Crop Profile for Potatoes in Texas

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General Production Information

- Texas ranks 13th in potato production in the U.S. In 2008, 15,400 acres of potatoes were planted in the state. This crop generates $84 million in cash for farmers annually.
- Average Texas potato yield in 2008 was 30,400 pounds per acre for a total production of 441,000,000 pounds in the state.

Production Regions

The High Plains region of Texas is located north and south of Lubbock, Texas between the Caprock and the New Mexico border. This area consists of 27 counties that produce a majority of the state's cotton crop. The hot days and cool nights plus loam and sandy soil types make it vital to implement water and soil conservation methods. Average rainfall is 16-22 inches, but there are wide year to year variations in both total and seasonal rainfall. Fifty percent of the potatoes grown in the state are produced in this region.

The Lower Rio Grande Valley (LRGV) is located between McAllen and Brownsville, adjacent to the Mexico border. Average rainfall is between 25 and 30 inches per year. This area produces roughly ten percent of the state's crop.

The Texas Wintergarden includes The South Texas Brush Country and is an inland region extending from slightly north of San Antonio south to the Mexican border. It has shallower soils and receives less rainfall than the LRGV. Approximately forty percent of Texas potatoes are grown in this production region.

Cultural Practices

Varieties: Recommended Russet varieties are: Russet Norkotah, Norgold M, and Century Russet. Recommended White varieties are: Atlantic, Gemchip, Chipeta, and Kennebec. Yukon Gold is the recommended Yellow Flesh variety. Red LaSoda, and Viking are the recommended Red varieties.

Soil type: Preferred soil types are well drained, sandy loam, loamy sand, or sandy clay loam with pH 6.0- 7.8.

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Optimum growing conditions: Potatoes are a cool season crop and prefer warm days (75^o F – 85^o F), long days (16 - 18 hours), and cool nights (50^o F -60^o F). Optimum mean temperatures are 60 F – 65 F.

Establishment methods: Plant 2 oz. tuber seed pieces 2 weeks after the last freeze when the soil temperature is greater than 50 F. Plant at the rate of 1,600 - 2,200 lbs. of seed per acre. Plant 2 - 3 inches deep, 7 - 10 inches apart on 34 - 40 inch raised beds. In the Winter Garden some plant protection is gained from planting on low beds and throwing soil to plants as they grow.

Fertilization: Fertilization rates should be based on actual soil test results. Generally, fertilization needs will be about 175 pounds of nitrogen, 80 pounds of phosphorus, and 80 pounds of potassium. Potassium is generally not needed in the High Plains, although many growers apply it.

Irrigation: Potatoes need 20-40 inches from rainfall or irrigation through the growing season. After establishment, the critical demand periods are: vining, bloom, tuber initiation, and tuber growth.

Land preparation: Shred or apply herbicide to destroy previous crop and weeds. Disc two or three times, apply fertilizer and irrigate.

Planting: Use treated seed. In the Lower Rio Grande Valley plant in late November or December. In the Winter Garden plant in December and January. In the High Plains plant in February through early April.

Growing season activities: Growing season activities include: monitoring fields for pest problems and field conditions, applying fertilizer and pesticides, hilling, irrigating, and cultivating.

Vine killing: Vines need to be killed prior to harvest in order to stop growth and facilitate ease of harvest. Chemicals used for vine killing can be found in a table in the Weed section of this profile. Vine mowers and beaters can also be used to kill vines.

Harvest: Harvest 100 - 120 days after planting. Potatoes are harvested mechanically onto hopper bottom trucks for hauling to the shed. The potatoes are washed, graded and sacked in burlap bags (100 lbs.) or packaged in box-waxed paper cartons (50 lbs.). Potato grades are U.S. #1, and U.S. #2, sized and unsized: Sizes range from 6 to 12 oz. tubers per count cartons. Anticipated yield is 250 to 350 cwt. per acre. Potatoes are harvested in April and May in the Lower Rio Grande Valley, in April, May and June in the Winter Garden, and in July through October in the High Plains.

Worker Activities

The majority of potato production occurs through mechanized processes. Tillage, spraying, and harvest are accomplished using motorized equipment usually from an enclosed cab. Limited worker contact might occur during repair of irrigation equipment or during field inspection/scouting activities.

