Crop Profile for Peanuts in Virginia

Prepared June, 2000

General Production Information

- Virginia ranked 9th in the nation in peanut production, accounting for 5.7% of the total in 1999.
- In 1999, 77,000 acres of peanuts (shelling) were planted and 76,000 acres were harvested from approximately 700 farms in Virginia.
- Approximately 218 million pounds of quota and non-quota peanuts were produced within Virginia in 1999.
- The average yield in 1999 was estimated at 2,870 pounds per acre.
- The 1999 Virginia peanut crop was valued at $59,983,000 or roughly $0.28 per pound.
- Total cost of production across Virginia and North Carolina averaged $762.50 per acre in 1999.

Production Regions:
The majority of peanuts are produced in the southeastern portion of the state, primarily within the following counties: Dinwiddie, Greensville, Isle of Wight, Prince George, Southampton, Surry, Sussex, and Suffolk.

Cultural Practices

Sandy loam soils such as Emporia and Norfolk are best suited for peanut production in Virginia. Soil pH should range from 5.8-6.2 with the optimum at 6.0. Conventional tillage practices are still recommended in Virginia, except in cases of highly erodible land. These practices have resulted from research suggesting that deep tillage, which completely turns under residue and creates soft root and pegging zones, improves yield. This type of tillage also helps facilitate the incorporation of potash (if applied) to a depth below the pod zone and thus prevents the chance of pod rot from this compound. Approximately 6% of the peanut acreage in Virginia was irrigated in 1999, which is fairly representative of previous years given the drought tolerant nature of peanuts and the expense of irrigation equipment.
In addition to proper soil type, pH, and potash applications, *Rhizobium* bacteria, which help to "fix" atmospheric nitrogen for use by the plant, are important in peanut production. If peanuts are to be planted in a field which has not been planted to peanuts within 4 to 5 years, or if the field has not produced a well nodulated, nitrogen-fixing peanut crop, inoculation of the seed or use of an in-furrow inoculant will be necessary. Commercial inoculants are available as either granular or liquid products. Additional inputs such as the trace elements manganese (mid-June to mid-August) and boron (early bloom stage) along with calcium (June 10-July15) may also be required for optimum peanut production.

The most common crop rotation in the peanut-producing region of Virginia is cotton-corn-peanuts. However the type of rotation may vary depending on producer preference. Rotations involving grass crops such as corn and small grains allow for better weed control and may also help to reduce nematode and soilborne disease problems.

The majority of peanuts are planted in Virginia during the first two weeks of May although optimal planting dates range between April 20 and May 10. Virginia peanut varieties typically require 145 to 160 days (5 months) to reach full maturity. The most common types include *VA 98R, NC-V 11*, and *VA C92R*. Mostly these are chosen based on adaptability and high yields; however, disease resistance is also an important consideration. All are Virginia-type peanuts grown primarily for the in-shell market. A new variety known as *Perry* is currently receiving a lot of attention for use in southeast Virginia.

**Insect Pests**

*Insect information found below was taken directly from the Peanut Insect section of the 2001 Peanut Production Guide written by D. A. Herbert, Jr., Extension Entomologist.*

Although most growers have become adept at managing thrips infestations in peanuts, thrips remain the most devastating insect to peanuts in Virginia. Potato leafhoppers and spider mites (in dry years) are also important followed by lepidopteran pests and southern corn rootworm (SCR). Although many growers apply an insecticide for SCR, it is rare to actually see economic loss from untreated areas or fields.

**Lepidoptera Pests**

**Corn Earworm** (*Helicoverpa zea*) and **Fall Armyworm** (*Spodoptera frugiperda*)

Annual infestations of the corn earworm (CEW) and occasional infestations of fall armyworm (FAW) occur in some Virginia peanut fields. Usually there is a single generation of each species per season. Worms feed on leaf tissue causing peanuts to look ragged; however, research has shown that one-third of peanut foliage can be lost at the normal time of corn earworm infestations (mid-August to early September) without loss of yield or grade.

**Monitoring:** Peanuts should be scouted by reaching halfway across 2 row-feet of plants and vigorously shaking the foliage towards the row middle. Repeat this process on the opposite row. Following shaking, count the number of worms on the ground. Repeat the scouting procedure in several spots throughout the field. If treatment is warranted, re-scout fields soon after application to monitor effectiveness and for possible increases in spider mite activity.

**Chemical Control:** Chemical application is recommended if an average of 8 or more worms are found per sample, or 4 per row-foot. Canopy penetration and coverage are important. Worms are much easier to control when they are less than 1 inch long.
**Biological Control:** Natural predators such as the damsel bug and spiders are usually present within fields and their presence should also be considered when making treatment decisions. A natural fungus, *Nomuraea rileyi* which attacks lepidopteran larvae, may provide beneficial control, especially in wet years.

**Cultural Control:** No commercially effective controls are available.

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**Potato Leafhopper, *Empoasca fabae***

The potato leafhopper (PLH) is a common foliage pest of peanuts in Virginia. This small, wedge-shaped, light green to yellow insect damages the peanut plant by feeding on the undersides of leaves in a piercing-sucking manner. Feeding may result in yellowing and then browning of the leaf tips. In severe cases toxin passed into the plant through feeding sites can stop vine growth resulting in reductions in peanut yield and grade.

**Monitoring:** Scout peanut plants for PLH beginning in mid-June through August.

**Chemical Control:** Foliar applications may be necessary depending on rootworm control decisions. Applications of foliar insecticides should be made only when 25% of the leaves show tip yellowing and active adult and immature leafhoppers are seen. If a *Lorsban* treatment for SCR is applied, populations of PLH are also greatly reduced.

**Biological Control:** No commercially effective controls are available.

**Cultural Control:** No commercially effective controls are available.

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**Southern Corn Rootworm, *Diabrotica undecimpunctata howardi***

The southern corn rootworm (SCR), which is the larval stage of the spotted cucumber beetle, can cause extensive injury to Virginia peanuts. SCRs develop in the soil and feed directly on pegs and pods. Although many growers within Virginia automatically treat with *Lorsban* for SCR, it is rare to see economic loss from untreated areas or fields.

