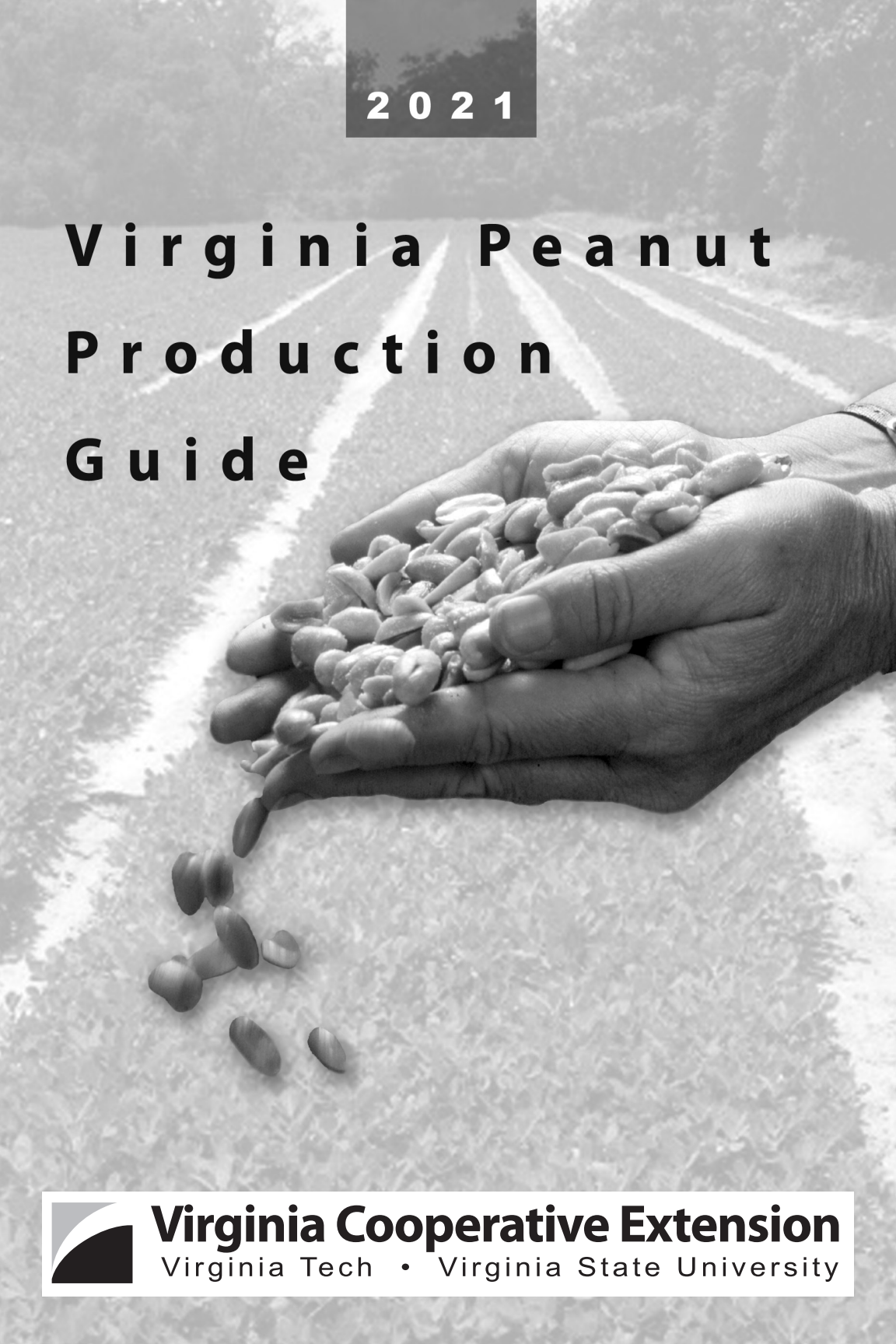
2021

Virginia Peanut Production Guide



Virginia Cooperative Extension
Virginia Tech • Virginia State University

2021

Virginia Peanut Production Guide

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Contents

SAFETY FIRST WITH PESTICIDES

Recommendations for the use of agricultural chemicals are included in this publication as a convenience to the reader. The use of brand names and any mention or listing of commercial products or services in this publication does not imply endorsement by Virginia Tech nor discrimination against similar products or services not mentioned. Individuals who use agricultural chemicals are responsible for ensuring that the intended use complies with current regulations and conforms to the product label. Be sure to obtain information about usage regulations and examine a current product label before applying any chemical. For assistance, contact your county Extension agent.

Keys to Proper Use of Pesticides

1. Read the label on each pesticide container before each use. Follow the printed instructions to the letter; heed all cautions and warnings; note precautions about residues.

2. Store pesticides in the containers in which you bought them. Put them where children and animals cannot get to them — preferably locked-up and away from food, feed, seed, and other materials that may become harmful if contaminated.

3. Dispose of empty containers in the manner specified on the label.

SEE YOUR DOCTOR IF SYMPTOMS OR ILLNESS OCCURS DURING OR AFTER USE OF PESTICIDES!

IN CASE OF SUSPECTED POISONING

The procedure to be followed is:

1. Call a physician immediately. If the family physician is not available, the patient should be **taken** to the nearest physician or hospital emergency department together with the **container of the poisoning agent**.

2. If necessary, the **physician** will call the nearest poison control center for further information concerning the toxicity of the suspected agent, treatment, and prognosis.

Protective Clothing and Equipment Guide

Use this table as a guide to the selection of protective clothing and equipment. Cross-reference the signal word from the product label and the type of formulation to determine the minimum protection you should wear. This guide is not to be used in place of label statements; refer to the label for specific information.

Table 1. Personal Protective Equipment (PPE) Guide

	Label Signal Word		
Formulation	**Caution**	**Warning**	**Danger**
Dry	Long-leg trousers and long-sleeve shirt; shoes and socks.	Long-leg trousers and long-sleeve shirt; shoes and socks; wide-brim hat; gloves.	Long-leg trousers and long-sleeve shirt; shoes and socks; hat; gloves; cartridge or canister respirator if dusts in air or if label precautionary statement says: **"Poisonous or fatal if inhaled."**
Liquid	Long-leg trousers; long-sleeve shirt; shoes and socks; wide-brim hat.	Long-leg trousers and long-sleeve shirt; shoes and socks; wide-brim hat; rubber gloves. Goggles if required by label precautionary statement. Cartridge or canister respirator if label precautionary statement says: "Do not breathe vapors or spray mists," or "Poisonous if inhaled."	Long-leg trousers and long-sleeve shirt, rubber boots, wide-brim hat, rubber gloves or face shield. Canister respirator if label precautionary statement says: **"Do not breathe vapors or spray mists,"** or **"Poisonous if inhaled."**
Liquid (when mixing)	Long-leg trousers; long-sleeve shirt; shoes and socks; wide-brim hat; gloves; rubber apron.	Long-leg trousers and long-sleeve shirt; shoes and socks; wide-brim hat; rubber gloves; goggles or face shield; rubber apron. Respirator if label precautionary statement says: **"Do not breathe vapors or spray mist."** or **"Poisonous (or fatal or harmful) if inhaled."**	Long-leg trousers and long-sleeve shirt, rubber boots, wide-brim hat, rubber gloves, goggles, rubber apron, canister respirator.

Table 1. Personal Protective Equipment (PPE) Guide (cont.)

	Label Signal Word		
Formulation	**Caution**	**Warning**	**Danger**
Liquid (prolonged exposure to spray, or application in enclosed area).	Long-leg trousers and long-sleeve shirt, boots, rubber gloves, water-proof, wide-brim hat.	Water-repellent, long-leg trousers and long-sleeve shirt, rubber boots, rubber gloves, rubber apron, waterproof, wide-brim hat, face shield, cartridge or canister respirator.	Waterproof suit, rubber boots, rubber gloves, waterproof hood or wide-brim hat, face shield, canister respirator.

Source: *Apply Pesticides Correctly: A Guide for Private and Commercial Applicators.* **USDA/ USEPA - 1984. p. 102.**

Emergency Information

Poison Treatment

In the event of a known or suspected exposure to a toxic (poisonous) substance, one of the Regional Poison Centers listed below should be contacted immediately. These centers provide 24-hour information and consultation services by poison information specialists and board-certified medical toxicologists. If possible, these centers should be called in advance of a person's admission to a local hospital or emergency department so the poison center experts can provide information on the proper treatment. These centers are located in hospitals equipped for all toxicological (poisoning) emergencies.

Poison Hotline – 1-800-222-1222

REGIONAL POISON CENTERS

CHARLOTTESVILLE, VA
Blue Ridge Poison Center
University of Virginia Health System
P.O. Box 67
Charlottesville, VA 22908
(434) 982-3158 or (434) 924-0347
(Serving: Central and Western Virginia)

RICHMOND, VA
Virginia Poison Center
Virginia Commonwealth University
Medical Center
600 E. Broad St., Suite 640
Richmond, VA 23298
(804) 828-4780
(Serving: Central and Eastern Virginia)

WASHINGTON, D.C.
National Capital Poison Center
George Washington University Medical Center
3201 New Mexico Avenue NW, Suite 310
Washington, DC 22016
(202) 362-3867
(Serving: Northern Virginia and D.C. area)

In addition to the Regional Poison Centers, there are several area hospitals with staff members who will provide some poison information by telephone. These hospitals are equipped for most toxicological emergencies.

GREENSBORO, N.C.
Triad Poison Center
Moses H. Cone Memorial Hospital
1200 North Elm Street
Greensboro, NC 27401-1020
(919) 574-8105
(800) 953-4001
(Calls from Virginia counties on the Va.-N.C. border only, please)

Table 2. Emergency, Spill, Accident, and Incident Information

Incident	Contact	Phone
SPILLS, accidents and other related emergencies	**CHEMTREC** - Chemical Transportation Emergency Center Industry Hotline	(800) 424-9300
SPILLS into water	Virginia Department of Environmental Quality	(804) 527-5194 (8:00 a.m. to 5:00 p.m.) (804) 527-5200 (after 5:00 p.m.)
24-Hour Medical Consultation	National Pesticide Telecommunication Network	(800) 858-7378
FOR ASSISTANCE WITH SPILLS AND EMERGENCIES	Virginia Department of Emergency Services	(804) 674-2400 or (800) 468-8892 (24-hours/day)
ACCIDENTS OR INCIDENTS that constitute a threat to any person, public Field Operations safety and health or the environment	Virginia Department of Agriculture and Consumer Services, Office of Pesticide Management	(804) 371-6560

EXTENSION PERSONNEL WORKING WITH PEANUTS

County Extension personnel with peanut responsibilities.

County	Name	Telephone	E-mail
Southampton	Josh Holland	(757) 653-2572	cvfd262@vt.edu
Greensville	Sara Rutherford	(434) 348-4223	sriggan@vt.edu
Dinwiddie	Mike Parrish	(804) 469-4514	mparrish@vt.edu
Prince George	Scott Reiter	(804) 733-2686	jreiter@vt.edu
Isle of Wight	Livvy Preisser	(757) 365-6262	livvy16@vt.edu
Suffolk	Elizabeth Pittman	(757) 514-4337	elizp16@vt.edu

Virginia Tech Extension specialists with peanut responsibilities.

Name	Department	Telephone	E-mail
Maria Balota	Peanut Variety	(757) 807-6538	mbalota@vt.edu
Dell Cotton	PGCMA	(757) 562-4103	dcotton25@cs.com
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Sally Taylor	Entomology	(757) 807-6546	svtaylor@vt.edu

AGRONOMIC RECOMMENDATIONS AND PROCEDURES

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The primary considerations when selecting peanut varieties are yield, grade factors, disease, pests, and drought and heat response. A good practice for farmers is recording for each field the variety, yield, rainfall, and disease and insect incidence every year. This will allow farmers to determine the production potential for each field and better fit the varieties to maximize return. For example, in disease prone fields, plant disease tolerant varieties. Bailey, Sullivan, and Wynne are good choices for Cylindrocladium black rot (CBR) infected fields, but Emery is susceptible to this disease. Varieties with partial resistance to the Tomato Spotted Wilt Virus (TSWV) can be planted early in the season on heavy soils but not the sensitive ones. TSWV sensitive varieties should be planted later and on sandy soils that usually warm up faster than heavy soils.

To alleviate the risks associated with peanut production plant several varieties instead of only one each year. A good source of information regarding selection of the best Virginia market type peanut varieties is the Peanut Variety and Quality Evaluation (PVQE) program. The results of multi-location tests within this program are updated every year and available at http://pubs.ext.vt.edu/category/crops.html. Hard copies of the results are also available through the VCE Extension Offices and Extension Agents.

Commercially available Virginia type peanut varieties include Bailey, Bailey II, Emery, Sullivan, Walton, and Wynne. Cultivars for niche markets such as Gregory are also available but seed is limited. From these, Bailey II, Emery, Sullivan, Walton, and Wynne are the most recent releases. The other cultivars included in some tables of this guide, such as NC-V11, Perry, Phillips, and Spain, are obsolete but they are included here for comparison with the new cultivars. These varieties were developed by the North Carolina State University and Virginia Tech breeding programs and released through the PVQE program. In general, these varieties have high yields, and big pod and kernel size. The most recent ones, Bailey II, Walton, Emery, Sullivan, Wynne, Bailey, and Sugg, have improved disease resistance, in particular early leaf spot, TSWV, CBR, and Sclerotinia blight (SB) resistance. CHAMPS is the earliest with only 135 days after planting (DAP) and Gregory the latest with 155 DAP required to reach maturity. The runners may need over 155 DAP to reach optimum maturity in Virginia. Bailey II, Walton, Emery, Sullivan, and Wynne have the high oleic fatty acid trait that extends the shelf life of peanuts from 2 weeks to 40 weeks.

Other Virginia market type varieties developed by breeding programs in Georgia and Florida are Florida Fancy, Georgia 05E, and Georgia 08V. In general, they have high yields, high oleic fatty acid trait, and good disease resistance, but require over 155 DAP to mature in Virginia.

Finally, runner type varieties, such as Georgia 09B, Georgia 06G, and Florida

07, could be grown in Virginia; from these only Georgia 09B and Florida 07 have the high oleic fatty acid trait. In general, the runner type varieties are resistant to diseases, have great pod retention and many of them have the high oleic fatty acid trait, but have much smaller pods and kernels than the Virginia type cultivars and require over 155 DAP to mature in Virginia, for which they may be more prone to early freeze than Virginia varieties.

Tables 3a, 3b, and 3c present pod yield, crop value, and content of fancy pods (% FAN), extra large kernels (% ELK), sound mature kernels (% SMK), and total meat of the kernels (% TM), from the last 5 years of PVQE testing locations in Virginia, North Carolina, and South Carolina. Through examining yield and grade factors at different digging dates, maturity requirements of each variety can be assessed. Comparative yields, value, and grading of Virginia and runner cultivars are presented in Table 4.

Table 3a. Agronomic Performance of Commercially Available Peanut Cultivars Across Years (2012-2019), Locations (Suffolk, VA, and Williamston, NC), and Digging Date (Dig I, Early; and Dig II, at optimum maturity).

	Dig I (Early)		Dig II (Optimal)	
Variety	Yield (lb/acre)	Value ($/acre)	Yield (lb/acre)	Value ($/acre)
Bailey	5125 a*	892 a	5539 a	995 ab
Bailey II	5360 a	953 a	5710 a	1035 a
Emery	5005 ab	890 a	5255 a	920 ab
Sullivan	4682 bc	786 bc	5218 a	898 ab
Walton	5173 a	861 ab	5667 a	995 ab
Wynne	4521 c	740 c	5084 a	858 b

*Averages followed by the same letters are not statistically different based on Fisher's LSD at 5% probability.

Table 3b. Agronomic Performance of Commercially Available Peanut Cultivars Across Years (2012-2019), and Locations (Suffolk, VA, and Williamston, NC) When Dug Approximately Two Weeks Early Than Optimum Maturity (Dig I).

Variety	Fancy Pods	Super Extra-large Kernels	Sound Mature Kernels	Total Meat
	---------- % ----------			
Bailey	86 bc	5 d	64 ab	71 ab
Bailey II	88 b	8 cd	66 a	71 a
Emery	92 a	13 a	66 a	71 a
Sullivan	88 b	9 bc	63 bc	69 bc
Walton	83 c	11 ab	63 bc	70 a-c
Wynne	92 a	10 bc	62 c	69 c

*Averages followed by the same letters are not statistically different based on Fisher's LSD at 5% probability.

Table 3c. Agronomic Performance of Commercially Available Peanut Cultivars Across Years (2012-2019), Locations (Suffolk, VA, and Williamston, NC) When Dug at Optimum Maturity (Dig II).

Variety	Fancy Pods	Super Extra-large Kernels	Sound Mature Kernels	Total Meat
	---------- % ----------			
Bailey	83 b	9 d	65 a	73 a
Bailey II	84 b	13 c	65 a	73 a
Emery	91 a	17 ab	65 a	73 a
Sullivan	83 b	13 c	64 a	71 ab
Walton	85 b	19 a	65 a	73 a
Wynne	91 a	14 bc	62 a	71 b

*Averages followed by the same letters are not statistically different different based on Fisher's LSD at 5% probability.

Description of Varieties

New Virginia-type Cultivars

*Denotes the mostly grown cultivars in Virginia and Carolinas

N.C. 20

N.C. 20 (tested as 'N14023') was derived from a three-way cross between Sugg, 'N01015T' and a Gregory derived, high-oleic line ('N00098ol') in 2008. N.C. 20 is a Virginia-type peanut breeding line with high-oleic seed oil chemistry and was selected in a program to develop cultivars with multiple disease resistance; this line exhibits a disease package comparable to Bailey II, including moderate-to-high levels of leaf spot, TSWV and Sclerotinia blight resistance. N.C. 20 is a higher yielding line than others previously released from the NCSU peanut breeding program and maintains yield under heavy leaf spot pressure. N.C. 20 has an intermediate growth habit and tan testa color with slightly larger pod and seed size characteristics than Bailey and Sullivan. Due to the release of this variety in 2020, seed will be available after the 2023 growing season.

Walton

Walton was tested as '08x09-3-14-1' line and jointly released in 2019 by the University of Florida and Virginia Tech. It is a Virginia-type peanut with similar good agronomic performance when compared with Bailey, Emery, and Bailey II under "normal" production, but with superior performance to these cultivars under extreme water conditions. Seeds are elongated in shape and seed testa color is light pink to pink. It has dark green foliage; an intermediate growth habit and the main stem is not distinguishable from the lateral branches. Walton is a high-oleic line with resistance to leaf spot and TSWV, and it was developed for the VC region. Seed will become available after the 2022 growing season.

Bailey II

Bailey II was released by the North Carolina State University in 2017; it is a high oleic version of Bailey but seeds are slightly larger than Bailey. Bailey II has good disease resistance to CBR, Sclerotinia blight and TSWV, and it matures at the same time with Bailey. Seed will be available after the 2020 growing season.

Emery

Emery is a 2015 release by the North Carolina State University. It was named in honor of Dr. Donald A. Emery, peanut breeder at NCSU. Emery is a high oleic large-seeded Virginia-type cultivar with alternate branching pattern, intermediate runner growth habit, and medium green foliage. It was tested as 'N10046ol'line in tests at NCSU and Virginia Tech. Emery has approximately 67% jumbo and 24% fancy pods, and seeds with tan seed coat averaging 940 mg seed-1. It also has 18% super-extra-large kernel content, 44% extra-large kernel content, and 71% sound mature kernel content. Emery is partially resistant to three of four major regional diseases: leaf spot, Sclerotinia blight, and Tomato Spotted Wilt virus, but it should be considered susceptible to Cylindrocladium black rot. Emery has bright pods and flavor comparable with runner-type standards. Yields and the number of days to maturity are similar with Bailey (145 days).

*Sullivan**

Sullivan is a 2013 release by the North Carolina State University. Sullivan is a high oleic Virginia-type cultivar with alternate branching pattern, intermediate runner growth habit, and medium green foliage. It was tested as 'N08075olCT'line in tests at NCSU and Virginia Tech. It was developed from a cross with a sister line of Bailey and, as Bailey, it has partially resistance to the four common diseases in the Virginia-Carolina peanut production area: early leaf spot, CBR, Sclerotinia blight, and TSWV. Sullivan has approximately 45% jumbo pods and 40% fancy pods, and seeds tan with seed coat averaging 931 mg seed-1. Yields and the number of days to maturity are similar with Bailey (145 days).

Wynne

Wynne was tested as 'N08081olJC' breeding line; it was released by the North Carolina State University in 2013. Plants resemble Sullivan, with which Wynne is related through a Bailey sister line. Wynne has partial resistance to early leaf spot, CBR, Sclerotinia blight, and TSWV and has the high oleic characteristic. The percentage of jumbo pods is 68 and fancy pods 21 for this cultivars. Seeds have pink seed coat and seeds average 1051 mg seed-1. Just like Sullivan, Wynne has yields and maturity similar with Bailey, but significantly higher than CHAMPS and Phillips.

*Bailey**

Bailey, released in 2008 by NCSU, is a medium to large-seeded and high yielding Virginia-type peanut. It produces high yields across multiple years and locations, which is an indication of good tolerance to fluctuations of weather and growth conditions. Bailey has a growth habit intermediate between runner and

bunch types, bright pods, and tan kernel color. More importantly, it is resistant to TSWV and trips. It matures in approximately 145 DAP, just a little after CHAMPS, but it holds pods much better than CHAMPS if picked later.

Sugg

Sugg was released in 2009. Before release, it was known as N 03091T, a line developed at the NCSU to hold multiple disease resistance. It has resistance to TSWV, CBR, SB, and early leaf spot. Sugg has an intermediate runner growth habit and the color of seed coat is pink. Sugg produces high yields and has larger kernels than Bailey. It also has good blanching and flavor characteristics.

Titan

Titan was released in 2010 by Virginia Tech. Titan is an extra large-seeded peanut with an exceptionally high content of jumbo pods and super extra large kernels. It is suitable for in-shell, gourmet, and green boiling products. Yields are relatively low if not irrigated. Maturity is considered early (only 5 later than CHAMPS). This variety is moderate susceptible to susceptible to TSWV, CBR, and SB.

Older Virginia-type Cultivars

(occasionally grown on very small acreages)

CHAMPS

CHAMPS has been introduced in 2004. It is a large-seeded Virginia-type peanut with a runner growth habit. It is the earliest maturing variety for which acreages planted with it in VA and NC increase every year. Yields at early digging (135-140 days after planting in Virginia) are high, and pod size, shape and color are suited for in-shell market. If an early frost advisory is in effect, CHAMPS can be harvested ten days earlier than NC-V 11 with no reduction in yield. CHAMPS is less susceptible to TSWV than most Virginia-type cultivars. CHAMPS is susceptible to CBR and SB. High yields and favorable pod characteristics were observed across years and locations and, similarly to Bailey, showed good tolerance to growth factors.

Gregory

Gregory has a growth habit intermediate between runner and bunch types. Maturity is similar to NC-V 11 (145 – 150 DAP). This variety produces an exceptionally high percentage of ELKs and Fancy pods. Due to large seed size, Gregory has a high soil calcium requirement which may result in reduced seedling vigor if seed is produced under conditions which limit calcium uptake. It is medium resistant to TSWV.

Other Virginia-type Peanut Varieties

Florida Fancy

Florida Fancy is a high oleic Virginia-type peanut variety released University

of Florida. It is being researched in Virginia because of its high oleic trait and its resistance to TSWV and Sclerotinia blight. This variety has an intermediate runner growth habit, pink seed-coat color, and a high proportion of ELK.

Georgia 05E

Georgia 05E is a new high oleic Virginia-type peanut released by the Georgia Agricultural Experiment Station in 2005. It is being researched in Virginia because of its improved oil quality (high O:L ratio) and its leaf spot and TSWV resistance. This peanut has a runner growth habit and a tan seed-coat color. Its medium to late maturity (over 150 DAP) may not make it suitable for Virginia.

Georgia 08V

Georgia 08V is also a new high oleic Virginia-type peanut release by the Georgia Agricultural Experiment Station. It is being researched in Virginia because of its improved oil quality (high O:L ratio) and its leaf spot and TSWV resistance. This peanut has a runner growth habit and also requires over 150 DAP to mature in V-C region.

Runner Market Types

Research thus far indicates that several runner varieties may have the potential to yield equal to Virginia-type peanuts and offer more TSWV resistance relative to Virginia market type peanuts. However, because of their late maturity, more research is needed to demonstrate their suitability for Virginia. They may be more suitable, however, for south North Carolina and South Carolina

Florida-07R

This is a medium to late runner type peanut released in 2006 by the University of Florida. It has shown good yield potential with good grades. It has larger seed size than typical runners therefore gypsum applications are recommended. It has medium resistance to TSWV. Florida-07 has high-oleic characteristic and good roasting, blanching, and processing characteristics.

FloRun-107

This is a medium maturity runner released by the University of Florida. It has shown good yield potential with good grades and a high percent of medium size kernels. It has good resistance to TSWV and medium resistance to white mold. Florida-07 has high-oleic characteristic. This cultivar is currently under testing for production in Virginia.

Georgia-06G

This is a high-yielding, large-seeded runner variety developed by the UGA Coastal Plain Experiment Station in Tifton. It seems to dominate the acreages in the South because of its high yields, grade and dollar value returns, and good TSWV resistance. It is not a high-oleic type.

Georgia-09B

This is a medium to late runner type peanut similar in maturity with Georgia Green. It produces high yields and is a high-oleic type, and had good TSWV resistance. Georgia-09B was developed by the UGA Coastal Plain Experiment Station in Tifton. It is considered a good fit for Virginia, where yields close to Bailey were obtained when the season was long, and it is favored by the shellers because of the high-oleic trait.

Georgia-12Y

Georgia-12Y was developed by the UGA Coastal Plain Experiment Station in Tifton. It is a late maturing variety, but in early plantings in the southeast U.S. can produce high yields. It is a medium-seeded variety with good resistance to the TSWV and white mold.

Georgia-13M

This is a new high-yielding and high-oleic variety developed at the UGA Coastal Plain Experiment Station in Tifton. Georgia-13M is a small seeded runner, but with resistance to TSWV and with very good roast flavor.

TufRunner 297

This extra-large seeded runner was developed by the University of Florida and released in 2014. It has the high-oleic oil chemistry, produces high yields, and has acceptable resistance to the TSWV and white mold, but it is susceptible to leaf spot.

TufRunner 511

This is another large-seeded runner from the University of Florida with medium maturity and high-oleic oil chemistry. Yields and grading traits are excellent, and white mold resistance is very good; but it only has moderate resistance to TSWV.

Older Runner Cultivars

Georgia Green

High yields, good grades and resistance to TSWV and white mold made Georgia Green a popular runner-type variety. It is susceptible to leaf spot, however. Georgia Green has high percentage of sound mature kernels in comparison to other varieties. Its medium to late maturity (over 150 DAP) may not make it suitable for Virginia, unless planted early.

Georgia Greener

Georgia Greener is a high yielding runner with a high level of resistance to TSWV. Georgia Green has high percentage of sound mature kernels in comparison to other varieties. As its name implies, Georgia Greener has dark green foliage, intermediate runner growth habit and typical runner seed size.

Table 4. Agronomic Comparisons of Runner and Virginia Peanut Varieties in research trials at Capron, Dinwiddie, and Suffolk, VA, and Rocky Mount, NC, 2016-2017.

