Crop Profile for Squash and Pumpkin in Minnesota

Prepared: February 2002

General Production Information

Minnesota accounted for 1.5% of total national squash and 2.4% of total national pumpkin production in 1997 (3). Minnesota growers produced 1799 acres of pumpkin and 951 acres of squash in 1997, respectively. Planted acreage for both crops decreased since the last survey was conducted in 1992 while the number of growers increased. For squash, harvested acres declined by 110 and the number of growers increased from 194 to 255. For pumpkin, harvested acres declined by 607 and the number of growers rose from 286 to 335. Pumpkin and squash crops are estimated to have an annual production value of $7 million in Minnesota (3).

Production Regions

Growers in Washington, Dakota, and Hennepin counties lead the state in pumpkin production for 1997, planting 248, 157, and 153 acres, respectively. The top three counties for squash production in 1997 were Hennepin, Dakota, and Washington, producing 112, 100, and 94 acres, respectively. All three of the above-mentioned counties are part of the immediate Twin Cities metropolitan area of Minneapolis and St. Paul (3).

Cultural Practices

Squash and pumpkin can be grown in a variety of soil types. While lighter, sandy-loam soils are advantageous for many varieties, heavier muck soils also support adequate vine-crop growth (1). Ideal soil pH for cucurbit production ranges from 6-7, but if soils are too acidic, lime can be applied to bring the soil pH into the ideal range (1,4,5). Soils should be well drained but also be able to retain some moisture as the crop thrives in hot conditions (1). Growers often make fertilizer treatments in the middle of the growing season just prior to vine stage in order to offset nutrient loss via leeching (1). High yields are also dependent on having plentiful pollinators; many farms will maintain one honeybee colony per acre of planted squash to aid flower pollination (1).

All types of squash should be planted 4-6 feet apart. Bush types (summer squash) should be planted 18-24 inches apart within rows with 4-6 lbs. of seed used per acre while vine types (winter squash and pumpkins) should be planted 2-5 feet apart within rows with 2-3 lbs. seed used per acre (4). Squash is very sensitive to low temperatures but thrives in heat (1). Although early planting takes place from mid-late May, it is important to protect squash from early season frost. While winter squash should not be planted until all chances of frost have passed, summer squash can be planted earlier by utilizing windbreaks or row covers can protect the crop from extreme temperature variation (5). Late-season planting can, however, result in viral infection prior to fruit and cause 50-80% yield loss (6).

Harvesting generally occurs by hand, as squash and pumpkin are very susceptible to physical damage. Summer squash can be harvested continuously throughout the growing season and are typically ready for harvest once fruit have reached 4-8 inches in length and have developed a soft rind (1). Winter squash is harvested after a vine-killing frost but prior to temperatures consistently falling below freezing because low temperatures damage fruit (1).

Insect Pests

Striped Cucumber Beetle (*Acalymma vittatum*) and Spotted Cucumber Beetle (*Diabrotica undecimpunctata howardi*)
The striped cucumber beetle is the first squash pest of the season and can destroy small plants before other pests arrive. Adult beetles are approximately 6-8 mm long and have yellow and black stripes running the length of the body. The insects overwinter as unmated adults in any protected place, generally under debris. It is believed, however, that the beetles are unable to survive Minnesota's low winter temperature (7). It is important to check for the beetles along field edges, in woodlots or along grassways which will shelter them until late April or early May, at which time they begin to emerge (7). In Minnesota, adults typically appear in late May to early June and begin feeding on small seedlings. Adults cause the most damage to the leaves, but will also feed on the stem, girdling the plant and causing it to die (7). Females oviposit bright yellow eggs at the base of plants and can produce 10-20 eggs daily, and as many as 1300 eggs over the 2 months they are actively reproducing. Larvae hatch after 5-8 days and begin to feed on roots and lower stems of plants and pupate in the soil in late June-early July for 7 days after which adults emerge (7). The second generation is not as damaging because the crop is physically larger, more mature, and hardy (7).

Spotted cucumber beetles are similar in size and shape to the striped cucumber beetle but are spotted rather than striped. The spotted cucumber beetle is far more sensitive to temperature extremes than the striped cucumber beetle and as such, beetles are typically observed 2-4 weeks later in the season (7).

