Cultural practices in the production of iceberg lettuce in southwestern Arizona

There are a great number of varieties that are grown successfully throughout the region. The number of varieties goes far beyond the scope of this publication. It is important to understand that each “window,” or season, requires specific characteristics for the growing conditions of that period. All varieties are bred for early vigor, size, earliness and uniformity of maturity, shape, texture, pest resistance and so forth. For more specific information regarding varieties in your area, consult your local County Cooperative Extension Office.

Soil selection and seedbed preparation

Soil types can greatly influence the earliness, uniformity, quality, size and yield of this crop. Heavy soils are generally cooler than lighter soils and should be considered for plantings when temperatures are high (fall). The lighter loamy and sandy loam soils are more suitable for winter and spring desert plantings when the air temperatures are somewhat cooler. Fields should be relatively level and well drained. The seedbed soil should be tilled so that it is soft and friable to a depth of 10 to 12 inches. It should be receptive to water and be free of hardpan at a depth of two feet (minimum). This crop has a “none to moderate” tolerance to salt. Soils with an electrical conductivity (EC) of less than 2 are highly desirable. Generally speaking, conventional 40 inch to 42 inch beds are used and always laid out in a north-south field orientation to eliminate temperature differences between the bed sides. Also, bed height is important. Higher beds (8 to 10 inch) tend to warm faster but require more water for an adequate wetting pattern, whereas lower beds warm slower but require less water to achieve the desired wetting pattern.

Planting rate

Iceberg lettuce is sensitive to high temperatures during germination. This is a main consideration for determining varieties and seed rates. Lower germination rates are (generally) expected when soil temperatures are above 85 degrees fahrenheit. Seed is usually planted at a depth of 1/8 to 3/8 inch with 10 percent to 15 percent of the seed being visible in the seed row after planting. Pelleted seed is planted at the rate of 6 to 8 pounds per acre which should result in about 6 to 12 seeds per foot of row. This will yield a plant population of 20,000 to 26,000 plants per acre after thinning. The seeding rate is largely a function of the planting date, method of irrigation and
variety to be planted. The crop should be thinned, after the first two true leaves have developed, to approximately 10 to 14 inches depending upon the head size of the variety planted.

**Planting date**

Once again, this is primarily a function of the variety and desired harvest date. Planting begins as early as late August and continues into the middle of December. Optimum germination and growing temperatures will vary depending upon the variety planted.

**Fertilization**

Preplant Nitrogen (N) and Phosphorus (P) applications should be based upon a soil analysis. Depending upon soil test results, lettuce requires from 150 to 300 pounds of N for optimal yields. Generally speaking, 50 pounds N/acre is considered adequate preplant N. Stand loss and stunting may result from excessive amounts of preplant ammonium-N (especially on light or sandy soils). Subsequent applications of N should be based upon midrib tissue analysis. Begin these analyses at the four to six leaf stage and take at one to two week intervals through heading. Phosphorus is essential for optimal yield, uniformity and quality lettuce. Phosphorus fertilizers should be broadcast prior to planting or banded 2 to 3 inches below and beside the seed row at planting.

Cooperative Extension bulletin 189022 *Fertilizing Head Lettuce in Arizona* provides tables for recommended fertilizer rates (based upon soil and midrib analysis) and detailed sampling procedures. Contact your local County Cooperative Extension Office for a copy of this publication.

**Weed control**

Economic losses due to weeds can be a serious problem in the production of iceberg lettuce. Weeds decrease crop yield and quality through competition for water, nutrients and sunlight. In addition, many weeds harbor destructive insect pests and serve as alternative hosts to other organisms which cause crop diseases.

**Balan** (benefin)

1.2 - 1.5 lb. active ingredient (a.i.) per acre, 3 - 4 qt. of 1.5 EC/acre, 1 - 2.5 DF/acre

Apply preplant incorporated before seeding. Controls some grasses and some small seeded broadleaves.

**Kerb** (pronamide)

1 - 2 pounds a.i./acre, 2 - 4 pounds of 50W/acre

Can be used preplant, preemergence or postemergence. For postemergent applications, apply before or after lettuce emerges but prior to weed emergence. Controls some grasses and many broadleaves.