	With Irrigation				Without Irrigation			
	Yield	ELK	SMK	Value	Yield	ELK	SMK	Value
Variety	lb/acre	%		$/acre	lb/acre	%		$/acre
Bailey	5384	43	64	953	5355	44	62	845
Bailey II	5711	48	64	1016	5806	51	66	933
Emery	6010	55	66	1086	5906	57	68	989
FloRun107	5332		66	944	4790		63	753
Florida07	5179		62	867	4916		61	728
Florunner	3920		59	630	4136		62	612
GA09B	5256		65	965	5086		66	836
Sugg	5359	44	64	935	5046	45	62	772
Sullivan	5349	45	64	930	4969	44	60	758
TUFRunner 297	5391		64	962	5373		64	851
TUFRunner 511	5552		67	1004	5338		64	827
Wynne	5365	46	62	924	5213	43	59	758

Table 5. Agronomic and Market Characteristics of Virginia Market-type Peanut Varieties Recommended for Virginia

Characteristics	Bailey	Bailey II	Walton	Sullivan	Wynne	Emery
General						
Growth Habit	Int.-Runner	Int.-Runner	Int.-Runner	Int.-Runner	Int.-Runner	Int.-Runner
Maturity[a]	0	0	0	0	+5	-3
Heat Units	2,590	2,590	2,600	2,600	2,700	2,550
Seed Coat Color	Tan	Tan	Lt. Pink	Tan	Pink	Tan
Seed Count/lb	600	575	600	600	450	535
Calcium Need	Mod.	Mod.	Mod.	Mod.	High	High
Grade & Quality Factors[b]						
% ELK	0	+	0	0	+++	+++
% SMK	0	+	++	0	-	0
% Fancy	0	+	0	0	++	++
Blanchability	0	0	0	0	0	0
Shelf-life[c]	0	+++	+++	+++	+++	+++

[a] 0 = Same as Bailey; '+' = Days later than Bailey; '-' – Days earlier than Bailey

[b] 0 = Same as Bailey; '++' = Substantially higher than Bailey; '-' = Substantially lower than Bailey; '+' = higher than Bailey

[c] +++ = Passes the high oleic fatty acid trait

Table 6. Disease and Insect Resistance Characteristics of Virginia Market-type Peanut Varieties Recommended for Virginia

Characteristics	Bailey	Bailey II	Walton	Sullivan	Wynne	Emery
Disease Resistance						
CBR	MR	MR	MR	MR	MR	S
Leaf spot	MR	MR	MR	MR	MR	MR
Pod rot	S	S	S	S	S	S
Sclerotinia blight	MR	MR	MR	MR	MR	MR
Stem rot	S	MR	S	S	S	S
TSWV	MR	MR	MR	MR	MR	MR
Web blotch	S	S	S	S	S	S
Insect Resistance						
Corn earworm	S	S	S	S	S	S
Leafhopper	S	S	S	S	S	S
Rootworm	S	S	S	S	S	S
Spider mites	S	S	S	S	S	S
Thrips	MR	S	S	S	S	S

VS = Very Susceptible; S = Susceptible; MR = Moderately Resistant

Pre-Plant Information

Tillage

Peanuts can be produced successfully with many different tillage systems, but in any system, they do better on a slight bed. If sub-soiled and bedded, knock the bed down so that at least a 16" wide flat bed is available (lower than typical cotton bed). If land is disked flat, throw up a bed with coulters on the planter. Bottom plowing is not recommended unless necessary to bury residue and reduce disease and burrower bug pressure on non-rotated fields and reduce resistant pigweed pressure. Dr. David Jordan details tillage systems in Peanut Information guide at http://www.peanut.ncsu.edu/. In short, while substantial reduction of moldboard plow was observed in 2014 relative to 1998, the majority tillage used in recent years by peanut farmers include disking, ripping and bedding, and field cultivation. While reduced tillage increased in recent years, there is concern about nutrient stratification when using this system. For example potassium application to reduced-tillage cotton may allow accumulation of toxic potassium in the peanut pegging zone with potential negative effect on yield. On 65 trials from 1997 through 2013 Dr. Jordan noted that peanut yield was in average 3.4% greater in conventional than in reduced tillage with variation from 16.1% less to 27.5% more in conventional tillage.

Strip-tillage has given equivalent yields on lighter soils and when weeds could be controlled without pre-plant incorporated herbicides. Strip-tillage into a cover crop or other crop residue reduces tomato spotted wilt. Use coulters on the strip-till planter to establish a slight planting bed. Planting between the previous rows is recommended to minimize roots and stalks in the pegging zone. In general there are few worm problems in strip-till peanuts.

Twin-row Planting Patterns

The impact of twin-row planting has been somewhat inconsistent. Yield increases (5 to 10 percent) due to twin-row planting have been documented with the NC-V 11, Perry and VA 98R varieties, but data on the currently grown cultivars is not yet available. Twin-row planting more consistently resulted in yield increases on light-textured soils (sands to loamysands) than on medium- to heavy-textured soils (loam to sandy clay loams). Yield increases have been documented in twin-row plantings both with seed spaced 3 to 4 inches apart and with seed spaced 5 to 6 inches apart. Twin-row planting has also been noted to reduce the severity of TSWV disease. Good early season weed control is essential when planting in twin rows.

Crop Rotation

A long crop rotation is essential for achieving high peanut yields. Also, not all other crops rotate well with peanut. For example, soybean is a poor choice because both are legumes and share many common disease. In fact, a good rotation program is aimed to reduction of sources of soil borne diseases that can infect peanut, damage the crop, and reduce the yield. A minimum of 3 years is recommended and used at the Tidewater Agricultural Research and Extension Center in Suffolk. Good crops to rotate peanut with are corn, cotton, wheat, barley, and sorghum. If soybean has been grown, it is probably a wise decision to plant peanut after 4, 5, or more years after the bean. According to specialists at NCSU, peanut varieties have different requirements relative to crop rotation. A good example of the influence of rotation on yield is presented for Gregory in Table 7. Similarly, under the same rotations during 2001 - 2006, Perry lost only 26% of yield due to poor rotation (tobacco-corn-peanut-tobacco-corn-peanut instead of corn-corn-corn-corn-corn-peanut), while Gregory lost 40%. Unfortunately, there is no information on the new cultivars other than assumption of less yield reduction because of increased disease resistance.

Table 7. Influence of Rotation on Yield when Gregory was used*

Rotation (1997-2006)	Peanut yield, 2006 (lb/A)
Corn-Cotton-Corn-Peanut-Corn-Corn-Corn-Corn-Corn-Peanut	5,920
Peanut-Corn-Corn-Peanut-Corn-Corn-Peanut-Corn-Corn-Peanut	5,030
Corn-Peanut-Corn-Peanut-Corn-Peanut-Corn-Peanut-Corn-Peanut	4,350
Peanut-Soybean-Corn-Peanut-Soybean-Corn-Peanut-Soybean-Corn-Peanut	3,800
Peanut-Peanut-Peanut-Peanut-Peanut-Peanut-Peanut-Peanut-Peanut-Peanut	2,600

*Modified from D. Jordan. 2013. Peanut Information.

Rotation into non-legumes (cotton, corn, or other grasses) is absolutely essential to sustainable long-term peanut production. Cylindrocladium black rot (CBR) is a major root rot disease for peanut in Virginia and rotation is the most important factor in suppressing this and other diseases. An absolute minimum of 2 years (3 or 4 years better) out of legumes is recommended for sustainable peanut production. **Soybeans** should be avoided in a peanut rotation due to increased CBR and white mold problems. Due to EPA regulation for Vapam use, good rotation will

become the major control of CBR, and a 3 to 4 rotation term could become standard in the future. We, at least, recommend it!

Volunteer peanuts must be controlled in the following crop to prevent losing a year's rotation. Peanuts are tough "weeds" and often require a two-step treatment program. **If decide to use Round-up, make sure that cotton or corn is Round-up Ready!**

Table 8. Control of Volunteer Peanut in a 3-year Rotation: Peanut, Cotton and Corn or Peanut, Corn & Cotton*

Control	Time of application	Herbicide	Rate
		Cotton Following Peanut	
G**	Pre-emergent	Cotoran	1 qt/ac
G - E	Pre-emergent	Round-up WeatherMAX (**if Round-up Ready cotton**)	22 oz/ac
E	Lay-by	Envoke	0.1 oz/ac
G		MSMA	1 qt/ac
G		Cotton Pro	1.5 pt/ac
		Corn Following Peanut	
G	Pre-emergent	Lariat (mixture of Atrazine & Lasso)	3 qt/ac
		(Atrazine controls volunteer peanut)	
G		Round-up WeatherMAX (if Round-up Ready corn)	22 oz/ac

*Information provided by B. Ashburn, Farm Manager at Tidewater AREC; ** G is good, E is excellent

Planting

Planting Date: The best planting window for peanuts in Virginia has been from 1 – 15 May. Recent research showed that April planting has benefits over late planting in particular in dry years. Large acreages (300 and up) should be spread out over a 2 week planting interval to spread harvest maturity. Early plantings, April and early May, have an increased risk of tomato spotted wilt virus (TSWV) due to high thrips activity at that time; thrips carry on the virus to the plants. However, availability of varieties with improved TSWV resistance allows scheduling of early planting with no effect of yield due to the virus. Fields with high CBR risk should be planted last (May 10) to maximize early season soil temperatures. We have enough growing season to finish planting during the last week of May if absolutely necessary, but harvest conditions usually deteriorate rapidly after 1 Nov. Lower temperatures and shorter days severely limit drying time and combining hours. See the discussion on cold injury.

Soil Temperature: Should be at least 65° F at 4" depth, in particular if Vapam is applied. Peanut can be planted in 14 days after Vapam application. Not many farmers in Virginia gasify the land, however (for alternatives see the Disease section of this guide).

Seeding Rate and Plant Population: Our goal is to get a uniformly emerged stand of 3-4 plants per row ft. to help control tomato spotted wilt virus. A seeding rate of 5-6 per row foot is recommended for runners.

Table 9. Cultural Practices: Plant Population, Seed Size, and Seeding Rates for Recommended Varieties

Seeding Rates			Variety and Approximate Seed Count Per Pound					
Seed Spacing (inches)	# Seed (per foot)	# Seeds (per acre)	Bailey (600)	Bailey II (575)	Walton (600)	Sullivan (600)	Wynne (450)	Emery (535)
For 36" rows*			Lbs seed required to plant 1 acre @ 36" row spacing**					
2.0	6	81,000	135	141	135	135	180	180
3.0	5	73,000	120	127	120	120	160	160
4.0	4	58,000	95	101	95	95	130	130
5.0	3	44,000	75	77	75	75	100	100
6.0	2	29,000	50	50	50	50	65	65

* For seed spacing in 32", 34", or 38" rows, multiply the pounds of seed required to plant 36-inch rows as noted below.

** All numbers were rounded to the nearest approximate five pounds intervals.

Seed Quality: Peanut seed require good germination (over 85%) to achieve adequate stands. Good germination is also necessary to produce plants with high vigor and yield potential. CBR is seed-transmitted – know your seed source!

Row spacing	Multiply lbs for 36" rows by:
32"	1.125
34"	1.060
38"	0.947

Seeding Depth: Assuming good seed quality (over 85% germination), a maximum depth of 3 inches in dry soil is sufficient. Under good moisture conditions, 1.5" depth is ideal and there is no need to plant shallower unless the seed has very poor vigor. Planting shallower than 1.5" will increase the risk of Valor injury and inoculants failure in marginal soil moisture.

Row Spacing: Conventional row spacing is 36 – 38" and 7" on 36-38" centers for twin-rows. For twin rows, GPS guidance is recommended to allow successful stands. On each twin row plant 3 seed per row ft.

Fertility

pH

The traditional recommended pH range for liming peanut land is 5.8 – 6.2. However, given the critical need for Ca in Virginia-type peanuts, we recommend a bias toward 6.2. At 6.4 pH increases the probability of Manganese (Mn) or Boron (B) deficiency, but decreases potential Zn toxicity problems. Mn or B needs can be met with a foliar application where needed.

Use of Inoculants

Peanut is a legume and as such can get most of its N needs from nitrogen-fixing bacteria (Bradyrhizobium) colonizing the plant's roots. To provide these needed bacteria, you absolutely must inoculate all "new" peanut land, and should also inoculate strip-tillage fields and land that has been out of peanut production for 3 years. Research at Clemson University showed that inoculation gives yield advantage even in soils regularly grown with peanut. Use liquid in-furrow inoculants. In-furrow granular inoculants are less effective than liquids and usually stop-up in the delivery tube. Seed treatment inoculants are not recommended due to having much lower bacterial counts. Inoculants are living organisms; treat them with care and make sure they are not out-of-date.

Inoculant Rules:

- Use only liquid in-furrow inoculants. Granular & seed treatments are less reliable.
- Do not expose to heat during transport and storage
- Use a minimum of 5 gal water per acre.
- Make sure the inoculant stream hits exactly in the center of the open furrow, not the dry furrow walls. Trash caught in strip tillage rigs can deflect the inoculants stream.
- Don't plant too shallow (less and 1.5") or in dry soil. Inoculant must hit moist soil or it will die.
- Do not use chlorinated water.
- Apply with a steady stream, not a pulsing pump.

Poorly inoculated fields usually will not show any yellowing until about 45 DAP. Inoculation can be checked by using a shovel to uproot plants. Simply pulling up plants will cause the lower taproot to break off and result in a low count. The presence of large (1/8" or larger) nodules on the taproot indicates successful inoculation. An average of 15 large nodules per taproot at 45 DAP is considered good; less than 10 per taproot is marginal and less than 5 indicates poor inoculation. If only small (1/16") nodules are present and these are mostly on the lateral roots rather than on the taproot, the plant has probably only been colonized by native Rhizobium bacteria, not the applied inoculants.

If inoculation fails, either by application of inoculants or natural inoculation, broadcast ammonium nitrate (375 lb/ac of 34% = 127 N units) or ammonium sulfate (600 lb/ac of 21% - 126 N units) can be used. Failure of natural inoculation can be expected in very dry planting seasons. If the canopy has not closed, liquid N can be dripped in the row middle. Foliar nitrogen applications are not cost effective and often cause unacceptable leaf burn.

P and K

Phosphorus and potash should be applied to the previous crop by soil test to the high level. Peanuts respond best to residual fertilizer, and typically no additional fertilizer is needed when the previous crop has been properly managed. Excess potash in the pegging zone can potentially interfere with Ca uptake and can cause pod rot, so avoid potash application unless soil test levels are below guidelines by the Virginia Tech's Soil Testing Laboratory, 145 Smith Hall (0465), Blacksburg, VA 24061.

Calcium

Calcium is critical for pod development and high quality peanuts. Adequate Ca uptake increases peanut yield and grade by reducing pod rot (Pythium), and preventing unfilled pods or "pops". Calcium also reduces the risk of aflatoxin. On seed peanuts, calcium is important to improve germination and seedling vigor. **Peanuts will not respond to foliar calcium application.**

Calcium can only enter the kernel by direct diffusion through the pod wall and adequate soil moisture lessens its absorption. Therefore in dry soil seed quality can be affected by reduced Ca uptake, even though plenty of Ca may be in the soil. Earlier research showed that higher Ca application can partially offset the decline in seed quality caused by drought. Virginia type peanuts require calcium application. Small runner type peanuts like Georgia Green usually do not respond to gypsum application when soil test calcium is over 600 lb/acre. Larger runner varieties such as Tifguard and Florida-07 have an intermediate need for calcium.

The critical period for calcium absorption begins about 20 days after pegs first enter the soil and extends for at least 40 days after that. The first 10 days of this interval are particularly critical. Depending on the season and planting time, peanuts first peg around 60 DAP in Virginia; so before 70 DAP we want calcium already available in soil solution. **Better early than late with land plaster.**

Landplaster-Calcium Recommendations

Table 10. Landplaster-Calcium Recommendations

Source	% $CaSO_4$	Band (16-18")	Broadcast
		lb/A	
USG Ben Franklin	85	600	-
USG 420 (granular)	83	-	1200
USG 500 (granular)	70	-	1300
Super Gyp 85	85	-	1200
Agri Gypsum	60	-	1800
Texasgulf Gypsum (Phosphogypsum)	50	-	2000
Gyp Soil	85	-	1200

Special Recommendation for Peanut Seed Production

It is essential that peanuts being grown for seed receive a continuously available supply of calcium from pegging through seed development to insure high germination. This can be accomplished by either using two applications or by increasing the amount used at the first application by 50 percent; being certain to apply it after June 10. Specific recommendations are:

a) June 10 - June 30: apply 75 percent of recommended amounts above for non-seed crop.

AND

b) July 1 - July 20: apply 400-500 lb/A of bagged or dry USG 420 or USG 500 Landplaster in a band over the row.

OR

c) June 10 - June 30: apply the higher rate of the above rate ranges.

CAUTION: If soil potash level is relatively low, this choice could cause a potash deficiency to occur unless potash is applied prior to planting.

Recommendations for Runner Market Type Peanut Production

Runner market type peanuts require less calcium (Ca) for optimum seed development than Virginia market types. To assess the need for supplemental Ca, soil samples should be taken up to a 3-inch depth in the pegging zone in mid to late June. If the ratio of calcium to potassium (K) exceeds 3 to 1 and the calcium levels exceed 250 ppm, Ca is not recommended. To calculate the ratio of Ca to K, use the following formula:

Ca to K ratio = Ca saturation (%) / K saturation (%)

To calculate Ca concentration in ppm, use the following formula:

Ca ppm = Ca saturation (%) x CEC x 200

The CEC is cation exchange capacity, and it can be found on the soil test result sheets.

Trace-element Requirements

While nitrogen is supplied through the symbiotic relationship with Rhizobium bacteria and phosphorus and potassium residues from previous crops suffice, beside calcium peanut requires minor elements called “trace elements”. For trace-elements, rates and number of applications should be based on soil test results from specialized soil testing laboratories. Virginia Tech provides soil testing through the Soil Testing Laboratory, 145 Smyth Hall (0465), Blacksburg, VA 24061. Soil samples are analyzed for pH (acidity), and content of phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), zinc (Zn), boron (B) and manganese (Mn), and results are expressed in parts per million (ppm) numbers.

Manganese

Manganese is needed in small amounts for peanut production. Manganese availability to plants most commonly becomes critical with a soil pH of 6.2 to 6.5 or higher. In

the heavier and more poorly drained soils, manganese deficiency symptoms (leafyellowing) often will occur when soil pH exceeds 6.2. On sandy soils, deficiency symptoms usually will not occur until the soil pH exceeds 6.5. Since peanut yields are not increased by pH values which exceed 6.2, it is recommended that peanut soils retain a pH value of 5.8 to 6.2. Generally, if soil tests indicate less than 3 ppm manganese, one or more foliar applications of the nutrient will be required. Monitor the crop for visual symptoms of manganese deficiency. If deficiency symptoms appear, foliar applications of the nutrient will be required. Soil application of manganese is not recommended. Typical plant deficiency symptoms are yellowing of leaflet tissues between the veins while the veins remain green. Nitrogen deficiency is sometimes confused with manganese deficiency when the whole leaf, including the veins, is pale yellow.

Manganese Recommendations

Apply 1 to 3 applications of manganese [Tecmangam, MnSO4, MnCl2, or Mn(NO3)2] as a foliar spray as needed between mid-June and August 15 at the rate of 0.5 to 1.0 lb elemental manganese per acre per application. Manganese sources may be tank-mixed with leaf-spot sprays by earlier recommendations but we have seen sometimes severe leaf burning when mixed with Provost. Cone-type nozzles used for leaf-spot sprays are well suited for application of manganese. If other manganese materials are available, spray the material to deliver 1.0 lb elemental manganese per acre. Do not mix Solubor with any of these manganese products. Boric acid may be mixed with these manganese products. When soil tests for manganese are 3.0 ppm or below and deficiency symptoms are evident, three applications should be made at 2-week intervals, beginning mid-June.

Soil Application - Application of manganese to the soil has been ineffective in providing this element to the crop.

Liquid Manganese Products

A number of liquid formulations containing manganese are available for use on peanuts. When used according to label instructions many of these products provide less than 1.0 lb elemental manganese per acre. Recent Virginia research results have shown that liquid manganese formulations should be applied in multiple applications, which supplies a total of at least 0.5 to 1.0 lb elemental manganese per acre per application. With manganese EDTA chelated products 0.25 to 0.50 lb elemental manganese per acre per application is supplied. EDTA chelated products may be tank mixed with cupric hydroxide and with inorganic sources of boron. Apply early in the morning or on cool days to avoid leaf burn.

Liquid manganese formulations are more convenient but not any more efficient than dry formulations. Make sure liquid formulations use rates are adequate to meet the nutrient requirement. See table below for equivalent liquid rates.

Table 11. Amount of Manganese Product Needed to Supply Equivalent Amounts of Elemental Manganese*

Source	Amounts needed to supply 0.5 lb Manganese per acre
Manganese sulfate 25%	2 lb
Tecmangam 32%	1.6 lb
ManGro DF 31%	1.6 lb
**Liquid 10%	2 quarts
**Liquid 5%	0.6 gal.
**Liquid 1%	4.8 gal.

*Modified from J. Chapin. 2011. Peanut Money-maker Production Guide

**Assumes weight of approximately 10.5 lb/gal.

To calculate how much product (manganese, boron, and magnesium product) to use to achieve a certain element rate follow these steps:

Step 1. Figure the weight of element per gallon

Lb element per gal = % element in product × lb product per gal

Step 2. Figure the gallon of product per acre

Gal product per acre = desired element per acre/lb element per acre

Example:

Step 1.

0.08 × 10.5 lb manganese sulfate per gal = 0.84 lb manganese sulfate per gal

Step 2.

$$\frac{\text{0.5 lb manganese per acre}}{\text{0.84 lb manganese per gal}} = \text{0.6 gal 8\% manganese product per acre}$$

Boron

Boron is needed during kernel development; hence, it should be applied about the time of, or immediately following, flowering. Generally, boron is applied as a wettable powder or liquid spray with the leaf spot fungicides. When plants are under stress or if the recommended rates are exceeded, leaf burning will occur. Excessive use of boron can cause severely reduced yields even when foliage burning is not obvious. Boron can be applied satisfactorily as a soil application in fertilizer. Do not mix solubor with inorganic sources of manganese due to potential compatibility problems.

Liquid Boron applications are more convenient but not any more efficient than dry formulations. Make sure liquid formulation use rates are adequate to meet the nutrient requirement. See table below for equivalent liquid rates.

Table 12. Amount of Boron Product Needed to Supply Equivalent Amounts of Elemental Boron*

Source	Amounts needed to supply 0.3-0.5 Boron per acre
Boric acid	1.8 – 3.0 lb
Solubor	1.5 – 2.5 lb
**Liquid 10% B	38 oz – 2 quarts
**Liquid 5% B	2.4 quarts – 1 gal.
**Liquid 1% B	3-5 gal.

*Modified from J. Chapin. 2011. Peanut Money-maker Production Guide

**Assumes weight of approximately 10 lb/gal.

Excessive foliar boron is toxic to peanuts

Never exceed a seasonal total of 0.5 B/ac.

Boron Recommendation

Apply 0.3 lb elemental boron per acre at the early bloom stage to prevent internal damage. The application of boron is especially important on light sandy soils. The following sources and rates are suggested:

1.5 lb/A Solubor foliar applied in 10-30 gal spray/A

1.7 lb/A Boron-spray foliar applied in 10-30 gal spray/A

1.8 lb/A Boric Acid foliar applied in 10-30 gal spray/A

Apply boron at the time of second or third leaf spot application. Do not apply when plants are under moisture stress. Do not apply with sulfur or other chemicals which tend to burn foliage and do not exceed 0.5 lb/A elemental Boron. Split applications, each of 0.25 lb elemental boron per acre, at 2- to 4-week intervals up to August 15 are suggested. Do not mix Solubor with Techmangam, MnS04, MnCl2, Mn(NO3)2, or with leaf-spot disease control products containing cupric hydroxide due to potential compatibility problems.

Magnesium

Peanuts have a low soil test requirement for Mg, but keep an eye on test Mg levels following peanut production. Use of excessive Ca applications to peanuts from land plaster can cause Mg to leach out of the rooting zone and lead to potential deficiencies on rotational crops (corn and cotton) which have much higher soil test Mg requirements. If Mg becomes deficient on soils with pH levels which are too high to lime, you get "boxed-in" because the only affordable way to supply Mg is in dolomitic lime. Peanuts only require a 20 lb/ac Mg soil test. But rotational crops require 60 lb/ac Mg with at least 10% of cation exchange capacity being from Mg. At Mg levels of 120 lb/ac there is no 10% CEC requirement. If the subsoil is within 15" of the surface, Mg leaching should not be a problem.

Zinc Toxicity

Peanuts are very sensitive to zinc. Beware of recommendations for Zn application in peanut rotations. Stunted, dying plants with split stems are a sign of zinc toxicity. Check zinc levels on any new land prior to planting, especially old peach orchards, pecan orchards, fields heavily treated with poultry litter or hog lagoon waste, or fields which zinc was repeatedly applied for high yield corn production. Zinc toxicity also occurs on old building sites around stock pens which had galvanized roofs. Soil test zinc levels of 10 lb/ac can cause toxicity when the soil pH is below 6.0. Liming to increase soil pH can reduce zinc toxicity in contaminated soils. Also make sure the lime source is not contaminated with zinc in fields which already have marginal Zn levels. Fields with Zn levels of 6-10 lb/ac should be limed to at least 6.2 pH; fields with Zn levels of 11 to 20 lb/ac should be limed to at least 6.4; and fields with 20-30 lb Zn/ac should be limed to 6.5. Given the risk of loss on a high value crop, the difficulty of achieving uniform pH, and the non-uniform distribution of Zn in soils, the maximum Zn level in peanut fields should probably not exceed 20 lb/ac.

Tissue Testing

Tissue testing can be useful for diagnosis of potential nutrient deficiencies. To get a representative sample, pick 20 recently mature tetra-foliate leaves from a suspected deficient area and compare to a similar sample from plants without the deficiency symptoms. Leaves should be pulled when dry and placed in a paper bag.

When diagnosing deficiency based on tissue testing always consider soil test evidence and field observations. For example, root stunting from very low pH or herbicide injury causes micronutrient deficiencies in leaves even when the nutrients are sufficient in the soil.

Table 13. Peanut Tissue Test Sufficiency Levels

N (%) 3.50 – 4.50	P (%) 0.20 – 0.50	K (%) 1.70 – 3.00	Ca (%) 0.50 – 2.00	Mg (%) 0.30 – 0.80	S (%) 0.20 – 0.35
Fe (ppm) 50-250	Mn (ppm) 20-350	Zn (ppm) 20 - 60	Cu (ppm) 5 – 20	B (ppm) 20 – 60	

Table 14. Peanut Fertility Checklist*

pH or Nutrient	Soil Test Sufficiency Level (Mehlichl)**	Recommendations / Comments
pH	5.8 to 6.5	Liming to a pH value of 6.4 is useful in maximizing soil Ca levels and reducing Zn toxicity risk where necessary, but Mn deficiency is more likely at high pH levels (see below).
Nitrogen (N)	---	Use liquid in-furrow inoculants on all fields that have been out of peanut production for 3 years.
Sulfur (S)	---	Sulfur has not been a limiting factor on peanut on coastal plain soils. Subsoil S and gypsum (CaSO4) applications can provide more than adequate S nutrition.
Phosphorus (P)	20 lb/ac	The soil test sufficiency level for both P and K on peanut is much lower than other crops because the peanut plant is very efficient at scavenging these nutrients from the soil. Add 40 lb P2O5/ac when soil test levels are medium (11-19 lb P/ac) and 80 lb P2O5/ac when soil test levels are low (<11 lb/ac). **Peanut phosphorus requirements can always be met my maintaining adequate P levels on rotational crops.**
Potassium (K)	40 lb/ac	**Maintaining adequate fertility on rotational crops eliminates the need for K application to peanut.** The soil test sufficiency level for both P and K on peanut is much lower than other crops because the peanut plant is very efficient at scavenging these nutrients from the soil. Excessive K levels can interfere with Ca uptake by pods (see Ca comments).
Calcium (Ca)	600 lb/ac and 3 : 1 Ca to K ratio (Always use gypsum on virginia types)	Runner type peanut yields seldom respond to gypsum application when soil test Ca is 600 lb/ac. However, virginia type peanuts have responded to gypsum even when Ca=1,000 lb/ac. Apply 1,500 lb gypsum (300 lb Ca) at bloom to all virginia type peanuts, all seed production peanuts, and to runners with < 400 lb/ac soil test or a Ca to K <3:1. Apply 1,000 lb/ac gypsum to runners with 400-600 lb/ac soil test. Maintain soil pH with dolomitic lime so both Ca and Mg will remain adequate.

