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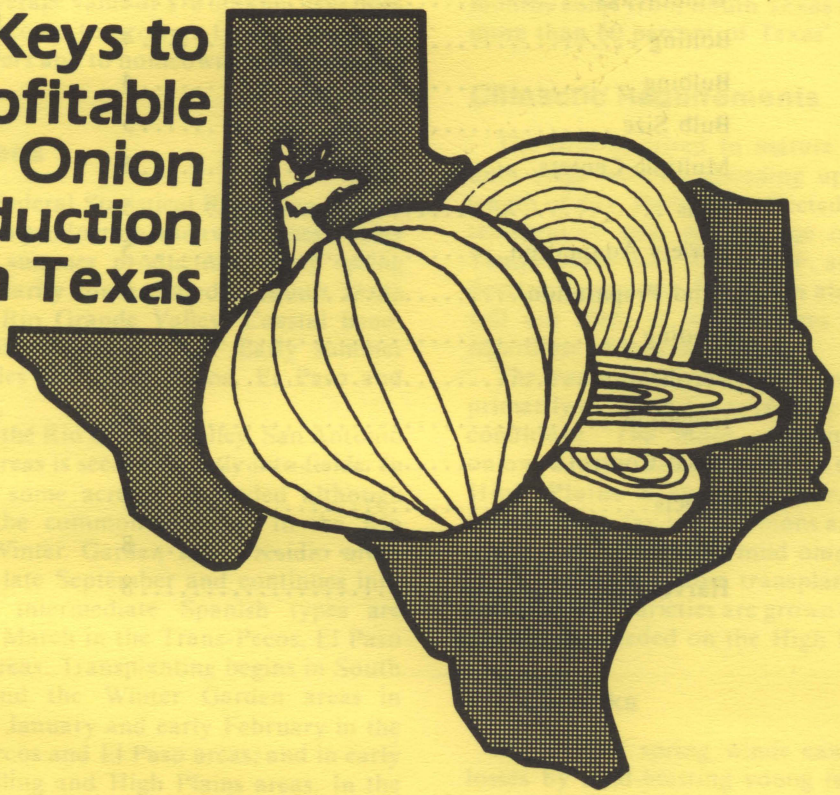
Keys to Profitable Onion Production in Texas



Texas Agricultural Extension Service • Zerle L. Carpenter, Director • The Texas A&M University System • College Station, Texas

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KEYS TO PROFITABLE ONION PRODUCTION IN TEXAS

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The value of the Texas onion crop usually ranks first to all other vegetable crops in Texas. During a 4-year period of 1982-85, onions were grown on 25,000 acres and returned an average value of $70 million. This does not include the income to growers from transplants sold to other growers and to homeowners in or out-of-state.

Production Areas

The State and Federal Statistical Reporting Service divides Texas onion production into two classes—early spring and early summer production. Early spring production is primarily concentrated in South Texas and includes the Rio Grande Valley, Coastal Bend, Laredo and Winter Garden areas. Early summer production includes the Trans-Pecos, El Paso and High Plains areas.

Most acreage in the Rio Grande Valley, San Antonio and the Presidio areas is seeded directly into fields. In the High Plains, some acreage is seeded although transplanting is the common practice. In the Rio Grande Valley, Winter Garden and Presidio areas seeding begins in late September and continues into December, while intermediate Spanish types are directly seeded in March in the Trans-Pecos, El Paso and High Plains areas. Transplanting begins in South Texas, Laredo and the Winter Garden areas in December; in late January and early February in the Presidio, Trans-Pecos and El Paso areas; and in early March in the Rolling and High Plains areas. In the High Plains, Grano/Granex types are transplanted in early March followed by the Spanish types in March and early April.

Seasonal Movements

Harvest begins early in March in the Rio Grande Valley and continues into June. Supplies are available from the Laredo area during April and May; whereas, Winter Garden areas supply onions in late May and June. Supplies are available from the Trans-Pecos and El Paso area from May through June. The High Plains furnishes onions from late June through September. Green onions are available from various producing areas throughout the year. Figure 1 shows that the peak movement of Texas onions to market occurs during April and May. Onions marketed during these 2 months come from South Texas areas and account for more than 60 percent of Texas' total production.