Insect Pests

Foliar feeding insects
Colorado potato beetle (*Leptinotarsa decemlineata*), potato aphid (*Macrosiphum euphorbiae*), leafhopper (*E. fabae and E . abrupta*), grasshoppers, spider mites, potato psyllid (*Paratrioza cockerelli*), false cinch bug (*Nysius raphanus*), cabbage looper (*Trichoplusia ni*), and tomato hornworm (*Manduca quinquemaculata*)

Frequency of Occurrence:
Every year these insects will appear in some part of the state and cause problems in potatoes. In the High Plains psyllids and grasshoppers are a problem every year.

Damage Caused:
Colorado potato beetle larvae and adults devour the foliage.

Potato aphids suck plant juices and curl leaves. They transmit viral pathogens, which cause more damage than actual feeding damage.

Leafhopper feeding causes curling, stunting and dwarfing, accompanied by a yellowing, browning or blighting of foliage. Injection of saliva into the phloem during feeding results in a physiological disturbance producing disease-like symptoms.

Grasshoppers feed on the potato foliage.

Immature *potato psyllids* inject a toxin when they feed on the potato plants. Plant yellowing is the most common symptom. Twenty to fifty percent yield losses can result.

Cabbage loopers are voracious feeders, which can strip foliage from infested plants in a short time. Often, when populations become crowded, a virus disease strikes, causing high larval mortality.

Tomato hornworm larvae are voracious foliage feeders. They can defoliate a plant in one day.

Percent Acres Affected:
One hundred percent of the Texas potato acreage is affected by *potato aphids*, *leafhoppers* and *psyllids*, 50% by *grasshoppers*, and 20% by *cabbage loopers*. An estimated 2% of Texas potato acreage is affected by *Colorado potato beetle* (*Colorado*

potato beetles can be found on 100% of the acreage but very seldom do they reach economic threshold to where they cause a problem and are treated).

Pest Life Cycles:
Colorado potato beetle (*Leptinotarsa decemlineata*) deposit about 500 eggs in batches of about 24 on the underside of leaves. The eggs hatch in 4 to 9 days and larvae become full- grown in 2 to 3 weeks, consuming the leaves. Pupation occurs in the soil and requires 5 to 10 days. Two to three generations occur in Texas.

Potato aphids (Macrosiphum euphorbiae) overwinter as eggs on a variety of crops and weeds. The eggs hatch in the spring, and after one or more generations on the over-wintering host, winged aphids are produced and migrate to a variety of other hosts, including potatoes. Females can reproduce without mating with males. Each aphid can give birth to 50-100 live young, all females. There may be 5-10 generations per season. In the fall, a generation with winged males and females is produced. These migrate back to over wintering hosts, mate, and lay eggs.

Leafhopper females deposit slender, white eggs into stems and larger veins of plant leaves. Hatching occurs in 6 to 9 days during summer; nymphs molt 4 times before becoming adults. Shortly after adults appear, mating takes place, followed by oviposition. Several generations overlap each season. Adults are very active, jumping or flying when disturbed. Both adults and nymphs can run backwards or sideways as rapidly as they move forward.

Grasshoppers pass the winter in the egg stage. Eggs are laid during summer and fall in packet-like masses below the soil surface of pasture land, field margins and road sides. Eggs hatch into small nymphs in April, May and June. Exact time and percentage of eggs hatching depends on weather conditions and locality.

Potato psyllids pass through three life stages in development: egg, nymph and adult. Psyllid eggs are frequently deposited along leaf margins but may occur on either leaf surface. Eggs hatch in 6 to 10 days. Newly hatched nymphs undergo four molts. While feeding, psyllid nymphs excrete small, waxy beads of material resembling granulated sugar. This material may cover leaves during heavy psyllid infestations. The nymph stage usually lasts from 14 to 22 days. Newly emerged adults remain green for a day or so on the plant before turning darker. There are four to seven generations of psyllids in a year with some overlap of generations.

There are continuous generations of *cabbage loopers* with reproduction slowing down during cold periods. In colder areas, the insect overwinters as pupae in flimsy silken cocoons attached to food plant residue. A complete generation occurs in 4 to 6 weeks in warm weather.

