

# Chapter 31.

## Okra Production in Florida

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### BOTANY

#### Nomenclature

Family - Malvaceae

Okra - *Abelmoschus esculentus*

#### Origin

Okra is native to northeastern Africa in the general area of Ethiopia and the Sudan.

#### Related Species

Okra is the only vegetable crop of significance in the Malvaceae family (Fig. 31-1). Cotton is the most important economic crop in this family, but there are many widely used ornamental plants.

### VARIETIES

Varieties of okra grown in Florida (H=hybrid):

Annie Oakley II (H)	Spike (H)
Cajun Delight (H)	Clemson Spineless (H)
Clemson Spineless 80	

### SEEDING AND PLANTING

Seeding and planting information for okra production in Florida is given in Table 1.

### FERTILIZER AND LIME

For unmulched crops with subsurface or sprinkler irrigation, broadcast all P<sub>2</sub>O<sub>5</sub>, micronutrients, and 25 to 50% of the N and K<sub>2</sub>O before planting. Increased fertilizer efficiency might result from broadcasting in the bed area only or by banding at planting. Remaining N and K<sub>2</sub>O should be banded in one or two applications during early plant growth. Soil test and fertilizer recommendations for okra grown on mineral soils are given in Table 2.

For mulched crops with subsurface irrigation, broadcast all P<sub>2</sub>O<sub>5</sub>, micronutrients, and 20 to 25% N and K<sub>2</sub>O in bed. Apply remaining N and K<sub>2</sub>O in a band in a groove 2 to 3

inches deep in bed center of twin-row crops. With sprinkler irrigation, incorporate all fertilizer in bed area. Leached N and K<sub>2</sub>O can be replaced by liquid fertilizer injection wheel. For drip-irrigated crops apply all P<sub>2</sub>O<sub>5</sub>, micronutrients, and up to 20 to 25% of N and K<sub>2</sub>O in bed. Inject remaining N and K<sub>2</sub>O through tube according to the schedule given in Table 3.

### PLANT TISSUE ANALYSIS

Plant tissue analysis for okra is listed in Table 4. Testing was done during the early flowering period on the most recently matured leaf.

### IRRIGATION

Okra water requirements (see Chapter 8, *Principles and Practices of Irrigation Management for Vegetables*, Tables 4-6) are highest during rapid growth and development (100% of ETo) decreasing to 90% of ETo (see Chapter 8, *Principles and Practices of Irrigation Management for Vegetables*, Table 3) during the final growth period. Root systems may be extensive on some typical deep sandy soils, thus allowing less frequent irrigation applications.

**Table 1.** Seeding and planting information for okra in Florida.

Planting dates	
North Florida	Mar - Jun
Central Florida	Feb - Aug
South Florida	Jan - Mar Aug - Oct
Seeding information	
Distance between rows (in)	36 - 60
Distance between plants (in)	4 - 10
Seeding depth (in)	0.5 - 1.0
Seed per acre (lb)	6 - 8 <sup>1</sup>
Days to first harvest from seed	60 - 70
Plant population <sup>2</sup> (acre)	43,560
<sup>1</sup> Assuming 80% germination.	
<sup>2</sup> Population based on closest between and within row spacing.	

### WEED MANAGEMENT

Herbicide labeled for weed control in okra are listed in Table 5.

### INSECT MANAGEMENT

Table 7 outlines the insecticides approved for use on insects attacking okra.

### DISEASE MANAGEMENT

The chemicals approved for disease management in okra are listed in Table 6.

**Table 2.** Soil test and fertilizer recommendations for okra grown on 6-foot bed in twin-rows on mineral soils.<sup>1</sup>

Target pH	N lb/A	$P_2O_5$					$K_2O$				
		VL	L	M	H	VH	VL	L	M	H	VH
		(lb/A/crop season)									
6.5	120	150	120	100	0	0	150	120	100	0	0

<sup>1</sup> See Chapter 2 section on supplemental fertilizer application and best management practices, pg 11.