**Monitoring:** Determining the need to treat for SCR should be done on a field-by-field basis and decisions should take into consideration both adult populations and past field history. Adult beetles can be readily detected in peanut fields. Their presence in moderate to high numbers from mid-July to early August should be a warning that a problem could develop. Also, rootworms have a higher survival rate in soils containing higher levels of organic matter and clay. Keep specific records on fields with these characteristics and note the extent of pod and peg injury at harvest time. Information such as peanut cultivar, soil texture, field drainage, rootworm history, and planting date can be plugged into the SCR Risk Index Calculator found on-line at [http://www.isis.vt.edu/cgi-bin/scrRisk](http://www.isis.vt.edu/cgi-bin/scrRisk). The calculator will then return a numerical risk assessment along with a non-treatment or treatment recommendation.

**Chemical Control:** Preventative chemical treatment is the best strategy to ensure rootworm damage does not occur. Once an infestation is established, control is difficult and often ineffective. If necessary, treatments should be applied as 10-18 inch bands on the row during early pegging (late-June to mid-July).

**Biological Control:** No commercially effective controls are available.
Cultural Control: Early planting and/or the use of early maturing cultivars may reduce the risk of SCR infestation. However, altering the planting date in this way may increase the risk of thrips infestation. If high populations of thrips have been observed in the past, chemical control options for SCR should be used.

Thrips*

Thrips are tiny, spindle-shaped insects that feed primarily within the developing unfolding leaflets of seedling peanut plants within the first 6-8 weeks after planting. Feeding results in leaf crinkling, reduced photosynthetic potential and plant stunting. If seasonal growing conditions are favorable, peanuts will outgrow early injury with no reduction in yield or grade. However, in most years early season thrips injury, if left uncontrolled, will result in substantial yield reductions of several hundred pounds per acre. Thrips may complete several generations per season in Virginia under favorable conditions.

Monitoring: Scout peanut fields beginning at plant emergence and continue for approximately 6 weeks after planting.

Chemical Control: Thrips can be controlled with either systemic or foliar applied insecticides. Systemics can be applied in furrow at planting. Foliar treatments are often applied as needed after crop emergence. Foliar treatment is recommended when 25% of the leaves show thrips damage and pest populations are still active. See Chemical Insect Control section below for recommended insecticides.

Biological Control: No commercially effective controls are available.

Cultural Control: Later planting (mid-May) often helps to reduce thrips pressure in peanuts.

*Tobacco thrips (Frankliniella fusca) is the predominant species affecting peanut seedlings in Virginia.

Twospotted Spider Mites, Tetranychus urticae

Spider mites feed mainly on the undersides of the leaves, causing them to turn brown and fall off. During the past several years, mite problems have become more numerous in Virginia. While insecticides are very valuable in controlling leafhoppers, thrips, and worms, they may be responsible for destroying some of the natural enemies of spider mites and thus promoting the build-up of mite populations. Mites are also particularly devastating in hot, dry seasons.

Monitoring: Monitor fields for typical leaf injury, leaf speckling and crinkling, beginning in mid-June through mid-September. Look on the undersides of leaves to see active mites crawling.

Chemical Control: The most effective treatments are applied early in the infestation cycle, before large numbers of eggs are deposited. Good canopy coverage, high spray volume and pressure are essential for good control.

Biological Control: Natural enemies and diseases often keep mite populations under control. Spraying for PLH or CEW can disrupt beneficial populations and flare mites.
**Cultural Control:** Spider mites will readily move into peanuts when corn dries down or is harvested or if infested weedy borders are mowed. Avoiding these activities until after peanuts are harvested may help prevent infestations.

**Chemical Insect Control**

The most recent pesticide usage survey, completed in 1990, indicated the following regarding insecticide applications on peanuts in Virginia. Insecticides accounted for 18% of the 73,036 lb. a.i. of pesticide applied to the 4,293 acres of peanuts represented in the survey. Within the insecticide group, approximately 96% of the survey acreage was treated with an at-plant application of soil insecticide (in-furrow), 17% received one early-season foliar spray, 89% a mid- to late-season foliar spray (mainly for CEW or PLH control) and 90% of the survey acreage received a pegging-time application of a soil insecticide. Of the various application types, Temik 15G was the most widely used at-plant soil insecticide, Sevin XLR the most widely used early-season foliar spray, Asana XL was largely applied to the foliage during mid- to late-season and Lorsban 15G was applied to the soil to treat SCR at pegging time. In addition, an acaricide (Comite 73L) was applied to 5% of the survey acreage, although this level was thought to be far below that required in many years, and may be attributed to a general absence of prolonged drought stress during the 1990 growing season.

Additional usage results from the 1990 survey are included in the insecticide descriptions found below. Several products which are currently recommended (Comite 6.5EC, Danitol 2.4EC, Karate Z, Lannate LV, Omite 30W, Orthene 97, Sevin 4F, Sevin XLR PLUS, Warrior T) were not labeled for use in 1990 and were therefore not included in the survey. Conversely, several products were included in the survey which are no longer labeled in Virginia. These products along with usage results are listed in Table 1.

Since 1990, the types of products available to producers for peanut insect control have changed with either the discontinuation of labels or the introduction of new chemistries. In particular, the pyrethroids Danitol 2.4EC, Karate Z and Warrior T were introduced in the mid- to late-1990's. Use of these products has greatly increased in recent years, while the use of other chemistries has declined. In lieu of updated survey data, current anecdotal information estimates that an average of two foliar insecticidal sprays are applied per season on approximately 75% of the peanut acreage in Virginia. Of these sprays, Orthene 75S or 97 is the most commonly used chemical for thrips control (1st spray) and Karate Z or Asana XL are most often used for worm and leafhopper control (2nd spray). Products containing carbaryl, malathion, and methomyl are very rarely used by producers for insect control.

- **Acephate (Orthene 75S)(Orthene 97)**-PHI-14 days. Organophosphate. For thrips control, apply as a liquid directly into the seed furrow at a rate of 0.75-1.00 lb. a.i./acre. Can also be applied to foliage at a band rate of 0.19-0.38 lb. a.i./acre for thrips, broadcast rate of 0.38-0.75 lb. a.i./acre for thrips and PLH control or broadcast at a rate of 0.75-1.00 lb. a.i./acre for CEW and other lepidopteran control. Peanut seed can also be treated with 0.19 lb. a.i./100 lb. seed for early-season thrips control. Do not feed treated forage or hay to livestock or allow animals to graze treated areas. Orthene 75S was applied as a foliar treatment for thrips control on 4.7% of the surveyed acreage. REI-24 hours.