Climactic Requirements

The time required to mature onions from seed to bulb stage varies, depending upon temperature and length of day. Bulbing is affected by length of day and temperature and not by age or size of the plant. Temperatures of 70° to 80° F. are favorable for bulb development when day length also is favorable. Bulbs will not form at temperatures below 50° to 60° F. regardless of length of day.

The sweet, mild, short-day onion types are grown primarily in South Texas because of favorable growing conditions. The more pungent, longer day-length onions are grown primarily in the Trans-Pecos and High Plains areas; however, some acreage of intermediate day-length onions are grown in the South Texas area. Short-day, mild onions are grown on the High Plains only from transplants. Intermediate-day and long-day varieties are grown from transplants and are directly seeded on the High Plains.

Windbreaks

Winter and spring winds can cause serious plant losses by sand-blasting young fall-seeded plants and spring transplants. Strip cropping configurations using late summer or early fall-planted windbreak strips were beneficial in the High Plains area farm demonstrations.

Winter freeze tolerant grasses such as Triticale, tall-growing wheat or Elbon rye are preferred for windbreak strips. Spring-seeded corn does not provide growth early enough to slow winds during spring transplanting. Seed one to eight rows of windbreak in each strip depending on whether the windbreak crop will be combined. Then plant four to eight onion beds between the windbreak strips. More than eight beds of onions between windbreak rows greatly reduces the effectiveness of the windbreaks. Direction of rows from east to west seems to work best against predominant north or southwest winds.

The windbreaks should be tall and strong-stemmed but only thick enough to slow the wind, without completely blocking air movement. High winds blowing against thick plant stands will lay them over, reducing the effectiveness of the windbreak.

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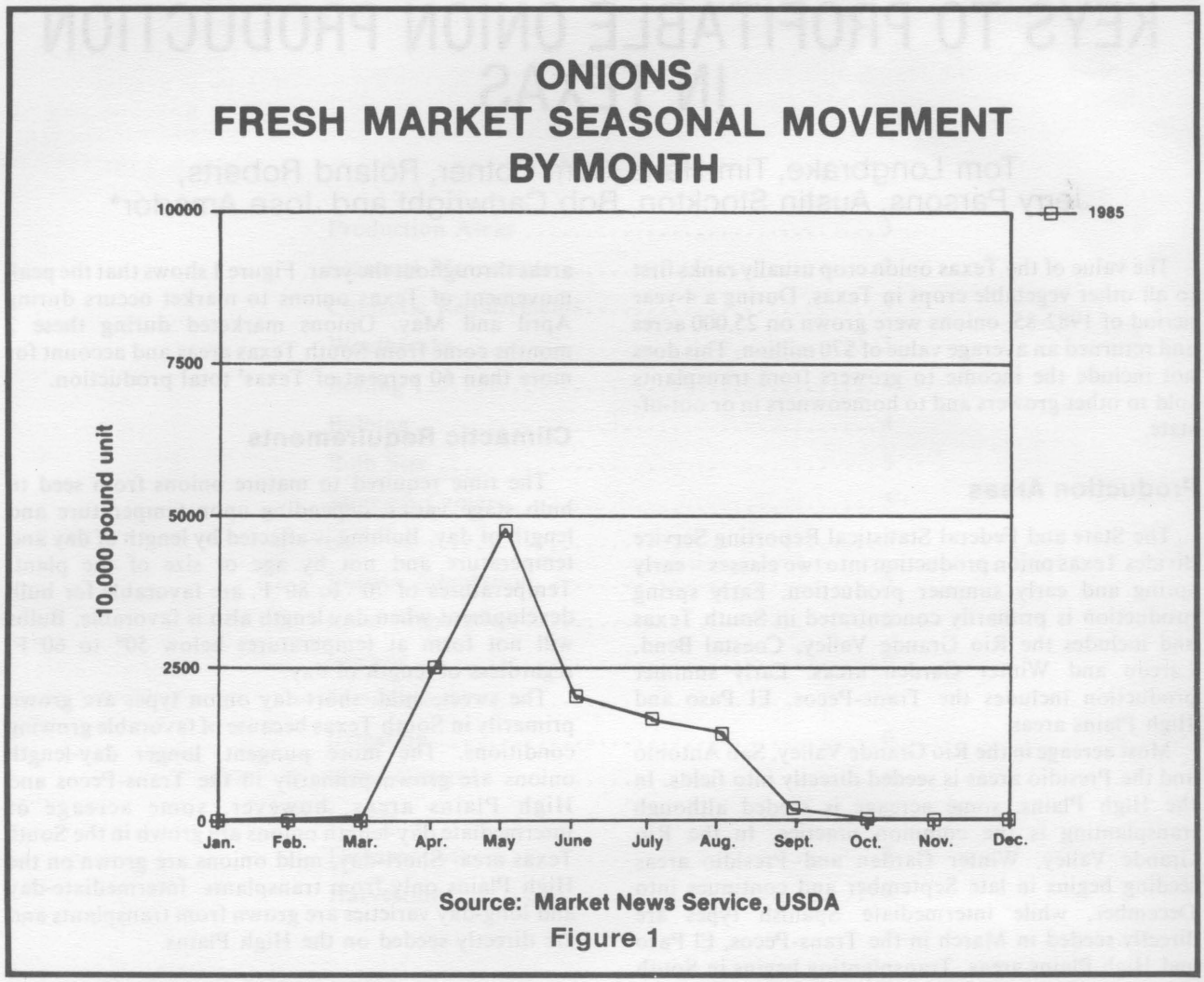