Timing of Control:
Pesticides are applied when necessary as determined through scouting activities. In the High Plains initial foliar applications for insect control are not needed until about the middle of the growing season.

Grasshoppers normally build up on field edges, and that is the best place to scout and treat when high numbers begin developing. Treating border areas is much cheaper than treating whole fields. Producers are urged to carefully monitor field margins adjacent to pastures and roadside areas for grasshoppers, damage and the need to treat. Control measures should be initiated early in the season while grasshoppers are in the nymphal stages and still within hatching sites (roadsides or fence rows, etc.). During dry periods, grasshoppers will migrate to more desirable plants; this is particularly noticeable as grass measures are aimed at suppressing hopper numbers. Persistence is the key to management of grasshopper numbers. Several insecticide applications may be required as the season progresses particularly under dry conditions. In essence, an insecticide treatment will reduce numbers within the treated area; however they will soon be replaced by hoppers migrating from adjacent areas.

Yield Losses:
If present and not controlled, *Colorado potato beetles* can cause yield losses of 30%, *potato aphids* 40%, *leafhoppers* 30%, *potato psyllids* 40%, *false cinch bugs* 50%, *grasshopper* 50%, *spider mites* 50% and *cabbage loopers* 40%.

Regional Differences:

There is no regional difference in frequency of occurrence for *Colorado potato beetles*, *potato aphids, leafhoppers, false chinch bugs,* and *spider mites*.

Potato psyllids are a big problem in the Winter Garden, less of a problem in the High Plains, and a minor problem in the Lower Rio Grande Valley.

Grasshoppers and *potato psyllids* are becoming a big problem in the High Plains.

Cabbage loopers are more of a problem in the Winter Garden and the Lower Rio Grande Valley than in the High Plains.

Cultural Control Practices:
Colorado potato beetle - Reduce migration from field to field with trenches, mulches, and no till. Rotate to non-susceptible crops to delay arrival of the first generation of the adults.

Potato aphid - Control weeds along ditch banks, roads, in farmyards, and other non-cultivated areas to reduce aphid habitat. Plant disease-free seed to reduce the incidence of potato leafroll virus.

Biological Control Practices:
Apply insecticides judiciously. Only apply what is needed after scouting reveals economic threshold is reached to avoid killing beneficial insects as much as possible.

Colorado potato beetle - Bacillus thuringiensis, variety tenebrionis and variety san diego are registered as bacterial controls. The pink spotted lady beetle (*Coleomegilla maculata*), a grounddwelling beetle (Lebia grandisa), and the spined soldier bug are insect enemies. Beauveria bassiana is an insect-pathogenic fungus that infects the larvae. Beauveria is used as a fungal microbial insecticide in some countries. Information on the efficacy of using these organisms for controlling the Colorado potato beetle is lacking.

Potato aphid - The sevenspotted lady beetle, pink spotted lady beetle (*Coleomegilla maculata*), and convergent lady beetle are potato aphid predators. The pink spotted lady beetle (*Coleomegilla maculata*) and the convergent lady beetle are commercially available.

Leafhopper - Common green lacewings prey on leafhopper eggs and they are available commercially.

Potato psyllid - The minute pirate bug and the damsel bug are effective predators on the potato psyllid as is the convergent lady beetle.

Cabbage looper - Bacillus thuringiensis.

Post-Harvest Control Practices:
Clean field completely from all leftover tubers, vines, weeds, and debris. Bury or feed to cattle.

Chemical Controls:

Insecticide	**Typical Rates**	**REI (hours)**	**MOA**
Esfenvalerate (Asana XL)	2.9-9.6 fl oz	12	3
Target insects	Aphids, flea beetles, leafhopper, potato psyllid, cabbage loopers, and grasshoppers.		
Phorate (Thimet)	11.2-17.2 lbs of 20G	48	1A
Target insects	Early season control of potato psyllid, aphids, Colorado potato beetle, flea beetles, and leafhoppers.		
Endosulfan (Phaser, Thiodan)	1.5-2 qt of 2 EC	48	2A
Target insects	Colorado potato beetle, aphids, flea beetles, leaf hoppers, potato psyllid, and false chinch bug.		
Imidacloprid (Admire, Provado)	5.7-8.7 oz of Admire 2F	12	4A
Target insects	Colorado potato beetle, aphids, flea beetles, leaf hoppers, and potato psyllid.		