In addition to feeding damage, the transmission of the bacteria Erwinia tracheiphila, causal agent for bacterial wilt, is a far more serious consequence of striped and spotted cucumber beetle infestations (6,7). Bacterial wilt overwinters within the bodies of infected cucumber beetles and can be transferred to plants that have been fed on by infected beetles. Hubbard and Butternut squash varieties are particularly sensitive to bacterial wilt while others are not susceptible. Bacterial presence can be determined in the field by cutting a stem in half and pressing the two pieces first together and then drawing them apart slowly. A stringy, bacterial slime would indicate the presence of the disease (6,7). It causes affected plants to wilt rapidly, typically within a day of infection. Beetles will aggregate on wilted plants, feed, and become infected thereby putting further pressure on the crop.

Because the striped cucumber beetle damages crops early in the season and treatment is most effective on younger larvae, it is essential to consistently check for their presence, as mentioned above. If the density of striped cucumber beetles exceeds 5 beetles/plant, treatment may be necessary (8). To prevent infestation, it is possible to attract overwintering adults to trap crops or yellow mulches. Other management techniques include deep plowing and clean cultivation may also impact overwintering adults after harvest. Row covers can delay the infestation of cucumber beetles until plants are hardier—but they must be removed when the crop begins flowering (5). See Table 1 following pest descriptions for a summary of the most common insecticide controls of the striped and spotted cucumber beetles.

Squash Vine Borer (*Melittia cucurbitae*)
Squash vine borer can be a problem in smaller fields or fields in which insecticide applications are made incorrectly. Squash vine borer overwinter as pupae below ground and adults emerge from mid June-July. Adults are often mistaken for wasps, leading to poorly timed and improperly directed pesticide applications (7). Adults are 16 mm long with 35 mm wingspans (7). The forewings are translucent greenish-brown in color while their hindwings are transparent and outlined by reddish-brown hairs (7). Females lay round eggs, 1 mm in diameter, at the base of the stems. Larvae hatch from eggs in 7-10 days and larvae immediately bore into stems leaving a ring of sawdust-like frass at the entrance point. Frass is the most reliable sign of a squash vine borer infestation (7). Larvae feed inside stems for 14-30 days, feeding on and destroying vascular tissue thereby making the translocation of water and nutrients impossible. This feeding damage ultimately causes the plant to wilt and die (7). Although two generations are common in the South, northern states, such as Minnesota, usually experience only one (7). If signs of larval feeding are discovered, insecticide treatment should begin immediately. Two applications of an appropriate insecticide at a 5-7 day interval are effective at eliminating small, newly hatched larvae (8).

Squash Bug (*Anasa tristis*)
Adult squash bugs are flat, gray colored insects, 13-19 mm long, with wings that do not extend the length of the abdomen (7). Unmated adults overwinter near field edges and in crop debris (7). They become active again in June as they emerge from overwintering and begin to lay eggs. Orange colored eggs 1.5 mm long are deposited on the underside of leaves, usually along two veins (7). Oviposition continues for approximately 45 days at a rate of 10-20 eggs/day. Because of this extended period of reproduction and the fact that squash bugs develop through 5 nymph stages, squash bugs in all life stages can be found at any one time during the summer (7). Eggs require 7-14 days to hatch into wingless, pale green nymphs and pass through 5 nymph stages over 5-6 weeks (7). Approximately 1-2 generations are completed each summer. Females maturing late in the summer enter diapause in preparation for overwintering rather than reproducing (7).

Squash bugs prefer Hubbard squash, summer squash and pumpkin but any variety can be attacked. Nymph feeding on leaves causes them to yellow and wilt. Rapid wilting attributed to squash bug feeding is referred to as ‘Asana wilt’ and can be reversed if the infestation is halted (7). Nymphs and adults will also feed on and damage fruit (7).

Control of squash bugs is difficult since the nymphs feed primarily on the undersides of leaves, protected from insecticide applications (7). This makes scouting for the insects very important in a management program. Observation of >1 egg mass per plant is enough to warrant insecticide treatment at flower stage. Insecticides are most effective while nymphs are small (7).

Melon Aphid (*Aphis gossypii*)
Aphids affect fruit quality and appearance and additionally, serve as disease vectors (8). Melon aphids are small-medium sized aphids which vary in color from pale yellow-green to black (8).