**Table 3.** Fertilization recommendations for okra grown in Florida on sandy soils testing very low in Mehlich-1 potassium (K<sub>2</sub>O)

Production system	Nutrient	Recommended-Base fertilization <sup>z</sup>						Recommended-Supplemental fertilization <sup>z</sup>		
		Total (lbs/A)	Preplant <sup>y</sup> (lbs/A)	Injected <sup>x</sup> (lbs/A/day)				Leaching rain <sup>r,s</sup>	Measured "low" plant nutrient content <sup>u,r</sup>	Extended harvest season <sup>u,s</sup>
				1-2	3-4	5-12	13			
Drip irrigation, raised beds, and polyethylene mulch (on deep sands or on soils with shallow Impermeable layer)	N	120	0-40	1.0	1.5	2.0	1.5	n/a	1.5 to 2 lbs/A/day for 7 days <sup>t</sup>	1.5 to 2 lbs/A/day <sup>p</sup>
	K <sub>2</sub> O	150	0-50	1.0	1.5	2.0	1.5	n/a	1.5 to 2 lbs/A/day for 7 days <sup>t</sup>	1.5 to 2 lbs/A/day <sup>p</sup>
Seepage irrigation, raised beds, and polyethylene mulch (on soils with shallow impermeable layer)	N	120	120 <sup>v</sup>	0	0	0	0	30 lbs/A <sup>q</sup>	30 lbs/A <sup>t</sup>	30 lbs/A <sup>p</sup>
	K <sub>2</sub> O	150	150 <sup>v</sup>	0	0	0	0	20 lbs/A <sup>q</sup>	20 lbs/A <sup>t</sup>	20 lbs/A <sup>p</sup>

<sup>z</sup> A=7,260 linear bed feet per acre (6-ft bed spacing); for soils testing "very low" in Mehlich 1 potassium (K<sub>2</sub>O) Seeds and transplants may benefit from applications of a starter solution at a rate no greater than 10 to 15 lbs/acre for N and P<sub>2</sub>O<sub>5</sub>, and applied through the plant hole or near the seeds.

<sup>y</sup> Applied using the modified broadcast method (fertilizer is broadcast where the beds will be formed only, and not over the entire field). Preplant fertilizer cannot be applied to double/triple crops because of the plastic mulch; hence, in these cases, all the fertilizer has to be injected.

<sup>x</sup> This fertigation schedule is applicable when no N and K<sub>2</sub>O are applied preplant. Reduce schedule proportionally to the amount of N and K<sub>2</sub>O applied preplant. Fertilizer injections may be done daily or weekly. Inject fertilizer at the end of the irrigation event and allow enough time for proper flushing afterwards.

<sup>w</sup> For standard 13 week-long, transplanted okra crop.

<sup>v</sup> Some of the fertilizer may be applied with a fertilizer wheel though the plastic mulch during the okra crop when only part of the recommended base rate is applied preplant. Rate may be reduced when a controlled-release fertilizer source is used.

<sup>u</sup> Plant nutritional status may be determined with tissue analysis or fresh petiole-sap testing, or any other calibrated method. The "low" diagnosis needs to be based on UF/IFAS interpretative thresholds.

<sup>t</sup> Plant nutritional status must be diagnosed every week to repeat supplemental fertilizer application.

<sup>s</sup> Supplemental fertilizer applications are allowed when irrigation is scheduled following a recommended method (see chapter 8 on irrigation scheduling in Florida). Supplemental fertilizations is to be applied in addition to base fertilization when appropriate. Supplemental fertilization is not to be applied "in advance" with the preplant fertilizer.

<sup>r</sup> A leaching rain is defined as a rainfall amount of 3 inches in 3 days or 4 inches in 7 days.

<sup>q</sup> Supplemental amount for each leaching rain

<sup>p</sup> Plant nutritional status must be diagnosed after each harvest before repeating supplemental fertilizer application.

**Table 4.** Plant tissue analysis at early flowering for okra. Dry wt. basis.

Status	N	P	K	Ca	Mg	S	Fe	Mn	Zn	B	Cu
	Percent						Parts per million				
Deficient	<3.5	0.3	2.0	0.5	0.25	0.3	50	30	30	25	5
Adequate range	3.5-5.0	0.3-0.6	2.0-3.0	0.5-0.8	0.25-0.50	0.3-0.8	50-100	30-100	30-50	25-50	5-10
High	>5.0	0.6	3.0	0.8	0.50	0.8	100	100	50	50	10