Methamidophos (Monitor)	1.5-2.0 pt of 4E	48	1B
Target insects	Colorado potato beetle, aphids, flea beetles, and leafhoppers.		
Permethrin (Ambush, Pounce)	6.4-12.8 oz of 25WP	12	3
Target insects	Colorado potato beetle, aphids, flea beetles, leaf hoppers, and potato psyllid.		
Oxamyl (Vydate L)	1-2 gal	48	1A
Target insects	Colorado potato beetle, aphids, flea beetles, leaf hoppers, and mites.		
Carbaryl (Sevin)	1-4 pt. of 4F; 1-1.5 lb of XLR Plus	12	1A
Target insects	Colorado potato beetle, flea beetles, grasshoppers (on field borders), and leafhoppers.		
Methomyl (Lannate LV)	1.5-3 pt	48	1A
Target insects	Aphids, flea beetles, cabbage loopers, and leafhoppers.		
Methyl-parathion (Pencap-M)	2-6 pt	288	1B
Target insects	Colorado potato beetle, flea beetles, cabbage loopers, and leafhoppers.		
Thiamethoxam (Actara/Adage)	1.5-3.0 oz	12	4A
Target insects	Colorado potato beetle, potato psyllids, and leafhoppers.		
Indoxacarb (Avaunt)	2.5-6.0 oz	12	22
Target insects	Colorado potato beetle, cabbage looper, and European corn borer.		

Diseases

Early blight and late blight
P. infestans(US - 8, A2 mating type)

Frequency of Occurrence: Annually

Damage Caused:
Early blight (*Alternaria solani*) often kills lower leaves and reduces yields. Oval to angular dark-brown to black target spots develop on the leaves. The lowest or oldest leaves are infected first. There is often a yellow area around the spots. Tuber infection may occur as brown-black sunken spots. Under very humid conditions *late blight* (*Phytophthora infestans*) may produce white mold on the underside of the leaves. Lesions on infected leaves and stems become visible as small flecks within three to five

days after infection. The infected tissue is initially water-soaked but becomes brown or black in a few days. Under high humidity, sporulation is visible as a delicate white mold surrounding the lesions. Under cool, wet conditions it may attack petioles and stems, ruining a field in a few days. Blight spores can infect tubers at harvest or while in the ground.

Percent Acres Affected:
Seventy five to one hundred percent of Texas potato acres are affected by *early blight*, depending on weather conditions. *Late blight* affects 1-2% of the state potato acreage annually.

Pest Life Cycles:
Early blight - Mycelia and spores of Alternaria survive between corps in crop residue and on a wide host range. Spores are air-borne. Heavy infection occurs with frequent rain and heavy dews. *Early blight* is primarily a disease of senescing plants. Early symptoms appear on the oldest foliage (lower canopy). In the High Plains it usually occurs from late May to early June.

Late blight - Spores of the late blight fungus are commonly carried by wind, rain, and equipment, reaching up to 100 miles in air. Healthy seed pieces may be infested during seed handling and cutting operations. In the white cottony mycelial growth, on lesions, microscopic lemon-shaped structures called sporangia form on stalk-like sporangiophores. These sporangia produce and release motile zoospores under cool moist conditions. Rain may wash sporangia from blighted foliage down the stems to the tubers below, causing tuber infection. The late blight fungus over winters in tubers in cull piles and in those left in the field. Young shoots form tubers in cull piles or in the field are produced early in the season. Late blight infections in these tubers provide initial inoculum for field infection. Infected seed potatoes also serve as an important source of inoculum. Current strains are resistant to metalaxyl and mefenoxam, previously an effective curative fungicide, thus posing a much greater economic significance than in the previous decade.

Timing of Control:
Fungicide seed piece treatments help reduce initial inoculum. Blight control efforts should be made throughout the growing season, including fungicide applications, depending on scouting results and weather conditions. Areas near outer pivot points should receive extra scouting and spraying because of increased leaf wetness.