- **Aldicarb (Temik 15G)**-PHI-90 days. Carbamate. Apply granules at a rate of 1.05 lb. a.i./acre in-furrow and cover with soil for early-season thrips and PLH control. Can also be applied for spider mite control at the same rate in a 12-18 inch band on the row at pegging. Must be applied at the onset of pegging to comply with 90-day tolerance time. Do not hog-off treated fields. Do not feed green forage, hay or straw to livestock. Do not plant corn, small grains, or forages within 12 months after the last application. Temik 15G was applied to 85.5% of the surveyed acreage for thrips control. REI-48 hours.

- **Carbaryl (Sevin 4F)**-PHI-14 days. Carbamate. Apply to foliage at a rate of 1.0-1.5 lb. a.i./acre for control of thrips, CEW and other lepidopteran larvae. Avoid application to wet foliage or...
during periods of high humidity. *Sevin 80S* was applied to 3.5% of the surveyed acreage for control of foliage feeders (mid- to late-season). REI-12 hours.

- **chlorpyrifos** (*Lorsban 15G*)-PHI-21 days. Organophosphate. Apply at pegging at a rate of 1.95 lb. a.i./acre for control of PLH and SCR. Do not apply more than 4.0 lb. a.i./acre. Do not feed peanut forage or hay to meat or dairy animals. *Lorsban 15G* was applied to 75.7% of survey acreage for control of pod feeders. *Lorsban 15G* is currently the only effective soil insecticide labeled in Virginia. There are no alternatives. REI-12 hours.

- **l-cyhalothrin** (*Warrior T*) (*Karate Z*)-PHI-14 days. Pyrethroid. Apply to foliage at a rate of 0.02-0.03 lb. a.i./acre to control thrips, PLH, CEW and other lepidopteran larvae. May be used only to suppress spider mites at a rate of 0.03 lb. a.i./acre. Do not apply more than 0.12 lb. a.i./acre/season. Do not graze livestock in treated areas, or use treated vines or hay for animal feed. REI-24 hours.

- **disulfoton** (*Di-Syston 15G*)-Organophosphate. Apply granules in a band on each side of the seed furrow at planting or as a side dressing at pegging at a rate of 1.0-2.0 lb. a.i./acre for thrips and PLH control. Do not apply directly on the seed. Do not feed treated vines to livestock. *Di-Syston 15G* was applied to 5.7% of the acreage surveyed for thrips control. REI-48 hours.

- **esfenvalerate** (*Asana XL*)-PHI-21 days. Pyrethroid. Apply to the foliage at a rate of 0.02-0.03 lb. a.i./acre for control of CEW. A higher rate of 0.05 lb. a.i./acre may be needed for adequate FAW control. *Asana XL* was used to control mid- to late-season foliage feeders on 68.7% of the acres surveyed. REI-12 hours.

- **fenpropathrin** (*Danitol 2.4EC*)-PHI-14 days. Pyrethroid. Apply to foliage at a rate of 0.20-0.30 lb. a.i./acre for PLH, CEW and spider mite control. Do not graze or feed treated peanut vine forage or dried hay within 14 days of the last application. Do not exceed 0.8 lb. a.i./acre/season. REI-24 hours.

- **malathion** (*Malathion 57EC*)-PHI-0 days. A rate of 0.94 lb. a.i./acre may be used in the case of mild thrips pressure and impending leafhopper or spider mite danger. *Malathion 57EC* was applied as a foliar thrips treatment and as a mid- to late-season control of foliage feeders on 0.42% and 1.7% of surveyed acres, respectively. REI-12 hours.

- **methomyl** (*Lannate LV*)-PHI-21 days. Carbamate. Apply to the foliage at a rate of 0.23-0.90 lb. a.i./acre for control of CEW and other lepidopteran larvae and at a rate of 0.45-0.90 lb. a.i./acre for control of thrips and PLH. Treated vines should not be fed to livestock. Do not feed treated vines. REI-48 hours.

- **phorate** (*Thimet 20G*)-PHI-90 days. Organophosphate. Apply in-furrow at a rate of 1.0 lb. a.i./acre for early-season thrips and PLH control. Granules can also be distributed over the fruiting zone at pegging for control of PLH and SCR at a rate of 2.0 lb. a.i./acre, but must be worked into the top few inches of soil immediately. Be sure to distribute granules evenly and do not graze or feed treated hay or forage to livestock. REI-48 hours.

- **propargite** (*Comite 6.5EC*) (*Omite 30W*)-PHI-14 days. Organophosphate. Apply *Comite 6.5EC* at a rate of 1.63 lb. a.i./acre or *Omite 30W* at a rate of 0.9-1.5 lb. a.i./acre for control of spider mites. Make no more than 2 applications per year (either *Comite 6.5EC* or *Omite 30W*). Do not plant rotational crops within 6 months of last application. Do not feed hay to livestock. REI-7 days.

<table>
<thead>
<tr>
<th>Active Ingredient</th>
<th>Formulation</th>
<th>Acres Treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>fonofos</td>
<td>Dyfonate 10G</td>
<td>9.9%</td>
</tr>
<tr>
<td>fonofos</td>
<td>Dyfonate 20G</td>
<td>4.8%</td>
</tr>
<tr>
<td>phorate</td>
<td>Thimet 15G</td>
<td>2.2%</td>
</tr>
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</table>

Table 1. 1990 Virginia Pesticide Use Survey results for insecticides not currently labeled in Virginia and for those currently recommended by Virginia Tech under a different trade name formulation.
Formulations not currently recommended, but included in the 1990 survey

<table>
<thead>
<tr>
<th>Active Ingredient</th>
<th>Formulation</th>
<th>Acres Treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>carbaryl</td>
<td>Sevin XLR</td>
<td>11.6 % (thrips)</td>
</tr>
<tr>
<td>carbaryl</td>
<td>Sevin XLR</td>
<td>11.8% (foliage feeders)</td>
</tr>
<tr>
<td>methomyl</td>
<td>Lannate 1.8L</td>
<td>3.7%</td>
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<tr>
<td>propargite</td>
<td>Comite 73L</td>
<td>5.1%</td>
</tr>
</tbody>
</table>

Tables 2-4 below summarize the effectiveness of some popular pesticides used at time of planting, at time of pegging, or as foliar treatments for the control of major insect pests which attack peanuts.