In the upper Midwest, aphids migrate northward annually. The time of greatest aphid activity occurs from June-September (8). The insects are prolific, with 12-15 overlapping generations being produced each year (8, 9, 11). The most severe damage caused by aphids is an indirect result of their feeding habits. Aphids use their piercing-sucking mouthparts to puncture the plant’s epidermis extracting plant sap resulting in leaf curl (11, 8). Aphids also excrete a gummy ‘honeydew’ that is difficult to remove. The act of feeding and sap removal itself generally does not have a detrimental effect on the viability of plants unless aphids are present in extremely high numbers (8, 10). Rather, it is through the transmission of more than 50 plant viruses, including cucumber mosaic virus and zucchini yellow virus, that aphids play their biggest role in the destruction of the cucurbit crop (7, 8, 9, 10, 11, 12). Aphids become infected by feeding on infected plants and later, when feeding upon uninfected plants, pathogens are transferred through aphids’ saliva (10). While aphids do have natural predators, such as lacewings and lady beetles, they are not highly effective control agents (7, 8). Nonetheless, conserving natural enemies by limiting pesticide applications will assist in managing aphid populations.

Insect Control Options (1,2,7,8)

Control options for dry edible beans insect pests (type of control/insecticide class):

Insecticide control options:
Carbamates
Carbaryl (Sevin XLR Plus) Sevin can be used to control cucumber beetles. There is a 12-hour REI for Sevin and a 21-day PHI. The labeled rate for Sevin XLR Plus in squash and pumpkin is 1 qt/A; not to exceed 6 qts/season.
Methomyl (Lannate LV) Restricted use product (RUP). Lannate is labeled to control cucumber beetles, squash vine borer, squash bug, and aphids. The labeled rate for Lannate LV is 1.5-3 pts/A; not to exceed 5.4 lbs AI/A/yr. Lannate LV carries a field REI of 48 hours and a 1-3 day PHI.

Pyrethroids
Esfenvalerate (Asana XL) RUP. Asana XL is labeled for use on squash and pumpkin to control cucumber beetles, squash vine borer, and squash bug. The labeled rate is 5.8-9.6 oz/A; not to exceed 0.25 lb AI/Ac/yr. Asana has a field REI of 12 hours and a 3-day PHI.
Bifenthrin (Capture 2EC) RUP. Registered in the late 1990s, this product provides control of cucumber beetles, squash vine borer and squash bug. Applied at 2.6-6.4 oz/A. Total product applied per season must not exceed 0.3 lb. AI/A. There is a field REI of 24 hours and a 3-day PHI.
Permethrin (Pounce 3.2EC) RUP. Is effective on cucumber beetles, squash vine borer, squash bug, and aphids. Applied at 4-8 oz./A. Total applied product must not exceed 1.6 lbs AI/A/yr. There is a field REI of 12 hours and a 0-day PHI.

Organophosphates
Diazinon (Diazinon 50W) RUP. Diazinon can be used to control aphids on squash but NOT on pumpkin. The product is applied at a rate of 1-1.5 lbs/A. The product has a REI of 12 hours and a 7-day PHI.

Table 1. Insect control options: chemical products (1,2,7,8)

Product	Field Rate	A.I. Rate	REI/PHI	Application Schedule	Remarks
Admire 2F	16-24 oz/A	0.25-0.38 lb/A	12 hrs 21 d	--	Cucumber beetles, aphids; apply as pre-plant in furrow spray, post plant drench, or sidedress; <0.5 lb AI/A/yr
Asana XL	5.8-9.6 oz/A	0.03-0.05 lb/A	12 hrs 3 d	As needed	Cucumber beetles, SVB, SB; <0.25 lb AI/A/yr
Capture 2EC	2.6-6.4 oz/A	0.04-0.10 lb/A	24 hrs 3 d	no more than 2 apps 7 d apart	Cucumber beetles, SVB, SB; <0.3 lb AI/A/yr
Diazinon 50W	1-1.5 lb/A	0.5-0.75 lb/A	24 hrs 3-7 d*	1 app/year	Aphids; for summer and winter squash ONLY, NOT for pumpkin
Lannate LV	1.5-3 pts/A	0.45-0.9 lb/A	48 hrs 1-3 d*	--	Cucumber beetles, SVB, SB, aphids; use on summer squash ONLY; <5.4 lbs AI/A/yr

Pounce 3.2EC	4-8 oz/A	0.1-0.2 lb/A	12 hrs 0 d	As needed	Cucumber beetles, SVB, SB, aphids; use on summer squash ONLY; <1.6 lbs AI/A/yr; minimum finished spray volume of 20 gal/A
Sevin XLR Plus	1 qt/A	1 lb/A	12 hrs 3 d	Apply after plants emerge, repeat as needed	Cucumber beetles; <6 qts/A/yr

*see label

Diseases

There are several diseases that affect squash and pumpkin in Minnesota. Common diseases include bacterial wilt, downy and powdery mildew, black rot, and Phytophthera blight. The frequency of occurrence diseases is highly dependent on the weather and other environmental factors encountered throughout the growing season (1, 6).