Table 14. Peanut Fertility Checklist* (cont.)

pH or Nutrient	Soil Test Sufficiency Level (Mehlichl)**	Recommendations / Comments
Magnesium (Mg)	60 lb/ac and Mg at least 10% of total CEC for rotational crops	**Soil test Mg levels above 20 lb/ac are considered adequate for peanut.** However, rotational crops will require Mg soil test levels > 60 lb/ac and Mg at least 10% of CEC. Use dolomitic limestone (contains about 200 lb Mg per ton) to maintain soil Mg levels.
Boron (B)	0.5 lb/ac	If soil test B is below 0.1 lb/ac, apply foliar 0.3-0.5 lb B/ac (1.5-2.5 lb Solubor) as a foliar spray in the first fungicide application. Avoid toxicity from excessive B application.
Manganese (Mn)	pH / Mn lb/ac: 5.8 / 6; 5.9 / 7; 6.0 / 8; 6.1 / 9; 6.2 / 10; 6.3 / 10.5; 6.4 / 11; 6.5 / 12	If soil test Mn is below the sufficiency value at the current pH or the target pH when lime is to be applied, apply 0.5 lb Mn (2 lb manganese sulfate 25%, 1.5 lb Tecmangam, or 1.5 lb ManGro DF 31%) with both the 60 and 75 DAP fungicide applications. For pH values above those shown, the Mn sufficiency soil test value is 1 lb higher for each additional 0.1 of a pH unit.
Zinc (Zn)	Toxicity: see comments Deficiency: 1.6 lb/ac	Soil test Zn levels of 10 lb/ac can cause toxicity when the soil pH is below 6.0. To prevent Zn toxicity, lime to the pH targets listed. Given the risk of loss, the difficulty of achieving uniform pH, and the non-uniform distribution of Zn in soils; fields with Zn levels over 30 lb/ac should probably not be planted in peanuts. Zn deficiency is more likely at high pH, high soil Ca, and high soil P levels. A Zn soil test level of 1.6 lb should be adequate even under these conditions.
Copper (Cu), Chlorine (C1), Iron (Fe), Molybdenum (Mo)		There is no evidence for deficiency of these micronutrients in coast plain peanut production.

* Modified from J. Chapin. 2011. Peanut Money-maker Production Guide

** If soil test results come with amounts expressed in parts per million (ppm) multiply with 2 to get lb/ac.

Irrigation

To grow and yield profitably, peanut needs regular water throughout the growing season. Figure 1 shows the close relationship between rainfall and pod yield in 30 varieties tested in PVQE trials in Virginia and North Carolina. The data in Fig. 1 suggest a yield bonus of 200 lb/acre for each inch of water received by the crop. Critical peanut growth stages for water are emergence, flowering, pegging, and pod filling, and availability of one-inch water per week until beginning seed and up to 2 inches per week thereafter will result in high yields. Southeastern Virginia climate usually provides adequate rainfall amounts until beginning seed with weekly averages around an inch. However, for the later part of the season, weekly averages range from 0.5 to occasional 2 inches. Keep in mind; the averages here are from 2000 to 2017. Within individual years, we have seen weeks with no rain in July and August. Therefore, irrigation is critical to supplement weekly water needs of the plants.

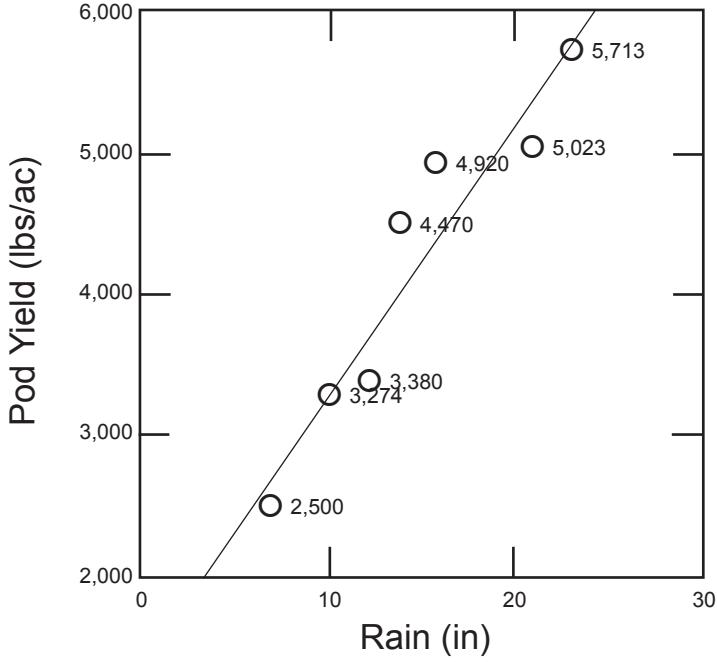

Figure 1. The dependence of yield on the amount of water received from planting to maturity.

Irrigation is critical in peanut production also because it allows better use of the inputs. Water is needed to move Ca from land plaster into the pegging zone and to keep soil Ca in solution and available to the pods.

Irrigation also improves the effectiveness of herbicides, soil fungicides, and insecticides. Without timely rain or irrigation, these inputs can be wasted. Irrigation lowers soil temperatures, which allows for normal peg development and greatly reduces aflatoxin risk.

Irrigation is also the best insect control available in that it makes the peanut plant much less susceptible to some of the most costly pest: lesser cornstalk borer, burrower bugs, corn earworm, and spider mites.

When irrigation is not available, drought tolerant varieties should be planted, in particular in fields and locations that historically are more prone to drought stress. The effect of irrigation on pod yield and value, and how Virginia and runner peanuts respond to irrigation is shown in Table 15a.

Table 15a. Effect of irrigation on pod yield and value of runner and Virginia-type peanut cultivars at two locations in 2016

	Dinwiddie, VA (2.6", 3 times)				Capron, VA (4", 2 times)			
	Irrigated		Non-irrigated		Irrigated		Non-irrigated	
Variety	Yield	Value	Yield	Value	Yield	Value	Yield	Value
	lb/acre	*$/acre*	*lb/acre*	*$/acre*	*lb/acre*	*$/acre*	*lb/acre*	*$/acre*
Bailey	5048 b*	892 c	3915 b	594 c	4197 ab	784 a	3627 ab	458 a
Sugg	4993 b	863 c	3831 b	551 c	4339 ab	880 a	3720 a	448 a
Sullivan	5075 b	878 c	3984 b	561 c	3774 b	666 a	3976 a	523 a
Wynne	4800 b	812 c	4056 b	560 c	4590 ab	871 a	3825 a	400 a
TUFRunner 297	5048 b	892 c	3915 b	594 c	4197 ab	784 a	3627 ab	458 a
TUFRunner 511	4993 b	863 c	3831 b	551 c	4339 ab	880 a	3720 a	448 a
Georgia 09B	5075 b	878 c	3984 b	561 c	3774 b	666 a	3976 a	523 a
FloRun 107	4800 b	812 c	4056 b	560 c	4590 ab	871 a	3825 a	400 a
Florida 07	5048 b	892 c	3915 b	594 c	4197 ab	784 a	3627 ab	458

*Averages followed by the same letters are not statistically different.

Growth and Development

Germination

Plants require a minimum or "base" temperature to germinate, grow, and produce yield, which is crop specific. For peanut, base temperature is 56° F. Beside temperature, seeds also need water and oxygen to germinate; water uptake is the first step in the resumption of active growth by quiescent seed after storage. Pre-harvest conditions can also influence germination. Soil fertility and nutrition, calcium uptake, and drought during seed development can affect germination and seedling vigor even under optimum temperature, moisture, and oxygen conditions. For example, soil moisture and soil calcium interact to influence pod uptake of calcium and thus affect peanut seed quality. Harvest, storage, and handling play important role in germination, too. For example, when seed moisture is high, excessively high or low temperatures may reduce seed quality.

Seed dormancy is an important factor in commercial peanut production. In Virginia type peanut dormancy may last up to 4 months, and the duration appear to depend on cultural practices, weather conditions at harvest, and storage conditions. For example, pods harvested later had seed with less dormancy than those harvested earlier. Seeds are more dormant during dry than wet harvest seasons.

Growth

Optimal temperature for peanut growth is between 77 and 86° F. Plant growth is significantly slower at temperatures below 60 and over 95° F. Leaf and stem weights increase up to a maximum value which occurs at about 90 to 100 days after planting (DAP). Good vine production is necessary for a good pod yield. Drought and heat can reduce vine production and therefore yield, even though peanut is an indeterminate plant. As such, peanut can resume growth after a drought episode even during the reproductive period, re-bloom and produce another crop of pegs. However optimal yields are produced when drought stress is avoided and extreme temperatures are minimized during the critical 60-100 DAP interval.

Development

Optimum temperature for peanut flowering and fruit-setting is between 83 and 91° F. Drought and heat stress reduces flower production and pollination, and extreme soil surface temperatures cause peg abortion. Peanut pollination and seed set hold up well under low weather as long as daily maximum temperatures do not exceed 97° F. Even under the most ideal conditions, maximum peanut pollen viability is about 90% and maximum seed set is about 75%. Above 97° F maximum temperature there is decline in both pollination and seed set. If the daily high temperature reaches 104° F pollen viability can drop to around 70% and seed set to around 50%. Although standard weather station temperatures seldom reach 104° F, peanut canopy may be greater than that measured in weather station shelters in sensitive varieties, and may be lower in tolerant once. Therefore development and use of tolerant varieties is critical in dry and hot years.

Temperature requirements to reach pod maturity can be thought of in degree days where the base temperature (56° F) is subtracted from the average daily temperature and summed over a period of time starting from planting. For example, a medium maturity Virginia type peanut such as Bailey requires about 2590 degree days (DD) after emergence to mature.

Table 15b. Peanut Growth Stages

Approximate Number Days after Planting*	Growth Stage	Description
7	Emergence	Seedling “cracking” the ground and cotyledons visible
45	Flower (R1)	One-half of the plants with a bloom
55	Beginning Peg (R2)	First visible peg
70	Beginning Pod (R3)	Peg tip swollen to twice the peg diameter
75	Full Pod (R4)	Fully-expanded pod, to dimensions characteristic of the variety
80	Beginning pod-fill (R5)	Pod in which seed is visible in cross-section
90	Full Size Seed (R6)	Seed is filling the pod cavity
130	Beginning Maturity (R7)	Pods having interior hull color and orange to brown mesocarp
150 - 160	Harvest Maturity (R8)	70% of harvestable pods have an orange, brown, or black mesocarp (scrape pod saddle with knife) and interior hull color (crack pod open)
165 – 170	Over-mature (R9)	Kernels in oldest pods develop tan-brown seed coat and pegs may have deteriorated; over-mature pods have coal-black mesocarp color

* Based on average of 30 Virginia type varieties planted on May 1 at Tidewater AREC. The numbers of days after planting increase for earlier and decrease for later plantings. If June is dry, these numbers are bigger from R1 through R4 and smaller afterwards.

Use of Growth Regulators: If vine growth control is needed for digging, Apogee (7.25 oz/ac) can be applied when 50% of the laterals touch in the row middle. A second application is made at 100% row closure. Treating “marker rows” such as the middle two of a 6-row digger pass is more cost-effective than broadcast treatment.

Effective uptake of Apogee requires addition of nitrogen to the spray solution. Use 1 pt urea / ammonium nitrate (UAN) or 1 lb ammonium sulfate (AMS) per treated acre. One quart crop oil concentrate per treated acre is also recommended.

Harvest Maturity

Determining when to dig is the most critical decision of the peanut production. Digging at the right time gives the farmer the maximum yield and grade. If dig is too early, grading factors will be lower. If dig is too late, over-mature pods can lose peg strength resulting in yield loss. There are several methods to determine the optimum digging time.

Days after Planting: This and other guides include information on the number of days after planting (DAP) that each variety needs to mature. For example, CHAMPS is the earlier Virginia-type variety available and it can mature in 135-140 DAP in Virginia, followed by Bailey, Emery, Sugg, and Sullivan with reachable maturity in 140-145 days from planting, and Gregory and Wynne with 145-150 DAP necessary to reach maturity in Virginia (Table 5). However, DAP is a general information on maturity and it should never be used alone for determining the digging date. The DAP information should rather be used to schedule planting date, and select varieties to allow spread out of planting and harvest on large acreages.

Heat Units or Degree Day Method: In order to mature, peanuts have certain temperature requirements over the growing season. For example, if the base temperature (56° F) is subtracted from the average daily temperatures (because plants will not grow bellow 56° F) and the remaining heat units are cumulated over time, from May to October there will be approximately 3000° F or degree days (DD). A medium maturity variety such as Bailey will only require 2590 DD to reach maturity. Like the DAP, the DD method is also imprecise because other factors beside temperature are important for peanut maturation. For example water, from rain or irrigation, is very important and in dry years maturity is delayed. Heat units for peanut are recorded daily at the Tidewater AREC for access by phone or internet at http://www.ipm.vt.edu/infonet/. Regional advisories for Capron, Waverly, Suffolk, and Skippers are available by calling (800) 795-0700 (see the Peanut Disease chapter).

Hull Color Method: Pod maturity can be determined by scraping away the outer hull layer with a knife or blasting with a pressure washer (with oscillating turbo nozzle and not high psi) to reveal the color of the middle layer of the mesocarp. As peanuts mature the mesocarp color changes from white to yellow, orange, brown, and then to black. Based on hull color, Virginia-type varieties are ready to dig when 70% of pods are in the orange, brown, and black combined, 20-30% in brown and black categories combines, and only 1-2% dark black. For runners the target is to have 75% in the orange, brown, and black combined, 30-40% in brown and black categories combines, and only 5% dark black. **Maturity charts** can be used for easy identification of the percentages of pods within each color group and determine how far the sample is from optimum digging. The pods are first scraped or blasted and then laid on the charts.

Tidewater AREC and county agents co-organize pod blasting events for farmers. Please contact your county agent and let him/her know that you are interested to participate. You will bring pod samples from various fields and we will do the work for you! Please keep in mind that several determinations need to be done starting from 120 DAP in order to more precisely find the optimum digging time for each field.

Peanut Grading Definitions and Economic Significance

The following definitions are intended to assist growers in understanding the economic significance of peanut grading terminology.

Farmers' Stock Peanuts: The peanuts the grower brings to the buying point.

FM (foreign material): Everything other than loose peanut kernels and in-shell peanuts in the farmers' stock sample. Foreign material includes dirt, peanut vines, sticks, stones, insect parts, peanut hulls, and "raisins" or "twisters". Raisins or twisters are very immature, shriveled pods which cannot be commercially shelled.

Foreign material is the first component to be separated from the grade sample of farmers' stock peanuts. There is no penalty for foreign material up to 4%. At 5% FM there is a 0.05 cents/lb ($ 1/ton) penalty which increases with additional % FM. At 10% FM, the penalty is 0.3 cents/lb ($6/ton or $12/ac for 2-ton peanuts). Foreign matter penalties may vary at different buying points. For example, some charge no penalty up to 7%, but then impose a $10/ton cleaning fee.

LSK (loose shelled kernels): Kernels and parts of kernels which are free from the hull in a load of farmers' stock peanuts.

LSKs are the second component separated out in grading. **LSKs are undesirable** because they spoil **more rapidly and are more likely to be contaminated with aflatoxin**. LSKs are checked for Aspergillus mold by the grader.

LSKs are worth only$0.07/lb ($140/ton) vs. $0.18/lb ($360/ton) for an "average" 72% TSMK load. So **each percent LSK results in a $2.20/ton loss ($4.40/ac for 2-ton peanuts)**.

At this point the grade sample has had the foreign material and LSKs removed. The remaining intact pods are then run down a set of sizing rollers to pre-size them for proper shelling and to determine the percent of "fancy pods" for virginia types.

Fancy Pods: The percentage of fancy (larger) pods is determined (virginia type only) by the percentage which rides a 34/64" roller spacing. The grower is not rewarded for fancy pods other than that they must meet the 40% fancy pod minimum to qualify for the virginia type market.

At this point the sample is shelled and the kernels will be mechanically shaken on screens.

ELK (extra large kernels): An ELK screen is used only for virginia types. ELK is the percentage by weight of kernels from the shelled sample that rides a 21.5/64 x 1" screen. There is a premium of 0.0175 cents/lb (36 cents/ton) for each percent ELK. A 40% ELK has a premium value of $14.40/ton (about $29/ac for 2-ton peanuts).

SMK (sound mature kernels): The percentage by weight of kernels from the shelled sample that rides a 15/64 x 1" (virginia type) or a 16/16 x ¾" (Runner type) screen.

Each percent increase in SMK increases peanut value by about $5.00/ton. See TSMK below.

SS (sound splits): The percentage by weight of kernels from the shelled sample that consists of undamaged split kernels or broken kernels (undamaged ¼ to ¾ kernel pieces; pieces less that ¼ kernel remain in OK (other kernel category); pieces larger than ¾ kernel are considered SMKs.

There is no sound split penalty up to 4% and for each percent above 4, the penalty is only 80 cents per ton.

TSMK (total sound mature kernels): TSMK is the total of SMK (sound mature kernels) + SS (sound splits). ELKs (extra large kernels) are also included in TSMK for Virginia types.

This is the number that counts. Each percent increase in TSMK is worth about 0.25 cents/lb ($4.96/ton), or about $10.00/ac for 2-ton peanuts. So a 1 point increase in TSMK is worth more than a 10 point increase in ELK. Higher TSMK also correlates with higher yield.

OK (other kernels): The percentage by weight of kernels from the shelled sample that falls through the SMK screen. Other kernels are mostly smaller, less mature kernels. Pieces of broken kernels less than ¼ kernel size are also included in other kernels.

Other kernels are worth less than sound mature kernels. When you look at a grade sheet this might not be clear because as the percent of OKs increases from left to right on the price sheet, the sample value increases about 0.07 cents/lb ($1.40/ton) for each point increase. So it might look like higher OK values are good news, but compare that 0.07 cent/lb increase to the 0.25 cent/lb ($4.96/ton) value of a 1 point increase in TSMK (read up the chart). Immature kernels (OKs) are work something, but mature kernels (SMKs) are worth more.

DK (damaged kernels): The percentage by weight of kernels from the shelled sample that are judged to be inedible due to decay, mold, insect damage, sprouting (>1/8"), discoloration or pitting darker than light yellow, freeze damaged, or skin-discoloration (<25%).

Although graders do have picture and definition guidelines, **the determination of damaged kernels is somewhat subjective.** Minor pitting, discoloration, or other damage to the kernel skin or flesh does not constitute a damaged kernel. Notice that broken kernels are also not included in damaged kernels; instead they are classified as sound splits and thus contribute to TSMK.

Damaged kernels are the major component of total damage penalties – see below.

Freeze Damage: The percentage by weight of kernels from the shelled sample that have characteristics of freeze damage such as hard, translucent, or discolored flesh. This damage is included in damaged kernels (DK) and thus contributes to total damage.

Concealed Damage (RMD): Concealed damage – rancid, moldy, or decayed, is damage detected after the kernel sample is put through a kernel splitter and examined on a belt. This damage is added to DK to determine total damage.

Total Damage: The sum of damaged kernels (DK), including freeze damage and concealed RMD.

Once total damaged kernels reach 2.5% by weight, the penalty can be catastrophic. At damage levels slightly above 2.5%, the peanuts can sometimes be cleaned (~$10/ton cleaning fee). If they can't be cleaned below 2.5% damage, the load is classified as segregation II and is consigned to the oil market, with a potential value as low as $125 per ton (35% of loan value).

Hulls: The percentage by weight of hulls from the shelled sampled. Although no grade premiums or penalties are based on hull weight, the lower the percentage hull weight, the higher the grade. Hull weights in the lower twenties indicate excellent grades because they indicate that the total kernel weight is in the high seventies.

***Aspergillus flavus* mold:** This is mold that produces aflatoxin. Only three grade components are examined for the presence of *A. flavus* mold (LSKs, OKs, and DKs) because these components have the greatest risk. The grader indicates on the grade sheet that *A. flavus* either was or was not detected.

Detection of *A. flavus* is bad news. Detection results in the lot being cleaned (~$10/ton cleaning fee) and re-examined. If the contamination is not adequately removed by cleaning, **the peanuts are consigned to segregation III for the oil market, with a potential market value as low as $125/ton (35% of loan value).**

Table 16. Peanut Grading Terms

Grading Term	Definition	Penalty or Reward
FM Foreign Material	Everything but in-shell peanuts and loose kernels.	No penalty up to 4%. At 5% lose $1/ton and increases with each %. FM not usually a problem even in strip-till.
LSK Loose shelled kernels	Kernels free from the hull	With each percent LSK you lose $2.20/ton. More importantly, LSKs associated with & checked for aflatoxin.
Fancy pods	Pods big enough to ride a 34/64" roller spacing	No reward or penalty. Only varieties with 40% fancy pods qualify as Virginia types
ELK Extra large kernels	Kernels big enough to ride a 21.5/64 x 1" screen (Virginia types only)	Premium of $0.36/ton for each percent ELK. So a 40% ELK has a $14.40/ton premium. A variety with 10% higher ELK worth only $3.60/ton more.
SMK Sound mature kernels	Kernels mature enough to ride a screen standard: 15/64 x 1" (Virginia type) or 16/64 x ¾" (runner type)	Each percent SMK increases value by about $5.00/ton (see TSMK below).
SS Sound splits	Undamaged split kernels in the shelled sample.	No penalty up to 4%; $0.80/ton penalty for each percent above 4%.
TSMK Total sound mature kernels	ELKs + SMKs + SSs (only Virginia types are graded for ELKs)	This is the important number. **Each percent TSMK increases value by about $5.00/ton. So a 1% increase in TSMK is worth more than a 10% increase in ELK.**
OK Other kernels	Smaller, immature kernels that fall through the SMK screen standard.	Each percent increase in other kernels detracts from the sound mature kernels.
DK Damaged kernels	Kernels judged to be inedible due to mold, insect damage, sprouting, or freeze injury.	At or above 2.5% the penalty is severe because if the load can't be cleaned ($10/ton cleaning fee) it is considered segregation II with an oil market value as low as $125/ton (35% of loan).
FD Freeze damage	Freeze damage is included in damaged kernels.	Same as DK penalty above.
Concealed RMD Concealed damage-rancid, moldy, decayed.	Damage detected after kernels in the grade sample are split in half.	Cannot exceed 1% or the load becomes segregation II.
TD Total damage	The total of damaged kernels, freeze damage, and concealed damage.	Same as DK penalty above.
Aflatoxin	A toxin produced by *Aspergillus flavus* and related molds.	If the load can't be cleaned, it goes into segregation III – the oil market (as low as $125/ton). LSKs, DKs, and OKs are checked for *Aspergillus*.

Table 17. Peanut Management Calendar

BEFORE PLANTING	
September-November	Collect soil samples from fields for nematode assay to determine risk of nematode damage in fields to be planted with peanut next year. Assay forms, sample bags, and instructions are available at the Tidewater AREC, and the contact person is Dr. David Langston (dblangston@vt.edu).
January	Soil test: Soil Testing Laboratory results will show if a nutrient is low or high; alternatively compare soil test values with the sufficiency levels in Peanut Fertility Checklist table. Lime application, if needed.
February	Take advantage of invited, out-of-state speakers on peanut production at the State Peanut Production Meeting. Plan land preparation for conventional tillage.
March	Early decisions on variety selection. The Peanut Variety and Quality Evaluation books may help you with the decision. Electronic copies are available at http://pubs.ext.vt.edu/category/crops.html.
Early April	30 days pre-plant, burn down weeds or cover crop for strip-tillage.
Late April	If Vapam fumigation is needed for CBR control, it should go out at least 14 days pre-plant when there is good soil moisture, minimal risk of rain within 3 days of application, and soil temperature is at least 60° F and forecast is for warming temperatures.

PLANTING TO DIGGING

Approx. Days After Planting	Date: Assumes 1 May Planting	Growth Stage	Management Steps
0	1 May	Planted	- Check seed germ on seed bags and plant seed with highest germination in early plantings and lower germination seed in later plantings when soil temps are 70˚ or higher. - Plant 3-4 seeds/row ft into good moisture at 1.5” depth (max. 3” if necessary). - Inoculate all new fields and fields out of peanuts for 3 years with liquid in-furrow inoculants. Hit the center of furrow! - Use in-furrow Thimet (phorate) 5 lb/acre, Admire Pro at 7-10.5 oz per acre, or Velum Total 18 oz/acre for thrips. Note that liquid in-furrow Orthene (acephate) is not labeled. - Proline at 5.7 fl oz/acre can be used infurrow to control CBR. - Spread planting dates of large acreage over 2-wk interval to spread harvest maturity. - Optimal planting interval about 1-15 May.

Table 17. Peanut Management Calendar

PLANTING TO DIGGING (cont.)

Days After Planting	Date: (if planted 1 May)	Growth Stage	Management Comments
0-2	1-2 May	---	- If Prowl or Sonolan are used, it must be applied at planting or within 2 days of planting. Intro and Dual can be tank-mixed.
7	7 May	Cracking Emergence	- A pegging zone (4” depth) soil test can be used to re-evaluate Landplaster needs on runner types.
7-28	7 – 28 May	Seedling	- Apply Gramoxone (plus Basagran or Storm) when needed to control first weed flush from cracking through seedling stage. - If thrips injury/stunting occurs after emergence a foliar Orthene treatment is recommended.
45	14 June	Bloom (R1)	- Land plaster applied at bloom 40 DAP (early better than late). - Herbicides to control broadleaf weeds are normally applied at this time.
55	24 June	Beginning Peg (R2)	- Boron and manganese can be tank-mixed with the first herbicide or fungicide if indicated by soil test (<0.4 lb). - Water is needed to move gypsum into the pegging zone and sustain pod development: irrigate if it is needed and you can. - Check to see that the taproot has active nodules if inoculation problems are suspected (yellow plants). - Start weekly spot check for hopperburn on field edges.

Table 17. Peanut Management Calendar

PLANTING TO DIGGING (cont.)

Days After Planting	Date: (if planted 1 May)	Growth Stage	Management Comments
70	9 July	Beginning Pod (R3)	- 1st application of fungicide for leaf spot control (Bravo, Bravo+Alto, Provost etc.0 should be applied at beginning podstage where peanuts are planted in a 2- or 3-yr rotation. Fungicide application can be delayed until beginning seed stage (R5) if peanut is planted in rotations of 4 yrs or longer. All subsequent leaf spot sprays should be applied according to the Virginia Peanut Leaf Spot Advisory and Sclerotinia Blight Advisory Programs available on the Peanut/Cotton InfoNet (http://webipm.ento.vt.edu/cgi-bin/infonet1.cgi) or Peanut Hotline at 1-800-795-0700. - Use Select or Poast Plus if needed for grass control. It usually takes a minimum of 60 DAP to close the canopy. - If Lorsban 15G is used to prevent soil insects, it should be applied during pegging (about the first week of July).
75	14 July	Full size pod (R4)	- Check Peanut/Cotton InfoNet and Peanut Hotline for last effective spray dates for leaf spot and Sclerotinia blight control. - Mn can be tank-mixed with the 60 DAP fungicide appl. if required by soil test. - Spot spray escaped grasses with Select or Poast Plus. - Most critical water use period begins; apply 1.0 – 1.5”/week minus rain 60-110 DAP. - Apogee growth regulator timing is 50% vines touching for 1st application and 2nd application at 100% row closure.

Table 17. Peanut Management Calendar

PLANTING TO DIGGING (cont.)

Days After Planting	Date: (if planted 1 May)	Growth Stage	Management Comments
80	19 July	Beginning Seed (R5)	-- 1st application of fungicide for leaf spot and stem rot control should be applied no later than beginning seed stage in fields with a 4-yr or longer rotation of peanut. - Check last effective spray date for control of leaf spot and Sclerotinia blight. Scout fields for leaf spot, Sclerotinia, and stem rot weekly for early detection of disease problems. - Check weekly for corn earworm and fall armyworm starting around 1 Aug. through first week of September.
90	29 July	Full Size Seed (R6)	- Under severe drought stress watch for spider mite hits in late August to September, particularly where Lorsban is used.
110	18 Aug.	Oldest pods show internal hull color (R7)	- Continue spraying fungicide according problems found when scouting fields and last effective spray dates on the Peanut/Cotton InfoNet and Peanut Hotline.
130	7 Sept.	Early Maturity (R7)	- Begin checking fields for maturity to plan digging dates. Use the hull scrape method to determine the percentage in white, yellow, orange, and brown-black hull color categories. - Continue spraying fungicide according with problems found when scouting fields and last effective spray dates on the Peanut/Cotton InfoNet and Peanut Hotline. The final spray of fungicide for leaf spot control should be chlorothalonil (Bravo or generic) for resistance management. - Irrigate between110-130 DAP 0.75-1.0”/wk as needed to prevent wilting. - Have digger and combine ready to go.