**Table 5.** Chemical weed controls: okra.

Herbicide	Labeled crops	Time of application to crop	Rate (lbs. AI./Acre)	
			Mineral	Muck
Carfentrazone (Aim)	Okra	Preplant Directed-hooded Row-middles	0.031	0.031
<b>Remarks:</b> Aim may be applied as a preplant burndown treatment and/or as a post-directed hooded application to row middles for the burndown of emerged broadleaf weeds. May be tank mixed with other registered herbicides. may be applied at up to 2 oz (0.031 lb ai). Use a quality spray adjuvant such as crop oil concentrate (coc) or non-ionic surfactant at recommended rates.				
Glyphosate (Roundup) Touchdown, Durango Glyphomax	Okra	Prior to crop emergence or pretransplanting	0.5 - 1.0	0.5 - 1.0
<b>Remarks:</b> Apply as directed for "Cropping Systems" under conditions described on label. Does not provide residual weed control.				
Pelargonic Acid (Scythe)	Okra	Preplant Preemergence Directed-Shielded	3-10% v/v	3-10% v/v
<b>Remarks:</b> Product is a contact, non-selective, foliar applied herbicide. There is no residual activity. May be tank mixed with glyphosate. May be tank mixed with trifluralin for soil residual activity. Consult label for rates and other information.				
Trifluralin (Several brands)	Okra	Preplant incorporated	0.5 - 0.75	---
<b>Remarks:</b> Controls germinating annuals, especially grasses. Incorporate 4 inches or less within 8 hours. Results in Florida are erratic on soils with low organic matter and clay contents. Note precautions of planting non-registered crops within 5 months.				

**Table 6.** Disease management for okra.

Chemical (a.i.)	FRAC Group <sup>1</sup>	Maximum Rate/Acre/ Application Season		Min. Days to Harvest	Pertinent Diseases or Pathogens	Remarks <sup>2</sup>
Amistar 80DF (Azoxystrobin)	11	5 oz or 0.25 oz/1000 row ft	20 oz	0	Anthracnose Powdery mildew	Do not exceed 1 sequential and 4 total applications of Amistar or other QoI fungicides. See label for soil applications.
Apron XL LS (Mefenoxam)	4	0.16-0.64 fl. oz./100 lbs. of seed			Pythium damping off	Apply as a seed treatment.
Armcarb 100 (Potassium Bicarbonate)		2.5-5.0 lbs./100 gal water			Various foliar diseases	Do not exceed 5.0 lbs Armcarb per 100 gal per application
Fosphite (Potassium Phosphite)		3 qt	18 qt		Pythium, Rhizoctonia, Fusarium	Do not exceed 6 applications per crop. Caution should be used when applying in a management program including copper fungicides. See label for foliar, root dip and irrigation application details.

Table 6. Continued.

Chemical (a.i.)	FRAC Group <sup>1</sup>	Maximum Rate/Acre/ Application Season	Min. Days to Harvest	Pertinent Diseases or Pathogens	Remarks <sup>2</sup>	
Heritage (Azoxystrobin)	11	3.2-8.0 oz. 64 oz	0	Powdery mildew Anthracnose	Do not exceed 2 sequential and 4 total applications of Heritage or other QoI fungicides. See label for soil applications.	
Kocide 2000 (Copper hydroxide)	M1	1.5-3 lbs.		Anthracnose Bacterial leaf spots Pod spots Powdery mildew	Begin treatment when disease threatens and repeat every 5-10 days as needed. Use higher rates and shorter spray intervals when conditions favor disease.	
Quadris Flowable (Azoxystrobin)	11	15.4 fl oz or 0.8 fl oz/1000 row ft	2.88 qt	0	Various (see label)	Do not exceed 1 sequential and 4 total applications of Quadris or other QoI fungicides. See label for soil applications.
Serenade Max (Bacillus subtilis QST 713)	11	3 lb		0	Pink rot (Sclerotinia)	Begin application approx. 8 wks prior to harvest and repeat on 14 day interval. Direct spray at base of plants and surrounding soil surface.
Sulfur (various brands)					Powdery mildew	Do not apply during periods of warm weather. Do not apply within 2 weeks of an oil spray.
Topaz (Potassium Phosphite)		1-3 qt/100 gal water	18 qt		Various diseases	Do not exceed 6 applications per a crop cycle or year
Trilogy (Neem oil)		0.5%-2.0% in 25-100 gal of water			Various foliar diseases	Do not exceed 2 gal Trilogy per acre, per application
<p><sup>1</sup> Fungicide group (FRAC Code): Numbers (1-37) and letters (M, U, P) are used to distinguish the fungicide mode of action groups. All fungicides within the same group (with same number or letter) indicate same active ingredient or similar mode of action. This information must be considered for the fungicide resistance management decisions. M = Multi site inhibitors, fungicide resistance risk is low; U = Recent molecules with unknown mode of action; P = host plant defense inducers. Source: <a href="http://www.frac.info/">http://www.frac.info/</a> (FRAC = Fungicide Resistance Action Committee). Be sure to read a current product label before applying any chemicals.</p> <p><sup>2</sup> Information provided in this table applies only to Florida. Be sure to read a current product label before applying any chemical. The use of brand names and any mention or listing of commercial products or services in the publication does not imply endorsement by the University of Florida Cooperative Extension Service nor discrimination against similar products or services not mentioned.</p>						

