Onion Seed Production in Yuma County

*by Don R. Howell & G. D. Waller**

Introduction.

The 2,000 acres of onions (*Allium cepa L.*) grown for seed annually in the U. S. produces an average of slightly less than 500 pounds of seed per acre. Much of it is hybrid seed from male-sterile plants in adjacent rows or in rows that are several rows away. Seed for southern types — the so-called "short-day" onions, is grown in southern California and southwestern Arizona. Seed for northern types, or "long-day" onions, is grown primarily in Idaho, Oregon, Washington and Northern California. This seed is used throughout the United States to plant 100,000 acres of bulb, or green onions, with a farm value of $100 million (USDA, 1969).

Onion seed production is generally most successful in an area which has warm sunny days during the period of bloom followed by a squall-free period during which the seed can mature without excessive shattering. Yuma County, Arizona enjoys such climate. Farmers in Yuma County are interested in producing onion seed. But, because yields have proven to be so inconsistent, onion seed production is considered a high-risk crop. By example, various growers report the 1969 yield varied from 45 to 1550 pounds of clean seed per acre.

During 1969 and 1970 commercial onion seed fields were visited in Yuma County to determine why some growers have seed crop failures.

Planting.

The planting method for onion seed production varies depending on whether open pollinated, or hybrid, seed is to be produced. It varies also as to whether it was planted by seed or bulbs.

Onion seeds are planted on 42 inch beds in two rows, twelve inches apart on each bed. The bulbs are planted in one row on the center of each bed. Open pollinated varieties are grown from either seed or bulbs. Hybrid seed is usually obtained from male-sterile plants grown from seed and crossed with male-fertile plants grown from bulbs. The ratios of male-sterile to male-fertile rows maybe four to one, eight to two, or twelve to two.

Figure 1. Harvesting onion seed with a modified combine, note the male-fertile rows on the right that have been pressed down to prevent mixing them with the male-sterile rows being harvested for hybrid seed.

The seed is planted in September, but bulbs are not planted until November. Planting rate for seed is five or six pounds per acre; while planting rate for bulbs depends on the size of the bulbs used. Planet Junior type planters were used for planting seed, while bulbs were dropped mechanically and then set into an upright position by hand before covering.

Fertilization.

Growers contacted reported that they applied preplant fertilizers at the rate of 60 pounds of nitrogen and 180 pounds of phosphate per acre. Post plant applications averaged 170 pounds of nitrogen and 115 pounds of phosphate per acre. Both sidedressing and water run fertilizers were used in the post plant applications.

Irrigation.

Irrigation practices were similar for most growers. Fields were usually pre-irrigated, but some fields were "irrigated-up" particularly when the seeds were planted.

Irrigations in September and October were at about two week intervals, but as weather cooled this interval lengthened. The biggest difference in irrigation practices was between seed-to-seed and bulb-to-seed crops.

Seed-to-seed fields must be "shocked" during the winter so the plants will bolt (produce seed heads). Irrigations are withheld during the winter to produce the shock effect. This shock period will usually last about two months, beginning about December first.

When bulbs are used for planting stock they need not go through a shock period, and are therefore irrigated during the December and January months. This time coincides with the coolest temperatures of the year, so frequent irrigations are unnecessary. A three week irrigation interval is common during the spring