Diseases

Control recommendations were taken from the 2000 Peanut Production Guide.

Sclerotinia blight, Cylindrocladium black rot, early leaf spot, and web blotch have been among the top disease problems facing Virginia producers over the last 5 years. Of course these diseases are weather-dependent and may vary in their severity from season to season.

Seed Rot and Seedling Diseases

Common seedborne pathogens of concern include Aspergillus niger, Rhizoctonia, Rhizopus spp. and Cylindrocladim parasiticum. As the heading of this section suggests, these soilborne organisms are responsible for seed rot and early season seedling diseases. Both can be very devastating if not controlled, especially in cool, wet years. Prior to planting, all seed in Virginia are treated with a fungicide. While there are several recommended seed treatments available to seed vendors, Vitavax PC is used most often, possibly on all seed planted in Virginia. This product is a combination of the active ingredients, carboxin, PCNB and captan. It is applied to the seed at a rate of 4.0 oz. product/cwt. Once treated, seed may not be used for food, feed, or oil purposes.

Foliar Diseases

Early Leaf Spot, Cercospora arachidicola

Early leaf spot is caused by the fungus, Cercospora arachidicola. Initial attack by this fungus results in the appearance of faint brown to black pinpoint dots on the upper surface of the lower leaves. As the disease develops, the dots enlarge to dark spots with a yellow "halo". If this disease is not controlled, defoliation and reduced yield may result. Diseased leaves that fall to the soil may trigger epidemics of certain soilborne diseases such as southern stem rot.
**Cylindrocladium Black Rot, *Cylindrocladium parasiticum***

Cylindrocladium black rot (CBR) caused by the fungus *Cylindrocladium parasiticum* can result in complete destruction of the peanut root system and pods. In most years, infected plants appear stunted, chlorotic, and often wilt during the hottest times of the day from mid-July until harvest. As the fungus continues to decompose the root system, however, these plants collapse and die. All below-ground plant parts may develop symptoms of CBR, even pods, which become black and necrotic. A diagnostic sign of CBR is the occurrence of small, reddish-orange perithecia of the pathogen in dense clusters on stems, pegs, and occasionally pods. Distribution may be localized to small areas or encompass entire fields. Low soil temperature and high levels of soil moisture early in the growing season are most conducive to CBR. It has been a cause of major concern, particularly in Virginia and North Carolina due to its widespread occurrence and chronic threat to peanut production. Recent research has confirmed that infected seeds can also transmit CBR.

**Rhizoctonia Pod and Limb Rot**

*Rhizoctonia solani* is a soilborne fungus that can attack both pods and limbs and commonly occurs after rain or in moist fields where air movement is limited. *Rhizoctonia* lesions usually form on the undersides of limbs where they touch the soil. As the lesions expand, girdling may occur causing the limbs to collapse. Further disease development allows for spread to the pods resulting in shedding from vines during harvest.

**Sclerotinia Blight, *Sclerotinia minor***

The first obvious symptom of Sclerotinia blight is the rapid wilting or flagging of the tips of infected branches. The disease is caused by a soilborne fungus, *Sclerotinia minor*, which appears as a cottony or fluffy mass on diseased tissue near the soil surface. Another symptom of the disease is the shredding of infected branch and peg tissue. Severe peg infection results in significant pod losses at harvest. Small, black, irregularly shaped survival structures called sclerotia are a distinguishing sign of Sclerotinia blight. These can be found both in and on diseased tissue and are important vehicles in the spread of this disease to other areas.

**Southern Stem Rot, *Sclerotium rolfsii***

Southern stem rot, also known as white mold, southern stem rot, southern blight, and Sclerotium rot is caused by a soilborne fungus, *Sclerotium rolfsii*. Presence of this fungus is detected by the often dense, white, stringy mold found growing on plant tissues at or near the soil surface. As the fungus decomposes stems near the crown, entire limbs may wilt and die. Peanut pods may also be affected in addition to stems and limbs. Southern stem rot is a sporadic disease in Virginia, but can cause severe damage if not managed properly. It is most active during the hottest part of the season and especially following significant rainfall.

**Web Blotch, *Phoma arachidicola***

Web blotch as the name suggests has web or net-like appearance that is initially visible on the upper surface of the leaves. As the disease progresses, the lesions on the upper surface change in color from brown to dark brown to black and change in shape to become circular with irregular margins. In the latter stages, small blotches may also be visible on the lower leaf surface. Infected leaves become brittle and fall from the peanut vine, ultimately resulting in complete defoliation. The web blotch fungus can survive from season to season in crop residue and can be a very challenging problem for Virginia growers in certain years. In severe cases, the defoliation can spread over an entire field in a very short period of time. Web blotch is also referred to as net blotch, Phoma leaf spot, Ascochyta leaf spot, and muddy spot.
Monitoring: (All Diseases)

Peanut fields should be scouted once a week beginning after pegging and continuing until harvest. Field histories should also be considered when making control decisions, especially in the case of soilborne diseases that often occur in locations where peanuts are consistently planted.

Chemical Control: (All Diseases)

Several chemicals are registered for disease control in peanuts. See the Chemical Disease Control section below. In Virginia, the Peanut/Cotton InfoNet (http://www.ipm.vt.edu/infonet/) and Peanut Hotlines (800-795-0700 plus others) are important sources of information for proper timing of fungicide applications. These tools provide daily weather-based advisories which help to enable the judicious use of chemicals by producers. As always, chemicals should be used only according to label directions and recommendations in the Virginia Peanut Production Guide.

Biological Control: (All Diseases)

No commercially effective controls are available.

Cultural Control: (All Diseases)

Sanitation Practices—such as moldboard plowing to bury crop residues prior to planting peanuts may reduce the risk from residual inoculum of organisms. Also, washing equipment frequently will help to avoid transport of inoculum from field to field. The removal and/or destruction of peanut vines after harvest has limited value for disease management because much of the diseased plant parts and inoculum remain intact in the field.

Crop Rotations—involving corn, grain sorghum, fescue, and other grass-type crops as well as cotton are beneficial to the control of peanut disease in Virginia. Soybean and other leguminous crops share many of the common destructive disease with peanuts and should be avoided.