Yield Losses:
If not controlled *early blight* can reduce yields by 40%. *Late blight* can reduce yields by 85% to 100%.

Regional Differences:
Early blight is more of a problem in the High Plains than in the Lower Rio Grande Valley and more of a problem in the Lower Rio Grande Valley than in the Winter Garden.

Late blight is a sporadic problem in all potato growing areas in the state.

Cultural Control Practices:
Early blight - Two year rotation and good fertility.

Late blight - Select fields for planting without trees or other obstacles for complete field spraying. Avoid overlapping pivots. Delay harvest about 2 weeks until vines are killed by chemical treatment. Commercial varieties do not have useful levels of resistance. Proper hilling and vinekilling practices reduce the exposure of tubers to spores. Use of disease-free seed treated with late-blight specific fungicides is important, because disease-free seed is not always available. Cull piles should be eliminated (buried or otherwise destroyed) before plants emerge in the spring. Foliage and vines should be completely dead and dry before harvest to avoid inoculating tubers. Crop rotation is not effective.

Post-Harvest Control Practices:
Clean field completely from all leftover tubers, vines, weeds, and debris. Bury or feed to cattle.

Other Issues:
Early blight enters Texas on infected seed. Texas growers are reminded to make sure the seed they purchase has been tested blight free. Since most purchase their seed from out of state.

Chemical Controls

Fungicide	**Typical Rates**	**REI (hours)**	**MOA**
Chlorothalonil (Bravo)	1.0 lb	12	M5
Target diseases	Early blight and late blight.		
Mancozeb	2.0 lb	48	M3
Target diseases	Early blight and late blight.		
Dimethomorph (Acrobat)	4.0-6.4 oz	12	40
Target diseases	Late blight.		
Cymoxanil (Curzate)	3.2 oz	12	27
Target diseases	Late blight.		
Azoxystrobin (Amistar)	2-5 oz	4	11
Target diseases	Early blight.		
Dithiocarbamate (Polyram)	2 lbs	24	M3
Target diseases	Early blight and late blight.		
Boscalid (Endura)	10 oz	12	7

Target diseases	Early blight.		
Triphenyltin Hydroxide (Super Tin)	4-6 oz	48	30
Target diseases	Early blight.		
Pyraclostrobin (Headline)	12 oz	12	11
Target diseases	Early blight.		
Trifloxystrobin (Gem)	2.9-3.8	12	11
Target diseases	Early blight and late blight.		
Iprodione (Rovral)	1-2 pts	24	2
Target diseases	Early blight.		
Famoxadone + Cymoxanil (Tanos)	6-8 oz	12	11 + 27
Fluazinam (Omega)	5.5 oz	48	29
Target diseases	Late blight.		

Seed Piece Decay

[Dry rot (*Fusarium* spp.), Black leg (*Erwinia carotovora*), Stem canker (*Rhizoctonia solani*), Commonscab (*Streptomyies scabies*), and silver scurf (*Helminthosporium solani*)]

Frequency of Occurrence:
Occurrences of *dry rot*, *black leg*, *stem canker*, *common scab,* and *silver scurf* are sporadic, depending on weather conditions (cool or wet conditions at or following planting), irrigation management, and seed quality.

Damage Caused:
Potato seed pieces can become infected with fungal or bacterial pathogens causing decay of seed pieces, stems, and developing tubers. Yield loss is due to loss of plant stand. During storage *silver scurf* can cause black circular lesions to occur on the surface. This affects potato quality and marketability.

Percent Acres Affected:
One hundred percent of the Texas potato acres are affected with *seed piece decay*.

Pest Life Cycles:
Seed pieces can become infected by Fusarium, Rhizoctonia, and Streptomyces spp. (common scab) as well as bacterial soft rot pathogens. These pathogens may be soil-borne or seed-borne. The *silver scurf* pathogen overwinters on infected seed-pieces and survives on crop residue. Symptoms appear as smooth, gray-to-silver sheen.

Timing of Control:
A seed treatment is applied at time of seed cutting, immediately before planting.

Yield Losses:
Yield losses of around 33% can result if seed pieces are not treated to control *seed piece decay*.