Source: Market News Service, USDA

Figure 1

Bolting—Caused by Cold Weather

Bolting or seed stalk formation occurs in fall-planted onions that are grown through the winter for spring harvest. The size of the over-wintering plant and exposure to cold temperatures are the most critical factors in determining whether the plant bolts. Early plantings in late August and September are more likely to bolt than later plantings in October and November. An extended warm period following planting may produce a large over-wintering plant (more than ¼ inch shank diameter) which results in a high percentage of bolting when exposed to extended temperatures from 42° to 48° F. Vernalization, exposure to cold which triggers bolting, occurs most effectively at temperatures of 42° to 48° F. It is difficult to predict the ideal planting date in South Texas because of the variable occurrence of cold weather. South Texas-grown transplants are subject to bolting when transplanted too early in northern areas. This is due primarily to a combination of oversized transplants (five or more leaves) and extended cold weather in the mid-40s following transplanting.

Bulbing—Initiated by Day-Length

Onion bulbing is a day-length response that is controlled by inheritance in each variety. In general, short-day varieties seeded during the fall in South Texas initiate bulbing in February and March when day-lengths are 11 to 12 hours. Intermediate-day varieties require 12- to 13-hour days which occur in South Texas during late March and April. Long-day varieties require 14- to 16-hour day-length to bulb. In South Texas the longest day-length is less than 14 hours; therefore, long-day varieties will not bulb when grown in the Rio Grande Valley. Long-day varieties of the Sweet Spanish types will bulb in the Texas High Plains area because of longer summer days.

In the El Paso, Rolling Plains and High Plains areas of Texas, fall direct seeding and winter survival are difficult and risky due to winter temperatues below 20° F. and dry winds. Therefore, spring seeding of intermediate to long-day varieties has been more successful. The Granex/Grano types are grown from February/March transplants. Note the mean monthly day-light hours and monthly temperatures between four

major onion production areas in Texas (table 1 and 2). Winter temperatures determine how early onions can be planted while the day-length controls the performance of specific varieties for bulbing response. Within each day-length grouping, there are early and late maturing varieties.

Table 1. Mean monthly temperatures.

Month	McAllen	Uvalde	El Paso	Hereford
December	61.5	51.0	44.1	38.6
March	69.0	63.0	54.9	46.0
June	83.5	84.0	81.0	75.0
September	82.0	79.0	74.5	70.0

Table 2. Hours of daylight in major onion production areas.