Resistant Varieties—No peanut varieties are immune to disease, but there is a wide range of susceptibility. Some important differences are noted below:

- **Cylindrocladium Black Rot:** NC 12C and Perry are partially resistant. Resistance is improved by good nematode control and delayed planting (i.e. May 10 or later).
- **Sclerotinia Blight:** VA 93-B is partially resistant to this disease. Early planting at seed rates of 110 lb./acre or lower can reduce the susceptibility of varieties in some years. NC 9 and NC-12C are highly susceptible to Sclerotinia and should be avoided in Virginia.
- **Early Leaf Spot:** NC 6 has some resistant to leaf spot, while NC 7 and NC-V 11 are moderately susceptible. All other varieties are susceptible.
- **Tomato Spotted Wilt Virus:** NC-V 11 may be the least susceptible. NC 7 is highly susceptible.

Other—Other sound cultural practices such as maintaining the proper soil pH, reducing vine injury by machinery and not irrigating during cool weather may help to reduce the likelihood of disease occurrence. Altering planting dates to avoid cool, wet conditions may also be beneficial in the case of certain diseases such as CBR.

Chemical Disease Control

Fungicides accounted for 42% of the 73,036 lb. a.i. of pesticide applied to the 4,293 acres of peanuts represented in the
Virginia Pesticide Use Survey for Peanuts in 1990. An average of 4.1 foliar applications of fungicides were made on each acre of peanuts for control of early leafspot in 1990. Almost all of the peanut acreage under survey was treated an average of 2.6 times with chlorothalonil alone. Cupric hydroxide plus sulfur was the second most widely used foliar fungicide with 1.7 applications being applied to 66% of the survey acreage. Sprays of iprodione were applied to about 19% of the survey acreage for control of Sclerotinia blight. PCNB and carboxin were used less frequently and were directed primarily at control of southern stem rot.

Additional usage results from the 1990 survey are included in the fungicide descriptions found below. Several products which are currently recommended (Abound 2.08F, Moncut 50WP, Bravo Ultrex 82.5WDG, Echo 720 and 90DF, Terranil 6F and 90DF, Tilt 3.6EC and Folicur 3.6EC) were not labeled for use in 1990 and were therefore not included in the survey. Conversely, several products were included in the survey which are no used in Virginia. These products along with their usage results are listed in Table 5.

Table 5. 1990 Virginia Pesticide Use Survey results for fungicide formulations not currently recommended by Virginia Tech.

<table>
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<th>Active Ingredient</th>
<th>Formulation</th>
<th>Acres Treated</th>
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<tr>
<td>benomyl</td>
<td>Benlate 50W</td>
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<td>cupric hydroxide</td>
<td>Kocide 404S</td>
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</tr>
<tr>
<td>sulfur</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mg EBDC</td>
<td>Maneb</td>
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<td>sulfur</td>
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<td>copper salts of fatty &amp; rosin acids</td>
<td>TennCop 5E</td>
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<td>PCNB</td>
<td>Terraclor 10G</td>
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<tr>
<td>carboxin</td>
<td>Vitavax 3F</td>
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</table>

Conditions during the 2000 growing season were uncharacteristically wet and highly suitable to the development of Sclerotinia Blight. Without proper control options, Sclerotinia blight can greatly reduce peanut yields in Virginia. To provide adequate control, it was necessary for Extension Specialists to apply for a Section 18 Emergency Label for fluazinam (Omega), which has been shown to be very effective against this disease. The request was approved for the 2000 growing season. While iprodione (Rovral) is fully labeled for the control of Sclerotinia blight, it has limited effectiveness when compared with fluazinam. Producers are ever hopeful that industry will pursue a full fluazinam label for the 2001 peanut season, especially with the recent trend in weather patterns.

- **azoxystrobin** (Abound 2.08F)-PHI-14 days. Recommended at a rate of 0.30-0.40 lb. a.i./acre for control of
Eriococcus leaf spot, southern stem rot and Rhizoctonia pod and limb rot. REI-4 hours.

- **chlorothalonil** (Bravo 720) (Bravo Utrex 82.5WDG) (Echo 720) (Echo 90DF) (Terranil 6F) (Terranil 90DF)-PHI-14 days. Applied at an average rate of 1.12 lb. a.i./acre for control of *Cercospora* leaf spot and web blotch. Bravo 720 and Bravo S was used on 98.6% and 2.4% of the 1990 surveyed, respectively. REI-48 hours.

- **flutolanil** (Moncut 50WP)-PHI-40 days. Recommended at a rate of 0.75-1.00 lb. a.i./acre for control of southern stem rot and *Rhizoctonia* pod and limb rot. Flutolanil (0.60 lb. a.i./acre) and propiconazole (0.11 lb. a.i./acre) have been combined to form a product known as Montero. Montero is formulated in a package that will treat 4-5 acres. It should be applied 2 or 3 times per season starting 45-60 days after planting for control of leaf spot. Montero is not recommended after August 15. REI-12 hours.

- **iprodione** (Rovral 4F)-PHI-10 days. Applied at a rate of 1.00 lb. a.i./acre for control of Sclerotinia blight. Rovral 4F was used on 19.1% of the surveyed acreage in 1990. REI-24 hours.

- **mancozeb** (Dithane M45, 80W, DF, F45, 4F) (Mankocide) (Manzate 200DF) (Penncozeb 75DF)-PHI-14 days. Recommended at an average rate of 1.50 lb. a.i./acre for control of *Cercospora* leaf spot. REI-24 hours.

- **metam sodium** (Vapam HL 42%) (Metam 42%) at 32.0-43.0 lb. a.i./acre is applied to ca. 75% of the peanut acreage annually in Virginia for control of CBR and nematodes. REI-48 hours.

- **propiconazole** (Tilt 3.6EC)-PHI-14 days. Recommended at a rate of 0.11 lb. a.i./acre for control of *Cercospora* leaf spot. See the flutolanil section for information on Montero (flutolanil + propiconazole). REI-24 hours.

- **tebuconazole** (Folicur 3.6F) -PHI-14 days. Should be applied at a rate of 0.20 lb. a.i./acre for control of *Cercospora* leaf spot, southern stem rot, and *Rhizoctonia* pod and limb rot. REI-12 hours.