Regional Differences:
Seed piece decay is a severe problem in the High Plains, a moderate problem in the Winter Garden, and a minimal problem in the Lower Rio Grande Valley.

Cultural Control Practices:
Seed quality is the most important factor in minimizing seed piece decay losses. Seed treatment with fungicides is the second most important consideration. Seed should be warmed to 50^0 F before handling, cutting, or planting. Seed planted into warm, well-drained soil will emerge faster, minimizing risk of loss. Shallow planting and light cultivation to break up compacted soil will increase soil temperature, improve oxygen levels around the seed piece, and speed plant growth. Physiological disorders due to lack of oxygen and cold temperatures during storage or in transit contribute to seed piece problems and poor stand establishment. Irrigation practices affect incidence of *blackleg-soft rot complex*.

Chemical Controls

Fungicide	**Typical Rates**	**REI (hours)**	**MOA**
Fludioxonil (Maxim)	0.5 lb per 100 lb seed pieces	12	12
Target diseases	Seed piece decay.		
Dithiocarbamate (Polyram)	1.5-2 lbs	24	M3
Target diseases	Seed piece decay.		

Zebra Chip

A new disease to potatoes was discovered around 2000 in the Lower Rio Grande Valley of Texas. Zebra chip is named for the dark stripes it leaves in the flesh of raw potatoes, is not harmful to human health, but causes serious and expensive reductions in crop yields and quality. Zebra chip is a bacterial disease that alters the sugar levels in the potato. The sugar caramelizes and turns the chip brown when it is fried, giving it an off taste and burnt appearance. While it is not harmful, it is a cosmetic and taste concern for consumers.

Scientists believe the disease is vectored by the potato psyllid. Crops have been affected in Guatemala, Mexico, Texas and as far north as Colorado. Symptoms are especially

pronounced when potatoes are sliced and fried to make potato chips, causing frying plants to reject entire loads of affected potatoes. It also affects fresh market potatoes.

There is no adequate control for the insect or the disease at this time.

Nematodes

Frequency of Occurrence:
Nematodes are a major problem where known infestations occur.

Damage Caused:
There are several species of *nematodes* pathogenic on potatoes. Damage caused by the various species includes: causing root injury that severely reduces yields and may accelerate the early dying disease, galling of tubers causing serious quality defects, pruning, stunting, and necrosis of roots, and producing severely misshapen, scruffy, and abnormally russetted tubers. They feed on the potato and cause water blisters that turn into dried up wart pimples. These will show as brown spots on the outside ring of potato chips. Nematodes also cause wet breakdown when hauling the potatoes.

Pest Life Cycles:
Root knot *nematode* females lay eggs in jelly-like masses on or just below the surface of infected roots and inside infected tubers: tuber cells surrounding egg masses turn brown. Eggs inside tubers can survive winter conditions. The worm-shaped juveniles that hatch from eggs can move as far as 2 or 3 feet through moist soil, but usually travel only short distances to find a host plant. They penetrate roots just behind root tips, where the root surface has not been strengthened with age. Inside the root or tuber, the nematode's salivary secretions contain enzymes and plant hormones that stimulate the formulation of "giant cells," greatly enlarged cells that supply the nematode with food. As they mature, females swell, become pear shaped, and lose the ability to move. Nematode populations increase at a rate that depends largely on soil temperature and moisture and the number of nematodes present in the spring. Populations usually decline by over 50% during the winter: spring populations consist mostly of eggs and juveniles.

Timing of Control:
Fumigate soil two to three weeks prior to planting or use liquid or granular nematicide and apply broadcast or banded at planting time.

Yield Losses:
Nematodes cause up to 30% yield losses if not controlled. Root knot damage can result in rejection by buyers of whole fields.

Regional Differences:
Nematodes are a significant problem in the Winter Garden but generally not as damaging in the High Plains and the Lower Rio Grande Valley.

Cultural Control Practices:
Crop rotation with unrelated crops is a sound practice for reduction of nematodes and other kinds of soilborne problems. Summer weed fee fallow is beneficial if wind and water erosion risks are low.