Table 17. Peanut Management Calendar

PLANTING TO DIGGING (cont.)

Days After Planting	Date: (if planted 1 May)	Growth Stage	Management Comments
150 - 160	27 Sept. – 7 Oct.	Harvest Maturity (R8)	- Monitor Virginia Peanut Frost Advisory available at (http://webipm.ento.vt.edu/cgi-bin/infonet1.cgi) or Peanut Hotline at 1-800-795-0700 from October 1 until completion of harvest. Do not dig peanuts when a freeze is forecast occur in the next 3 to 5 days. Freshly dug peanuts contain high moisture (28-30%) and will sustain freeze damage that can reduce value to as low as 7 cents/lb compared to 25 cents or higher for peanuts without freeze damage. - Never dig strictly based on DAP. Variety, seasonal temperature and rainfall determine maturity. Use hull color guidelines to verify harvest maturity. - Optimum dig for Virginias: 70% pod color (orange + brown + black); 20-30% brown + black; 1-2% coal black; 132-135 days for medium maturity varieties. - Optimum dig for runners: 70-75% pod color (orange + brown + black); 30-40% brown + blacks; 5% coal black; 140 days for medium maturity varieties. - In October check for velvet bean caterpillar defoliation on the latest maturing fields.
170	17 Oct.	Over-mature (R9)	- Even on healthy plants, by 170 DAP there is a very high risk of pod loss from deteriorating peg strength on over-mature Virginia type pods.

WEED CONTROL IN PEANUTS

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Effective weed management is essential for profitable peanut production. Peanuts are not very competitive with weeds and thus require higher levels of weed control than most other agronomic crops to avoid yield losses. Weeds may also decrease digging efficiency, so effective late-season weed control can minimize losses during harvest. A weed management program in peanuts consists of good weed control in rotational crops; cultivation, if needed; establishment of a satisfactory stand and growing a competitive crop; and proper selection and use of herbicides. Finally, weeds interfere with fungicide movement into the peanut canopy, often referred to as deposition, and this can negatively affect disease control.

Crop Rotation

Rotate peanuts with corn, cotton, or grain sorghum to help manage various pests, including weeds. Crop rotation allows the use of different herbicides on the same field in different years. Crop and herbicide rotation, along with good weed control in the rotational crops, helps prevent the buildup of problem weeds and helps keep the overall weed population at lower levels. Crop rotation will also help reduce the chance of developing populations of weeds that are resistant to herbicides.

Cultivation

Cultivation can supplement chemical weed control. However, cultivation can damage the crop and reduce yield if not done properly. Moving soil onto the lower branches and around the base of the plants causes physical damage and enhances development of stem and pod diseases. Deep cultivation also destroys residual herbicide barriers and brings up additional weed seeds. Cultivate when peanuts are small. Set sweeps to run flat and shallow to avoid throwing soil onto the peanut plants. Generally, in-season cultivation of peanuts is not recommended.

Weed Identification and Scouting

All fields, regardless of the crop being grown, should be surveyed for weeds between mid-August and the first killing frost. Record the weed species present and note the general level of infestation of each species (light, moderate, or heavy). Weeds present in the fall will be the ones most likely to be problems the following year. Knowing what problems to expect allows you to better plan a weed management program for the following crop.

Scout peanut fields weekly from planting through mid-July to determine if or when postemergence herbicide treatment is needed. Proper weed identification

is necessary because species respond differently to various herbicides. Contact your county Extension center for aid in weed identification. Timely application of postemergence herbicides is critical for effective control. Cultivation may be more appropriate if herbicide-resistant biotypes increase in prevalence.

Comments of Peanut Herbicides

To develop a herbicide program, a grower must know what weeds are present, the soil characteristics of the field, and herbicide limitations and capabilities. Seldom will one herbicide provide control of all weeds present. As a result, several herbicides must be used together for a successful program. By knowing what each herbicide provides to the program, the grower may eliminate expensive duplication or choose the herbicide that provides the best overall balance of weed control capabilities, crop safety, and economic return.

Preplant Burndown Herbicides

Glyphosate (various formulations) and Gramoxone SL (other formulations are available) are relatively nonselective herbicides that control many of the winter weeds present in reduced tillage fields (Table 4-4). Harmony Extra and 2,4-D (various formulations) can also be applied. Harmony Extra can be applied no closer to planting than 45 days before planting. 2,4-D should be applied at least 30 days before planting.

Preplant Incorporated, Preemergence, and Postemergence Herbicides

Numerous herbicides are labeled for use in peanuts (Tables 4-5, 4-6, 4-7). Timely application of the appropriate herbicide at the correct rate is essential for successful weed control in peanuts. Additional information on feeding restrictions of peanut hay (Table 4-8), suggested rain-free period to maintain control (Table 4-9), and rotation restrictions on herbicide use (Table 4-10) are provided.

Reduced Rates of Herbicides

When crop prices are low, producers are looking for ways to reduce production costs. One possibility is to reduce the application rate of herbicides. Under certain environmental conditions and with certain weed species or weed complexes, specific herbicides can be applied below the manufacturer's suggested use rate without sacrificing weed control. However, growers are cautioned that herbicides applied at reduced rates often do not control weeds adequately when environmental conditions (soil moisture in particular) do not favor herbicide activity. Applying herbicides at reduced rates to large weeds or weeds that are "hardened" often results in poor control as well. Weeds can also be more difficult to control if they were injured by herbicide with previous treatment. Using reduced rates will require that growers apply herbicides in a more timely manner and when weeds are not stressed. Regardless of the previously mentioned factors relative to reduced rates, manufacturers of herbicides will not back up their products when they are applied below the suggested use rate. Liability falls exclusively to the grower.

COMPATIBILITY OF AGROCHEMICALS

Compatibility is an important consideration when applying two or more products in the same tank. See chapter 9 for more information on agrochemical compatibility. Consult product labels, chapter 9, and your county Extension agent for more information on agricultural chemical compatibility.

Table 18. Chemical Weed Control in Peanuts

Herbicide and Formulation	Pounds Active Ingredient Per Acre	Precautions and Remarks
Preplant Incorporated, Annual grasses and small-seeded broadleaf weeds		
alachlor, MOA 15 (Intrro 4 EC)	2 to 3 (2 to 3 qt)	Incorporate no deeper than 2 inches; see label for specific instructions. Unless shallowly incorporated, Intrro is more consistently effective when applied preemergence. Weak on Texas panicum. Do not apply more than 3 qt of Intrro per acre per season. Before using Intrro, check with buyers to determine if there are marketing restrictions on Intrro-treated peanuts.
acetochlor, MOA 15 (Warrant 3 ME)	0.94 to 1.5 (1.25 to 2 qt)	Apply and incorporate in top 2 inches of soil. Do not apply more than 4 qt of Warrant per acre per year.
ethalfluralin, MOA 3 (Sonalan 3 EC)	0.56 to 0.75 (1.5 to 2 pt)	Controls common annual grasses including Texas panicum. Use 3 pt Prowl or 2 pt ethalfluralin for control of broadleaf signalgrass, Texas panicum, and fall panicum. Incorporate 3 inches deep for Texas panicum; otherwise, incorporate 2 to 3 inches deep. See labels for maximum waiting period between application and incorporation. Immediate incorporation is best. Dual Magnum, Outlook, or Warrant may be tank mixed with Prowl or Sonalanto suppress yellow nutsedge.
pendimethalin, MOA 3 (Prowl H2O 3.8 EC) (Prowl 3.3 EC)	0.71 to 1.43 (1.5 to 3 pt) (1.7 to 3.5 pt)	

Table 18. Chemical Weed Control in Peanuts (cont.)

Herbicide and Formulation	Pounds Active Ingredient Per Acre	Precautions and Remarks
Preplant Incorporated, Annual grasses, small-seeded broadleaf weeds, and nutsedge		
dimethenamid, MOA 15 (Outlook 6.0 L)	0.75 to 1 (16 to 21 fl oz)	Apply and incorporate in top 2 inches of soil within 14 days of planting. Use high rate of Dual Magnum, Dual, or Outlook for yellow nutsedge and broadleaf signalgrass. Not effective on purple nutsedge. Weak on Texas panicum. May be tank mixed with Prowl or Sonalan.
metolachlor, MOA 15 (Dual Magnum 7.62 EC) (Dual 8 EC)	0.95 to 1.27 (1 to 1.33 pt) (1.5 to 2 pt)	
Preplant Incorporated, Broadleaf weeds and suppression of nutsedge		
diclosulam, MOA 2 (Strongarm 84 WDG)	0.024 (0.45 oz)	Effective on common cocklebur, morningglory, common ragweed, eclipta, and common lambsquarters. Suppresses yellow and purple nutsedge. Does not control sicklepod. More effective when applied in combination with Dual, Outlook, Warrant, Prowl, or Sonalan. See label for rotation restrictions, especially corn and grain sorghum. Growers are cautioned that Strongarm can occasionally injure cotton the following year on soils with a shallow hardpan (less than 10 inches) and/or loam soils. Cotton grown under early season stress resulting from conditions such as excessively cool, wet, dry, or crusted soils may be particularly susceptible to carryover of Strongarm. The rotation interval between applying Strongarm to peanut and then planting cotton is 18 months in Camden, Currituck, Pasquotank, and Perquimans counties. Some weed species have developed resistance to Strongarm including common ragweed and Palmer amaranth.

Table 18. Chemical Weed Control in Peanuts (cont.)

Herbicide and Formulation	Pounds Active Ingredient Per Acre	Precautions and Remarks
Preplant Incorporated, Annual grasses, broadleaf weeds, and suppression of nutsedge		
diclosulam, MOA 2	0.024	Effective on annual grasses, common cocklebur, common ragweed, eclipta, morningglory, and common lambsquarters. Suppresses purple and yellow nutsedge. Does not control sicklepod. See Strongarm label for rotation restrictions.
Strongarm	(0.45 oz)	
+	+	
pendimethalin, MOA 3	0.71 to 1.43	
(Prowl H2O 3.8 EC)	(1.5 to 3 pt)	
(Prowl 3.3 EC)	(1.7 to 3.5 pt)	
or	or	
ethalfluralin, MOA 3	0.56 to 0.75	
(Sonalan 3 EC)	(1.5 to 2 pt)	
or	or	
metolachlor, MOA 15	0.95 to 1.27	
(Dual Magnum 7.62 EC)	(1 to 1.33 pt)	
(Dual 8 EC)	(1.5 to 2 pt)	
or	or	
dimethenamid	0.75 to 1	
(Outlook 6.0 L)	(16 to 21 fl oz)	
or	or	
acetochlor	0.95 to 1.5	
(Warrant 3 ME)	(1.24 to 2 qt)	

Table 18. Chemical Weed Control in Peanuts (cont.)

Herbicide and Formulation	Pounds Active Ingredient Per Acre	Precautions and Remarks
PPI followed by PRE, Annual grasses, broadleaf weeds, and suppression of nutsedge		
pendimethalin, MOA 3	0.71 to 1.43	Controls most broadleaf weeds. Will not control sicklepod and is marginal on certain large-seeded broadleaf weeds. Do not incorporate Valor SX. Valor SX should be applied to the soil surface immediately after planting. Significant injury can occur if flumioxazin is incorporated or applied 3 or more days after planting. Significant injury from Valor SX has been noted in some years even when applied according to label recommendations. However, injury is generally transient and does not affect yield. See previous comments about cotton response to Strongarm applied the previous year on some soils. Up to 3 oz per acre of Valor SX can be applied to peanut but injury potential increases. See product label for sprayer cleanup before other uses.
(Prowl H2O 3.8 EC)	(1.5 to 3 pt)	
(Prowl 3.3 EC)	(1.7 to 3.5 pt)	
or	or	
ethalfluralin, MOA 3	0.56 to 0.75	
(Sonalan 3 EC)	(1.5 to 2 pt)	
or	or	
metolachlor, MOA 15	0.95 to 1.27	
(Dual Magnum 7.62 EC)	(1 to 1.33 pt)	
(Dual 8 EC)	(1.5 to 2 pt)	
or	or	
dimethenamid, MOA 15	0.75 to 1	
(Outlook 6.0L)	(16 to 21 oz)	
or	or	
acetochlor, MOA 15	0.95 to 1.5	
(Warrant 3 ME)	(1.24 to 2 qt)	
followed by		
diclosulam, MOA 2	0.024	
(Strongarm 84 WDG)	0.45 oz	
or	or	
flumioxazin, MOA 14	0.063	
(Valor SX 51 WDG)	(2 oz)	

Table 18. Chemical Weed Control in Peanuts (cont.)

Herbicide and Formulation	Pounds Active Ingredient Per Acre	Precautions and Remarks
Split application (PPI + POST), Most broadleaf weeds and nutsedge		
imazethapyr, MOA 2 (Pursuit 2 AS)	0.031 + 0.031 (2 + 2 oz)	Effective on most common broadleaf weeds and yellow and purple nutsedge. Does not control eclipta, lambsquarters, ragweed, or croton. Pursuit will usually control seedling johnsongrass and foxtails. For control of other annual grasses, Pursuit may be tank mixed with Dual Magnum, Dual, Outlook, Prowl H2O, Prowl, or Sonalan and incorporated. See label for incorporation directions and rotational restrictions. Some weed species have developed resistance to Pursuit. Research in N.C. has generally shown more effective control of a broader spectrum of weeds with split applications of half of the Pursuit applied preplant incorporated followed by the other half applied early postemergence.
Preemergence, Annual grasses and small-seeded broadleaf weeds		
alachlor, MOA 15 (Intrro 4 EC)	2 to 3 (2 to 3 qt)	Apply as soon after planting as possible. All four herbicides are weak on Texas panicum. Before using Inntro, check with buyers to determine if there are marketing restrictions on Intrro-treated peanuts.
dimethenamid, MOA 15 (Outlook 6.0 L)	0.75 to 1 (16 to 21 fl oz)	
metolachlor, MOA 15 (Dual Magnum 7.62 EC) (Dual 8 EC)	0.95 to 1.27 (1 to 1.33 pt) (1.5 to 2 pt)	
acetochlor (Warrant 3 ME)	0.95 to 1.5 (1.25 to 2 qt)	

Table 18. Chemical Weed Control in Peanuts (cont.)

Herbicide and Formulation	Pounds Active Ingredient Per Acre	Precautions and Remarks
Preemergence, Broadleaf weeds		
flumioxazin, MOA 14 (Valor SX 51 WDG)	0.063 2 oz	Apply within 2 days after planting. Significant injury can occur if Valor SX is incorporated or applied 3 or more days after seeding. Controls carpetweed, common lambsquarters, Florida pusley, nightshade, pigweeds, prickly sida, and spotted spurge. Does not control sicklepod, yellow and purple nutsedge, or annual grasses. Morningglory control is marginal where Valor SX is applied at 2 oz per acre. Significant injury from Valor SX has been noted in some years even when applied according to label recommendations. However, injury is generally transient and does not affect yield. Injury may occur if excessive and forceful rainfall occurs when peanut is emerging. Peanut recovers from injury by midseason in most instances. Up to 3 oz per acre of Valor SX can be applied to peanut, but injury potential increases. See product label for comments on sprayer cleanup before other uses.

Table 18. Chemical Weed Control in Peanuts (cont.)

Herbicide and Formulation	Pounds Active Ingredient Per Acre	Precautions and Remarks
Preemergence, Annual grasses, broadleaf weeds, and suppression of nutsedge		
flumioxazin, MOA 14 (Valor SX 51 WDG) + metolachlor, MOA 15 (Dual Magnum 7.62 EC) (Dual 8 EC) or dimethenamid, MOA 15 (Outlook 6.0L) or acetlochlor, MOA 15 (Warrant 3 ME)	0.063 (2 oz) + 0.95 to 1.27 (1 to 1.33 pt) 1.5 to 2 pt) or 0.75 to 1 (16 to 21 fl oz) or 0.94 to 1.5 (1.25 to 2 qt)	Apply within 2 days after planting. Significant injury can occur if applied 3 or more days after planting. The combination of Valor SX and Dual, Dual Magnum, Warrant, or Outlook does not control sicklepod but will control annual grasses (except Texas panicum) and will suppress yellow nutsedge. Valor SX and Warrant will not suppress yellow nutsedge. Significant injury from Valor SX has been noted in some years even when applied according to label recommendations. However, injury is generally transient and does not affect yield. Injury may occur if excessive and forceful rainfall occurs when peanut is emerging. Peanut recovers from injury by midseason in most instances. Up to 3 oz per acre of Valor SX can be applied to peanut but injury potential increases. See product label for comments on sprayer cleanup before other uses.
diclosulam, MOA 2 (Strongarm 84 WDG)	0.024 (0.45 oz)	Effective on common cocklebur, morningglory, common ragweed, eclipta, and common lambsquarters. Suppresses yellow and purple nutsedge. Does not control sicklepod. More effective when applied in combination with Dual, Dual Magnum, Outlook, Prowl, Sonalan, or Warrant. See label for rotation restrictions, especially corn and grain sorghum. See previous comments on possible cotton injury from Strongarm applied the previous year on some soils.

Table 18. Chemical Weed Control in Peanuts (cont.)

Herbicide and Formulation	Pounds Active Ingredient Per Acre	Precautions and Remarks
sulfentrazone, MOA 14 + carfentrazone, MOA 14 (Spartan Charge (0.35 + 3.15 F)	0.07 to 0.12 (3 to 5 fl oz)	Do not apply Spartan Charge after peanuts crack soil. Application immediately after planting is advised. See label for specific rates based on soil texture and organic matter content. See product label for comments on application with other herbicides. Rotation restriction for planting cotton following Spartan Charge at recommended rates for peanut is 12 months.
diclosulam, MOA 2 (Strongarm 84 WDG) + metolachlor, MOA 15 (Dual Magnum 7.62 EC) (Dual 8 EC) or dimethenamid, MOA 15 (Outlook 6.0 L) Or acetolchlor, MOA 15 (Warrant 3 ME)	0.024 (0.45 oz) + 0.95 to 1.27 (1 to 1.33 pt) 1.5 to 2 pt) or 0.75 to 1 (16 to 21 oz) or 0.94 to 1.5 (1.25 to 2 qt)	Effective on annual grasses, common cocklebur, common ragweed, eclipta, morningglory, and common lambsquarters. Suppresses purple and yellow nutsedge. Does not control sicklepod. See label for rotation restrictions. Some weed species have developed resistance to Strongarm. See previous comments on carryover potential to cotton on some soils and restrictions on planting corn or grain sorghum after use in peanut.

Table 18. Chemical Weed Control in Peanuts (cont.)

Herbicide and Formulation	Pounds Active Ingredient Per Acre	Precautions and Remarks
Preemergence, Most annual broadleaf weeds and nutsedge		
imazethapyr, MOA 2 (Pursuit 2 AS)	0.063 (4 fl oz)	Effective on most common broadleaf weeds and yellow and purple nutsedge. Does not control ragweed, eclipta, lambsquarters, or croton. Pursuit may be tank mixed with Dual, Dual Magnum, Warrant, or Outlook for annual grass control. See label for rotational restrictions. Some weed species have developed resistance to Pursuit. Research in N.C. has generally shown more effective control of a broader spectrum of weeds with split applications of half of the Pursuit applied preplant incorporated followed by the other half applied early postemergence.
Cracking stage, Emerged annual grasses and broadleaf weeds		
paraquat, MOA 22 (Gramoxone 2.5 SL) (Parazone 3 SL)	0.13 (8 oz) (5.4 oz)	Apply at ground cracking for control of small emerged annual grasses and broadleaf weeds. May be tank mixed with Dual, Dual Magnum, Outlook, or Warrant for residual control. Tank mix may increase injury to emerged peanuts. Add 1 pint nonionic surfactant per 100 gallons spray solution. Follow all safety precautions on label. Applying Basagran at 0.5 pt per acre will reduce injury.

Table 18. Chemical Weed Control in Peanuts (cont.)

Herbicide and Formulation	Pounds Active Ingredient Per Acre	Precautions and Remarks
Cracking stage and Postemergence, Additional residual control of annual grasses and certain small-seeded broadleaf weeds		
alachlor, MOA 15	2 to 3	Use as a supplement to preplant or preemergence herbicides to provide additional residual control of annual grasses and certain small-seeded broadleaf weeds such as pigweed and eclipta. This treatment will not control emerged grasses or broadleaf weeds. See product labels for recommended tank mixtures with contact and systemic herbicides with foliar activity on weeds. With the exception of Anthem Flex, these herbicides do not provide appreciable control of weeds that have emerged. Anthem Flex does control morningglory species that have emerged (carfentrazone in Anthem Flex controls morningglory). Peanuts are often injured more by Anthem Flex than other residual herbicides applied to peanut, but injury is generally transient and does not affect yield.
(Intrro 4 EC)	(2 to 3 qt)	
dimethenamid, MOA 15	0.75 to 1	
(Outlook 6.0L)	(16 to 21 oz)	
metolachlor, MOA 15	0.95	
(Dual Magnum 7.62 EC)	1 pt	
(Dual 8 EC)	1.5 pt	
acetochlor, MOA 15	0.95 to 1.5	
(Warrant 3 ME)	(1.25 to 2 qt)	
pyroxasulfone, MOA 15	0.08 to 0.11	
(Zidua 85 WG)	(1.5 to 2.1 oz)	
(Zidua 4.25 SC)	(2.4 to 3.3 oz)	
Pyroxasulfone, MOA 15	0.073	
+	+	
Carfentrazone, MOA 15	0.005	
(Anthem Flex)	(2.5 oz)	
Cracking stage, Most annual broadleaf weeds and nutsedge		
imazethapyr, MOA 2	0.063	Effective on most common broadleaf weeds and yellow and purple nutsedge. Does not control ragweed, eclipta, lambsquarters, or croton. If weeds are emerged, add surfactant or crop oil according to label directions. See label for rotational restrictions. Pursuit may be tank mixed with paraquat. Some weed species have developed resistance to Pursuit.
(Pursuit 2 AS)	(4 oz)	

Table 18. Chemical Weed Control in Peanuts (cont.)

Herbicide and Formulation	Pounds Active Ingredient Per Acre	Precautions and Remarks
Cracking stage, Some emerged broadleaf weeds and suppression of eclipta and yellow nutsedge		
diclosulam, MOA 2 (Strongarm 84 WDG)	0.024 (0.45 oz)	Strongarm can be applied through the cracking stage. Add 1 quart nonionic surfactant per 100 gallons. The spectrum of weeds controlled is much narrower when applied to emerged weeds. Strongarm will not control emerged common lambsquarters or pigweeds but will control common ragweed and morninglories and will suppress yellow nutsedge and eclipta. See product labels for information on mixing Strongarm with other herbicides. Some weed species have developed resistance to Strongarm. See product label for carryover potential to cotton, corn, and grain sorghum. Strongarm suppresses emerged marestail and dogfennel more effectively than other postemergence broadleaf herbicides when applied to small weeds.
Postemergence, Annual broadleaf weeds		
acifluorfen, MOA 14 (Ultra Blazer 2 L)	0.25 to 0.38 (1 to 1.5 pt)	Apply when weeds are small and actively growing. Use minimum of 20 GPA and high pressure (40 to 60 psi). See label for species controlled, maximum weed size to treat, and addition of surfactant. Do not apply more than 2 pints per acre per season. May make sequential applications of 0.25 pound followed by 0.25 pound per acre. Allow at least 15 days between sequential applications. Can be applied with residual herbicides for improved control.

Table 18. Chemical Weed Control in Peanuts (cont.)

Herbicide and Formulation	Pounds Active Ingredient Per Acre	Precautions and Remarks
acifluorfen, MOA 14 (Ultra Blazer 2 L) + 2,4-DB, MOA 4 (Butyrac 200 2 L)	0.25 to 0.38 (1 to 1.5 pt) + 0.25 (16 fl oz)	Addition of 2,4-DB to Ultra Blazer improves control of certain weeds when weed size exceeds that specified on the Ultra Blazer label. See label suggestions on use of surfactant or crop oil. Apply when peanuts are at least 2 weeks old and before pod filling begins. Can be applied with residual herbicides for improved control.
bentazon, MOA 6 (Basagran 4 L)	0.75 to 1 (1.5 to 2 pt)	Apply when weeds are small and actively growing. Use minimum of 20 GPA and high pressure (40 to 60 psi). See label for addition of oil concentrate, species controlled, and maximum weed size to treat. Basagran may also be applied at 1 pint per acre for control of cocklebur, jimsonweed, and smartweed 4 inches or less. Do not apply more than 4 pints of bentazon per acre per season. Can be applied with residual herbicides for improved control.
bentazon, MOA 6 (Basagran 4 L) + acifluorfen, MOA 14 (Ultra Blazer 2 L)	0.5 to 1 (1 to 2 pt) + 0.25 to 0.38 (1 to 1.5 pt)	See above comments for Ultra Blazer and Basagran. See labels for weeds controlled, maximum weed size to treat, and use of adjuvants. Can be applied as a tank mixture or as Storm 4L. Can be applied with residual herbicides for improved control.
bentazon, MOA 6 + acifluorfen, MOA 14 (Storm 4L)	0.5 + 0.25 (1.5 pt)	These rates of bentazon and acifluorfen (Ultra Blazer and Basagran) may not provide consistent control of lambsquarters, prickly sida, spurred anoda, and morningglory. Can be applied with residual herbicides for improved control.

Table 18. Chemical Weed Control in Peanuts (cont.)

Herbicide and Formulation	Pounds Active Ingredient Per Acre	Precautions and Remarks
bentazon, MOA 6 (Basagran 4 L) + acifluorfen, MOA 14 (Ultra Blazer 2 L) + 2,4-DB, MOA 4 (Butyrac 200 2 L)	0.5 (1 pt) + 0.25 (1 pt) + 0.125 to 0.25 (8 to 16 fl oz)	Adding 2,4-DB will improve control of larger morningglory, cocklebur, common ragweed, pigweed, jimsonweed, and citron. Add surfactant or crop oil according to label directions. Apply when peanuts are at least 2 weeks old. Do not apply after pod filling begins. See comments for Ultra Blazer and Basagran alone. Can be applied with residual herbicides for improved control.
bentazon, MOA 6 (Basagran 4 L) + 2,4-DB, MOA 4 (Butyrac 200 2 L)	0.75 to 1 1.5 to 2 pt) + 0.125 (8 fl oz)	Addition of 2,4-DB to Basagran improves control of morninglories. See above comments for Basagran. Add surfactant or crop oil according to label directions. Do not make more than two applications per year. Apply when peanuts are at least 2 weeks old and not within 45 days of harvest. Can be applied with residual herbicides for improved control.
imazapic, MOA 2 (Cadre 2 AS) (Impose 2 AS)	0.063 (4 fl oz)	Controls most broadleaf weeds except ragweed, croton, lambsquarters, and eclipta. Apply before weeds exceed 2 to 4 inches; see label for specific weed sizes to treat. Add nonionic surfactant at 1 quart per 100 gallons or crop oil concentrate at 1 quart per acre. A soil-applied grass control herbicide should be used. However, Cadre will usually control escaped broadleaf signalgrass, large crabgrass, fall panicum, and Texas panicum but not goosegrass. Cadre can be mixed with Cobra, Ultra Blazer, and 2,4-DB. See label for rotational restrictions. Some weed species have developed resistance to Cadre. Can be applied with residual herbicides for improved control.

Table 18. Chemical Weed Control in Peanuts (cont.)

Herbicide and Formulation	Pounds Active Ingredient Per Acre	Precautions and Remarks
imazethapyr, MOA 2 (Pursuit 2 L)	0.063 (4 fl oz)	Effective on most common broadleaf weeds and yellow and purple nutsedge. Does not control eclipta, lambsquarters, ragweed, or croton. Apply when weeds are 3 inches tall or less. Add surfactant or crop oil according to label directions. See label for rotational restrictions. Pursuit rmay be tank mixed with Basagran, Ultra Blazer, Gramoxone, and 2,4-DB. Some weed species have developed resistance to Pursuit.
2,4-DB, MOA 4 (Buryrac 200 2 L)	0.2 (12.5 fl oz)	Apply after peanuts have at least six true leaves. Apply to actively growing peanut. Controls most annual broadleaf weeds. See label for species controlled and maximum weed size to treat. Add nonionic surfactant at 1 quart per 100 gallons or crop oil concentrate or methylated seed oil at 1 to 2 pints per acre. See label on when to use various adjuvants. Allow at least 14 days between applications. Can be tank mixed with Basagran, Pursuit, Cadre, 2,4-DB, and/or Select. Can be applied with residual herbicides for improved control.
lactofen, MOA 14 (Cobra 2 EC) + bentazon, MOA 6 (Basagran 4 L)	0.2 (12.5 fl oz) + 0.75 to 1 (1.5 to 2 pt)	See above comments for Basagran and Lactofen alone. See labels for weeds controlled, maximum weed size to treat, and use of adjuvants. Can be applied with residual herbicides for improved control.