Bacterial wilt (*Erwinia tracheiphila*)
Bacterial wilt can cause serious damage to all cucurbits in North America. Although cucumber and watermelon are among the most susceptible cucurbits to bacterial wilt, squash and pumpkin can be affected, particularly, Hubbard and butternut squash (8). The bacterium resides in the guts of infected beetles and is transferred to plants through insect feeding on foliage. As insects feed on plants, the bacterium is introduced first to the leaves and then moves throughout the plants vascular system. The infection spreads quickly in young, vegetative plants while in older plants it spreads more slowly (16). Since the presence and multiplication of E. tracheiphila affects the xylem cells of the plant, wilting of the first inoculated leaf is the first and most apparent symptom. Leaves and stems will begin to appear chlorotic and may become stiff and brown. Plant wilting is caused when the vascular cells become plugged with gums and resins produced by the bacterium. Once plants have been infected and are expressing symptoms, cucumber beetles will aggregate on affected plants, feed, and become infected themselves. Plants may survive infection only to produce small, underdeveloped and unmarketable fruit (5). To verify that wilting is caused by bacterial wilt, cut a stem of the plant in question and press the two cut pieces together. When slowly drawing the pieces apart, infected plants will posses a stringy bacterial slime while uninfected plants will not (7). Managing the cucumber beetle, primarily the striped cucumber beetle, is key to controlling bacterial wilt (5). For additional information on the transmission and control of bacterial wilt, refer back to the section on striped and spotted cucumber beetles.

Gummy stem blight and Black rot (*Didymella bryoniae* and *Phoma cucurbitacearum*)
These two diseases compose two phases in the cycle of one disease, which damages winter squash more critically than summer squash. Infection of the stem and leaves is gummy stem blight while the infection of the fruit is black rot. Gummy stem blight causes leaf and stem necrosis. Black rot is the later stage of gummy stem blight, and begins as small water-soaked lesions expand into large, indented brown spots (6). Black rot ultimately causes infected fruit to rot, either in the field or after harvest. Plant inoculation occurs via seed and/or soil once temperatures warm (6).

As this disease has 2 phases that affect both the plant and fruit, there are a number of different steps that must be taken to prevent it from decreasing crop yield. A 3-year crop rotation should be implemented as the bacterium can persist in the soil for up to a year and a half. In addition, using clean seed treated with a fungicide will minimize disease effects. Poorly drained soils and low quality seed also favor black rot development. Fungicide applications should be made in mid-late July to suppress the disease and minimize plant injury. During late July applications, use a fungicide or combination of fungicides to attack both black rot and powdery mildew. Wet summers may require additional fungicide applications. After the crop has been harvested, all remaining debris should be removed and/or destroyed. Harvested fruit must be carefully handled to minimize injury prior to curing since infection also occurs post-harvest (1,6).

Phytopthora blight (*Phytophthora capsici*)
The fungus that causes phytopthora blight has many hosts and is primarily soil-born. A characteristic symptom is wilting of the aboveground plant. Winter squash is more affected than summer squash, although any fruit that is produced by an infected plant will be underdeveloped and may show signs of infection. Additional symptoms include a white mold and spores that appear to be yeast-like (6). As the disease pathogen can remain viable in the soil for several years, crop rotation with a minimum of 3 years between susceptible crops is essential. Susceptible crops include tomato, pepper and eggplant (2,6). Any vulnerable or susceptible crops should be planted in well-drained fields to minimize risk of disease (6).

Anthracnose (*Colletotrichum orbiculare*)
Anthracnose infections begin as small water-soaked lesions on leaves near the veins and then expand to become larger tan spots with light centers (6). The leaf tissue eventually dies and the tissue within the lesion disintegrates or the whole leaf dies. Similarly, fruits develop water-soaked or black sunken spots which often contain spores (6). Even though this lesion never penetrates deeper than the rind of the fruit, fruit flavor can be affected. Additionally, lesions can serve as entry-points for other diseases (6).