**Table 7.** Selected insecticides approved for use on insects attacking okra.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code <sup>1</sup>	Notes
<b>Acramite-50WS</b> (bifenazate)	0.75-1.0 lb	12	3	twospotted spider mite	25	One application per season.
<b>Admire 2F</b> (imidacloprid)	16-32 fl oz	12	21	aphids, flea beetles, leafhoppers, foliage feeding thrips, whiteflies	4A	No more than 32 oz per acre.
<b>Admire Pro</b>	7-14 fl oz					
<b>Admire 2F</b> (imidacloprid)	0.1 fl oz/1000 plants	12	21	aphids, whiteflies	4A	<b>Planthouse</b> - 1 application to transplants. See label.
<b>Admire Pro</b>	0.44 fl oz/10,000 plants					
<b>Asana XL (0.66 EC)</b> (esfenvalerate)	5.8-9.6 fl oz	12	1	cabbage looper, corn earworm, southern armyworm	3	Florida only.
<b>Aza-Direct</b> (azadirachtin)	1-2 pts, up to 3.5 pts, if needed	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, mites, stink bugs, thrips, weevils, whiteflies	26	Antifeedant, repellent, insect growth regulator. OMRI-listed <sup>2</sup> .
<b>Azatin XL</b> (azadirachtin)	5-21 fl oz	4	0	aphids, beetles, caterpillars, leafhoppers, leafminers, mites, stink bugs, thrips, weevils, whiteflies	26	Antifeedant, repellent, insect growth regulator.
<b>Biobit HP</b> ( <i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i> )	0.5-2.0 lb	4	0	caterpillars (will not control large armyworms)	11B2	Treat when larvae are young. Good coverage is essential. Can be used in the greenhouse. OMRI-listed <sup>2</sup> .
<b>BotaniGard 22 WP, ES</b> ( <i>Beauveria bassiana</i> )	<b>WP:</b> 0.5-2.0 lb/100 gal <b>ES:</b> 0.5-2 qt/100 gal	4	0	aphids, thrips, whiteflies	--	May be used in greenhouses. Contact dealer for recommendations if an adjuvant must be used. Not compatible in tank mix with fungicides.
<b>Crymax WDG</b> ( <i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i> )	0.5-2.0 lb	4	0	caterpillars	11B2	Use high rate for armyworms. Treat when larvae are young.
<b>Deliver</b> ( <i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i> )	0.25-1.5 lb	4	0	caterpillars	11B2	Use higher rates for armyworms. OMRI-listed <sup>2</sup> .
<b>Entrust</b> (spinosad)	0.5-2.5 oz	4	1	armyworms, flower thrips, leafminers, loopers, other caterpillars, Thrips palmi, tomato fruitworm	5	Do not apply more than 9 oz per acre per crop. OMRI-listed <sup>2</sup> .
<b>Esteem Ant Bait</b> (pyriproxyfen)	1.5-2.0 lb	12	1	red imported fire ant	7D	Apply when ants are actively foraging.
<b>Extinguish</b> (S)-methoprene)	1.0-1.5 lb	4	0	fire ants	7A	Slow-acting IGR (insect growth regulator). Best applied early spring and fall where crop will be grown. Colonies will be reduced after three weeks and eliminated after 8 to 10 weeks. May be applied by ground equipment or aerially.