### Nematodes

*Control recommendations were taken from the 2000 Peanut Production Guide.*

Nematodes are tiny worm-like parasites which attack plant roots. Feeding by these pests can result in stunting, wilting, and/or discoloration of the above ground portion of the plant. Nematode infestation in peanuts can also damage the pods (root knot) and can increase susceptibility to fungal diseases such as *Cylindrocladium* black rot (CBR). The most common infestations in Virginia peanuts are caused by the northern root knot (*Meloidogyne hapla*), stubby root (*Trichodorus* sp.), lesion (*Pratylenchus brachyurus*), ring (*Criconemella ornata*), and sting (*Belonolaimus longicaudatus*) nematodes.

**Monitoring:** Both the diagnostic and predictive nematode assay programs in Virginia provide data to producers on the numbers and kinds of nematodes in soil along with recommendations for control. Soil samples for diagnostic assays are processed without charge to determine the cause of production problems during the growing season. Predictive nematode assays are done on samples collected after harvest. These samples are processed at a cost of $11 per sample, and must be collected in the fall no later than November 20. While diagnostic samples are pulled from problem spots in a crop, the predictive samples are pulled in a uniform pattern across areas of up to 4-5 acres. Table 6 lists the threshold levels of nematodes that may damage the crop in Virginia. Checking roots at the time of harvest for masses of galls on roots (*Meloidogyne hapla*) may alert producers of probable root knot nematode infestations. If nematode problems are suspected during the cropping season, a soil sample from a particular field location can be sent through the local extension office to the Plant Disease Clinic at Virginia Tech. The results of a diagnostic assay can be considered when determining future crop rotations and management practices.

**Table 6. Nematode risk thresholds for determining treatment of peanuts.**
<table>
<thead>
<tr>
<th>Nematode</th>
<th>A (little or no risk)</th>
<th>B (moderate risk)</th>
<th>C (high risk)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Root Knot</td>
<td>&lt; 25</td>
<td>25-100</td>
<td>&gt; 100</td>
</tr>
<tr>
<td>Dagger</td>
<td>&lt; 100</td>
<td>100-280</td>
<td>&gt; 280</td>
</tr>
<tr>
<td>Sting</td>
<td>0</td>
<td>10-20</td>
<td>&gt; 20</td>
</tr>
<tr>
<td>Lesion</td>
<td>&lt; 30</td>
<td>30-100</td>
<td>&gt; 100</td>
</tr>
<tr>
<td>Rink</td>
<td>&lt; 40</td>
<td>40-200</td>
<td>&gt; 200</td>
</tr>
<tr>
<td>Spiral</td>
<td>&lt; 300</td>
<td>&gt; 300</td>
<td>--</td>
</tr>
<tr>
<td>Stubby Root</td>
<td>&lt; 100</td>
<td>100-300</td>
<td>&gt; 300</td>
</tr>
</tbody>
</table>

Risk code based on nematodes/500cc soil (August 1 to November 20 of year before planting crop)

A = nematodes are not likely to cause crop damage
B = borderline populations
C = populations are likely to cause crop damage and a significant loss of yield

**Chemical Control:** Several chemicals are registered for nematode control in peanuts (see *Chemical Nematode Control* section below).

**Biological Control:** No commercially effective controls are available.

**Cultural Control:** Rotating with non-host crops of nematodes that are a problem in peanuts has been a common practice in Virginia. Common rotational crops include cotton and corn, while soybeans are avoided in a peanut rotation due to its high susceptibility to northern root knot nematode and CBR.

**Chemical Nematode Control**

- *metam sodium (METAM 42%)* at 32.0-43.0 lb. a.i./acre is applied to ca. 75% of the peanut acreage annually in Virginia for control of CBR and nematodes. REI-48 hours. While other soil fumigants having 1,3-dichloropropene (Telone II) as the active ingredient are highly effective in nematode control, these products are not used because of their failure to provide control of CBR.

- *aldicarb (Temik 15G)* at 0.75 to 1.50 lb. a.i./acre is applied to the seed furrow at planting on 85% or more of the planted acres with and without metam sodium as a means to boost nematode control and suppress crop damage by early-season insects. Aldicarb is classified in the carbamate group of chemicals. REI-48 hours. Ethoprop (Mocap 10G and 15G) and fenamiphos (Nemacur 15G) are rarely used due to their spectrum of activity being confined primarily to nematodes. Carbofuran (Furadan) is no longer registered for use on peanuts in Virginia.
Experimental compounds of either a chemical or biological nature have not been evaluated by industry in peanuts in the last five years. Fosthiazate was the last experimental material to be evaluated as a nematicide in field trials. This product offered poor control of northern root knot nematode, and as a result, field testing was terminated in 1994. Only registered products (i.e. metam sodium, aldicarb, fenamiphos) have been tested in field trials annually since 1995.

**Weeds**

*Control recommendations were taken from 2001 Peanut Production Guide.*

As reported in the 1998 Southern Weed Science Society Proceedings, large crabgrass, lambsquarters, morningglory spp., fall panicum, pigweed spp., common ragweed, ntsedge spp. prickly sida, cocklebur, and spurred anoda are the most commonly occurring weeds in Virginia, with large crabgrass being the most common. This list changes slightly in terms of problem weeds, with bermudagrass followed by purple nutsedge, eclipta, common ragweed, spurred anoda, Texas panicum, morningglory spp. yellow nutsedge, horsenettle, and prickly sida being the top ten most difficult to control.

**Monitoring:** Proper weed identification is the key to successful weed control. Scout fields to determine weed species present. Record weed problems on a field map, if possible, to help with herbicide selection for the following cropping season.

**Chemical Control:** Sequential herbicide applications are usually necessary for adequate control of the troublesome weeds listed above. Tables 8 and 9 provide efficacy data for several commonly used herbicides on a variety of weed species. See *Chemical Weed Control* section below.

**Biological Control:** No commercially effective controls are available.

**Cultural Control:** Rotations to corn allow for herbicidal control of perennial broadleaf weeds.

**Chemical Weed Control**

Herbicides accounted for 31% of the 73,036 lb. a.i. of pesticide applied to the 4,293 acres of peanuts represented in the Virginia Pesticide Use Survey for Peanuts in 1990. Metolachlor and alachlor were among the most widely used herbicides in 1990, considering the array of materials applied at pre-plant, preemergence, and/or postemergence. Vernolate was also widely used at the time of the survey as a pre-plant treatment for weed control, but this product is not currently being manufactured for use within the southeastern U.S. Several products which are currently recommended (*Boa 2.5SC, Cadre 70DG, Dual Magnum 7.62EC, Dual II Magnum 7.64EC, Frontier 6E, Lasso II, Pursuit 70DG, Partner 65WDG, Select 2EC, Strongarm 84WDG, Tough 3.75EC*) were not labeled for use in 1990 and therefore were not included in the survey. Other products have undergone slight formulation changes and still others are no longer used in Virginia. All survey results are listed in Table 7. Current anecdotal data was used to supplement survey results.