Month	McAllen	Uvalde	El Paso	Hereford
December	10.5	10.3	10.1	10.0
March	12.0	12.0	12.0	12.0
June	13.8	14.0	14.2	14.4
September	12.3	12.3	12.4	12.4

Bulb Size

Bulb size is determined by genetic characteristics inherited through breeding programs. Bulb size is also a function of soil factors and pest problems. However, the plant must be grown under mean temperatures above 60° F. and each variety must be grown under a minimum day-length for bulbing to be initiated. Increasing day-lengths and increasing temperatures as the season progresses speed up onion plant maturity. Plant maturity is recognized when the entire plant begins to fall over at the neck above the bulb. Finally, bulb size is determined by the number of leaves, length of growing season and size of leaves. As carbohydrates are translocated from the leaf blades down to the base of the leaf, each leaf forms a ring in the bulb.

Multiple Centers

Some varieties have a higher percentage of multiple centers and in certain seasons multiple centers are more prevalent. Onions used specifically for making onion rings have a priority for single centers. Multiple centers reduce the number of usable rings and therefore reduce the percent recovery. Multiple center is a genetic characteristic that can be controlled to a great extent through plant breeding. Any abrupt change or shock to onion plant growth rate can result in development of axillary buds located between the leaves at the base plate. The abrupt change may be caused by drought, cold, mechanical damage, etc. When this stress occurs early in the season, bulb spliting or formation of doubles is more likely to occur.

Soils

Select a soil for onions that is well-drained but capable of retaining adequate moisture. Good onion soils have a physical structure that permits bulb expansion. Avoid heavy, tight soils with poor internal drainage or soils which crust or bake. Onions grow satisfactorily on highly fertile sandy loams, clay loams and clay soils. Onions grow best in a soil pH range of 6.0 to 8.4 but do not grow well in very acid soils. Disk lime in to raise the pH to 6.0 based on soil analysis.

Variety Adaptation

Most onion varieties are limited in their climatic adaptation. A variety may yield well in one area and yet be a failure in another. Adaptation to an area is determined primarily by length of day and temperature. The length of day necessary to promote bulbing varies with each variety and is influenced by temperature.

Short-day, medium-day and long-day are three varietal categories. Most varieties fit into only one category. Short-day types are grown in the Rio Grande Valley, Coastal Bend, Winter Garden and Trans-Pecos areas during the late fall, winter and early spring. Some short-day onions are transplanted in North Texas in early spring. Limited acreage of medium-day onions are grown in the spring and summer in the Winter Garden, Trans-Pecos and El Paso areas (table 3).

Long-day onions are grown primarily on the High Plains as spring-seeded crops for bulb production during summer and early fall.

Short-day, yellow skin varieties include Dessex, Granex, TEG 1015Y, Early Premium, Henry's Special, Special 38, TEG 1025Y, TEG 1105Y, Early Grano 502 and New Mexico Yellow Grano. White onions in this early group are Crystal Wax, Eclipse, Early Supreme, Robust, White Granex, Majesty and Tampico.

Table 3. Onion varieties and planting periods for different areas of Texas.

Varieties	Area	Seed	Harvest
Short-day varieties	Rio Grande Valley	Sept.-Nov.	March-May
	Winter Garden	Oct.-Nov.	April-May
	Trans-Pecos	Sept.-Nov.	May-June
	High Plains	Oct.-Nov.	June
Intermediate-day varieties	Rio Grande Valley	Nov.-Dec.	May-June
	Trans-Pecos	Sept.-Oct.	May-June
	Winter Garden	Nov.-Dec.	June-early July
	High Plains	March-April	July-Aug.
Long-day varieties	High Plains	March-April	July-Aug.

Intermediate-day yellow onion varieties are Spano, Yula, Cimarron, BR-1, Texspan, Texas 91438, Spanish Main, Texstar and Pronto S. White varieties in this group include New Mexico White Grano and Midstar.

Yellow long-day varieties are Di Maru, Winner, Chieftain 80, Vega, Durango, Celebrity and Armada. White long-day varieties are Avalanche, Ringmaster and Snow White.

Varieties grown for green onions include Evergreen Bunching, Ringmaster and Crystal Wax.

Land Preparation

Plowing, disking, often redisking to break clods and land leveling to maintain correct slopes for irrigation and drainage are important in preparing land for onion production.