Table 18. Chemical Weed Control in Peanuts (cont.)

Herbicide and Formulation	Pounds Active Ingredient Per Acre	Precautions and Remarks
lactofen, MOA 14 (Cobra 2 EC) + bentazon, MOA 6 (Basagran 4 L) + 2.4-DB, MOA 4 (Butyrac 200 2 L)	0.2 (12.5 fl oz) + 0.75 to 1 (1.5 to 2 pt) + 0.125 to 0.25 (8-16 fl oz)	Adding 2,4-DB will improve control of larger morningglory, cocklebur, common ragweed, jimsonweed, and citron. See above comments for bentazon, lactofen, and 2,4-DB. See labels for weeds controlled, maximum weed size to treat, and use of adjuvants. Can be applied with residual herbicides for improved control.
lactofen, MOA 14 (Cobra 2 EC) + imazapic, MOA 2 (Cadre 2 AS) (Impose 2 AS)	0.2 (12.5 fl oz) + 0.063 (4 fl oz)	See above comments for imazapic and lactofen. See labels for weeds controlled, maximum weed size to treat, and use of adjuvants. Some weed species have developed resistance to Cadre. Can be applied with residual herbicides for improved control.
lactofen, MOA 14 (Cobra 2 EC) + imazethapyr, MOA 2 (Pursuit 2 AS)	0.2 (12.5 fl oz) + 0.063 (4 fl oz)	See above comments for imazethapyr and lactofen. See labels for weeds controlled, maximum weed size to treat, and use of adjuvants. Some weed species have developed resistance to Pursuit.

Table 18. Chemical Weed Control in Peanuts (cont.)

Herbicide and Formulation	Pounds Active Ingredient Per Acre	Precautions and Remarks
paraquat, MOA 22 (Gramoxone 2 SL) (Parazone 3 SL)	0.13 (8 fl oz) (5.4 fl oz)	See label for weeds controlled and maximum weed size to treat; best results if weeds 1 inches or less. A postemergence application may be made following an at-crack application. Do not make more than two applications per season, do not apply later than 28 days after ground cracking, and do not apply if peanuts are under stress or have significant injury from thrips feeding. Gramoxone is more effective when applied within 2 weeks after peanut emergence. Add 1 pint of nonionic surfactant per 100 gallons of spray solution. Will cause foliar burn on peanuts, but peanuts recover, and yield is not affected. Follow all safety precautions on label. Can be applied with residual herbicides for improved control.
paraquat, MOA 22 (Gramoxone 2 SL) (Parazone 3 SL) + bentazon, MOA 6 (Basagran 4 L)	0.13 (8 oz) (5.4 oz) + 0.25 to 0.75 (0.5 to 1.5 pt)	See previous comments for paraquat alone. Adding Basagran improves control of common ragweed, prickly sida, smartweed, lambsquarters, and cocklebur and reduces injury to peanuts from paraquat. May be applied any time from ground cracking up to 28 days after ground cracking. Add 1 pint of nonionic surfactant per 100 gallons of spray solution. Can be applied with residual herbicides for improved control.

Table 18. Chemical Weed Control in Peanuts (cont.)

Herbicide and Formulation	Pounds Active Ingredient Per Acre	Precautions and Remarks
paraquat, MOA 22 (Gramoxone 2 SL) (Parazone 3 SL) + bentazon, MOA 6 + acifluorfen, MOA 14 (Storm 4 L)	0.13 (8 fl oz) (5.4 fl oz) + 0.5 + 0.25 1 pt	See previous comments for paraquat alone. Storm improves control of common ragweed, smartweed, lambsquarters, common cocklebur, tropic croton, and spurred anoda. May be applied anytime from ground cracking up to 28 days after ground cracking. Add 0.5 pint of nonionic surfactant per 100 gallons of spray solution. The mixture of Gramoxone SL and Storm is more injurious than these herbicides applied alone. Can be applied with residual herbicides for improved control.
Postemergence, Florida beggarweed		
chlorimuron, MOA 2 (Classic 0.25 DF)	0.008 (0.5 oz)	Use only for control of Florida beggarweed. Apply from 60 days after crop emergence to within 45 days of harvest. Application to peanuts less than 60 days old will result in crop injury and yield reduction. Apply before Florida beggarweed has begun to bloom and before it has reached 10 inches tall. Larger beggarweed may only be suppressed. Add 1 quart of nonionic surfactant per 100 gallons spray solution; do not add crop oil. May be tank mixed with 2,4-DB; see label for rates and precautions. Recommended as a salvage treatment only.
Postemergence, Yellow nutsedge		
bentazon, MOA 6 (Basagran 4 L)	0.75 to 1 (1.5 to 2 pt)	Apply when nutsedge is 6 to 8 inches tall. A repeat application 7 to 10 days later may be needed. Adding crop oil concentrate at 1 quart per acre will increase control. Do not apply more than 2 pints of Basagran per season. Not effective on purple nutsedge.

Table 18. Chemical Weed Control in Peanuts (cont.)

Herbicide and Formulation	Pounds Active Ingredient Per Acre	Precautions and Remarks
Postemergence, Yellow and purple nutsedge		
imazapic, MOA 2 (Cadre 2 AS) (Impose 2 AS)	0.063 (4 fl oz)	Apply postemergence when nutsedge is 4 inches or less. Add nonionic surfactant at 1 quart per 100 gallons or crop oil concentrate at 1 quart per acre. See label for rotational restrictions.
imazethapyr, MOA 2 (Pursuit 2 AS)	0.063 (4 fl oz)	Apply before nutsedge is larger than 3 inches tall. Add surfactant at 1 quart per 100 gallons or crop oil concentrate at 1 quart per acre. Do not mix with Basagran for nutsedge control. See label for rotational restrictions. A split application with half of the Pursuit applied preplant incorporated and half applied early postemergence may be more effective than applying all of the Pursuit at one time.
Postemergence, Annual grasses		
clethodim, MOA 1 (Select Max 0.97 EC) (Various “2 EC” formulations)	0.094 to 0.125 (9 to 16 fl oz) (6 to 8 fl oz)	Apply Select and Poast to actively growing grass not under drought stress. Consult labels for maximum grass size to treat. Apply in 5 to 20 GPA at 40 to 60 psi. Do not cultivate within 7 days before or after application. Add 2 pints crop oil to Poast. See label for adjuvant use with Select or Select Max. Some broadleaf/sedge herbicides and fungicides can reduce the efficacy of Select and Poast when applied in tank mixtures. See product labels for specific instructions concerning compatibility with other chemicals. See Chapter 9 in 2021 Peanut Information AG-331 for specific pesticides that reduce control by these herbicides.
sethoxydim, MOA 1 (Poast 1 EC) (Poast Plus 1.5 EC)	0.19 (1.5 pt) (1 pt)	

Table 18. Chemical Weed Control in Peanuts (cont.)

Herbicide and Formulation	Pounds Active Ingredient Per Acre	Precautions and Remarks
Postemergence, Bermudagrass		
clethodim, MOA 1	0.125 to 0.25	Apply to actively growing bermudagrass before runners exceed 6 inches In most cases, a second application will be needed. Make second application if regrowth occurs. See comments under annual grasses for adjuvant selection and tank mixing for these herbicides.
(Select Max 0.97 EC)	(12 to 32 fl oz)	
(Various “2 EC” formulations)	(8 to 16 fl oz)	
sethoxydim, MOA 1	0.28	
(Poast 1 EC)	(2.25 pt)	
(Poast Plus 1.5 EC)	(1.5 pt)	
Postemergence, Rhizome johnsongrass		
clethodim, MOA 1	0.125 to 0.25	Apply to actively growing johnsongrass before it exceeds 25 inches tall. Add 2 pints per acre of crop oil concentrate. A second application of the same rates can be made if needed before new plants or regrowth exceeds 12 inches.
(Select Max 0.97 EC)	(12 to 32 fl oz)	
(Various “2 EC” formulations)	(8 to 16 fl oz)	
sethoxydim, MOA 1	0.28	
(Poast 1 EC)	(2.25 pt)	
(Poast Plus 1.5 EC)	(1.5 pt)	

Table 18. Chemical Weed Control in Peanuts (cont.)

Herbicide and Formulation	Pounds Active Ingredient Per Acre	Precautions and Remarks
Postemergence, Suppression of large Palmer amaranth and other pigweed species that are resistant to the ALS inhibiting herbicides imazapic, chlorimuron, imazethapyr, and diclosulam		
2,4-DB, MOA 4 (Buryrc 200 2 SL) + lactofen, MOA 14 (Cobra 2 EC) or acifluorfen, MOA 14 (Ultra Blazer 2 L)	0.25 (16 fl oz) + 0.20 (12.5 fl oz) or 0.38 (1.5 pt)	Suppresses and does not completely control Palmer amaranth and other pigweed species that exceed 8 inches. Suppression of weeds exceeding 12 inches will be less than suppression of smaller weeds. Do not expect suppression to exceed 60%. Applying 2,4-DB 3 to 4 days prior to Ultra Blazer or Cobra may be more effective than tank mixtures of 2,4-DB with Ultra Blazer or Cobra. Cobra is generally more effective on larger Palmer amaranth and other pigweed species than Ultra Blazer. Apply crop oil concentrate at 1 gallon per 100 gallons water with acifluorfen or lactofen. See product labels for comments on spray volume and effects on peanut especially during pod set and pod fill. Higher spray volumes are more effective by increasing spray coverage of the contact herbicides Ultra Blazer and Cobra.
2,4-DB, MOA 4 (Butyrac 200 2 SL) then lactofen, MOA 14 (Cobra 2 EC) or acifluorfen, MOA 14 (Ultra Blazer 2 L)	0.25 (16 fl oz) then 0.20 (12.5 fl oz) or 0.38 (1.5 pt)	
2,4-DB, MOA 4 (Butyrac 200 2 L) then 2,4-DB, MOA 4 (Butyrac 200 2 L)	0.25 (16 oz) then 0.25 (16 oz)	Two applications of 2,4-DB spaced 10 to 14 days apart will suppress Palmer amaranth and other pigweed species. Although suppression by 2,4-DB is lower than sequential or tank mix application of 2,4-DB and acifluorfen or lactofen within two weeks after application, suppression by sequential applications of 2,4-DB 4 to 5 weeks after initial application is only slightly lower than suppression by sequential or tank mix application of 2,4-DB and Ultra Blazer or Cobra.

Table 18. Chemical Weed Control in Peanuts (cont.)

Herbicide and Formulation	Pounds Active Ingredient Per Acre	Precautions and Remarks
paraquat, MOA 22 (Gramoxone SL)	See comments	Apply in a roller/wiper implement. Best control achieved when at least 60% coverage of weed foliage occurs. Do not allow paraquat to contact peanut foliage. Mix 1 part Gramoxone SL (other formulations may not be labeled) with 1 to 1.5 parts water to prepare 40 to 50% solution. Add nonionic surfactant at 1 quart per 100 gallons. Adjust equipment to apply up to 2 pints per acre of the herbicide-water mixture.
Postemergence, Late-season residual control of annual grasses and certain small-seeded weeds		
dimethenamid, MOA 15 (Outlook 6.0 L)	0.75 to 1 (16 to 21 fl oz)	Will not control emerged grasses or weeds; apply following a cultivation or appropriate postemergence her-bicide if emerged grasses or broad-leaf weeds are present. Benefit likely only on very sandy fields heavily in-fested with annual grasses that re-ceive above normal rainfall during the first 4 to 5 weeks of the growing season. Lay-by of Dual Magnum, Outlook, Warrant, or Anthem Flex may also be of value in fields with a history of eclipta problems; the ap-plication must be made before eclipta emerges. Rates are on a broadcast basis; apply in an 18-inch band to row middles. Anthem Flex also provides post-emergence con-trol of broadleaf weeds. Anthem Flex improves the control of emerged morningglory. This product may cause leaf burn and stunting but does not lead to yield reduction. See labels for preharvest intervals.
metolachlor, MOA 15 (Dual Magnum 7.62 EC)	0.64 to 0.84 (0.67 to 0.88 pt)	
acetochlor, MOA 15 (Warrant 3 ME)	0.95 to 1.5 (1.25 to 2 qt)	
Pyroxasulfone, MOA 15 + Carfentrazone, MOA 15 (Anthem Flex)		

Table 18. Chemical Weed Control in Peanuts (cont.)

Herbicide and Formulation	Pounds Active Ingredient Per Acre	Precautions and Remarks
Postemergence, Harvest Aide for morningglory control		
Carfentrazone, MOA 14 (Aim 2 EC)	0.016 to 0.031 (1.0 to 2.0 oz)	Aim desiccates annual morningglory. Apply with nonionic surfactant at 1 quart per 100 gal or crop oil concentrate at 1 gal per 100 gal within 7 days of optimum pod maturity and digging and vine inversion. Do not apply earlier in the season. Yield reductions occur when applied prior to 7 days before optimum pod maturity.

Table 19. Weed Response to Preplant Incorporated, Preemergence, At-Cracking, and Postemergence Herbicides in Peanuts

Herbicides Key: PPI = Preplant Incorporated; PRE = Preemergence; AC= At-Cracking; POST = Postemergence

	Prowl or Sonalan PPI	Prowl or Sonalan + Dual Magnum or Dual PPI	Prowl or Sonalan + Outlook PPI	Dual Magnum or Dual PPI	Warrant PPI	Outlook PPI	Strongarm PPI or PRE	Prowl or Sonalan + Strongarm PPI	Dual Magnum, Dual or Outlook PPI or PRE	Pursuit PPI + POST	Dual Magnum or Dual PRE	Intrro PRE	Warrant PRE	Outlook PRE	Valor SX PRE	Prowl or Sonalan PPI + Valor SX PRE	Dual Magnum, Dual, Outlook or Warrant + Valor SX PRE	Dual Magnum or Dual AC[1]	Intrro AC[1]	Outlook AC[1]	Gramoxone SL AC or POST	Strongarm AC[2]	Gramoxone + Strongarm AC[2]	Zidua, AC[2], or POST[1]	Anthem Flex, AC[2], or POST[1]
Bermudagrass	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	P	N	P	N	N
Black nightshade	N	F	F	F	F	F	N	N	F	G	F	FG	FG	F	E	E	E	F	FG	F	PF	N	G	F	F
Broadleaf signalgrass	G	E	E	G	FG	FG	P	G	G	G	G	FG	FG	FG	P	G	FG	G	FG	FG	E	N	GE	FG	FG
Carpetweed	G	G	G	FG	FG	FG	G	G	G	FG	FG	FG	FG	G	–	G	G	FG	FG	G	FG	–	G	G	G
Cocklebur	N	N	N	N	N	N	G	G	G	GE	N	N	N	N	PF	PF	PF	N	N	N	E	E	E	N	N
Common ragweed	N	P	PF	PF	PF	F	G	G	GE	P	PF	PF	PF	F	FG	G	GE	PF	PF	F	F	E	E	FG	F
Crabgrass	E	E	E	E	E	E	P	E	E	F	E	E	E	E	PF	E	E	E	E	E	G	N	G	E	E
Crowfootgrass	E	E	E	E	E	E	–	–	–	–	E	E	E	E	PF	G	G	E	E	E	E	N	GE	E	E
Dayflower	P	GE	–	GE	–	–	G	G	GE	–	GE	–	–	–	F	F	GE	GE	–	–	–	–	G	–	–
Eclipta	N	G	G	G	FG	G	GE	GE	GE	P	FG	FG	FG	FG	G	G	GE	FG	FG	FG	FG	NP	FG	FG	FG
Fall panicum	G	E	E	E	E	E	P	E	E	PF	E	E	E	E	PF	FG	GE	E	E	E	E	N	GE	E	E

Table 19. Weed Response to Preplant Incorporated, Preemergence, At-Cracking, and Postemergence Herbicides in Peanuts (cont.)

Herbicides Key: PPI = Preplant Incorporated; PRE = Preemergence; AC= At-Cracking; POST = Postemergence

	Prowl or Sonalan PPI	Prowl or Sonalan + Dual Magnum or Dual PPI	Prowl or Sonalan + Outlook PPI	Dual Magnum or Dual PPI	Warrant PPI	Outlook PPI	Strongarm PPI or PRE	Prowl or Sonalan + Strongarm PPI	Dual Magnum, Dual or Outlook PPI or PRE	Pursuit PPI + POST	Dual Magnum or Dual PRE	Intrro PRE	Warrant PRE	Outlook PRE	Valor SX PRE	Prowl or Sonalan PPI + Valor SX PRE	Dual Magnum, Dual, Outlook or Warrant + Valor SX PRE	Dual Magnum or Dual AC[1]	Intrro AC[1]	Outlook AC[1]	Gramoxone SL AC or POST	Strongarm AC[2]	Gramoxone + Strongarm AC[2]	Zidua, AC[2], or POST[1]	Anthem Flex, AC[2], or POST[1]
Florida beggarweed	N	PF	PF	F	F	F	F	F	F	P	F	F	F	F	G	GE	E	F	F	F	E	FG	G	F	F
Foxtails	E	E	E	E	E	E	P	E	E	G	E	E	E	E	PF	E	E	E	E	E	E	N	GE	E	E
Goosegrass	E	E	E	E	E	E	P	E	E	PF	E	E	E	E	PF	GE	E	E	E	E	E	N	GE	E	E
Jimsonweed	N	N	N	N	N	N	GE	GE	GE	G	N	N	N	N	G	G	GE	N	N	N	E	–	E	N	N
Johnsongrass, Seedling	G	G	G	PF	PF	PF	N	G	PF	GE	PF	PF	PF	PF	N	FG	PF	PF	PF	PF	E	N	GE	PF	PF
Johnsongrass, Rhizome	P	PF	PF	N	N	N	N	P	N	FG	N	N	N	N	N	N	N	N	N	N	P	N	P	N	N
Lambsquarters	G	NG	G	F	F	FG	FG	GE	GE	FG	F	F	F	FG	GE	GE	GE	F	F	FG	F	N	G	FG	FG
Morningglory	P	P	P	N	N	N	G	G	G	G	N	N	N	N	FG	G	G	N	N	N	F	GE	E	N	GE
Nutsedge, Yellow	N	G	FG	G	N	FG	FG	FG	G	FG	FG	P	N	F	P	PF	FG	FG	P	F	PF	PF	G	F	F
Nutsedge, Purple	N	N	N	N	N	N	FG	FG	FG	FG	N	N	–	N	P	P	P	N	N	N	PF	NP	PF	N	N

Table 19. Weed Response to Preplant Incorporated, Preemergence, At-Cracking, and Postemergence Herbicides in Peanuts (cont.)

Herbicides Key: PPI = Preplant Incorporated; PRE = Preemergence; AC= At-Cracking; POST = Postemergence

	Prowl or Sonalan PPI	Prowl or Sonalan + Dual Magnum or Dual PPI	Prowl or Sonalan + Outlook PPI	Dual Magnum or Dual PPI	Warrant PPI	Outlook PPI	Strongarm PPI or PRE	Prowl or Sonalan + Strongarm PPI	Dual Magnum, Dual or Outlook PPI or PRE	Pursuit PPI + POST	Dual Magnum or Dual PRE	Intrro PRE	Warrant PRE	Outlook PRE	Valor SX PRE	Prowl or Sonalan PPI + Valor SX PRE	Dual Magnum, Dual, Outlook or Warrant + Valor SX PRE	Dual Magnum or Dual AC[1]	Intrro AC[1]	Outlook AC[1]	Gramoxone SL AC or POST	Strongarm AC[2]	Gramoxone + Strongarm AC[2]	Zidua, AC[2], or POST[1]	Anthem Flex, AC[2], or POST[1]
Palmer amaranth and other pigweed	G	E	E	G	G	G	G	E	E	E	G	GE	G	GE	E	E	E	G	GE	GE	E	NP	E	GE	GE
Prickly sida	N	P	P	P	P	P	FG	FG	FG	G	P	P	P	P	FG	G	G	P	P	P	F	–	G	P	P
Purslane	G	GE	GE	G	FG	G	–	G	G	–	G	G	FG	G	G	GE	GE	GE	P	P	–	–	–	G	P
Sicklepod	N	NP	NP	NP	NP	NP	P	P	P	P	NP	PF	NP	NP	P	PF	PF	NP	PF	NP	G	N	G	NP	NP
Smartweed	N	N	N	N	N	N	G	G	G	G	N	N	N	N	–	–	–	N	N	N	G	–	E	N	N
Spurge spp.	P	F	F	PF	P	PF	–	–	–	P	F	P	P	F	G	G	G	N	N	N	F2	–	F2	N	N
Spurred anoda	N	N	N	N	N	N	FG	FG	FG	G	N	N	N	N	F	FG	FG	N	N	N	P	–	G	N	F
Texas panicum	G	G	G	PF	PF	PF	P	G	PF	PF	PF	PF	PF	PF	PF	G	F	PF	PF	PF	E	N	GE	F	F
Tropic croton	N	N	N	N	N	N	PF	PF	PF	P	N	N	N	N	–	–	-	N	N	N	F	–	F	N	N
Velvetleaf	N	N	N	N	N	N	GE	GE	GE	FG	N	N	N	N	F	FG	FG	N	N	N	F	–	FG	N	N

[1] *Residual control only (except morningglory control by Anthem Flex).*

[2] *Assumes weeds are 1- to 2-inches tall or smaller.*

Table 20. Weed Response to Postemergence Herbicides — Peanuts

Key: E = excellent control, 90% or better; G = good control, 80% to 90%; F = fair control, 50% to 80%; P = poor control, 25% to 50%; N = no control, less than 25%	Herbicides Key: PPI = Preplant Incorporated; PRE = Preemergence; AC= At-Cracking; POST = Postemergence																			
	Butyrac 200	Gramoxone[1]	Gramoxone + Basagran	Gramoxone + Storm	Basagran	Basagran +Butyrac 200	Ultra Blazer	Ultra Blazer + Butyrac 200	Ultra Blazer + Basagran[2]	Storm	Storm + Butyrac 200	Pursuit + Butyrac 200	Cadre or Impose	Cobra	Cobra + Basagran	Cobra + Basagran + Butyrac 200	Cobra + Cadre or Impose	Cobra + Pursuit	Poast or Poast Plus	Clethodim products
Bermudagrass	N	P	P	P	N	N	N	N	P	N	N	N	N	N	N	N	N	N	FG	G
Black nightshade	N	PF	PF	G	P	P	G[1]	G[1]	G[1]	G[1]	G[1]	G	G	G[1]	G[1]	G[1]	G	G	N	N
Broadleaf signalgrass	N	GE	E	GE	N	N	NP	NP	P	NP	NP	G	G	N	N	N	G	G	E	E
Carpetweed	P	FG	FG	G	P	P	GE	E	E	G	G	FG	FG	G	G	G	G	G	N	N
Cocklebur	E	G	E	E	E	E	G	E	E	E	E	E	E	G	G	E	E	E	N	N
Common ragweed	PF	F	G	E	G[4]	G[4]	E[1]	E[1]	E[1]	E[1]	E[1]	P	PF	E	E	E	E	E	N	N
Crabgrass	N	G	G	G	N	N	N	N	N	N	N	FG	FG	N	N	N	FG	FG	GE	GE
Crowfootgrass	N	GE	G	GE	N	N	P	P	P	P	P	P	G	N	N	N	G	P	F	G
Dayflower	–	G	G	FG	G	G	–	–	G	FG	FG	–	G	–	G	G	G	–	N	N
Eclipta	P	F	F	FG	FG	FG	G	G	G	FG	FG	P	F	G	G	G	G	G	N	N
Fall panicum	N	GE	G	GE	N	N	PF	PF	P	PF	PF	PF	G	N	N	N	G	PF	E	E

Table 20. Weed Response to Postemergence Herbicides — Peanuts (cont.)

Key:

E = excellent control, 90% or better

G = good control, 80% to 90%

F = fair control, 50% to 80%

P = poor control, 25% to 50%

N = no control, less than 25%

	Herbicides Key: PPI = Preplant Incorporated; PRE = Preemergence; AC= At-Cracking; POST = Postemergence																			
	Butyrac 200	Gramoxone[1]	Gramoxone + Basagran	Gramoxone + Storm	Basagran	Basagran +Butyrac 200	Ultra Blazer	Ultra Blazer + Butyrac 200	Ultra Blazer + Basagran[2]	Storm	Storm + Butyrac 200	Pursuit + Butyrac 200	Cadre or Impose	Cobra	Cobra + Basagran	Cobra + Basagran + Butyrac 200	Cobra + Cadre or Impose	Cobra + Pursuit	Poast or Poast Plus	Clethodim products
Florida beggarweed	P	G	GE	G	N	P	PF	F	F	P	P	P	F	F	F	F	F	F	N	N
Foxtails	N	GE	G	GE	N	N	PF	PF	P	PF	PF	G	G	N	N	N	G	G	E	E
Goosegrass	N	GE	G	GE	N	N	N	N	N	N	N	N	F	N	N	N	F	N	GE	GE
Jimsonweed	P	G	E	E	E	E	E	E	E	E	E	G	E	E	E	E	E	E	N	N
Johnsongrass, Seedling	N	GE	GE	GE	N	N	P	P	P	P	P	GE	E	N	N	N	E	GE	E	E
Johnsongrass, Rhizome	N	P	P	P	N	N	N	N	N	N	N	F	FG	N	N	N	FG	F	G	GE
Lambsquarters	PF	F	G	G	FG	G[4]	G	G	GE	G	G	P	PF	P	FG	G	PF	P	N	N
Morningglory, Pitted	FG	F	FG	E	P	G	E	E	E	E	E	G	GE	G	G	G	GE	G	N	N
Morningglory, Others	E	F	FG	E	P	E	GE	E	E	GE	E	E	G	G	G	E	G	E	N	N

Table 20. Weed Response to Postemergence Herbicides — Peanuts (cont.)

Key:

E = excellent control, 90% or better

G = good control, 80% to 90%

F = fair control, 50% to 80%

P = poor control, 25% to 50%

N = no control, less than 25%

	Herbicides Key: PPI = Preplant Incorporated; PRE = Preemergence; AC= At-Cracking; POST = Postemergence																			
	Butyrac 200	Gramoxone[1]	Gramoxone + Basagran	Gramoxone + Storm	Basagran	Basagran +Butyrac 200	Ultra Blazer	Ultra Blazer + Butyrac 200	Ultra Blazer + Basagran[2]	Storm	Storm + Butyrac 200	Pursuit + Butyrac 200	Cadre or Impose	Cobra	Cobra + Basagran	Cobra + Basagran + Butyrac 200	Cobra + Cadre or Impose	Cobra + Pursuit	Poast or Poast Plus	Clethodim products
Nutsedge, Yellow	N	PF	FG	G	G[3]	G	N	N	G	F	F	F	G	N	G[3]	G[3]	G	F	N	N
Nutsedge, Purple	N	PF	PF	PF	NP	P	N	N	P	N	N	FG	G	N	P	P	G	FG	N	N
Palmer amaranth and other pigweed	PF F	G F	G G	E G	N G	P G	E N	E F	E G	E FG	E G	E P	E G	E G	E G	E G	E G	E G	N N	N N
Prickly sida	FG	–	G	G	G	G	E	E	E	GE	GE	FG	–	E	E	E	E	E	N	N
Purslane																				
Sicklepod	G[3]	G	G	G	N	G[6]	NP	G[6]	NP	NP	G[6]	G[6]	E	P	P	G[6]	E	F	N	N
Smartweed	PF	G	E	E	E	E	GE	E	E	E	E	G	F	F	E	E	F	G	N	N
Spurge spp.	P	F[1]	F[1]	F[1]	P	P	F[1]	F[1]	F[1]	PF[1]	PF[1]	PF[1]	–	F[1]	F[1]	F[1]	F[1]	–	N	N
Spurred anoda	P	P	FG	G	G	GE	P	P	G	F	F	F	G	F	G	GE	G	F	N	N

Table 20. Weed Response to Postemergence Herbicides — Peanuts (cont.)