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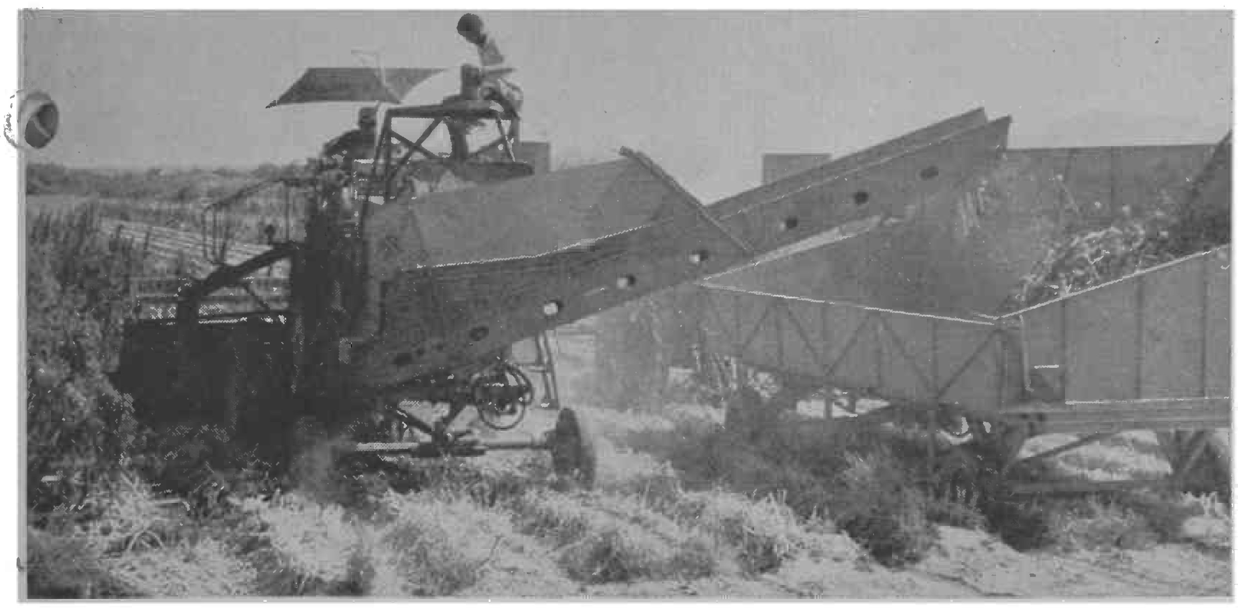

Figure 2. Rear view of combine elevating onion seed stalks into the wagon that is pulled along beside the combine.

when the growing rate increases. As bolting becomes pronounced and a few blooms start to open, irrigation intervals are shortened to two weeks. This interval is maintained until the "dry-up" for harvest.

Control of Pests.

Herbicides were used by all growers contacted. Two applications of DCPA (Dacthal**) were applied to most fields. One application was commonly incorporated in a preplant treatment and the other was applied post plant at layby, or as needed. Application rates varied from eight to twelve pounds per acre.

Other herbicides were tried on an experimental basis. Weeds were thought to be a serious problem since the crop is actually in the ground for a long period of time (September to July, eleven months), and both summer and winter weeds need to be controlled. Mechanical cultivators and hand labor were used for additional weed control. Hand labor was also used for rogueing, or the removal of off-type plants.

Downy mildew (*Peronospora destructor*) infected some fields of onions seriously in 1969, but in 1970 it infected nearly every field. It was the main cause of seed crop failure in some fields and reduced yields drastically in others. Some fungicidal treatments were attempted, but most growers felt that mildew control was impractical, if not impossible to control when conditions for the disease development were ideal, as they were during the cool damp winter of 1970. Purple blotch (*Alternaria porri*) infected many fields in 1970 and caused severe injury in at least one field.

Insect pests discussed by growers were onion thrips (*Thrips tabaci*), flower thrips (*Franklindella tritici*), and armyworms (*Laphygma* spp.). Thrips were the most troublesome insect and treatment for them was thought by most growers to be critical since flower thrips caused damage mainly when the crop is in bloom and bees are necessary for pollination. For this reason some growers did not use any insecticides while others treated only before the onset of bloom. Phosdrin** and the parathion** were both reported as fairly successful in controlling thrips during 1969.

Armyworms were troublesome only when the onions were planted from seed and then only while the onion plants were quite small. One grower did treat to control armyworms.

Pollinators.