The fungus that causes Anthracnose can overwinter in dead plant material for up to 5 years (6). Spores can be carried on water and wind and will infect cucurbit plants at any stage in their life cycle (6,7). Utilizing a crop rotation greater than 1 year between susceptible plantings, deep plowing after harvest and the use of clean seed are suggested management practices (2). Several fungicides, including zineb, maneb, mancozeb, captafol and chlorothalonil, are labeled to control Anthracnose (6).

Powdery Mildew (*Sphaerotheca fuliginea* and *Erysiphe cichoracearum*)
Powdery mildew thrives in warm, humid climates. The disease can overwinter in plant debris and alternative hosts and may also be carried in affected seed. It tends to be more prevalent in late-planted pumpkin and squash when days are dry and nights are cool with dew formation. The first indication of powdery mildew is the presence of talcum powder-like blotches, often beginning on the undersides of leaves. These spots expand until they meet edges and join together, causing the leaves to shrivel and eventually die (6). The ultimate impact upon the plant will be a reduction in yield and/or in quality of yield (4,5,6).

Resistant cultivars and use of fungicides are both effective tactics of controlling powdery mildew. Selecting sites with favorable water drainage, good air circulation and low humidity will also aid in preventing the onset of the disease (6). Labeled fungicides include Benlate, Nova 40W, Quadris 2.08EC and Flint.

Downy mildew (*Pseudoperonospora cubensis*)
Downy mildew can attack cucurbits and present serious problems for these crops (6). The disease sometimes attacks squash and pumpkin grown in cool, moist conditions. The disease penetrates the plant via stomata, aided by wind or rain. Symptoms may appear as lesions on leaves and may be yellow or brown in color. Irregular shaped spots appear on upper leaf surfaces while fluffy, grayish-white growth appears on the underside of leaves. Infections tend to start on the lower foliage and progress upwards. The disease will typically kill plants when they become infected prior to flowering but will only cause stunting and/or deformed pods if the plant becomes infected later in development. Symptoms are almost exclusively found on foliage. The disease eventually kills the foliage, leaving only the fruit behind (6). When warm, moist weather favors spores, they will be produced on the underside of the lesions, appearing downy and ranging in color from gray to dark purple (6).

Downy mildew may overwinter as thick-walled spores in northern regions or be transported northward during the spring from southern regions (6). Since downy mildew can overwinter in plant debris, one of the best control options is to remove all infected crop debris. Additionally, the disease can persist in soil for 10-15 years making eradication nearly impossible. Choosing a site with good drainage, adequate sun exposure and steady air movement can be very helpful in preventing the onset of the disease because the fungus thrives in a cool, damp environment (6).

Viruses
The five primary viruses which affect cucurbits include: papaya ringspot virus, cucumber mosaic, watermelon mosaic, zucchini yellows and squash mosaic viruses. All of these diseases cause discoloration of the foliage and disfiguring and

discoloring of the fruit (6). These viruses, with the exception of squash mosaic virus which is transmitted by beetles and can be seed-borne, are aphid transmitted. Selecting varieties with resistance and utilizing cultural practices are important due to the difficulty of controlling aphids with insecticides. Row covers, reflective mulches, weed control, and plot isolation of late and early plantings can also aid in disease prevention (6).

Control options for squash and pumpkin diseases:
Cultural practices/crop rotation
Cultural control practices can play an important role in the management of diseases in sweet corn. Most disease pathogens that affect sweet corn overwinter in field debris, on or below the soil surface, or are vectored by insects. As such, managing the amount of crop residue, organic matter, or fertilizer applied becomes critical to the suppression of many of the above mentioned diseases. Rotating crops can drastically reduce the presence of disease inoculum in fields while also benefiting soil health as it allows key nutrients to be cycled into the soil.