Post-Harvest Control Practices:
Land should be disked as soon as possible after harvest to ensure death and desiccation or decomposition of all host plant tissues. If other cultural considerations make it practical, a brief fallow period during hot weather, during which the land is disked at least twice to expose additional soil to desiccation and sunlight, can reduce populations of nematodes.

Chemical Control:

Nematicide	Typical Rates	REI (hours)	MOA
Potassium N-methyldithiocarbamate (K-Pam)	varies	48	na
Dichloropropene + chlorpicrin (Telone C-17)	varies	120	na
1,3-Dichloropropene (Telone II)	varies	120	na

Weeds

Broadleaf, grass, and sedge weeds
(pigweed, purslane, sunflower *(including yellow top or prairie sunflower)*, Russian thistle, morningglory, field bindweed, mustard, barnyardgrass, johnsongrass, Texas panicum, bermudagrass, and nutsedge)

Frequency of Occurrence:
Weeds are present and must be controlled every year of production.

Damage Caused:
Weeds reduce yields due to competition. They interfere with harvesting and act as alternate hosts for insects, and pathogens, especially nematodes.

Percent Acres Affected:
One hundred percent of Texas potato acres are affected by weeds.

Pest Life Cycles:
The broadleaf weeds, *pigweed*, *morningglory*, *purslane*, and *sunflower* are native to Texas and are warmseason annuals. *Field bindweed* is a broadleaf warm-season perennial introduced to Texas.
Russian thistle is an introduced annual warm-season broadleaf weed. *Mustard* is an introduced annual cool-season broadleaf weed. *Bermudagrass* and *johnsongrass* are

introduced perennial warm-season grasses; *barnyard grass* is an introduced annual warm-season grass; *Texas panicum* is a native annual warm-season grass; and *nutsedge* is a native perennial warm-season sedge.

Timing of Control:
Preplant, preemergence, and postemergence.

Yield Losses:
If present and not controlled each weed can cause an estimated yield loss of: barnyardgrass -40%, johnsongrass - 30%, Russian thistle - 20%, Texas panicum - 50%, pigweed - 50%, purslane 10%, sunflower - 55%, nutsedge - 40%, morningglory - 25%, bermudagrass - 15%, bindweed - 20% and mustard - 60%.

Regional Differences:
Johnsongrass is a severe problem in the Lower Rio Grande Valley, a moderate problem in the Winter Garden and a minimal problem in the High Plains.

Barnyardgrass is a significant problem in the Lower Rio Grande Valley but a minimal problem in the High Plains and the Winter Garden.

Russian thistle is a small problem in the High Plains and a minimal problem in the Winter Garden and the Lower Rio Grande Valley.

Texas panicum is a severe problem in the Winter Garden and the Lower Rio Grande Valley and a minimal problem in the High Plains.

Bermudagrass is a small problem in the Winter Garden and a minimal problem in the High Plains and the Lower Grande Valley.

Pigweed is a serious problem in the High Plains and the Winter Garden and a substantial problem in the Lower Grande Valley.

Purslane is a small problem in the Winter Garden and the Lower Rio Grande Valley and a minimal problem in the High Plains.

Sunflower is a severe problem in the Winter Garden and the Lower Rio Grande Valley but a minimal problem in the High Plains.

Nutsedge is a severe problem in the Winter Garden, serious problem in the High Plains and a significant problem in the Lower Rio Grande Valley.

Morningglory is a significant problem in the Winter Garden and a minimal problem in the Lower Rio Grande Valley and the High Plains.

Mustard is a severe problem in the Winter Garden and a minimal problem in the High Plains and the Lower Rio Grande Valley.

Cultural Control Practices:
Cultivate 1 to 2 times after planting.

Post-Harvest Control Practices:
Cultivation. Post-harvest application of herbicides to control perennial weeds.

Other Issues:
No herbicide effectively controls the following weeds: field bindweed, Texas panicum, puncturevine , and field sandbur. Experts who responded to a questionnaire included these weeds when asked to list the most damaging weeds to potato production and estimate yield losses if the weeds are not controlled.

Estimated yield losses were: field bindweed - 20%, Texas panicum - 55%, puncturevine - 50%, and field sandbur - 90%.