**Poast** (sethoxydim)

.1 - .3 pounds a.i./acre, .5 - 1.5 pints/acre; use with a crop oil concentrate. Postemergence selective control of annual and perennial grasses. Apply when grasses are small. Timing is critical; see label for specific directions. Do not apply to grasses under stress. Thorough coverage is required. Do not tank mix with other pesticides. Do no cultivate within five days prior to application or within seven days following application.

**Prefar** (bensulide)

5 - 6 pounds a.i./acre, 5 - 6 quarts 4E/acre

Preplant or preemergence for selected annual grass and broadleaf control but will not control many important weeds in lettuce fields.

1. **EC** = Emulsifiable Concentrate.
2. **DF** = Dry Flowable.
3. **W** = Wettable Powder (50W = 50% Wettable Powder).
4. **E** = Emulsifiable Concentrate (4E = 4% Emulsifiable Concentrate).

**Irrigation**

Generally, 38 to 50 inches are required to make a good crop. Varies dramatically with soil type, slope of field, temperatures and planting window. In the desert regions, it will be necessary to use sprinklers to establish a stand until at least October 15. When using sprinklers, the water source must be low (800 parts per million [ppm] or less) in sodium and chloride salts. Preplant irrigations vary also with season, locality and soil, and are of greater importance when weeds or salts are a problem.

For effective germination, beds should be moistened throughout but not to the point that they become waterlogged and be kept moist during germination and emergence. Usually an irrigation is made to soften the soil prior to thinning. Maintain adequate moisture throughout plant development. During harvest, an irrigation may be necessary between cuttings if multiple harvests are necessary or profitable.
Insect control

There are several insect pests that cause economic damage to lettuce in the desert growing areas. Pest outbreaks in lettuce often relate to planting dates and adjacent crops. Seedling pests such as crickets and beetles are most severe in fall plantings following the destruction of other host field crops. Whiteflies, armyworms, loopers, and leafminers have the greatest impact during the warmer periods in fall. Generally speaking, aphid populations increase during the cooler months of fall, winter and early spring. Additionally, variations in weather, plant stress, cropping practices and insecticide applications can also influence the time which pests may occur.

**Aphids**

**Orthene** (acephate)  
.5 - 1.0 pounds per acre. Head lettuce only, do not exceed 5 pounds per season. PHI: 21 days.

**Cyon** (dimethoate)  
.25 pounds per acre. PHI is 7 days for head lettuce and 7 days for leaf lettuce.

**Thiodan** (endosulfan)  
1 pound per acre. No more than two applications per season on leaf. No more than three applications after thinning head lettuce. Remove wrapper leaves of head lettuce at harvest. PHI: 14 days.

**Phosdrin** (mevinphos)  
.5 - 1.0 pound per acre. Use as manufacturer directs. PHI: 2 - 4 days.

**Metasystox-R** (oxydemtonmethyl)  
.5 pound per acre. For use on head lettuce only. No more 3 applications per season.

**Corn earworm**

**Ambush** (permethrin)  
.1 - .2 pound per acre. Do not apply more than 2 pounds per season. PHI: 1 day.

**Crickets and grasshoppers**

**Sevin** (carbaryl bait formulation)  
1 - 2 pounds per acre. Use near edges of field especially next to cotton. For use on head and leaf lettuces. Not labeled for use on Romaine. PHI: 3 days on head lettuce, 14 days on leaf lettuce.

**Diazinon**  
.25 - .5 pound per acre. Head lettuce only. Rates vary with label. Toxic to bees. PHI: 10 days.

**Cutworms and armyworms**

**Orthene** (acephate)  
1 pound per acre. Armyworm in head lettuce only. Do not exceed 5 pounds per season. PHI: 21 days.

**B. thuringiensis**  
There are numerous manufacturers and formulations. Labeled for use on armyworm only. Most effective on small larvae. Usually requires a sticker-spreader to enhance control. PHI: zero days.

**Ammo** (cypermethrin)  
.75 - 1 pound per acre. Use as manufacturer directs. PHI: 5 days.

**Lannate** (methomyl)  
.45 - .9 pound per acre. Beet armyworm only. PHI: 7 days when applied at .45 lb./acre rate and 10 days when applied at the .9 lb./acre rate.

**Ambush** (permethrin)  
.1 - .2 pound per acre. Do not exceed 2 lb./acre per year A.I. For control of armyworm only on head lettuce. PHI: 1 day.