For fall seeding it is important that previous crop residues from crops such as cotton or grain sorghum be shredded and plowed under to facilitate seeding. Heavy surface residues lower the effectiveness of chemical herbicides and interfere with uniform seed placement.

After the soil is prepared, list the land into 36- to 40-inch beds. Then shape beds to give a uniform raised bed with a flat top for precision seed and fertilizer placement at planting and for more uniform moisture movement from furrow irrigation.

Seeding

Onions are planted on beds with two seed lines 14 to 16 inches apart or four to six lines across the top of the bed. The amount of seed used per acre varies from less than 2 to 4 pounds per acre depending on the number of lines planted per bed. Final in-row spacing of plants varies from 2 to 4 inches depending upon size of bulbs desired at harvest.

Wider in-row spacing produces large smooth bulbs at maturity and closer plant spacing produces smaller bulbs. If pelleted seed are used, 10 to 20 pounds per acre are generally required. A seeding depth of ¼ to ¾ inch is preferable with the shallow seeding used on heavy soils.

Fertilization

Always rely on soil test recommendations. Apply phosphate and nitrogen to fall-seeded onions. The most efficient use of phosphorus fertilizer by onions is through band placement at 2 to 4 inches directly below the seed or transplant. On heavy soil, 100 to 120 pounds per acre of phosphate and on light soils, 60 to 80 pounds should be sufficient when banded beneath the seed.

For the mild flesh Grano/Granex types which are subject to bolting when too much growth occurs before the onset of cold weather, apply a maximum of 20 pounds of nitrogen preplant. When active growth starts in the spring, sidedress nitrogen at 30 to 40 pounds per acre. Make three to four additional nitrogen sidedressing applications at the same rate at about 3-week intervals for a total of 150 to 180 units of nitrogen per acre. Excess nitrogen applied within 40 days before harvest may delay maturity.

For spring-seeded or transplanted onions, band all the phosphate and 20 to 30 pounds of nitrogen 3 inches beneath the row. Make the first nitrogen sidedressing application on seeded onions at 30 to 40 pounds per acre when the plants are in the four- to five-leaf stage or when they are the size of a good transplant. For newly transplanted onions apply the first nitrogen sidedressing when active growth becomes apparent. Three or four additional nitrogen sidedressings may be made at the same rate at intervals of 3 weeks or as needed. In transplanted onions, the soil's nitrogen content should decrease after bulbs exceed 2 inches in diameter and reach a low point at maturity.

Irrigation

All commercial onions grown in Texas require irrigation. The onion is a comparatively shallow-rooted crop with most of the roots in the top foot of soil. Keep onions growing steadily with timely irrigations. Stress causes splits and doubles that reduce the yield of U.S. No. 1 bulbs.

Over-irrigation where the surface soil is continuously wet can be as detrimental to yields as insufficient irrigation.

Research shows that the greatest water use by the onion is during bulbing through maturity. Irrigation during this period may be required at weekly intervals or more often to keep onion plants growing vigorously. Onions utilize between 1 and 3 acre-inches of water per week.

When the bulbs start to mature and the tops begin to fall, discontinue irrigation and allow the soil to dry to facilitate undercutting the roots.

Weed Control

For preemergent weed control on onions, use 5 to 6 quarts of Prefar or 10 to 12 pounds of Dacthal 75W per acre on a broadcast basis. Prefar performs best when incorporated 2 to 3 inches deep before planting. Do not incorporate Dacthal but apply to soil surface after planting and just before irrigating. Dacthal may also be applied postemergent to onions during the growing season to extend preemergent weed control to harvest.

Postemergent weed control chemicals include 3 to 6 percent sulfuric acid solution and Goal. (Use extreme caution to prevent damage to eyes and skin when mixing and applying these chemicals. Always dilute the chemical into the sprayer nearly filled with water.) Water volume is important—use 50 to 70 gallons per acre volume. Apply Goal herbicide for postemergent weed control to directly seeded onions in the two fully developed leaf stage or to transplants as soon as practical after planting. Apply when weeds or grasses

are in the two- to four-leaf stage in onions for dry bulb use only. Do not apply to onions under wet weather conditions as crop injury may result. Apply all postemergent herbicides in sufficient water to give adequate coverage of young seedling weeds and grasses.