- **2,4-DB (Butyrac 2SC) (Butoxone 1.75SC)-PHI-45 days.** Apply at a rate of 0.20-0.25 lb. a.i./acre mainly for postemergence control of cocklebur and annual morningglory. Do not graze or feed treated forage to livestock. The chemical 2,4-DB is often mixed with other products for improved weed control. REI-48 hours.
- **acifluorfen (Blazer 2L)-PHI-75 days.** Apply at a rate of 0.25-0.50 lb. a.i./acre for postemergence control of common ragweed, jimsonweed, morningglory, pigweed, carpetweed, purslane, cocklebur, tropic croton,
lambquarters, black nightshade, smartweed, spotted and prostrate spurge, wild mustard. Adding 2,4-DB provides improved control of large morningglory, cocklebur, and certain other broadleaf weeds when size exceeds that specified on the acifluorfen label. REI-48 hours.

- **alachlor** (Lasso 4EC) (Lasso II) (Micro-Tech 4ME) (Partner 65WDG)-Apply preemergence at a rate of 3.0-4.0 lb. a.i./acre for good annual grass control except for Texas panicum. There has been some concern among manufacturers regarding the use of this product and whether or not they will use peanuts treated with this chemical. REI-12 hours.

- **bentazon** (Basagran 4SC)-PHI-45 days. Apply at a rate of 0.50-1.00 lb. a.i./acre for postemergence control of cocklebur, common ragweed, jimsonweed, smartweed, prickly sida (teaweed), spurred anoda, wild mustard, and yellow nutsedge. The addition of 2,4-DB improves control of morningglories and spurred anoda. The addition of acifluorfen improves control of pigweeds, morningglories and common ragweed. Do not apply more than 2.0 lb. a.i./acre of bentazon per season. REI-12 hours.

- **clethodim** (Select 2EC)-PHI-40 days. Apply at a rate of 0.125-0.156 lb. a.i./acre for postemergence control of annual grasses, bermudagrass, and rhizome johnsongrass. A second application may be needed for complete control of perennial grasses. REI-24 hours.

- **diclosulam** (Strongarm 84WDG)-PHI-30 days. Incorporated within 4 weeks of planting at a rate of 0.024 lb. a.i./acre for control of broadleaf weeds and suppression of nutsedges. May also be applied at the same rate for preemergence control of the same weeds. Strongarm 84WDG was first available for use by during the 1999 season. Currently it is not being used on a great number of acreage, but this is expected to increase. REI-12 hours.

- **dimethenamid** (Frontier 6E)-PHI-80 days. Incorporate within 14 days of planting at a rate of 1.20-1.50 lb. a.i./acre for control of crabgrass fall panicum, goosegrass, broadleaf signalgrass, pigweed, carpetweed, and yellow nutsedge. May be applied at the same rate for preemergence control of the same weeds. Does not adequately control purple nutsedge or Texas panicum. REI-12 hours.

- **ethalfluralin** (Sonalan 3HFO)-Incorporate prior to planting at a rate of 0.56-0.75 lb. a.i./acre for control of crabgrass, goosegrass, fall panicum, johnsongrass, broadleaf signalgrass, carpetweed, lambsquarters, and pigweed. For control of Texas panicum incorporate 3 inches, which is deeper than the label specifies. REI-24 hours.

- **imazapic** (Cadre 70DG)-PHI-90 days. Apply at a rate of 0.063 lb. a.i./acre for postemergence control of spurred anoda, morningglories, pigweeds, velvetleaf, and yellow and purple nutsedge. Recommended for application as a sequential treatment following a soil-applied grass control herbicide. Used on an estimated 10% of the peanut acres during the 1999 season. REI-12 hours.

- **imazethapyr** (Pursuit 70DG)-PHI-85 days. Incorporate prior to planting at a rate of 0.063 lb. a.i./acre for control of spurred anoda, pigweeds, prickly sida, velvetleaf, and yellow and purple nutsedge. May also be applied at the same rate for preemergence and early postemergence control of the same weeds, although this method is less consistent than the pre-plant application. Do not apply more than 0.063 lb. a.i./acre/season. An estimated 20% of the peanut acres were treated with imazethapyr during the 1999 season. REI-12 hours.

- **metolachlor** (Dual) (Dual 8E) (Dual II) (Dual IIG) (Dual 25G)-PHI-90 days. Incorporate within 14 days of planting at a rate of 1.50-2.00 lb. a.i./acre for control of crabgrass, fall panicum, goosegrass, broadleaf signalgrass, pigweed, and yellow nutsedge. May be applied at the same rate for preemergence control of the same weeds or applied over the top of peanuts for control of late grasses. Do not apply Dual II or Dual IIG after peanut emergence. Metolachlor and s-metolachlor were used on an estimated 80% the peanut acreage in 1999. REI-12 hours.

- **paraquat** (Starfire 1.5SC) (Gramoxone Max 3SC) (Boa 2.5SC)-Apply at a rate of 0.125 lb. a.i./acre for control of small annual grasses and broadleaf weeds at ground cracking. Does not provide residual control. Adding 2,4-DB improves morningglory and cocklebur control. Adding bentazon improves control of prickly sida, common ragweed, lambquarters, smartweed, spurred anoda, and cocklebur and reduces peanut injury. Do not apply later than 28 days after ground cracking. Gramoxone Max 3SC and Boa 2.5SC are relatively new products. Starfire 1.5SC, on-the-other-hand, received an emergency label (Section 18) in 1987 and a full label the next year. Despite the emergency label in 1987, it was not recorded in the 1990 survey. REI-12 hours.
- pendimethalin (Prowl 3.3EC)-Incorporate prior to planting at a rate of 0.75-1.0 lb. a.i./acre for the control of crabgrass, goosegrass, fall panicum, johnsongrass, broadleaf signalgrass, carpetweed, lambsquarters, and pigweed. For control of Texas panicum incorporate 3 inches, which is deeper than the label specifies. Pendimethalin was used on an estimated 30% of the peanut acreage during the 1999 season. REI-12 hours.