Table 7. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code <sup>1</sup>	Notes
<b>Intrepid 2F</b> (methoxyfenozide)	4-16 fl oz	4	1	beet armyworm, cabbage looper, fall armyworm, hornworms, southern armyworm, tomato fruitworm, true armyworm, yellowstriped armyworm	18	Do not apply more than 64 fl oz per acre per season.
<b>Javelin WG</b> ( <i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i> )	0.12-1.50 lb	4	1	most caterpillars, but not <i>Spodoptera</i> species (armyworms)	11B2	Treat when larvae are young. Thorough coverage is essential OMRI-listed <sup>2</sup> .
<b>JMS Stylet-Oil</b> (oil, insecticidal)	3-6 qts/100 gal	4	0	leafminers, mites, whiteflies	--	See label for tank mix cautions. Organic Stylet-Oil is OMRI-listed <sup>2</sup> .
<b>Knack IGR</b> (pyriproxyfen)	8-10 fl oz	12	14	whiteflies (immatures)	7D	Do not make more than 2 applications per season.
<b>Lepinox WDG</b> ( <i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i> )	1.0-2.0 lb	12	0	for most caterpillars, including beet armyworm (see label)	11B2	Treat when larvae are small. Thorough coverage is essential.
<b>Malathion 8F</b> (malathion)	1.5 pt	12	1	aphids	1B	
<b>Neemix 4.5</b> (azadirachtin)	4-16 fl oz	12	0	aphids, armyworms, leafhoppers, leafminers, loopers, whiteflies	26	IGR and feeding repellent. OMRI-listed <sup>2</sup> .
<b>Provado 1.6F</b> (imidacloprid)	3.8 oz	12	0	aphids, leafhoppers, whiteflies	4A	Do not apply more than 18.8 oz per acre per year.
<b>Pyrellin EC</b> (pyrethrin + rotenone)	1-2 pt	12	12 hours	aphids, leafhoppers, leafminers, loopers, lygus bugs, plant bugs, mites, thrips, whiteflies	3, 21	
<b>Sevin XLR, 4F, 80S</b> (carbaryl)	<b>XLR, 4E:</b> 1-1.5 qt <b>80S:</b> 1.25-1.88 lb	12	3	corn earworm, stink bugs	1A	Do not apply more than a total of 6 qt or 7.5 lb per acre per season.
<b>SpinTor</b> (spinosad)	1.5-8.0 fl oz	4	1	armyworms, flower thrips, hornworms, leafminers, <i>Liriomyza</i> spp., Thrips palmi, tomato fruitworm	5	For resistance management, do not use more than 3 times in any 21-day period, then rotate to a different class of products or no insecticide for 21 days.
<b>*Telone C-35</b> (dichloropropene + chloropicrin)	See label	5 days - See label	preplant	symphylans, wireworms	--	See supplemental label for use restrictions in south and central Florida.
<b>*Telone II</b> (dichloropropene)	See label					
<b>Trilogy</b> (extract of neem oil)	0.5-2.0% V/V	4	0	aphids, mites, suppression of thrips and whiteflies	26	Apply morning or evening to reduce potential for leaf burn. Toxic to bees exposed to direct treatment. OMRI-listed <sup>2</sup> .

The pesticide information presented in this table was current with federal and state regulations at the time of revision. The user is responsible for determining the intended use is consistent with the label of the product being used. Use pesticides safely. Read and follow label instructions.

Table 7. Continued.

Trade Name (Common Name)	Rate (product/acre)	REI (hours)	Days to Harvest	Insects	MOA Code <sup>1</sup>	Notes
<sup>1</sup> Mode of Action codes for vegetable pest insecticides from the Insecticide Resistance Action Committee (IRAC) Mode of Action Classification v.3.3 October 2003. 1A. Acetylcholine esterase inhibitors, Carbamates 1B. Acetylcholine esterase inhibitors, Organophosphates						
2A. GABA-gated chloride channel antagonists						
3. Sodium channel modulators						
4A. Nicotinic Acetylcholine receptor agonists/antagonists, Neonicotinoids						
5. Nicotinic Acetylcholine receptor agonists (not group 4)						
6. Chloride channel activators						
7A. Juvenile hormone mimics, Juvenile hormone analogues						
7D. Juvenile hormone mimics, Pyriproxifen						
9A. Compounds of unknown or non-specific mode of action (selective feeding blockers), Cryolite						
9B. Compounds of unknown or non-specific mode of action (selective feeding blockers), Pymetrozine						
11B1. Microbial disruptors of insect midgut membranes, B.t. var aizawai						
11B2. Microbial disruptors of insect midgut membranes, B.t. var kurstaki						
12B. Inhibitors of oxidative phosphorylation, disruptors of ATP formation, Organotin miticide						
15. Inhibitors of chitin biosynthesis, type 0, Lepidopteran						
16. Inhibitors of chitin biosynthesis, type 1, Homopteran						
17. Inhibitors of chitin biosynthesis, type 2, Dipteran						
18. Ecdysone agonist/disruptor						
20. Site II electron transport inhibitors						
21. Site I electron transport inhibitors						
22. Voltage-dependent sodium channel blocker						
23. Inhibitors of lipid biosynthesis						
25. Neuroactive (unknown mode of action)						
26. Unknown mode of action, Azadirachtin						
<sup>2</sup> OMRI listed: Listed by the Organic Materials Review Institute for use in organic production.						
* Restricted Use Only.						