Key: E = excellent control, 90% or better G = good control, 80% to 90% F = fair control, 50% to 80% P = poor control, 25% to 50% N = no control, less than 25%	Herbicides Key: PPI = Preplant Incorporated; PRE = Preemergence; AC= At-Cracking; POST = Postemergence																			
	Butyrac 200	Gramoxone[1]	Gramoxone + Basagran	Gramoxone + Storm	Basagran	Basagran +Butyrac 200	Ultra Blazer	Ultra Blazer + Butyrac 200	Ultra Blazer + Basagran[2]	Storm	Storm + Butyrac 200	Pursuit + Butyrac 200	Cadre or Impose	Cobra	Cobra + Basagran	Cobra + Basagran + Butyrac 200	Cobra + Cadre or Impose	Cobra + Pursuit	Poast or Poast Plus	Clethodim products
Texas panicum	N	GE	G	GE	N	N	NP	NP	NP	NP	NP	NP	G	N	N	N	G	NP	E	E
Tropic croton	PF	F	F	G	F	F	G	G	G	G	G	P	P	G	G	G	G	G	N	N
Velvetleaf	P	F	G	FG	G	G	PF	PF	FG	FG	FG	FG	G	G	G	G	G	G	N	N

[1] Assumes weeds are 1 to 2 inches tall or smaller.

[2] Assumes optimum rates and ratios of Basagran and Blazer; see labels.

[3] Two applications, 10 to 14 days apart.

[4] Assumes optimum conditions and addition of crop oil concentrate.

[5] Ratings assume weeds in one- to two-leaf stage.

[6] Assumes follow-up treatment with 2,4-DB.

Table 21. Restriction on Feeding Peanut Hay to Livestock Following Treatment with Herbicides

Feeding Restricted (Do not feed treated hay to livestock.)	No Feeding Restrictions or Defined Feeding Restrictions*
2,4-DB, Aim, Cadre, clethodim-containing products, Cobra, Impose, Poast, Poast Plus, Pursuit, Sonalan, Storm, Ultra Blazer	Basagran, Dual Magnum, Gramoxone SL, Outlook, Prowl, Zidua

* See product labels for specific information.

Table 22. Suggested Rain-free Periods After Application of Postemergence Herbicides

Herbicide	Rain-free Period (hours)	Herbicide	Rain-free Period (hours)
2,4-DB	NR**	Paraquat	0.5
Arrow	1		1
Basagran	NR*		1
Ultra Blazer	NR*		1
Cadre, Impose	3		1
Classic	1	Storm	NR*
Cobra	1		

* No restriction listed on label. Suggest 4 to 6 hours for best results.

** No restriction listed on label. Suggest at least 1 hour for best results.

Table 23. Restrictions on Crop Rotation of Herbicides with Significant Residual Activity Applied to Peanuts

Herbicide	Corn	Cotton	Soybean	Tobacco	Wheat	Grain Sorghum
Anthem Flex	NR	2 months	NR	9 months	4 – 6 months***	6 – 12 months***
Cadre, Impose	9 months	18 months	9 months	9 months	4 months	18 months
Pursuit	NR/8.5 months*	9.5 months/ 18 months*	NR	9.5 months	4 months	18 months
Strongarm	18 months**	9 months	NR	> 18 months	4 months	18 months
Valor	NR	NR	NR	NR	4 months	NR
Prowl	Following year	NR	NR	NR	4 months	NR

Table 23. Restrictions on Crop Rotation of Herbicides with Significant Residual Activity Applied to Peanuts (cont.)

Herbicide	Corn	Cotton	Soybean	Tobacco	Wheat	Grain Sorghum
Outlook	NR	Following year	NR	NR	4 months	NR
Dual Magnum	NR	NR	NR	NR	4.5 months	NR
Warrant	NR	NR	NR	NR	4 months	NR
Zidua	NR	NR	NR	18 months	4 – 6 months***	6 – 12 months***

NR = no restriction.

*No restriction and 9.5 months if applied postemergence; 8.5 and 18 months if applied preplant incorporated.

See label on rainfall and temperature requirements.

**No restriction if appropriate IMI-tolerant corn hybrid is planted. See label for specific instructions.

***See label for Anthem Flex and Zidua rates.

Preventing and Managing Herbicide-Resistant Weeds

Populations of weeds that were once controlled by specific herbicides have developed resistance to these herbicides. Historically, the resistance of individual weeds within a population of a species has rarely occurred. However, increased selection pressure and the occurrence of cross and multiple resistance have resulted in increased frequency of herbicide resistance in some peanut fields. Two steps are critical to prevent yield loss from weed interference and preserve herbicide effectiveness: (1) determine whether weed escapes are herbicide resistant, and (2) develop an appropriate management strategy for herbicide-resistant weeds. While most weed escapes are the result of an application error or weather conditions, herbicide resistance is a real threat. Indicators of herbicide resistance, approaches to managing herbicide-resistant weed populations, and classification of resistance potential by mode of action are listed in Tables 24 and 25. Note that herbicides that are generally not prone to having resistance populations develop can become ineffective if they are used repeatedly without implementation of other weed management practices. The intensity of selection pressure (frequency of application) and likelihood of resistance to develop for a particular herbicide are the two essential elements in determining occurrence of herbicide resistant biotypes. Contact your local Cooperative Extension agent if herbicide resistance is suspected.

In North Carolina and Virginia, populations of Palmer amaranth and common ragweed resistant to acetolactate synthase (ALS) inhibiting herbicides have been confirmed. The effectiveness of the herbicides Cadre, Pursuit, and Strongarm will be less in fields where resistant populations exist. To manage weeds in these fields, growers must use herbicides with a different mode of action from the ALS-inhibiting herbicides. This goal can be accomplished in a variety of ways, including

application of herbicide mixtures to broaden the spectrum of control.

While not confirmed, it is speculated that populations of Palmer amaranth resistant to PPO-inhibiting herbicides (Valor SX, Cobra, Ultra Blazer, and Storm) are present in North Carolina. Although PPO-herbicide-resistant weeds have not been documented in Virginia, it has been suggested to prevent weeds escaping PPO-inhibiting herbicides from reproducing when these weed escapes are first observed. Experiences with development of Palmer amaranth resistance to glyphosate and ALS-inhibiting herbicides reminds us that recognizing and addressing resistant populations when they first develop is critical.

Table 24. Identification and Management of Herbicide-Resistant Weeds
Possible reasons why herbicides do not control weeds that are NOT associated with herbicide resistance:
Improper herbicide choice or rate.
Poor or improper application of herbicide.
Poor timing of herbicide application.
Weather conditions were not favorable when herbicide was applied.
Weeds emerged after the postemergence herbicide was applied.
Other chemicals antagonized the herbicide.
Indicators suggesting that weeds are resistant to herbicides:
Herbicide normally controls the weed in question.
Performance poor on one species while other species are controlled well. Poor control is confined to spots in the field.
Some plants of the weed in question are controlled well while other plants of that species are controlled poorly.
Field history of heavy use of herbicides with the same mechanism of action.
Steps to take to prevent or manage herbicide resistance:
Rotate herbicides having different mechanisms of action.
Use tank mixes or sequential applications of herbicides having different mechanisms of action.
Be especially vigilant when using herbicides with higher risk of resistance development.
Integrate nonchemical controls when possible.
Avoid allowing weeds to produce seeds when herbicide resistance is suspected.

Table 24. Identification and Management of Herbicide-Resistant Weeds (cont.)
Additional key points:
Although some herbicides inherently are at low risk for resistance development, selection pressure (the frequency of herbicide applications with the same mode of action) can overcome the low or moderate theoretical possibility of resistance developing. Spraying weeds that are large and beyond the recommendation on the herbicide label is equivalent to applying herbicides at rates lower than the recommended labeled rates applied to small weeds. This approach increases the decreases the length of time (number of generations) required for weed populations to become resistant.

Table 25. Herbicide Categories Prone to Have Weeds Develop Resistance

Trade Name	Common Name	Family	MOA
ALS* Inhibitors—Weeds highly susceptible to developing resistance			
Cadre, Impose, Pursuit	Imazapic, Imazethapyr	Imidazolinone	2
Strongarm	Diclosulam	Triazolopyrimidine	2
Classic	Chlorimuron	Sulfonyl urea	2
ACCase* Inhibitor—Weeds moderately to highly susceptible to developing resistance			
Arrow, Clethodim, Cleanse, Select, Select MAX, Tapout, Volunteer	Clethodim	Cyclohexanedione	1
Poast, Poast Plus	Sethoxydim	Cyclohexanedione	1
Microtubule Assembly Inhibition—Weeds moderately susceptible to developing resistance			
Prowl	Pendimethalin	Dinitroaniline	3
Sonalan	Ethafluralin	Dinitroaniline	3
Herbicides at low to moderate risk for resistance development			
Aim	Carfentrazone ethyl	Aryltriazinone	14
Anthem Flex	Pyroxasulfone + Carfentrazone ethyl	azole + Aryltriazinone	15
Basagran	Bentazon	Benzothiadiazole	6
Cobra	Lactofen	Diphenylether	14
Gramoxone SL	Paraquat	Bipyridilium	22
Dual Magnum	Metolachlor	Chloroacetamide	15
Intrro	Alachlor	Chloroacetamide	15
Outlook	Dimethenamid	Chloroacetamide	15
Spartan Charge	Carfentrazone + Sulfentrazone	Triazolinone + Triazolinone	14

Table 25. Herbicide Categories Prone to Have Weeds Develop Resistance (cont.)

Trade Name	Common Name	Family	MOA
Storm	Acifluorfen + Bentazon	Diphenylether + Benzothiadiazole	14 + 6
Ultra Blazer	Acifluorfen	Diphenylether	14
Valor SX (various formulations	Flumioxazin	*N*-phenylphtalimide derivative	14
Warrant	Acetochlor	Chloroacetamide	15
Zidua	Pyroxasulfone	Pyrazole	15
2,4-DB (various formulations)	2,4-DB	Phenoxy	4

*ALS = acetolactate synthase; ACCase = acetyl CoA carboxylase; MOA, mode of action.

Table 26. General Recommendations on Herbicides to Use in a Comprehensive Weed Management Program for Peanuts

Herbicide	Timing	Should these herbicides be used?
Prowl or Sonalan	Preplant incorporated	**Yes.** These herbicides are relatively inexpensive and provide early season control of grasses and small-seeded broadleaf weeds. Although Prowl can be applied preemergence, it is generally more effective incorporated. Sonalan always needs to be incorporated. These herbicides are an important part of a comprehensive weed management strategy and should always be applied.
Dual Magnum (various formulations), Outlook, or Warrant	Preplant incorporated or preemergence	**Yes.** These herbicides are important in suppressing yellow nutsedge, especially Dual Magnum, and provide control of small-seeded broadleaf weeds including pigweeds. While these herbicides do not control weeds for the entire season, they provide good early-season control and are an important foundation of a comprehensive weed management strategy for peanuts.

Table 26. General Recommendations on Herbicides to Use in a Comprehensive Weed Management Program for Peanuts (cont.)

Herbicide	Timing	Should these herbicides be used?
Valor SX (various formulations) or Strongarm	Preemergence	**Yes.** Under current situations with increased prevalence of Palmer amaranth and traditional broadleaf weeds such as eclipta, common ragweed, and common lambsquarters, one of these two herbicides is needed in a comprehensive weed management strategy for peanuts. Valor SX provides excellent rotation options for crops grown the following season, while Strongarm will carry over to corn and grain sorghum, and there is some concern about carryover to cotton on some soils. Weeds present, especially Palmer amaranth, that express resistance to Strongarm keep this herbicide from being a complete answer in some fields. Although Valor SX is effective early in the season, the rate used in peanut (2 oz/acre) generally does not control morningglories and will not control other weeds season-long every year.
Paraquat plus Basagran plus Anthem Flex, Dual Magnum (various formulations), Outlook, Warrant, or Zidua	At cracking or early postemergence	**Yes.** Given that Palmer amaranth is present in many fields and that preplant incorporated and preemergence herbicides often are incomplete in control due to weather conditions or poor incorporation, this treatment (paraquat, with Gramoxone SL being the most prevalent commercial product) can often clean up fields when applied on time, taking pressure off of other postemergence options. Basagaran reduces injury from paraquat. In fields with known histories of Palmer amaranth and other problematic weeds, applying Anthem Flex, Dual Magnum, Outlook, Warrant, or Zidua with paraquat plus Basagran will improve early-season weed control. Apply paraquat early in the season, no later than 28 days after peanuts emerge, but preferably within the first three weeks. Anthem Flex causes more injury than other residual herbicides, but injury is transient and research data indicate that it does not adversely affect peanut yield.

Table 26. General Recommendations on Herbicides to Use in a Comprehensive Weed Management Program for Peanuts (cont.)

Herbicide	Timing	Should these herbicides be used?
Cobra, Ultra Blazer, Storm, Basagran	Postemergence	**Most likely.** These herbicides should be applied as needed. In fact, many if not most peanut fields will need at least one application of these herbicides. Weed size has a major impact on the degree of control obtained with these herbicides. If weeds exceed 3 inches, control is often incomplete. When preplant incorporated or preemergence herbicides are not applied or are marginally effective, growers often have to apply repeat applications of these herbicides (Cobra, Storm, Ultra Blazer). Multiple applications in some cases can negatively affect peanut yield. For this reason growers are encouraged to have a comprehensive program of preplant incorporated and preemergence herbicides and apply paraquat plus Basagran to take the pressure off of Cobra, Storm, and Ultra Blazer. Note that Storm does not contain sufficient Ultra Blazer to control Palmer amaranth and other weeds in most cases, so adding additional Ultra Blazer to Storm is recommended in some circumstances. Residual herbicides can be added to improve control (see comments under Paraquat plus Basagran).
Postemergence grass herbicides (clethodim and sethoxydim are active	Postemergence	**Most likely.** Preplant incorporated and preemergence herbicides often control annual grasses through midseason and sometimes late into the season. However, many fields need a postemergence application of sethoxydim (several formulations) or clethodim (several formulations). These herbicides should be applied as needed because grasses often cause peanut pod loss during the digging process

Table 26. General Recommendations on Herbicides to Use in a Comprehensive Weed Management Program for Peanuts (cont.)

Herbicide	Timing	Should these herbicides be used?
Cadre, Pursuit	Postemergence	**In many cases.** Pursuit is used much less often now than in previous years. Cadre (also formulated as Impose) is a very good herbicide that controls yellow and purple nutsedge, annual grasses in many cases, and a range of broadleaf weeds. The challenge with Cadre is presence of resistant Palmer amaranth and carryover potential to cotton and grain sorghum. Cadre continues to be a good option for peanut growers as long as they realize carryover potential and know whether or not resistance to this herbicide is present in certain fields. Residual herbicides can be added to improve control.
2,4-DB	Postemergence	**Yes.** The broadleaf herbicides mentioned above, with the exception of paraquat, benefit from the addition of 2,4-DB. For example, when Palmer amaranth is slightly larger than the size recommended for complete control by Cobra, Ultra Blazer, or Storm, the inclusion of 2,4-DB can help obtain complete control. 2,4-DB is often effective when applied alone, but this is very species dependent. For example, common cocklebur can be controlled completely by 2,4-DB. 2,4-DB is also a viable option for suppression of escapes of sicklepod and Palmer amaranth when applied sequentially.

INSECT CONTROL IN PEANUTS

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Thrips

Seedling peanut plants are usually attacked by thrips within the first six to eight weeks after planting. These tiny, spindle-shaped insects feed primarily within the developing, unfolded leaflets causing crinkling of the leaflets and stunting of the plants. Blackening of the small leaflets occurs with severe infestations and can be mistaken for chemical injury. Under favorable conditions, plants normally outgrow this injury with no reduction in yield or grade. The delay in vine growth from early-season thrips injury may delay maturity and reduce yield. Additional plant stress, such as herbicide burn, can increase yield loss.

Thrips are best controlled by insecticides applied in the seed furrow at planting. Foliar treatments can be applied as needed after crop emergence. During dry seasons or seasons with excessive rains, insecticides applied in the seed furrow may not give adequate thrips control due to poor systemic uptake by the plants or leaching of chemicals from the soil. Foliar treatments may be warranted, if systemics are ineffective, or if injury appears excessive. Foliar treatment is recommended when 25 percent of the leaves show thrips damage and pest populations are still active.

Table 27. Recommended Insecticides for Thrips Control

Treatment	Insecticide (Formulation)	Amount product per acre	Time limits: days before harvest	Remarks
Foliar	Cyantraniliprole (Exirel)	13.5-20.5 oz/A	14 day PHI	Labeled for suppression of foliage feeding only.
	acephate (Orthene 97) band rate broadcast rate	 3.0-6.0 oz 6.0-12.0 oz	14	Do not feed treated forage or hay to livestock or allow animals to graze treated areas.
In-furrow	phorate (Thimet 20G)	5.0 lb	90	**RESTRICTED USE.** Distribute granules evenly in the furrow. Do not graze or feed treated hay or forage to livestock.
	imidacloprid (Admire Pro)	7.0-10.5 oz	14	Apply as an in-furrow spray during planting directed on or below seed.

Table 27. Recommended Insecticides for Thrips Control (cont.)

Treatment	Insecticide (Formulation)	Amount product per acre	Time limits: days before harvest	Remarks
	aldicarb (AgLogic 15G, AgLogic 15GG)	7 lb	90	Do not hog-off treated fields or allow livestock to graze in treated areas before harvest. Do not feed hay or vines to livestock. Immediately deep-disk any spills at row ends or elsewhere to ensure the granules are covered with a layer of soil.
	imidacloprid + fluopyram (Velum Total)	18.0 oz	14	Apply as an in-furrow spray during planting directed on or below seed.
On seed	acephate (Acephate 90SP)	3.5 oz/100 lb seed	14	Mix in the planter to obtain good coverage of ALL seed by layering seed and product. Fill the planter box 1/3 full of seed with 1/3 cup of the product, add the next 1/3 of the seed and product; then add the last 1/3 of the seed and product. Gently stir each layer before adding the next. CAUTION: Do not use with seed inoculants. Not recommended for air planters. Do not use treated seed for food or feed purposes or process for oil.

Potato Leafhopper

The potato leafhopper is a common 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. The injured leaf tips first turn yellow then brown and tend to curve downward. Toxins also are passed into plants at feeding sites. If enough damage is done, the toxins can stop vine growth, resulting in reductions in yield and grade. Injury may occur at any time from early June to the middle of August or later in some years. It is important to note that although late-season damage appears worse in some years, damage done early in the season probably has a greater effect on plant vigor and yield. Systemic insecticides applied at planting time will usually control potato leafhoppers that occur early, but if no pegging-time insecticide is applied, it may be necessary to make foliar applications in July or early August. Pegging-time applications of rootworm insecticides will usually control leafhoppers until harvest.

Foliar treatments should be made only if needed. When 25 percent of the leaves show tip yellowing typical of leafhopper damage and active adult and immature leafhoppers are seen, treat with an effective chemical. When foliar treatments are required, the first application usually is made about mid-July, and the second about the first of August (if needed). If scheduled treatments are being made for control of leafspot, insecticides may be tank mixed. Do not include insecticides with all leaf-spot treatments. Too many insecticide applications, or applications later in the season, could cause spider mite populations to increase, especially in dry years after adjacent corn and weedy areas have been cut. Make leafhopper applications only when problems have been identified.

Table 28. Recommended Insecticides for Potato Leafhopper Control

Treatment	Insecticide (Formulation)	Amount product per acre	Time limits: days before harvest	Remarks
Foliar	methomyl (Lannate LV) (Lannate SP)	 0.75-3.0 pt 0.25-1.0 lb	 21 21	**RESTRICTED USE.** Do not feed treated vines.
	acephate (Orthene 97)	6.0-12.0 oz	14	Do not feed treated forage or hay to livestock or allow animals to graze treated areas.
	lambda-cyhalothrin (Karate Z)	0.96-1.6 oz	14	**RESTRICTED USE.** Do not apply more than 15.36 oz/A/season. Do not graze livestock in treated areas or use treated vines or hay for animal feed.
	esfenvalerate (Asana XL)	2.9-5.8 oz	21	**RESTRICTED USE.** Do not feed or graze livestock on treated vines. Do not exceed 29 oz/A/season.
	zeta-cypermethrin (Mustang Max)	1.28-4.0 oz	7	**RESTRICTED USE.** Do not graze livestock in treated areas. Do not use treated vines for hay for animal feed.
	fenpropathrin (Danitol 2.4EC)	6.0-10.6 oz	14	**RESTRICTED USE.** Do not graze or feed treated vine forage or dried hay within 14 days of the last application. Do not exceed 2.6 pt /A/season.
	beta-cyfluthrin (Baythroid XL)	1.0-1.8 oz	14	RESTRICTED USE.
	bifenthrin (Brigade 2EC)	2.1-6.4 oz	14	**RESTRICTED USE.** Do not feed immature plants and peanut hay to livestock.

*** GENERAL** - *Apply pegging treatments in 10- to 18-inch bands on row from the last week in June through mid-July after pegging begins and before vines close in middles. Effectiveness of treatments is increased if insecticides are covered by shallow cultivation to avoid exposure to sunlight and lateral movement with heavy rains.*

Table 28. Recommended Insecticides for Potato Leafhopper Control (cont.)

Treatment	Insecticide (Formulation)	Amount product per acre	Time limits: days before harvest	Remarks
Foliar (cont.)	chlorantraniliprole + lambda - cyhalothrin (Besiege)	5.0 - 8.0 oz	14	
	beta-cyfluthrin + imidacloprid (Leverage 360)	2.8 oz	14	**RESTRICTED USE.**
Pegging*	chlorpyrifos (Lorsban 15G)	–	–	Lorsban 15G is not labeled for use against leafhopper but will provide suppression if applied for soil insects.

* **GENERAL** - *Apply pegging treatments in 10- to 18-inch bands on row from the last week in June through mid-July after pegging begins and before vines close in middles. Effectiveness of treatments is increased if insecticides are covered by shallow cultivation to avoid exposure to sunlight and lateral movement with heavy rains.*

Southern Corn Rootworm

The southern corn rootworm, which is the immature stage of the spotted cucumber beetle, can cause extensive injury to the Virginia peanut crop. Rootworm larvae develop in the soil and feed directly on pegs and pods. Finding rootworms in the soil is very difficult and injury is often not detected until after peanuts are dug. A preventive treatment is the best strategy. After an infestation is established, control is difficult and often ineffective. Determining the need to treat for southern corn rootworm should be done on a field-by-field basis. Decisions can be based on both adult populations and past history of fields. 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. Adults will lay eggs that develop into the damaging larval stage. Thus, early detection of adults can allow for timely treatment and prevention of injury.

Knowledge of the past history of rootworm injury also can be useful in determining the need for treatment. If injury has ever occurred in a field, it will likely occur in other years. Keep field records on the extent of pod and peg injury noticed at harvest time. Pay particular attention to fields with higher levels of organic matter and clay. Rootworms have a higher survival rate in those soils due to higher moisture holding capacity, and injury will typically be more severe than in “light” soils. Use the “Peanut Rootworm Advisory” (VCE Publication 444-351) to aid you in deciding which fields need insecticide treatment.

Lorsban is the only labeled insecticide for rootworm control. It should be applied as 10- to 18-inch bands on the row during early pegging. Usually, this period occurs from the last week in June through mid-July. Treatment effectiveness is increased if materials are lightly incorporated using shallow cultivation. If vine growth and pegging are in an advanced stage, do not cultivate, as vine “dirting,” which leads to disease development and injury to pegs, may offset the gain from insect control. Carefully calibrate equipment to deliver recommended insecticide rates. Using more than is recommended will not increase effectiveness and using less could result in a complete insecticide failure.

Table 29. Recommended Insecticides for Southern Corn Rootworm Control

Treatment	Insecticide (Formulation)	Amount product per acre	Time limits: days before harvest	Remarks
Pegging[1]	chlorpyrifos (Lorsban 15G)	13.0 lb	21	Do not apply more than 13.3 lb/season. Do not feed peanut forage or hay to meat or dairy animals.

[1] **GENERAL -** *Apply pegging treatments in 10- to 18-inch bands on row from the last week in June through mid-July after pegging begins and before vines close in middles. Effectiveness of treatments is increased if insecticides are covered by shallow cultivation to avoid exposure to sunlight and lateral movement with heavy rains.*

Corn Earworm and Fall Armyworm

Annual infestations of the corn earworm and fall armyworm occur in most Virginia 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. Scouting fields is the only way to determine if treatment is needed. Scout by reaching halfway across 2 row-feet of plants and shaking foliage vigorously towards the row middle. Repeat on the opposite row. Count the worms on the ground and repeat the sample in several spots in the field. Treatment is recommended if an average of 8 or more worms are found per sample, or 4 per row-foot. This number should increase to 6 per row-foot later in the season.

If treatment is necessary, apply sprays using systems that provide good canopy penetration and coverage. If spider mites are already present in the field, use of some insecticides may allow for rapid build-up. Scout fields for treatment effectiveness and for possible increases in spider mite activity soon after applications. Pyrethroids offer poor to moderate control of corn earworm in Virginia and poor control of fall armyworm. If you decide to spray a pyrethroid, use the highest labeled rate and do not expect good control of heavy infestations or large worms.

Table 30. Recommended Insecticides for Corn Earworm Control

Treatment	Insecticide (Formulation)	Amount product per acre	Time limits: days before harvest	Remarks
Foliar*	methomyl			**RESTRICTED USE.**
	(Lannate LV)	0.75-3.0 pt	21	Do not feed treated vines.
	(Lannate SP)	0.25-1.0 lb	21	
	esfenvalerate			**RESTRICTED USE.**
	(Asana XL)	2.9-5.8 oz	21	Do not feed or graze livestock on treated vines. Do not exceed 29.0 oz/season.
	zeta-cypermethrin			**RESTRICTED USE.**
	(Mustang Max)	3.2-4.0 oz	7	Do not graze livestock in treated areas. Do not use treated vines for hay for animal feed.

*__GENERAL__ - Treat ONLY IF foliage loss is heavy (1/3 or more). Earworms are easier to control when they are less than 1/2 inch long.

Table 30. Recommended Insecticides for Corn Earworm Control (cont.)

Treatment	Insecticide (Formulation)	Amount product per acre	Time limits: days before harvest	Remarks
Foliar (cont.)	lambda-cyhalothrin			**RESTRICTED USE.** Do not graze livestock in treated areas, or use treated vines or hay for animal feed. Do not exceed 15.36 oz/A/ season.
	(Warrior II)	2.56-3.84 oz	14	
	(Karate Z)	1.28-1.92 oz	14	
	(Karate EC)	2.56-3.84 oz	14	
	(Kaiso 24WG)	2.0 oz	14	
	fenpropathrin (Danitol 2.4EC)	10.6-16.0 oz	14	**RESTRICTED USE.** Do not graze or feed treated peanut vine forage or dried hay within 14 days of the last application. Do not exceed 2.6 pt/A/season.
	beta-cyfluthrin (Baythroid XL)	1.8-2.4 oz	14	**RESTRICTED USE.**
	bifenthrin (Brigade 2EC)	2.1-6.4 oz	14	**RESTRICTED USE.** Do not feed immature plants and hay to livestock.
	indoxacarb (Steward EC)	9.2-11.3 oz	14	Do not feed or graze livestock on treated fields.
	spinosyn (Blackhawk)	1.7-3.3 oz	3	Do not allow grazing of crop residue or harvest of crop residue for hay until 14 days after last application.
	spinetoram (Radiant SC)	3.0-8.0 oz	3	Do not allow grazing of peanut hay.
	beta-cyfluthrin + imidacloprid (Leverage 360)	2.8 oz	14	**RESTRICTED USE.**
	chlorantraniliprole (Prevathon)	14.0-20.0 oz	14	
	chloratraniliprole +lambda - cyhalothrin (Besiege)	6.0 - 10.0 oz	14	

*__GENERAL__ - Treat ONLY IF foliage loss is heavy (1/3 or more). Earworms are easier to control when they are less than 1/2 inch long.

Table 30. Recommended Insecticides for Corn Earworm Control (cont.)