**Larvin** (thiocarb)  
.4 - .9 pound per acre. Use as manufacturer directs. PHI: 1 day.

**Leafminers**

**Orthene** (acephate)  
.5 - 1 pound per acre. Head lettuce only. No more than 6.66 pounds total per season. Do not feed waste to livestock. PHI: 21 days in spring. In fall, do not apply after plants have headed (about 35 days).

**Diazinon**  
.25 - .5 pounds per acre. Head lettuce only. Rates vary with label. Toxic to bees. PHI: 10 days.
Cygon (dimethoate)  
.25 pound per acre. Not registered for use on Romaine. PHI: 7 days for head lettuce and 14 days for leaf varieties.

5 Note: Amount of material recommended (active ingredient) for the chemical. Always read the label and use as directed by the manufacturer.

6 PHI = Preharvest interval or days to harvest. Do not apply material within this many days of harvest.

Loopers

B. thuringiensis  
1 - 2 qts./pounds per acre. Use a sticker-spreader to enhance control. PHI: zero days.

Thiodan (endosulfan)  
.75 - 1 pounds per acre. Do not make more than two applications per season on leaf lettuce. Do not make more than three applications after thinning head lettuce. Remove wrapper leaves at harvest. PHI: 14 days.

Phosdrin (mevinphos)  
.5 - 1 pound per acre. Use as manufacturer directs. PHI: 2 - 4 days.

Dibrom (naled)  
1 - 1.5 pounds per acre. May cause phytotoxicity. PHI: 1 day.

Ambush (permethrin)  
Do not exceed 2 pounds per acre per season. PHI: 1 day.

Whiteflies

Orthene (acephate)  
.66 pound per acre. Head lettuce only. Do not exceed .66 pounds total per season. Do not feed waste or graze. PHI: 21 days in spring. In fall, do not apply after plants have headed (about 35 days).

Cygon (dimethoate)  
.25 pound per acre. Not registered for use on Romaine. PHI: 7 days for head lettuce and 14 days for leaf varieties.

Thiodan (endosulfan)  
For head lettuce, do not apply more than 3 times after thinning. Remove wrapper leaves at harvest. For leaf lettuce, no more than 2 applications per season. Rates vary with label. Not labeled for use on Romaine. Toxic to bees. PHI: 14 days.

Diseases

There are six virus diseases that have the potential of causing moderate to serious crop losses on southwestern Arizona lettuce plantings. They are: Lettuce Infectious Yellows Virus (LIYV), Lettuce Mosaic Virus (LMV), Beet Western Yellows Virus (BWYV), Cucumber Mosaic Virus (CMV), Alfalfa Mosaic Virus (AMV) and Big Vein. For any of these viruses, there are no known chemical controls. It has been suggested that controlling insect vectors, eliminating other sources of host plant material, maintaining sound cultural and crop rotation practices and using only indexed seed are the only viable controls available to date.

There are four serious fungal diseases which have potential for causing economic crop losses in commercial lettuce production.

Sclerotinia sclerotiorum

Ronilan (vinclozolin)  
1 - 2 pounds per acre. Do not exceed 6 pounds per acre per season. Labeled for use on head and leaf types of lettuce. Do not cultivate immediately after application. PHI: 28 days.

Rovral (Iprodione)  
1.5 - 2 pounds per acre. Do not make more than three applications per crop. Labeled for use on head and leaf types. Do not cultivate immediately after application. PHI: 14 days.

Downy mildew

Maneb  
1.5 - 2 pounds per acre. Do not apply more than 12.8 pounds of product per season. For use on leaf and head types. Apply on a 7 to 10 day schedule after disease appears. Remove wrapper leaves at harvest. PHI: 10 days.
Bottom rot

**Rovral** (Iprodione)
1.5 - 2 pounds per acre. Do not make more than three applications per crop. Labeled for use on head and leaf types. Do not cultivate immediately after application. Do not apply in less than a 40 gallon per acre tank mix. PHI: 14 days.

Powdery mildew

**Microthiol Special** (sulfur)
5 - 6 pounds per acre. Begin applications at early leafing stages and repeat at 14 day intervals. Thorough coverage is required. May cause phytotoxic side effects on plants. Consult the Arizona Department of Agriculture for PHI.