Table 2. Disease control options: chemical products (2,7,8)

Product	Field rate	AI Rate	REI/PHI	Application schedule	Remarks
Bravo 500	2.25-4.25 lbs/A	1.17-2.22 lbs/A	48 hrs 0 d	7 d	Anthracnose, downy and powdery mildew, black rot leaf blight/spot
Manex	1.2-1.6 qts/A	1.2-1.6 lbs/A	24 hrs 5 d	7-10 d	Powdery and downy mildew, Anthracnose, black rot; <12.8 qts/A/yr
Quadris 2.08EC	11-15.4 oz/A	0.18-0.25 lbs/A	4 hrs 1 d	5-7 d	Powdery and downy mildew, Anthracnose, black rot; <1.92 qts/A/yr
Kocide DF	1.5-3 lbs/A	0.6-1.2 lbs/A	24 hrs --	7 d	Powdery mildew
Ridomil Gold	2-3 lbs/A	1.53-2.30 lbs/A	48 hrs --	10-14 d	Downy mildew, Anthracnose, black rot; begin application prior to onset of disease; <5 apps/crop
Flint	1.5-4 oz/A	0.75-2 lbs/A	12 hrs 0 d	7-14 d	Powdery and downy mildew; <8 oz/A/yr and 4 apps/yr

Weeds

Weeds compete with squash and pumpkin crops for light, nutrients, and water. Weeds can also harbor disease pathogens and insect pests that can invade squash and pumpkin after planting. Many annual weeds produce copious amounts of seeds that often remain viable in the soil for many years. Early season cultivation may control weed seedlings, but as the growing season progresses, cultivation will damage vines and roots. Herbicide application should made early in the growing season before fields are overgrown with foliage and vines later in the season (2,4,5,7).

Broadleaf Weeds
Many broadleaf weeds adversely affect squash and pumpkin in Minnesota. Some examples of annual broadleaf weeds are: velvetleaf, *Abutilon theophrasti*, common lambsquarters, *Chenopodium album*, pigweed, *Amaranthus retroflexus*, and giant and common ragweed, *Ambrosia trifida* and *Ambrosia artemisiifolia*, respectively. All of these weeds grow taller than squash and pumpking and can out-compete peas for available light and soil nutrients. In absence of control, weeds can significantly reduce yield.

Grasses
Annual grasses cause significant problems with squash and pumpkin production because of their fast growth and ability to compete for resources. They are very tolerant of extreme moisture and temperature variation once established and can be very difficult to eliminate from production areas once established. Given their reproductive potential, they require management prior to seed-set. Examples are foxtail, *Setaria spp*., wild proso millet, *Panicum miliaceum*, and crabgrass, *Digitaria spp*.

Table 3. Weed control option: chemicals (2,8)

Preemergence Products	**Field Rate**	**A.I. Rate**	**REI/PHI**	**Remarks***
Dacthal 75WP	6-15 lbs/A	4-11.25 lbs/A	12 hrs --	G and some BL; apply after plants have 4-5 true leaves
Glyphosate 4E	24-36 oz/A	0.75-1 lbs/A	12 hrs --	G & BL; apply prior to planting, wait 3 days after application to plant
Command 4E	0.5-2 pts/A	0.25-1 lbs/A	12 hrs --	G & some BL; incorporate 1" deep and plant below treated zone. Don't feed treated vines to livestock
Curbit EC	3-4 pts/A	1.2-1.5 lbs/A	12 hrs --	G; apply at planting or within 2 days of planting; do not incorporate
Prefar 4E	5-6 qts/A	5-6 lbs/A	12 hrs --	G; apply prior to planting/emergence and incorporate into soil 1-2"
Postemergent Prodcuts				
Poast 1.5E	1.5 pts/A +1 qt COC/A	0.28 lb/A	12 hrs 14 d	G; apply to actively growing grasses; total applied product <3 pts/A/yr

*G: grass, BL: broadleaf

Table 4. Effectiveness of selected herbicides against selected weeds affecting pumpkin and squash (2)

Herbicide	**Application Type**	**Foxtail**	**Crabgrass**	**Lambsquarters**	**Ragweed**	**Nightshade**	**Pigweed**	**Smartweed**	**Velvetleaf**
Dacthal	pre	G	G	G	N	N	N	N	N
Glyphosate	post	G	G	G	G	G	G	G	G
Command	ppi	G	G	G	G	P	P	G	G
Curbit	pre	G	G	F	P	F	G	P	N
Prefar	ppi	G	G	F	N	N	F	N	N
Poast	post	G	F-G	N	N	N	N	N	N

G=Good, F=Fair, P=Poor, N=None
pre=preemergence, ppi=preplant incorporate, post=post emergence

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