Many insects visit onion flowers, but the honey bee (*Apis mellifera L.*) is the most valuable of the pollinators (Shaw and Bourne, 1936). Few non-honey bee pollinators were observed visting onion seed fields. Most growers rent four or more honey bee colonies per acre for pollination purposes and generally distributed them around the field in groups of 6 to 12 colonies after flowering has commenced. Additional colonies are added if bee activity on the onion flowers is considered inadequate. Onion seed fields are usually isolated from each other to prevent contamination by undesirable sources of pollen. The relatively small fields are often surrounded by large fields of other crops or by areas

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Figure 3. Dumping onion seed stalks onto polyethylene tarps to dry them in preparation for threshing.

Wheat . . .

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Viscosity

Stressing wheat for soil-moisture at the jointing and flowering stages resulted in flour viscosity ratings that were significantly higher than flour viscosities from wheat stressed at the dough stage or grown with optimum irrigation (Table 1). These data indicate that when soil-moisture was withheld from wheat it resulted in flour with higher viscosity and stronger gluten. Wheat with these characteristics and that which is produced in this manner is less desirable for milling.

Mixing Curve Peak

In evaluating wheat flour, the length of time required to reach the mixing curve peak and the total area under the mixing curve are measures of flour quality. Normally, anything that increases the mixing curve peak or area tends to lower the quality of wheat for milling purposes.

When wheat was stressed for water at the dough stage, it required a longer time to reach the flour mixing curve peak than when wheat was grown under any other treatment (Table 1). The shortest time required to reach the flour mixing curve peak was obtained when water was withheld from wheat at jointing, and the longest time was obtained when moisture stress occurred at the dough stage.

Mixing Curve Area

Stressing wheat for moisture at any stage of growth significantly increased the flour mixing curve area (Table 1). The lowest flour mixing curve area was obtained when wheat was grown with optimum irrigation, followed by moisture stress at the dough, jointing, and flowering stages, in increasing order. The flour mixing curve data also suggest that when wheat was grown under soil-moisture stress, it resulted in stronger gluten flour, which would have to be blended differently by the miller or baker.

Increases in viscosities and mixing curve areas of flour from grain from stressed plants were due to the increases in flour protein content. However, changes in A.W.R.C. and mixing curve peak values were not related to changes in protein content and must be due to other factors resulting from water stress.

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of desert flora that may be more attractive to bees. For example, peak onion bloom occurs in April and May; the duration and exact time depends on the variety. This is when several desert plants such as mesquite (*Prosopis juliflora*) salt cedar (*Tamarix pentandra*), arrow weed (*Pluchea serica*), and creosotebush (*Larrea tridentata*) also bloom. These desert plants appear to be attractive to honey bees as sources of both pollen and nectar, so problems of poor bee visitation to onion seed fields are probably related to the lower relative attractiveness in onion flowers.

One problem observed was that the bees were slow to start working the onion flowers after the colonies were placed in the field resulting in poor seed set on the early heads. This seemed more of a problem in 1969 than in 1970. Attempts at encouraging the bees by spraying the onions with artificial attractants have given variable results. Until the onion flowers can be made more attractive we suggest that growers continue the practice of bringing in more honey bee colonies when bees are working in the field poorly.

In addition to poorer seed set on early blooms there were some fields in 1969 where the seed crop failure could be attributed mainly to poor bee activity. Bee activity in 1970 was considered good enough for adequate pollination in most fields.

Harvest.

The most common method of harvest was by specially adapted combines (Figure 1) which removed the heads and passed them through a widely spaced cylinder and then transferred them to a large especially-built wagon being pulled along beside the combine (Figure 2). From the wagons the onion heads were dumped onto polyethylene tarps where they were dried in the open for a few weeks before threshing (Figure 3). Such mechanization of the harvest has reduced the cost compared with hand harvesting methods used previously. Also, harvest is completed in a shorter time, thus preventing unnecessary shattering of seed from mature plants ready for harvest.

Conclusions.

Onion seed production in Yuma County can be a profitable enterprise and in general satisfactory cultural practices have been developed. Two areas of uncertainty remain:

- control of plant diseases during cool wet years, such as occurred in 1970
- assurance of an adequate pollinator population in the fields during the time of bloom.

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