All necessary mechanical cultivation should be shallow to avoid root damage to the shallow rooted onion crop.

Insects

Thrips. Thrips are the most serious insect pest of onions in Texas. Recent difficulties have been experienced in controlling thrips, leading to significant onion yield reductions. Thrips damage may cause a decrease in bulb size, resulting in a reduction in grade and a lower price received per unit.

Leaf areas damaged by thrips appear silvery and may be speckled with black fecal spots. Thrips feed by rasping leaf tissue and removing cell liquids, thereby destroying plant cells. The rasping of leaf tissues by thrips may also predispose onions to infection by several diseases.

Two thrips species of economic importance occur on onions — the onion thrips *(Thrips tibaci)* and the western flower thrips *(Frankliniella occidentalis).* Damage by both species appears to be similar. Large immigrations of western flower thrips from maturing wheat into onion fields have been noted in the High Plains.

The thrips life cycle may be as short as 2 to 3 weeks under high temperatures. Winged adults colonize onions, begin feeding and lay eggs in leaf tissue. After hatching, two immature stages (larva) feed and develop on the plant. A pre-pupal and pupal stage follow larval development and are mobile but do not feed. Adults soon emerge and may colonize other plants. Many generations of thrips occur during the growing season.

Controlling thrips is usually dependent on use of insecticides; although, natural mortality of a thrips population can be significant. Minute pirate bugs *(Orius spp.)* and banded-wing thrips *(Aleothrips sp.)* are both predators that provide some biological control. Heavy rainfall may also greatly reduce populations.

Carefully scout onion fields twice weekly, examining enough plants to give a representative estimate of thrips populations. Randomly check a minimum of 20 plants for a small field with proportionally more for large fields. Most currently registered insecticides generally fail to provide adequate control. Therefore, to avoid exceeding economic injury levels, initiate insecticide applications when populations exceed five thrips per plant (adults and larvae). Thrips population declines usually coincide with plant maturity and the disappearance of a growing point. As plants near maturity (10 to 14 days before harvest), thrips normally do not warrant spraying.

Thrips commonly are found feeding in leaf axils near the growing point. In older plants, they also aggregate beneath the bends of leaves. The habit of hiding beneath leaves or in the axils makes them less likely to contact insecticides unless the spray droplets penetrate these hidden areas. Therefore, spray applications by ground rig with high volume of more than 30 gallons per acre and high pressure of 80 pounds per square inch or more usually provide better control. Insecticides registered for thrip control are listed in table 4. Always refer to specific use instructions and precautions on all pesticide containers before applying chemicals.

Other pests. Soilborne insects such as wireworms and white grubs can cause serious damage to onions. Soil

Table 4. Insecticides labeled to control insect pests on onions in Texas with application rates and pre-harvest intervals (rates in pounds of active ingredient per acre).

Insecticide	Days between last application and harvest*	PEST				
		Beet armyworm	Climbing cutworms	Onion maggot	Thrips	Wireworms/ white grub
Azinphosmethyl (Guthion)	28 - green 7 - dry				0.5-.75 0.5	
Chlorpyrifos (Lorsban 15G)	AP					
Diazinon	10			2-4 ppg	0.5	2.9-3.9 ppg
Fensulfothion (Dasanit)	AP			1.0		
Fonofos (Dyfonate)	AP			1.0		
Malathion	3				0.94	
Methomyl (Lannate)	25 - green 7 - dry	0.45			0.45	
Methyl parathion	15				0.45	
Mevinphos (Phosdrin)	1		0.25 0.5		0.25-0.5	
Oxamyl (Vydate)	7				0.25-0.5	
Parathion	15			2.0	0.25	3-4 ppg

*Pre-harvest intervals apply to green onions or dry bulb onions unless specifically noted. PPG = applied as pre-plant granular. AP =at-planting application.

insects are more common when onions are planted following a grass crop or in a weedy field. Under such conditions or if the field has a history of soil insect problems, apply a pre-plant soil insecticide. Beet armyworms also may be a serious pest of onions. Adult armyworm moths lay eggs in clusters on plants resulting in "hot spots" of larvae. After a female moth lays a group of eggs, she covers them with white hair-like scales from her body, giving the egg masses a cottony appearance. Larvae molt several times before pupation and the entire life cycle can be completed in 2 to 4 weeks during warm weather. Larvae vary in color, usually light green, and have a smooth body surface with few hairs. Larvae normally have a dark spot on the side of the body above the second true leg. Natural mortality of beet armyworm is often high and, thus, control measures are not always needed. Some defoliation can be tolerated without yield loss, probably at least 5 to 10 percent of total leaf area, depending on the size and health of the plant. When significant foliage loss is anticipated, apply an insecticide in a manner to assure good coverage.