Treatment	Insecticide (Formulation)	Amount product per acre	Time limits: days before harvest	Remarks
Foliar (cont.)	methaxyfen-ozide + spine-toram (Intrepid Edge)	4.0 - 8.0 oz	7	
	Bacillus thuriengiensis (Dipel ES)	1.0-2.0 pt	0	For pyrethroid resistant corn earworm when tank mixed with a pyrethroid at labeled use rate.

*__GENERAL__ - Treat ONLY IF foliage loss is heavy (1/3 or more). Earworms are easier to control when they are less than 1/2 inch long.

Table 31. Recommended Insecticides for Fall Armyworm Control

Treatment	Insecticide (Formulation)	Amount product per acre	Time limits: days before harvest	Remarks
Foliar	methomyl (Lannate LV) (Lannate SP)	 0.75-1.5 pt 0.25-0.5 lb	 21 21	**RESTRICTED USE.** Do not feed treated vines. High rates may be required for good control.
	esfenvalerate (Asana XL)	9.6 oz	21	**RESTRICTED USE.** Suppression only. Do not feed or graze livestock on treated vines. Do not exceed 29.0 oz/season.
	zeta-cypermethrin (Mustang Max)	3.2-4.0 oz	7	**RESTRICTED USE.** Do not graze livestock in treated areas. Do not use treated vines for hay for animal feed.
	acephate (Orthene 97)	12.0-16.0 oz	14	Do not feed treated forage or hay to livestock or allow animals to graze treated areas.

Table 31. Recommended Insecticides for Fall Armyworm Control (cont.)

Treatment	Insecticide (Formulation)	Amount product per acre	Time limits: days before harvest	Remarks
Foliar (cont.)	fenpropathrin (Danitol 2.4EC)	10.6-16.0 oz	14	**RESTRICTED USE.** Do not graze or feed treated peanut vine forage or dried hay within 14 days of the last application. Do not exceed 2.6 pt/A/ season.
	beta-cyfluthrin (Baythroid XL)	2.4-2.8 oz	14	**RESTRICTED USE.**
	bifenthrin (Brigade 2EC)	2.1-6.4 oz	14	**RESTRICTED USE.** Do not feed immature plants and peanut hay to livestock.
	indoxacarb (Steward EC)	9.2-11.3 oz	14	Do not feed or graze livestock on treated fields.
	spinosyn (Blackhawk)	1.7-3.3 oz	3	Do not allow grazing of crop residue or harvest of crop residue for hay until 14 days after last application.
	spinetoram (Radiant SC)	3.0-8.0 oz	3	Do not allow grazing of peanut hay.
	beta-cyfluthrin + imidacloprid (Leverage 360)	2.8 oz	14	**RESTRICTED USE.**
	chlorantraniliprole (Prevathon)	14.0-20.0 oz	14	
	chloratraniliprole +lambda - cyhalothrin (Besiege)	6.0 - 10.0 oz	14	
	methaxyfen-ozide + spine-toram (Intrepid Edge)	4.0 - 8.0 oz	7	
	Bacillus thuriengiensis (Dipel ES)	1.0-2.0 pt	0	For pyrethroid resistant corn earworm when tank mixed with a pyrethroid at labeled use rate.

Spider Mite

Mites, which have become more numerous during the past several years, are especially injurious during hot, dry weather. 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, thus promoting the build-up of mite populations. Insecticides should be used **only when needed** for insect control. Tank mixes including fungicides and insecticides are more likely to allow spider mite build-up than when either material is used separately.

Spider mites feed mainly on the undersides of the leaves. They suck the juice from the foliage and cause the leaves to turn brown and eventually drop off. Heavy infestations usually first occur around the borders of peanut fields; then they spread inward throughout the fields. Avoid mowing weedy areas next to peanut fields until peanuts are harvested. Spider mites will readily move into peanuts when corn dries down or is harvested. Be prepared to treat peanuts if adjacent corn is infested.

IMPORTANT: If you are going to treat, calibrate your equipment to deliver the right amount of pesticide per acre. Arrange and adjust the nozzles or spouts in a manner that will direct the chemical into the desired area to be treated. Adequate sprayer pressure (40 to 60 psi) will aid in getting chemicals in contact with the undersides of leaves and within denser foliage. Penetration of foliage with 20 to 30 gal of water per acre is very important for the control of spider mites.

Table 32. Recommended Insecticides for Spider Mite Control

Treatment	Insecticide (Formulation)	Amount product per acre	Time limits: days before harvest	Remarks
Foliar	propargite (Comite 6.5EC) (Omite 30W)	 2.0 pt 3.0-5.0 lb	 14 14	Use a minimum of 20 gal/A with ground equipment or 5 gal by air. Make no more than 2 applications/year (either Comite **OR** Omite). Do not plant rotational crops within 6 months of last application. Do not feed hay to livestock.
	fenpropathrin (Danitol 2.4EC)	 10.6-16.0 oz	 14	**RESTRICTED USE.** Do not graze or feed treated vine forage or dried hay within 14 days of the last application. Do not exceed 2.6 pt/A/season.

Lesser Cornstalk Borer

Lesser cornstalk borer typically is not a problem in Virginia peanut fields. However, it does thrive under hot dry conditions and can become a problem when those conditions continue for 3 to 4 weeks. Infestations will be most severe where soils are sandy and in high, well drained areas within fields. Larvae are 0.5 to 0.75 inch long and are banded with alternating brown and blue stripes. They wiggle vigorously when disturbed. Larvae feed by burrowing into main stems, lateral limbs, plant crowns, and pods and can do extensive damage, even kill plants. Larvae produce a silk-and-sand web tube which is attached to pods or stems at the point of feeding. Evidence of web tubes is a sure sign of borer activity.

If weather conditions become favorable for borers, survey fields for damaged plants and larvae. If damage is obvious and active larvae are still present in 10 percent or more of the plants, treatment is recommended.

Table 33. Recommended Insecticides for Lesser Cornstalk Borer Control

Treatment	Insecticide (Formulation)	Amount product per acre	Time limits: days before harvest	Remarks
Granular	chlorpyrifos (Lorsban 15G)	6.7-13.3 lb	21	Apply in 10- to 18-inch band on row at first sign of borer. Do not feed peanut forage or hay to meat or dairy animals. Do not apply more than 13.3 lb/season. 10.0-13.0 lb may be broadcast by air as a rescue treatment.

Table 34. Recommended Insecticides for Grasshopper Control

Treatment	Insecticidev (Formulation)	Amount product per acre	Time limits: days before harvest	Remarks
Foliar	acephate (Orthene 97)	4.0-8.0 oz	14	Do not feed treated forage or hay to livestock or allow animals to graze treated areas.
	esfenvalerate (Asana XL)	5.8-9.6 oz	21	**RESTRICTED USE.** Do not feed or graze livestock on treated vines. Do not exceed 29.0 oz/ season.
	zeta-cypermethrin (Mustang Max)	3.2-4.0 oz	7	**RESTRICTED USE.** Do not graze livestock in treated areas. Do not use treated vines for hay for animal feed.
	beta-cyfluthrin (Baythroid XL)	1.8-2.4 oz	14	**RESTRICTED USE.**
	bifenthrin (Brigade 2EC)	2.1-6.4 oz	14	**RESTRICTED USE.** Do not feed immature plants and peanut hay to livestock.

Pesticide Usage Charts

Many pesticides control more than one pest. The three following tables 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.

Table 35. Insecticide Activity of Products Applied at Time of Planting

	Pests			
Chemical	**Thrips**	**Leafhopper**	**Rootworm**	**Spider Mite**
Thimet	G	Early	P	No
Orthene	E	Early	No	No

Table 36. Insecticide Activity of Granules Applied at Time of Pegging

	Pests			
Chemical	**Rootworm**	**Leafhopper**	**Spider Mite**	**Corn Earworm**
Thimet	G	Aids	No	No
Lorsban[1]	E	G	No	No

[1] *NOT SYSTEMIC. Do not apply in the furrow.*

P=poor control, F=fair control, G=good control, E=excellent control, No=not labeled or no activity expected.

Table 37. Insecticide Activity of Foliar Treatments Applied When Pests are Present

		Pest Species Controlled						
Insecticide	**Formulation**	**Thrips**	**Leaf-hopper**	**Root-worm**	**Corn Ear-worm**	**Fall Army-worm**	**Less Corn-stalk Borer**	**Spider Mite**
Sevin[2]	4F, 80S, XLR PLUS	P	E	No	F	F	No	No
Lannate	L	P	G	No	E	G	No	No
Comite, Omite	6.5EC, 30W	No	No	No	No	No	No	E
Asana[2]	XL	No	E	No	F/P	G	No	No
Orthene[2]	97	E	E	No	G	F	No	No
Warrior	II	E	E	No	F/P	G	No	F
Danitol	2.4EC	No	E	No	F/P	G	No	E
Steward	1.25SC	No	No	No	E	E	No	No
Blackhawk		No	No	No	E	E	No	

There are other insecticides and other formulations which have federal registration for use on peanuts.

[2] *Use of these insecticides may allow rapid build-up of spider mites. Use with caution during extended periods of dry weather.*

P=poor control, F=fair control, G=good control, E=excellent control, No=not labeled or no activity expected.

PEANUT DISEASES

David Langston, Extension Plant Pathologist, Tidewater AREC

Management Tools

Advisory Programs

A network of weather monitors in southeastern Virginia record data for improving the efficiency of disease management. Weather data are used to produce daily advisories and reports for growers and industry workers. Included are daily weather summaries (air and soil temperature, rainfall), peanut leaf spot and Sclerotinia blight advisories, heat-unit reports for peanuts, and degree-day reports for cotton. The Peanut Frost Advisory is provided during the fall-harvest period. Each program is designed to guide growers in making decisions that maximize yield, quality, and net profit. The Tidewater Agricultural Research and Extension Center (AREC) in cooperation with Extension agents, growers, and the industry make this information available in the following ways:

Peanut/Cotton InfoNet: Information from four weather monitors is available on the Internet at *https://webipm.ento.vt.edu/cgi-bin/infonet1.cgi*. Contact your local Extension agent or call David Langston at (757) 807-6536 or Linda Byrd-Masters at (757) 807-6557 if you need assistance in accessing or interpreting the information.

Hotlines: Disease advisories, heat units, and frost advisories are recorded daily at the Tidewater AREC for access by telephone. Regional advisories for Capron, Waverly, Suffolk, and Skippers are available by calling (800) 795-0700. The information is also available through local county Extension offices.

Clinical Services

Diagnostic services for plant diseases are provided by the Tidewater AREC in Suffolk. Plant samples should be submitted with the required forms by unit Extension agents. A period of 3-5 days is needed to complete biopsy tests and e-mail reports. Diagnostic tests for nematodes and soil fertility problems during the season are also performed in cooperation with laboratories at Virginia Tech.

Predictive Nematode Assay

This program provides data on the numbers and kinds of nematodes in the soil and recommendations on needs for control. Soil samples should be collected in the fall following harvest and no later than November 20. Local Extension offices have instructions, sample information sheets, and bags for packaging samples. Samples can be sent to the Tidewater AREC Nematode Diagnostic Lab. For additional information contact Dr. David Langston.

Management Inputs

The most effective and economical strategy for disease control combines the benefits of sanitation, crop rotation, resistant varieties, scouting, and judicious use of pesticides. For example, changing from a 2-year to a 3 year rotation of

peanuts with corn or cotton can reduce disease losses to leaf spot, Sclerotinia blight, and Cylindrocladium black rot by as much as 50% in as few as two or three cycles. Inputs for disease control should be determined on the basis of field history, scouting, disease advisory programs, and recommendations by Virginia Cooperative Extension. This approach to disease management will enable the judicious use of chemicals while providing for a maximum return on investments.

Sanitation

Soil and decayed plant debris may contain residual inoculum of disease-causing organisms. Wash equipment frequently to avoid transport of inoculum from field to field. Peanut combines should be cleaned to remove loose soil and plant material after harvesting fields with heavy infestations of soil-borne diseases. The removal and destruction of peanut vines after harvest has limited value for disease management because much of the diseased plant parts and inoculum remains intact in the field. Furthermore, this practice negates a significant part of the soil fertility benefits of peanut hay in the following year.

Crop Rotation

A 4-year rotation of peanut with corn, grain sorghum, fescue, and other grass-type crops is beneficial for control of peanut diseases. Cotton is also a good rotational crop for peanuts in Virginia, but growers should not apply potash (K) in excess of recommended rates of the soil test report. Elevated levels of potash can interfere with calcium uptake and result in pod rot by fungi such a *Rhizoctonia* and *Pythium* species. Soybean and other leguminous crops share many of the common destructive diseases with peanuts and should be avoided. Where soybean is grown in a peanut rotation, double-crop soybean with wheat and follow with either cotton, corn, or another grass-type crop.

Tillage

Recent research has demonstrated that strip tillage into a wheat or rye cover crop can reduce production costs without increasing the risk of soilborne diseases in peanut. Strip tillage has been most successful in sandy-textured soils, with peanut production in a 3-year or longer rotation.

Resistant Varieties: Virginia-Type

No peanut varieties are immune to disease, but there is a wide range in susceptibility. Some important differences are noted below with respect to the most common diseases.

Cylindrocladium black rot (CBR): Bailey, Bailey II, Sugg, Sullivan, and Wynne are resistant to CBR and when planted to fields with good rotation practices (3-year rotation out of peanut or longer) CBR is rarely a problem. In fields with a history of severe CBR even resistant varieties may be impacted by the disease, but disease severity can be reduced by good nematode control and delayed planting to May 10 or later. Cool, wet conditions at planting favor epidemics of CBR.

Sclerotinia blight: Sullivan, Bailey, and Bailey II are partially resistant to this disease. Early planting at seed rates of 110 lb/A or lower can reduce the susceptibility of varieties in some years. However, this practice will increase the risk of tomato spotted wilt disease.

Early and leaf spot: Sullivan, Bailey, Bailey II,and Wynne are moderately esistant to early leaf spot, but they are susceptible to late leaf spot which has become the dominant foliar disease of peanut in the region.

Tomato spotted-wilt virus: Bailey, Bailey II, Wynne, and Sullivan are resistant to TSWV. Reduced plant populations and planting before May 1 sometimes increases disease incidence.

Resistant Varieties: Runner-Type

Recent releases of disease resistant runner-type varieties that mature early can be grown with reduced input costs and offer good disease resistance in southeastern Virginia. These varieties include:

Florida 07, Florun 107, GA 06G, GA 09B: resistant to TSWV; moderately susceptible to CBR.

Florida 07, Florun 107: susceptible to Sclerotinia.

Tifguard: resistant to root-knot nematodes.

Whenever growing runner-type peanuts, early planting is recommended to improve opportunities for achieving maturity between October 1 and 10.

Scouting

Peanut fields should be scouted once a week for disease after pegging. Scouts should use different entry and exit points as well as travel patterns across fields at each visit. After a canopy of foliage covers the soil, scouts should part the vines and look for signs of soilborne diseases on plant stems at the soil surface (e.g. Sclerotinia, Southern stem rot, and CBR).

Chemicals

When host resistance, crop rotation, and cultural practices are insufficient for disease management, chemical control can be employed. A wide array of chemicals are registered for disease control in peanuts. Selection of the most effective/economical chemical requires knowledge of the target disease and other diseases in the field. Whenever the cause of disease is uncertain, plant samples should be submitted for diagnostic tests in the plant pathology clinic at the Tidewater AREC. If nematode or soil fertility problems are suspected, a 1-pt sample of soil should be submitted. The Peanut/Cotton InfoNet and Peanut Hotlines are important sources of information on timing of fungicide applications to control leaf spot and Sclerotinia blight. The following tables (38, 39, and 40) provide listings of approved chemicals for control of specific disease problems. Mixing or rotating fungicides with different modes of action is necessary to prevent fungicide resistance. Apply all pesticides according to label instructions and be aware of all recommended safety precautions.

Though it primarily applies to exports, it should be noted that due to recent pesticide residue restrictions made by the European Union, certain peanut shellers will not accept ANY peanuts that have had the restricted chemicals applied. The new restrictions are NOT based on increased safety concerns, and they may still be labelled for use in the U.S. However, under the current circumstances peanut

growers should NOT use them, and many chemical suppliers are voluntarily ceasing sales of these products for use in peanut. The chemicals fall into two major categories:

1) propiconazole-containing products and

2) mono/dipotassium salts or phosphorous acid based products.

Products in category 1 are used for leaf spot management and include Tilt (propiconazole), Tilt Bravo (propiconazole + chlorothalonil), Stratego (propiconazole + trifloxystrobin), and Artisan (propiconazole + flutolanil). There are several generic products with propiconazole as well, so be sure to check labels for propiconazole as an active ingredient. Some good alternatives to propiconazole in leaf spot fungicide programs include Alto (cyproconazole) + Bravo Weather Stik (chlorothalonil), Absolute (tebuconazole + trifoxystrobin), and Priaxor (fluxapyroxad + pyraclostrobin).

Fungicides in the second category are applied for management of Pythium pod rot, and there is not widespread use of these fungicides in Virginia. However, growers still need to be aware and be sure they are not using these. Typically, a different type of fungicide for Pythium control is included in seed treatments such as Dynasty, and these products are still okay to use.

Due to these restrictions, fungicide products containing these active ingredients are no longer recommended and are not included in the fungicide tables below.

READ THE LABEL INSTRUCTIONS ATTACHED TO PESTICIDE CONTAINERS BEFORE APPLICATION.

Table 38. Seed Treatments*

Disease	Product and Formulation	Rate of Formulation	Method and Timing of Application	Precautions and Remarks
Seed decay and seedling disease	Allegiance-FL or Apron 50W or Apron XL LS	0.75 fl oz 0.5-1.0 oz 0.16-0.64 fl oz	Apply as water-based slurry with commercial seed treatment equipment.	Control Pythium seed rot and damping-off. Use in combination with a broad-spectrum fungicide.

** All rates of seed treatments are formulated product/100 lb seed. Do not use treated seed for food, feed, or oil purposes. Bags with treated seed should bear a tag or label cautioning their use for these purposes as well as against the reuse of bags for packing feed or foodstuffs. Read use restrictions on labels and follow all labeling requirements for packaging treated seed.*

Table 38. Seed Treatments* (cont.)

Disease	Product and Formulation	Rate of Formulation	Method and Timing of Application	Precautions and Remarks
Seed decay and seedling disease (cont.)	Maxim 4FS	0.08-0.16 fl oz	Same as above.	Protects against seed decay, damping-off, and seed transmission of CBR.
	Protégé (azoxystrobin)	0.153 fl oz	Same as above	Controls Aspergillus crown rot and Rhizoctonia damping off.
	Captan 30DD or Captan 400	6.0 fl oz 3.0-6.0 fl oz	Same as above.	Protects against seed decay, damping-off, and seedling blights.
	RTU-PCNB	1.75-2.5 fl oz	Same as above.	Same as above.
	42-S Thiram	3.0 fl oz	Same as above.	Same as above.
	Vitavax-30C	3.0 fl oz	Same as above.	Controls Sclerotium rot and damping-off. Use in combination with a broad-spectrum fungicide.
	Thiram 50WP	4.5 oz	Apply with dust treater.	Controls seed decay, damping-off, and seedling blights.
	Vitavax PC (captan, PCNB, Vitavax)	4.0-5.0 oz	Same as above.	Same as above.
	Trilex Optimum DS (captan, trifloxystrobin, metalaxyl)	4.0 oz	Same as above.	Controls seed decay, damping-off, and seedling blights.

** All rates of seed treatments are formulated product/100 lb seed. Do not use treated seed for food, feed, or oil purposes. Bags with treated seed should bear a tag or label cautioning their use for these purposes as well as against the reuse of bags for packing feed or foodstuffs. Read use restrictions on labels and follow all labeling requirements for packaging treated seed.*

Table 38. Seed Treatments* (cont.)

Disease	Product and Formulation	Rate of Formulation	Method and Timing of Application	Precautions and Remarks
Seed decay and seedling disease	Trilex Star DS (captan, trifloxystrobin, thiophanate-methyl, metalaxyl)	4.0 oz	Same as above.	Same as above.
	Dynasty PD (azoxystrobin, fludioxonil, mefenoxam)	4.0 oz	Same as above.	Same as above, and reduces seed transmission of CBR.
	Rancona V PD (ipconazole, carboxin, metalaxyl)	4.0 oz	Same as above	Same as above.

** All rates of seed treatments are formulated product/100 lb seed. Do not use treated seed for food, feed, or oil purposes. Bags with treated seed should bear a tag or label cautioning their use for these purposes as well as against the reuse of bags for packing feed or foodstuffs. Read use restrictions on labels and follow all labeling requirements for packaging treated seed.*

Table 39. Foliar Fungicides*

Disease(s) controlled	Active Ingredient	Product and Formulation	Rate per acre	Method and Timing of Application[1]	Precautions and Remarks[2]
Foliar diseases only (early and late leaf spot, web blotch)	Chlorothalonil	Bravo 720 Bravo Ultrex Echo 720 Various others	1.5 pt 1.4 lb 1.5 pt	Apply according to leaf-spot advisory program or a calendar-based program using 14-21 day intervals.	**Caution:** Sclerotinia blight will be more difficult to control when these products are applied at intervals of less than 21 days.
	Tebuconazole + trifloxystrobin	Absolute 500SC	3.7-7.0 fl oz	Same as above.	Do not apply more than 4 sprays and apply chlorothalonil as the final spray for fungicide resistance management. Also controls limb rot.
	Mancozeb	Koverall	1.0-2.0 lb	Same as above.	Only effective against early leaf spot.
	Cyproconazole	Alto 100SL	5.5 fl oz	Same as above.	Mix or alternate with another fungicide to improve foliar disease control and reduce risk of fungicide resistance.
	Flutriafol	Topguard 1.04 SC	7-14 fl oz	Same as above.	Same as above.
	Tetraconazole	Eminent 125SL	6-13 fl oz	Same as above.	Same as above.

[1] For best results, apply sprays according to leaf spot advisory program in a volume of 12.0 to 15.0 gal/A by ground sprayers or 5.0 gal/A with aircraft.

[2] Read labels and observe all precautions and restrictions on application, pre-harvest interval, and restrictions on feeding treated hay, vines, or hulls to livestock.

Table 39. Foliar Fungicides* (cont.)

Disease(s) controlled	Active Ingredient	Product and Formulation	Rate per acre	Method and Timing of Application[1]	Precautions and Remarks[2]
Early and late leaf spot, web blotch, Rhizoctonia limb rot, Southern stem rot	Tetraconazole	Domark 230ME	5.25 to 6.9 fl oz	Same as above.	Do not make more than 2 applications or 13.8 fl oz per acre per year. PHI = 14 days.
	Pydiflumetofen	Miravis	3.4 fl oz	Begin applications prior to disease development. For early and late leaf spot control, apply on a 21 to 28-day interval.	Do not make more than three applications of Miravis or other Group 7 fungicides before alternating with another fungicide mode of action. Also suppresses Sclerotinia blight.
	Tebuconazole + prothiocon-azole	Provost Opti Provost 433SC	7-10.7 fl oz	Same as above.	Apply up to 4 sprays then use a fungicide with a different mode of action. Suppresses CBR at the highest rate.

[1] For best results, apply sprays according to leaf spot advisory program in a volume of 12.0 to 15.0 gal/A by ground sprayers or 5.0 gal/A with aircraft.

[2] Read labels and observe all precautions and restrictions on application, pre-harvest interval, and restrictions on feeding treated hay, vines, or hulls to livestock.

Table 39. Foliar Fungicides* (cont.)

Disease(s) controlled	Active Ingredient	Product and Formulation	Rate per acre	Method and Timing of Application[1]	Precautions and Remarks[2]
Early and late leaf spot, web blotch, Rhizoctonia limb rot, Southern stem rot (cont.)	Metconazole	Quash 50 WDG	2.5-4 oz	Same as above.	Apply up to 4 sprays then use a fungicide with a different mode of action.
	Tebuconazole	Folicur 3.6F Multiple generics	7.2 fl oz	Same as above.	Many populations of leaf spot fungicide are not controlled by tebuconazole alone. Mix with chlorothalonil or another fungicide with a different mode of action.
	Penthiopyrad	Fontelis 1.67SC	12-24 fl oz	Same as above.	Apply up to 3 sprays, then use a fungicide with a different mode of action. Also suppresses Sclerotinia blight.
	Azoxystrobin	Abound 2.08F	9.0-12.3 fl oz	Apply according to leaf spot advisory program, but do not make more than two applications.	Do not apply within 50 days of harvest. Not recommended for the last spray.

[1] For best results, apply sprays according to leaf spot advisory program in a volume of 12.0 to 15.0 gal/A by ground sprayers or 5.0 gal/A with aircraft.

[2] Read labels and observe all precautions and restrictions on application, pre-harvest interval, and restrictions on feeding treated hay, vines, or hulls to livestock.

Table 39. Foliar Fungicides* (cont.)

Disease(s) controlled	Active Ingredient	Product and Formulation	Rate per acre	Method and Timing of Application[1]	Precautions and Remarks[2]
Early and late leaf spot, web blotch, Rhizoctonia limb rot, Southern stem rot (cont.)	azoxystrobin + tebuconazole	Custodia SC	15.5 fl oz	Apply according to leaf spot advisory.	Make up to 2 to 4 applications in mid-season as part of an advisory program.
	fluoxastrobin	Evito 480SC Aftershock	3.8-5.7 fl oz	Same as above.	Make up to 2 applications per season and rotate or mix with another fungicide with a different mode of action.
	fluoxastrobin + tetraconazole	Evito T	6-11.2 fl oz	Same as above.	Make up to 2 to 4 applications in mid-season as part of an advisory program.
	Pyraclostrobin	Headline 2.09EC, 2.08SC	6-15 fl oz	Same as above.	Make up to 2 applications per season and rotate or mix with another fungicide with a different mode of action.
	Fluxapyroxad + pyraclostrobin	Priaxor	4-8 fl oz	Same as above.	Use 1 to 3 times per season. Use higher rates for limb rot and stem rot control.

[1] For best results, apply sprays according to leaf spot advisory program in a volume of 12.0 to 15.0 gal/A by ground sprayers or 5.0 gal/A with aircraft.

[2] Read labels and observe all precautions and restrictions on application, pre-harvest interval, and restrictions on feeding treated hay, vines, or hulls to livestock.

Table 39. Foliar Fungicides* (cont.)

Disease(s) controlled	Active Ingredient	Product and Formulation	Rate per acre	Method and Timing of Application[1]	Precautions and Remarks[2]
Early and late leaf spot, web blotch, Rhizoctonia limb rot, Southern stem rot (cont.)	Azoxystrobin + benzovindiflupyr	Elatus	7.3-9.5 fl oz	Same as above.	Make no more than 3 applications before alternating with a fungicide with a different mode of action. May also be applied as an early season banded application for suppression of soilborne diseases. Excellent stem rot control.
	Prothioconazole	Proline	5.0-5.7 fl oz	Same as above	Apply up to 4 sprays, then use a fungicide with a different mode of action. Also suppresses CBR.
	bixafen + flutriafol	Lucento	3-5.5 fl oz	Apply according to leaf-spot advisory program or a calendar-based program using 14-21 day intervals.	Do not apply more than 11 fl oz of product/A per year. PHI = 14 days.

[1] For best results, apply sprays according to leaf spot advisory program in a volume of 12.0 to 15.0 gal/A by ground sprayers or 5.0 gal/A with aircraft.

[2] Read labels and observe all precautions and restrictions on application, pre-harvest interval, and restrictions on feeding treated hay, vines, or hulls to livestock.

Table 39. Foliar Fungicides* (cont.)

Disease(s) controlled	Active Ingredient	Product and Formulation	Rate per acre	Method and Timing of Application[1]	Precautions and Remarks[2]
Early and late leaf spot, web blotch, Rhizoctonia limb rot, Southern stem rot (cont.)	mefentri-fluconazole	Provysol	2.5-7.0 fl oz	For leaf spot, apply at 14 to 21 day intervals; for soilborne diseases apply at 14 to 28 day intervals. Use the higher rate for soilborne diseases.	Do not apply more than 21 fl oz/A per year. PHI = 14 days.
	mefentri-fluconazole + pyraclostrobin + fluxapyroxad	Revytek	8.0-15.0	For leaf spot, apply at 14 to 21 day intervals; for soilborne diseases apply at 14 to 28 day intervals. Use the higher rate for soilborne diseases.	Do not apply more than 15 fl oz/A per year. PHI = 14 days.

