acre. Discontinue using parathion 21 days before harvest. Malathion, 4 percent, dust applied at the rate of 10 to 20 pounds per acre, or $\frac{1}{4}$ to $\frac{1}{2}$ pound of active liquid material in 50 to 100 gallons of water per acre may be used 5 days before harvest. An application of 2 percent phosdrin dust, or $\frac{1}{4}$ to $\frac{1}{2}$ pound of active material in liquid formulation in 50 to 100 gallons of water per acre may be used. Phosdrin can be applied 48 hours before harvest.

Cabbage Worms: These leaf eating worms can be controlled by applying 2 percent phosdrin dust at the rate of 10 to 20 pounds per acre, or by the application of $\frac{1}{4}$ to $\frac{1}{2}$ pound of active material in 50 to 100 gallons of water per acre.

WARNING: Many insecticides are highly poisonous to man and animals. The directions on the label MUST BE followed.

Diseases

The major diseases of lettuce are (1) damping-off, (2) bottom rot, (3) drop, (4) tipburn, and (5) slime.

Damping-off: Damping-off may become a problem in the coldframe or in unprotected plant bed during prolonged periods of warm wet weather. It may attack plants in the field but is primarily a disease of the plant bed. Preventive measures consist of thinning and ventilating the plants for good air circulation so as to dry the soil around the base of the plants.

Bottomrot: Bottomrot, which may be a problem during warm wet weather, is produced by an organism that causes damping-off. Bottomrot may be severe during wet warm weather and disappear when the soil dries out. To control bottomrot rotate lettuce with corn or any other crop that is not attacked by the organism and use only land that is well drained.

Drop: Drop attacks the plants during cool moist weather. It usually attacks mature plants and may become a serious problem. Very young plants affected by the disease wilt and die rapidly. In mature plants the symptoms vary. In some cases the plant may wilt down in a slimy mass or it may begin wilting gradually. An examination of the stem at the soil line reveals water soaked spots. No effective way to eliminate the drop organism from the soil has yet been found. More plants are lost in the fields that are too wet. Care should be taken to keep the tops of the rows as dry as possible.

Tipburn: Tipburn is a brown-dry dead area on the margin of the leaves inside the head and provides an excellent source of infection by the rot producing organisms which causes slime of lettuce. Tipburn is thought to be a physiological condition within the plant and several factors have been found to increase the occurrence and severity of tipburn: (1) rapid succulent growth, (2) high temperatures

as well as humidity, (3) fluctuation or inadequate soil moisture.

The control of tipburn consists of planting tipburn resistant varieties. Use only vigorous stocky plants that will head rapidly when spring temperatures become warm enough for growth, maintain a uniform supply of soil moisture, and set the plants in the field by January 27 so they will mature before hot weather occurs.

Slime: Slime is a serious problem accounting for a large portion of unmarketable heads during the last of the growing season at this Station. It may be caused by bacteria or fungi in the soil or on the plants. In order for these causal agents to infect the plant it must have some means of entering the plant tissue. Since they are not able to attack healthy sound tissue their entrance is through damaged tissue caused by tipburn, mechanical or insect, salt burning, sunburning, frost, other disease and spray injuries. The control of this disease is by carefully attending to the best practices recommended for the production of lettuce.

Harvesting and Packing

Only experience can teach a grower when lettuce is ready for harvest. The heads should be reasonably firm but not hard. An inexperienced cutter will have to guard against cutting heads that are too loose. It is essential that the heads be harvested as soon as they reach maturity. Any delay in harvest increases the danger of disease, insect and head bursting. Lettuce planted between January 15 and 25 will have some marketable heads ready to cut around April 9. The grower should begin inspecting his crop for mature heads during the first week of April. Earlier planted lettuce grown during a mild winter may produce heads the first week in April. Lettuce that is to be sold to local stores or nearby markets should be cut early in the morning while the heads are

cool. However, the heads should be handled carefully because the leaves are easily broken and crushed when the heads are cut before the plant has wilted.

During the harvest of the heads the plants stem is cut at the ground line. The stem is trimmed, and dead, diseased, or broken outer leaves are trimmed off to make an attractive head. Leave about four of the older outer leaves on the stem. They will serve as wrapper leaves to protect the head until it is placed on the display counter at the store.

The containers in which the heads are to be packed should be located in convenient places in the field. The heads should be packed in the containers as soon as possible after having been cut and carried to a cool place until a load has been harvested. Lettuce should move from the field to the market in the shortest time possible in order to preserve the fresh field quality.

The type of container a producer will use and the method of packing the heads will be determined by the specifications of the market on which the lettuce is sold.