Diseases

The main onion diseases in Texas are purple blotch and pink root. In addition to these, damping-off of young seedlings can occasionally be troublesome. Recently, two new diseases—downy mildew and powdery mildew—were found in South Texas. Blast, a common onion disease caused by *Botrytis sp.*, is a serious problem in the High Plains area.

Purple blotch is a disease of leaves and bulbs that can be a severe problem during moderately warm and wet weather. Occurrence of 14 or more continuous leaf *wetness hours* daily for several days are favorable for disease development. Time protective fungicide applications to give plants maximum protection during these periods.

Pink root is a soilborne disease; therefore, the longer onions are grown in the same field, the more destructive the disease becomes. Resistant varieties and crop rotation reduce losses from this disease. Cultural practices such as frequent cultivation, good drainage and good fertility all discourage damping-off. Downy mildew seriously affects onion production; avoid its establishment particularly during periods of cool and wet weather, by observing fields closely for disease development and using fungicides with known effectiveness. Powdery mildew damages have been negligible so far in Texas and no specific control practices are recommended.

For control of leaf and tip blight, downy mildew, purple blotch and other leaf diseases, use regular applications of Dyrene (2 to 6 pounds, 50 percent wettable powder per acre), Rovral (1 to 1.5 pounds, 50 percent wettable powder per acre), Bravo 720 (1 to 2 pints, 54 percent flowable per acre), Dithane M-45 (2 to 3 pounds, 80 percent wettable powder per acre), Manzate 200 (2 to 3 pounds, 80 percent wettable powder per acre), Dithane M-45 F (2.4 quarts, 37 percent flowable per acre), Manzate 200 F (1.7 to 2.5 quarts, 37 percent flowable per acre), Manex (1.2 to 1.6 quarts, 37 percent flowable per acre) and Ridomil MZ-58 (1.5 pounds, 58 percent wettable powder per acre) with a spreader sticker in sufficient water to obtain good coverage. Ten to 12 applications per crop may be required in South Texas with decreasing frequency needed in the drier Trans-Pecos and High Plains areas.

Several diseases can cause severe losses to onions in transit and storage. These diseases usually can be prevented by maintaining low humidity, low temperature and good ventilation with air circulation. Field sanitation and proper handling during harvest and storage are very important in preventing the type of damage that enhances disease losses in storage and transit.

Harvesting

When onion bulbs approach maturity, the tops fall over. Some growers begin harvest when 50 percent of the tops have fallen. Most growers loosen the soil by running a wing-sweep or rod weeder several inches below the bulbs. This cuts the roots in the same operation. Under dry weather conditions, bulbs may be left in this condition and allowed to dry. Onions are pulled, clipped and placed in burlap sacks for up to a week for field curing. Sacks are aligned in rows to facilitate loading.

Onions are hauled from the field to a packing shed where they are elevated directly into grading and sizing machines or elevated into large wooden bins for further drying with forced, heated air. Trucks are bulk loaded in the field. Truck beds may be especially constructed to facilitate unloading with a slanted floor to one side or with V-shaped bottoms fitted with a belt conveyor in the truck to unload to the rear.

Forced air drying is accomplished by using natural gas or electrically heated air forced through loose onions in bulk bins. Air temperatures of 90° to 93° F. are used for drying for periods of 8 to 16 hours. Higher temperatures may scorch the onions. Forced air drying reduces the time interval of field curing and thus reduces the chance of losses that occur with wet weather and generally improves the quality for long distance transporting. The harvesting and drying operation is usually the shipper's responsibility, although the grower may be charged for this service.

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