[1] For best results, apply sprays according to leaf spot advisory program in a volume of 12.0 to 15.0 gal/A by ground sprayers or 5.0 gal/A with aircraft.

[2] Read labels and observe all precautions and restrictions on application, pre-harvest interval, and restrictions on feeding treated hay, vines, or hulls to livestock.

Table 39. Foliar Fungicides* (cont.)

Disease(s) controlled	Active Ingredient	Product and Formulation	Rate per acre	Method and Timing of Application[1]	Precautions and Remarks[2]
Southern stem rot	Inpyrfluxam	Excalia	2.0-4.0 fl oz/ acre	Apply prior to disease development. Do not apply earlier than 30 days after planting.	Apply up to 4 applications of Excalia Fungicide per year provided that the yearly rate does not exceed 8 fl oz/A (0.178 lb ai/A). Do not apply this product within 50 feet of any freshwater lake, pond, river, stream or wetland. PHI: 40 days. Do not apply this product by aerial application.
Sclerotinia blight	fluazinam	Omega 500F	1.0-1.5 pt	Make first application according to disease scouting and the Sclerotinia advisory program. Up to two additional sprays may be applied depending upon disease pressure.	Provides good control of Sclerotinia blight and suppression of southern stem rot and Rhizoctonia pod rot.

[1] For best results, apply sprays according to leaf spot advisory program in a volume of 12.0 to 15.0 gal/A by ground sprayers or 5.0 gal/A with aircraft.

[2] Read labels and observe all precautions and restrictions on application, pre-harvest interval, and restrictions on feeding treated hay, vines, or hulls to livestock.

Table 39. Foliar Fungicides* (cont.)

Disease(s) controlled	Active Ingredient	Product and Formulation	Rate per acre	Method and Timing of Application[1]	Precautions and Remarks[2]
Sclerotinia blight (cont.)	boscalid	Endura 70 WG	8-10 fl oz	Make first application according to the Sclerotinia advisory program and disease scouting in problem fields. Up to three sprays are allowed, but do not make more than two sequential applications.	Provides partial control of Sclerotinia blight and suppression of stem rot. Also suppresses leaf spot and provides excellent control of web blotch.
	Penthiopyrad	Fontelis 1.67SC	12-24 fl oz	Apply prior to disease onset and thereafter according to scouting or Sclerotinia blight advisory.	Suppression only. Also controls leaf spot, southern stem rot, and suppresses CBR. Do not apply more than three sequential sprays or 72 fl oz/A per season.
	Prothiocon-azole + fluopyram	Propulse 3.34SC	13.6 fl oz	Apply the first spray when disease is initially detected, and if needed, a second application according to scouting or Sclerotinia blight advisory.	Suppression only. Also suppresses CBR and limb rot. Do not apply more than 34.2 fl oz/A per season. May also be applied to the seed furrow at planting for suppression of soilborne diseases.

[1] For best results, apply sprays according to leaf spot advisory program in a volume of 12.0 to 15.0 gal/A by ground sprayers or 5.0 gal/A with aircraft.

[2] Read labels and observe all precautions and restrictions on application, pre-harvest interval, and restrictions on feeding treated hay, vines, or hulls to livestock.

Table 39. Foliar Fungicides* (cont.)

Disease(s) controlled	Active Ingredient	Product and Formulation	Rate per acre	Method and Timing of Application[1]	Precautions and Remarks[2]
Cylindrocladium black rot (CBR)	Prothioconazole	Proline 480SC	5.7 fl oz	Apply to seed furrow at planting in a volume of 5 gal/A with spray nozzle or microtube.	Use for suppression of CBR in fields with low to moderate disease pressure and crop rotation of three years or longer. Only recommended when using a CBR resistant variety.
	Prothioconazole + fluopyram	Propulse 3.34SC	13.6 fl oz	Same as above. May also be applied by chemigation.	Same as above. May also suppress nematodes.

[1] For best results, apply sprays according to leaf spot advisory program in a volume of 12.0 to 15.0 gal/A by ground sprayers or 5.0 gal/A with aircraft.

[2] Read labels and observe all precautions and restrictions on application, pre-harvest interval, and restrictions on feeding treated hay, vines, or hulls to livestock.

Table 40. Nematicides and Soil Fumigants

Pest(s)	Product and Formulation	Rate per acre	Method and Timing of Application	Precautions and Remarks
Nematodes and Cylindrocladium black rot (CBR)	Metam 42%, Sectagon 42%, OR Vapam HL (metam sodium)	7.5 gal	Use with resistant varieties in cases of severe disease pressure; plant other varieties only in cases of low to moderate CBR pressure. Apply 8 in. under rows at least 14 days pre-plant with one injector shank in front of bed shaper to mark rows. Do not mix treated soil with untreated soil after application.	Apply if soil temps are ≥60° F at 4 in. depth and likely to be the same or warmer for 5 days. Delay application if >1 in. of rainfall is forecast in next 72 to 96 hrs. Note: metam sodium is now a restricted use pesticide and requires growers be approved for use. See current label requirements.

Table 40. Nematicides and Soil Fumigants (cont.)

Pest(s)	Product and Formulation	Rate per acre	Method and Timing of Application	Precautions and Remark
Nematodes	Telone II (1,3 dichloro-propene)	3.0-6.0 gal	Apply 8 to 12 in. under rows at least 7 days before planting.	See label for precautions and restrictions.
	Velum Total (fluopyram + imidacloprid)	18 fl oz	Apply in-furrow during planting directed on or below seed. May also be applied by chemigation into the root-zone.	Also controls thrips and suppresses early and late leaf spot.
	Propulse (fluopyram + prothioconazole)	13.6 fl oz	May be applied by chemigation or foliar spray.	For maximum nematode suppression, Propulse should be applied 45 days after planting following an at-plant nematicide (e.g. Velum Total).
	AgLogic 15G, AgLogic 15GG (aldicarb)	7 lb	In furrow at planting.	See label for precautions and restrictions. Also controls thrips.

**All rates are listed as formulated product/A. Read labels and observe all precautions and restrictions on application, pre-harvest interval, and restrictions on feeding treated hay, vines, or hulls to livestock.*

PEANUT IRRIGATION

Julie Shortridge, Biological Systems Engineer, Virginia Tech

Although considered to be somewhat drought resistant, peanuts exhibit a variation in drought tolerance depending upon the stage of growth and variety. There are critical times during the growth of the peanut plant that a soil moisture deficit can severely limit yields and/or diminish quality. The table below divides the peanut growing season into four stages and indicates the relative response of the plants to a lack of moisture during each stage.

Response of Peanut Plants to Irrigation at Various Growth Stages

Plant Growth Stage (Duration)	Plant Indicators	Relative Drought Susceptibility
germination (1-2 weeks)	planting to emergence	high
early vegetative growth (5-6 weeks)	emergence to flowering/ pegging	low
nut development/fruiting (8-9 weeks)	flowering/pegging to pod formation	high
maturation (5-6 weeks)	pod formation to harvest	moderate

While adequate moisture during the germination stage is necessary for a good, uniform stand, the mid-season nut development, or fruiting stage, is the most critical time for irrigation if there is a shortage of rainfall. In addition to being the stage in which the peanut plant is most susceptible to drought stress, it is also the stage of maximum water use by the plant.

In Virginia, the critical part of the nut development/fruiting period includes the latter part of July and the month of August. Irrigation in June or earlier is discouraged, unless extremely dry conditions persist, because excess moisture can trigger excessive vine growth. Irrigation of peanuts in September is also not preferred because too much moisture during the plant maturing stage can increase the severity of diseases such as CBR, Sclerotinia blight, and leaf-spot diseases. Late unnecessary irrigation can also delay maturity and promote the development of small pods. In dry years, irrigation can reduce the threat of Aflatoxin and suppress the outbreak of spider mites.

Irrigation Scheduling Methods

Soil Feel Method

A soil sample should be taken from several sites, representative of the predominant soil type in the field, by digging down to a 6- to 12-inch depth. To evaluate soil moisture, hold a sample of soil in the palm and fingers of the hand and squeezed to form a ball. Based on the appearance of the ball, the following table can be used to estimate plant-available water. The upper end of the ranges given should be used for coarse-textured soils, such as loamy sands, while medium-textured soils, such as sandy loams, apply to the lower end of the ranges.

Estimating Soil Moisture By The Soil Feel Method

Plant-available Water Remaining In Soil	Feel or Appearance at 6-12 Inches
100%	No free water appears on soil, but wet outline of ball is left on hand
75-100%	Forms a ball that breaks easily
50-75%	Forms a weak ball that falls apart
<50%	Appears dry, will not form a ball
0%	Dry, loose, flows through fingers

In deciding whether to irrigate or not, the plant growth stages described earlier should be considered. For the germination and nut development/fruiting stages, soil moisture should not be allowed to drop below the 50 percent to 60 percent plant-available water level, while during the early vegetative growth and maturation stages it could be allowed to drop below the 50 percent level. The amount of irrigation water which should be applied once an irrigator has determined the approximate soil moisture content will be discussed below.

Tensiometer Methods

Tensiometers are well-suited to the light, sandy soils found in southeast Virginia. Depending upon the size of the irrigated field and the variability in soil textures, one or more tensiometer stations should be installed. A station consists of 2 tensiometers, 1 inserted to a 12-inch depth and the other at 24 inches. The shallow instrument reflects the need for irrigation while the deep one provides an indication of whether or not irrigation amounts have been adequate. If the deep tensiometer continues to dry during the season while irrigation is continuing, it indicates that insufficient irrigation water is being applied. Manufacturers' recommendations should be closely followed regarding installation and interpretation of tensiometer readings.

The following table relates tensiometer gauge vacuum reading to approximate soil moisture content. In the case of soil tension, readings differ according to soil texture.

Soil Water Availability at Various Tensiometer Readings

Irrigation Trigger Point		Tensiometer Reading (Centibars)	
Peanut Plant Growth Stage	**Plant-available Water Remaining in Soil (%)**	**Sandy loam**	**Loamy sand**
germination	60	40	20
early veg. growth	40	60	40
nut devel./fruiting	60	40	20
maturation	40	60	40

Electrical Resistance Methods

A gypsum soil block is an “electrical resistance” device which uses gypsum as a porous material in which electrodes are embedded. Electrical resistance between the electrodes varies with soil water content. Gypsum has a characteristic much like a very heavy clay with small pores. Gypsum blocks, therefore, are not recommended for the light, sandy soils of southeast Virginia.

Another electrical resistance type sensor is called the Watermark sensor. As with the gypsum block, the sensor’s resistance varies with the electrical conductivity of solution between the electrodes. Pore sizes in this matrix are larger than those of the gypsum block, thereby making it more suitable for coarse-textured soils. Unlike gypsum blocks, Watermark sensors may be reused year after year.

Watermark sensors (and gypsum blocks) come with a meter that is attached to the terminals. Some meters give an instant reading of soil water tension while others provide a digital readout which can be converted to tension using a simple chart. Irrigation should occur when sensor readings exceed a set tension level as with tensiometers. Follow manufacturer’s recommendations carefully when using this method. Additional detailed information, the selection, calibration, and operation of soil moisture sensors can be found in Virginia Cooperative Extension Publication BSE 198P - Understanding Soil Moisture Sensors: A Fact Sheet for Irrigation Professionals in Virginia.

How Much Irrigation?

In peanut irrigation, it may be advisable to bring soil moisture back up to only 85 percent to 90 percent of plant available water-holding capacity in the event that rainfall occurs shortly thereafter. This will allow the soil to accommodate part of the rainfall and may help to reduce associated disease incidence.

The amount of water to apply depends on soil texture, root zone depth, and the plant-available water level when irrigation is begun as well as the sprinkler

irrigation efficiency. The following table provides irrigation estimates considering these factors for two soil textures.

Maximum Water Application at Various Growth Stages, Soil Moisture Levels, and Soil Textures

Peanut Plant Growth Stage	Plant-available Water Remaining in Soil (%)	Maximum Amount of Irrigation Water to Apply (Inches)*	
		Sandy Loam	Loamy Sand
germination	60	0.33-0.50	0.25-0.33
early veg. growth	40	2.00-2.25	1.25-1.50
nut devel./fruiting	60	1.25-1.50	0.75-1.00
maturation	40	2.00-2.25	1.25-1.50
**Acre-inch of water = 27,154 gallons.*			

To determine if these applications are adequate, an irrigator can evaluate the deep tensiometer readings or examine deep soil samples by the soil feel method.

SPRAYER INFORMATION

Information on Spray Tips for Herbicides

Tip No. 8004 is recommended for application of preplant and at-cracking herbicides.

Flat Fan Spray Tip No.	Liquid Pressure in psi (at tip)	Gallons Per Acre[1]		
		3 MPH	4 MPH	5 MPH
8004[2] (50-mesh screen)	20	28	21	17
	25	31	24	19
	30	34	26	21
	40	40	30	24

[1] Values are based on a nozzle spacing of 18 inches.

[2] or equivalent.

Information on Spray Tips for Soil Fungicides

Tip numbers 8008 LP, 8010 LP, TK 7.5, and TK 10 are recommended for application of soil fungicides (i.e., Terraclor 75W, Rovral 4F, Vitavax 3F). Center each nozzle directly over the row, and calibrate to deliver 40 gal of spray per acre.

Flat Fan Spray Tip No.	Liquid Pressure in at tip (psi)	Gallons Per Acre[1]		
		3 MPH	4 MPH	5 MPH
8008 or 11008 (no strainer)	15	26.9	20.2	16.2
	20	31.1	23.2	18.7
	30	38.1	28.6	22.9
	40	44.0	33.0	26.4
8010 or 11010 (no strainer)	15	33.7	25.3	20.2
	20	38.9	29.2	23.3
	30	47.6	35.7	28.6
	40	55.0	41.3	33.0
TK 7.5 (no strainer)	10	41.3	30.9	24.8
	20	58.3	43.8	35.0
	30	71.4	53.6	42.9
	40	82.5	61.9	49.5
TK 10 (no strainer)	10	55.0	41.3	33.0
	20	77.8	58.3	46.7
	30	95.3	71.4	57.2
	40	110.0	82.5	66.0

[1] Values are based on a nozzle spacing of 36 inches.

Flat Fan Spray Tip No.	Pressure (psi) required to achieve 40 Gallons per acre 36" Row Spacing		
	3 MPH	4 MPH	5 MPH
8008 or 11008 (no strainer)	33 psi	59 psi (NR)[1]	92 psi (NR)
8010 or 11010 (no strainer)	21 psi	38 psi	59 psi (NR)
TK7.5 (no strainer)	9 psi (NR)	17 psi	26 psi
TK 10 (no strainer)	5.3psi (NR)	9psi (NR)	15 psi
[1] NR - Not recommended, outside of the operating pressure for the nozzle.			

Information on Spray Tips for Leaf-Spot Fungicides

Orfice disc number D_2 or D_3 and core number 13 or 23 are routinely used to spray leaf-spot fungicides. Three nozzles per row, a minimum of 50 lb spray pressure, and a spray volume of 15 gal/A are recommended.

Combination Disc and Core No.	Liquid Pressure (at tip) (psi)	Gallons Per Acre - 36" Row Spacing Using 3 Nozzles Per Row		
		3 MPH	4 MPH	5 MPH
D_2-13	40 60 80	13.1 16.4 18.1	9.8 12.3 13.7	7.9 9.9 10.9
D_2-23	40 60 80	16.5 20.5 23.3	12.3 15.4 17.3	9.9 12.3 13.9
D_3-23	40 60 80	19.4 23.3 26.6	15.5 17.3 19.8	11.7 13.9 16.0

NOTE: Consult a commercial spray guide and/or your Extension agent for selection of suitable tips to achieve special low- or high-volume spray needs.

Using three nozzles per row, a minimum of 560 psi spray pressure, and a spray volume of 15 gal/A are recomended. The following tables shows the speed needed to achieve 50 psi and 15 gal/A.

Combination Disc and Core No.	Speed (MPH) required to achive 15 Gallons Per Acre @ 50 psi Using 3 Nozzle Per Row
D_2-13	3 MPH
D_2-23	3.7 MPH
D_3-23	4.4 MPH

Calibration of Boom Sprayers

Be sure to calibrate your sprayer properly. NEVER exceed the labeled rate. Using too much pesticide is illegal and may injure your crop. Using too little may result in little or no pest control. Pressure, nozzle orifice size, spacing of nozzles, and speed all affect the application rate. Be sure that all of your spray equipment is in good working order and your sprayer is configured properly.

Large-area Method of Calibration

1. Measure and stake off one acre (43,560 sq ft) in the field to be treated.
2. Fill sprayer tank with water.
3. Maintain constant pressure and speed while spraying the acre. Mark pressure, throttle, and gear settings.
4. Measure the amount of water used. The amount of water necessary to refill the tank is equal to gallons per acre applied.
5. Make up the spray solution with the correct amount of chemical, based on the amount of water applied per acre.
6. Make the application at pressure, throttle, and gear settings used in calibrating.

“Ounce” Calibration Method

1. Mark off a test course, based on the chart below. (Measure nozzle spacing for booms; row spacing for directed and band rigs.)
2. Set the throttle for spraying and operate the equipment as you drive the measured distance. Operate under field conditions. Fill your tank half full (average weight). Get a running start. Drive the measured distance several times while operating the equipment, recording driving times (# of seconds).
3. Calculate the average time in seconds required to drive the measured distance.

4. Run the equipment for the average time it took to drive the course, using the same settings (RPM5, pressure). Catch output during that time in a container marked in ounces. (If you are using a boom sprayer, catch the output from one nozzle. If you are using a directed/band rig, catch the spray from all nozzles per row for the prescribed time.)

5. Output in ounces = gallons per acre (GPA) applied.

"Ounce" Method Distances Row Width or Nozzle Spacing

Spacing (inches)	Distance (feet)
40	102
38	107
36	113
30	136
28	146
24	170
20	204
18	227

This method works because the test course is 1/1 28th of an acre, and 128 ounces in a gallon - the proportions are the same.

A word of caution: If you use the "ounce" method, your calibration check is based on only one nozzle. Be sure your calibration check is based on the right nozzle (and pressure) for the job - and that the nozzle is in good condition. This method is valid ONLY if the output from each nozzle (or sets of nozzles) is uniform! So, you should check ALL nozzles (or sets of nozzles, in the case of banding/directed applications) to be sure the output from each one (or each set) is the same. You can do this by using a flow meter, or by catching the output from each for a short time (ex. 10 seconds). Replace any nozzles that do not match the pattern and flow rate of the one(s) you used in the calibration test.

For more information concerning the "Ounce" calibration method review: "Fine Tuning a Sprayer with the "Ounce" Calibration Method." Virginia Cooperative Extension, Publication 442-453, *http://www.ext.vt.edu/pubs/bse/442-453/442-453.html*

For information and/or for guidance on calibration methods for other types of equipment, contact your local Extension agent.

Travel Speed Chart

Miles per hour	Time required to travel[1]		
	88 feet	176 feet	352 feet
1	1 minute	2 minutes	4 minutes
2	30 seconds	1 minute	2 minutes
3	20 seconds	40 seconds	1 minute 20 seconds
4	15 seconds	30 seconds	1 minute
5		24 seconds	48 seconds
6			40 seconds
7			34 seconds

[1] *1 MPH = 88 feet per minute; 1 MPH = 1.466 feet per second*

Measure Equivalency Tables

Land Measure

16.5 feet = 5.5 yards OR 1 rod

66 feet = 4 rods OR 1 chain

272.25 square feet = 30.25 square yards OR 1 square rod

4,356 square feet = 16 square rods OR 1 square chain

43,560 square feet = 160 square rods OR 10 square chains OR 1 acre

Length of Row Required for One Acre

Row spacing	Length or distance
24 inches	7260 yards = 21,780 feet
30 inches	5808 yards = 17,424 feet
32 inches	5445 yards = 16,335 feet
34 inches	5125 yards = 15,374 feet
36 inches	4840 yards = 14,520 feet
38 inches	4585 yards = 13,756 feet
40 inches	4356 yards = 13068 feet

Measurement Equivalency Chart

A teaspoon or tablespoon throughout this table refers to a level, standard measuring teaspoon or tablespoon.

80 drops	=	1	teaspoon or about 1/6 fluid ounce
	=	5	milliliters or cubic centimeters (cc)
1 tablespoon	=	3	teaspoons
		15	milliliters (ml) or cubic centimeters (cc)
		1/2	fluid ounce
1 cup	=	16	tablespoons
		8	fluid ounces
		236.6	milliliters (ml) or cubic centimeters (cc)
		1/2	pint
1 pint	=	16	fluid ounces
			(NOTE: 1 pint or quart dry measure is about 16 percent larger than 1 pint or 1 quart liquid measure.)
		473.2	milliliters (ml) or cubic centimeters (cc)
1 fluid ounce	=	2	tablespoons or 29.6 milliliters (ml) or cubic centimeters (cc)
1 U.S. gallon	=	4	quarts
		8	pints
		3,785	milliliters (ml) or cubic centimeters (cc)
		8.3	pounds (lb) water
1 milliliter	=	1	cubic centimeter (cc)
	=	0.2	teaspoon
1 liter	=	1,000	milliliters (ml) or cubic centimeters (cc)
		1.08	quarts (1 quart + 1 fluid ounce)
1 pound	=	16	ounces
		453.59	grams
1 kilogram	=	1,000	grams, approximately 2 pounds 3 ounces
1 ounce	=	28.4	grams
1 bushel of soil	=	1.25	cubic feet
1 mile	=	5,280	feet
		320	rods
		1,609.4	meters
1 acre	=	43,560	square feet
		160	square rods
		0.4047	hectare
10 millimeters (mm)	=	1	centimeter (cm)
		0.3937	inch
100 centimeters	=	1	meter (m)
		39.37	inches

ESTIMATED CROP PRODUCTION COSTS

Estimated costs and returns per acre, 2017; based on 4004 pound per acre yield

	Unit	Quantity	Cost ($) per Unit	Total ($) per Acre	Your Farm
1. GROSS RECEIPTS	lbs	4000.00	0.23	900.00	
Peanuts					
Total Receipts				**$900**	
2. VARIABLE COSTS					
Seed	lbs	130.00	0.85	110.50	
Inoculant	acre	1.00	6.00	6.00	
Fertilizer*					
Nitrogen	lbs	15.00	0.52	7.80	
Phosphate	lbs	22.00	0.69	15.18	
Potash	lbs	35.00	0.42	14.70	
Manganeze	lbs	3.00	0.35	1.05	
Boron	lbs	2.50	1.35	3.38	
Lime (Prorated)	ton	0.33	56.00	18.48	
Gypsum	ton	0.60	58.70	35.22	
Herbicides	acre	1.00	45.30	45.03	
Insecticides	acre	1.00	16.39	16.39	
Fungicides	acre	1.00	79.04	79.04	
Surfactant	acre	1.00	7.05	7.05	
Scuplting	acre	1.00	16.00	16.00	
Hauling	ton	2.00	12.00	24.00	
Drying & Cleaning	ton	2.00	45.00	90.00	
State Check-off Fee	ton	2.00	3.00	6.00	
National Assessment**	acre	1.00	8.60	8.60	
Crop Insurance	acre	1.00	30.00	30.00	
Tractor/Machinery	acre	1.00	59.43	59.43	
Labor	hrs	4.25	10.74	48.45	
Interest on OP. CAP.	dol.	$233.85	4.8%	11.11	
TOTAL VARIABLE COSTS				**$653.41**	
3. INCOME ABOVE VARIABLE COSTS				**$246.59**	
4. FIXED COSTS					
Tractor/Machinery	acre	1.00	101.25	101.25	
TOTAL FIXED COSTS				**$101.25**	
5. OTHER COSTS					
General Overhead	dol.	$653.41	7.0%	$45.74	
TOTAL OTHER COSTS				**$45.74**	
6. TOTAL COSTS				**$800.40**	
7. NET RETURNS TO LAND, RISK, AND MANAGEMENT				**$99.60**	

BREAK-EVEN YIELD		BREAK-EVEN PRICE	
VARIABLE COSTS	2743 lbs	VARIABLE COSTS	$0.16
TOTAL COSTS	3507 lbs	TOTAL COSTS	$0.20

Prepared by: Garry Bullen, David Jordan, Derek Washburn, North Carolina State University, Dept. Agricultural and Resource Economics FOR PLANNING PURPOSES ONLY AND IT DOES NOT INCLUDE LAND RENT

*Fertilizer amounts refer to amount of Nitrogen, Phosphorus, Potash required as replacement values per acre based on yield

**NATIONAL ASSESSMENT is 0.095% of GROSS RECEIPT

Agronomic

Lenticels: structures due to excessive soil Moisture (courtesy Texas AgriLife Extension)

Chemical burn on leaf margins (courtesy Texas AgriLife Extension)

Nitrogen deficiency and inoculation failure in peanut: normal plant (left) and N-deficient (right)

Calcium deficiency showing unfilled pods or "pops".

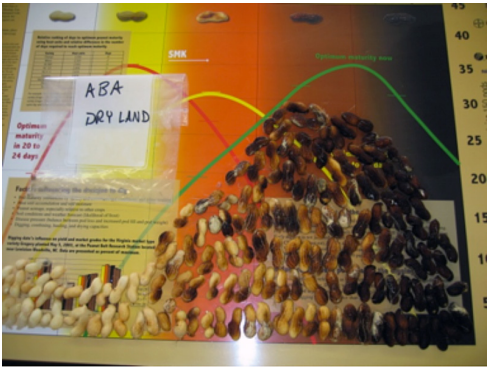
Manganese deficiency in peanut (courtesy Walt Mozingo)

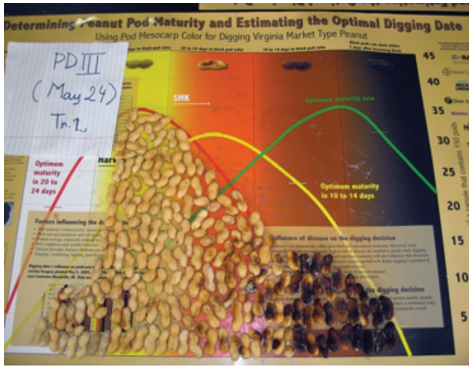
Agronomic cont.

Germination failure due to Ca (left) and B (right) deficiency (courtesy Walt Mozingo)

Drought sensitive (left) and tolerant (right) varieties

Disease susceptible (left) and resistant (right) varieties





Variety ready to harvest (left) and 3 weeks from optimum harvest (right)

Weed Control

Ragweed, young and mature plants

Sicklepod

Cocklebur

Morning glories: Pitted

Ivyleaf

Tall

Weed Control cont.

Valvet leaf

Crabgrass

Prickly sida

Eclipta

Bermudagrass

Nutsedge

Insect Control



Thrips damage on peanut; adult and larvae feeding on leaves.



'Hooper burn' injury on peanut; adult and nymph are colored in bright green to yellow.

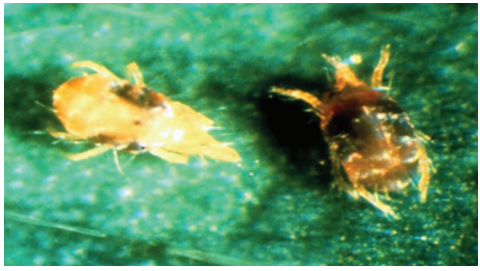


Pod damage by corn rootworm larvae; adults are also presented.

Insect Control cont.

Larvae of corn earworm feeding on leaves

Tobacco budworm (left) and fall armyworm (right)



Spider mites on peanut leaves; larvae and adult feeding on the plants

Lesser cornstalk borer damage on peanut pods; larvae feeding on the pods.

Disease Control

Early Leaf Spot

Early (Brown) and Late (black) Leaf Spot

Web Blotch

Tomato Spotted Wilt Virus on the peanut leaves

Tomato Spotted Wilt Virus showing stunned plants (courtesy Texas AgriLife Extension)

Seed of Tomato Spotted Wilt Virus infected plants (courtesy Texas AgriLife Extension)

Disease Control cont.

Cylindrocladium black rot (CBR)

Red fruiting bodies of CBR

Root and pod rot caused by CBR

Speckled seed with CBR

Southern stem rot (white mold)

Sclerotinia blight (bleached)

Root knot nematode galls

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