- pyridate (Tough 3.75EC)-PHI-68 days. Apply at a rate of 0.90-1.40 lb. a.i./acre for control of cocklebur, lambsquarter, jimsonweed, pigweed, prickly sida and velvetleaf. The addition of 2,4-DB greatly improves the spectrum of weeds controlled. REI-12 hours.

- s-metolachlor (Dual Magnum) (Dual II Magnum)-PHI-90 days. Incorporate within 14 days of planting at a rate of 0.95-1.27 lb. a.i./acre for control of crabgrass, fall panicum, goosegrass, broadleaf signalgrass, pigweed, and yellow nutsedge. May be applied at the same rate for preemergence control of the same weeds. Does not adequately control purple nutsedge or Texas panicum. Do not use Dual II Magnum after peanuts have emerged. Metolachlor and s-metolachlor were used on an estimated 80% the peanut acreage in 1999. REI-24 hours.

- sethoxydim (Poast 1.5EC) (Poast Plus 1EC)-PHI-40 days. Apply at a rate of 0.19 lb. a.i./acre for postemergence control of annual grasses. For control of bermudagrass, and johnsongrass rhizomes apply at a rate of 0.28 lb. a.i./acre. A second application for bermudagrass and johnsongrass rhizome control may be necessary; apply at a rate of 0.19 lb. a.i./acre. An estimated 5% of the peanut acres were treated with sethoxydim during the 1999 season. REI-12 hours.

Table 7. 1990 Virginia Pesticide Use Survey results for herbicides not currently recommended by Virginia Tech.

<table>
<thead>
<tr>
<th>Active Ingredient</th>
<th>Formulation</th>
<th>Timing</th>
<th>Acres Treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>benefin</td>
<td>Balan 2.5G</td>
<td>Pre-plant</td>
<td>0.35%</td>
</tr>
<tr>
<td>benefin</td>
<td>Balan 1.5LC</td>
<td>Pre-plant</td>
<td>11.2%</td>
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<tr>
<td>monocarbamide</td>
<td>Enquik</td>
<td>Post-emergence</td>
<td>1.2%</td>
</tr>
<tr>
<td>dihydrogensulfate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>vernolate</td>
<td>Vernam 10G</td>
<td>Pre-plant</td>
<td>7.4%</td>
</tr>
<tr>
<td>vernolate</td>
<td>Vernam 7E</td>
<td>Pre-plant</td>
<td>21.9%</td>
</tr>
</tbody>
</table>

Formulations used in Virginia, but slightly modified from those included in the 1990 survey*

<table>
<thead>
<tr>
<th>Active Ingredient</th>
<th>Formulation</th>
<th>Timing</th>
<th>Acres Treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,4-DB</td>
<td>Butoxone 1.75L (I.75SC)</td>
<td>Postemergence</td>
<td>1.4%</td>
</tr>
<tr>
<td>2,4-DB</td>
<td>Butyrac 200 (2SC)</td>
<td>Postemergence</td>
<td>62.6%</td>
</tr>
<tr>
<td>alachlor</td>
<td>Lasso 4E (4EC)</td>
<td>Pre-plant</td>
<td>12.0%</td>
</tr>
<tr>
<td>Ingredient</td>
<td>Formulation</td>
<td>Application</td>
<td>Percentage</td>
</tr>
<tr>
<td>-------------------------</td>
<td>------------------------</td>
<td>---------------</td>
<td>------------</td>
</tr>
<tr>
<td>alachlor</td>
<td>Lasso 4E (4EC)</td>
<td>Preemergence</td>
<td>35.8%</td>
</tr>
<tr>
<td>alachlor</td>
<td>Lasso 4E (4EC)</td>
<td>Postemergence</td>
<td>34.5%</td>
</tr>
<tr>
<td>bentazon</td>
<td>Basagran 4S (4SC)</td>
<td>Postemergence</td>
<td>11.3%</td>
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<tr>
<td>bentazon + acifluorfen</td>
<td>Storm 4S (4EC)</td>
<td>Postemergence</td>
<td>32.8%</td>
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<td>ethalfluralin</td>
<td>Sonalan 3EC (3HFO)</td>
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<td>32.7%</td>
</tr>
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<td>Sonalan 3EC (3HFO)</td>
<td>Preemergence</td>
<td>3.1%</td>
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<tr>
<td>paraquat</td>
<td>Gramoxone Extra 2.5L</td>
<td>Preemergence</td>
<td>4.7%</td>
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<td></td>
<td>(Gramoxone Max 3SC)</td>
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<td></td>
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<tr>
<td>paraquat</td>
<td>Gramoxone Extra 2.5L</td>
<td>Postemergence</td>
<td>13.2%</td>
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<tr>
<td></td>
<td>(Gramoxone Max 3SC)</td>
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<td></td>
</tr>
<tr>
<td>pendimethalin</td>
<td>Prowl 4E (3.3EC)</td>
<td>Pre-plant</td>
<td>16.5%</td>
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</table>

*Current formulations as modified from those included in the survey are noted in parentheses.*

**Formulations used in Virginia, and included in the 1990 survey**

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<th>Formulation</th>
<th>Application</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>acifluorfen</td>
<td>Blazer 2L</td>
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<tr>
<td>metolachlor</td>
<td>Dual 8E</td>
<td>Pre-plant</td>
<td>31.8%</td>
</tr>
<tr>
<td>metolachlor</td>
<td>Dual 8E</td>
<td>Preemergence</td>
<td>31.7%</td>
</tr>
<tr>
<td>metolachlor</td>
<td>Dual 8E</td>
<td>Postemergence</td>
<td>16.0%</td>
</tr>
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<td>metolachlor</td>
<td>Dual 25G</td>
<td>Preemergence</td>
<td>4.1%</td>
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<tr>
<td>sethoxydim</td>
<td>Poast 1.5EC</td>
<td>Postemergence</td>
<td>11.1%</td>
</tr>
<tr>
<td>sethoxydim</td>
<td>Poast Plus 1EC</td>
<td>Postemergence</td>
<td>0.23%</td>
</tr>
</tbody>
</table>

**On-line Resources**
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