Chemical Controls – Pre-plant Incorporated or Preemergence

Herbicide	**Typical Rates**	**REI (hours)**	**MOA**
EPTC (Eptam)	4 pt	12	8
Target weeds:	purslane, pigweed, morningglory, bermudagrass, barnyard grass, seedling johnsongrass, nutsedge, and Texas panicum.		
s-Metolachlor (Dual Magnum)	1-2 pts	24	15
Target weeds:	pigweed, barnyardgrass, and seedling johnsongrass. Suppresses purslane. Some control of yellow nutsedge.		
Linuron (Lorox)	1.5-4 lb	24	7
Target weeds:	pigweed, purslane, mustard, sunflower, lambsquarters, and barnyard grass.		
Dimethenamid (Outlook)	12-21 oz	12	15
Target weeds:	pigweed, barnyardgrass, and seedling johnsongrass. Suppresses purslane.		
Pendimethalin (Prowl)	1.8-3.6 pts	24	3
Target weeds:	Pigweed, barnyardgrass, seedling johnsongrass, purslane, Texas panicum		
s-Metolachlor + Metribuzin (Boundary)	1.5-2.75 pts	12	15 + 5
Target weeds:	pigweed, barnyardgrass, and seedling johnsongrass. Suppresses purslane. Some control of yellow nutsedge.		
Ethalfluralin	1.33-2.66 pts	24	3

(Sonalan)			
Target weeds:	pigweed, barnyardgrass, and seedling johnsongrass.		
Trifluralin (Treflan)	1-2 pts	12	3
Target weeds:	pigweed, barnyardgrass, and seedling johnsongrass		
Flumioxazin (Chateau)	1.5 oz	12	14
Target weeds:	primarily suppression of pigweed, sunflower, lambsquarter, and purslane		

Chemical Controls – Postemergence

Herbicide	**Typical Rates**	**REI (hours)**	**MOA**
Rimsulfuron (Matrix)	1-1.5 oz	4	2
Target weeds:	purslane, pigweed, barnyard grass, kochia, and mustard.		
Sethoxydim (Poast)	1-2.5 pints	12	1
Target weeds:	barnyardgrass, bermudagrass, Texas panicum, and johnsongrass.		
Clethodim (Select)	6-16 oz	24	1
Target weeds:	barnyardgrass, bermudagrass, Texas panicum, and johnsongrass.		
Products Used for Vine Dessication			
Diquat (Reglone)	1-2 pts	24	22
Target weeds:	Potato vines		
Carfentrazone (Aim)	3.2-5.8 oz	12	14
Target weeds:	Potato vines		
Glufosinate (Rely)	29 oz	12	10
Target weeds:	Potato vines		

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References

1. Amosson, S. H. and J. G. Smith. Texas Crop Enterprise Budgets Texas High Plains Projected for1998. Texas Agricultural Extension Service, Texas A&M University System, Zerle Carpenter, Director, College Station, Texas, 1998.
2. Dainello, F. Texas Commercial Vegetable Production Guide. Texas Agricultural Extension Service, Texas A&M University System, Zerle Carpenter, Director, College Station, Texas, 1996.
3. Dainello, F. and J. Anciso. Commercial Vegetable Production: Recommendations for Texas. Texas AgriLife Extension Service. B-6159. 2004.
4. Sanchez, A. M. and M. C. Black. Texas Plant Diseases Handbook Chemical Control Supplement for Vegetables and Herbs. Bulletin B-1140B, Department of Plant Pathology and Microbiology, Texas A&M University, Texas Agricultural Extension Service, Uvalde, Texas, November 1997.
5. Sparks, A. N. Texas Guide for Controlling Insects on Commercial Vegetable Crops. Bulletin B-1305, Texas Agricultural Extension Service, Texas A&M University System, Zerle Carpenter, Director, College Station, Texas, 1997.
6. Texas Agricultural Statistics. 2009. Compiled by National Agricultural Statistics Service. http://www.nass.usda.gov
7. Weeden, C. R., A. M. Shelton, and M. P. Hoffman, Editors. Biological Control: A Guide to Natural Enemies in North America. Cornell University. Website http://www.nysases.cornell.edu:80/ent/biocontrol/.