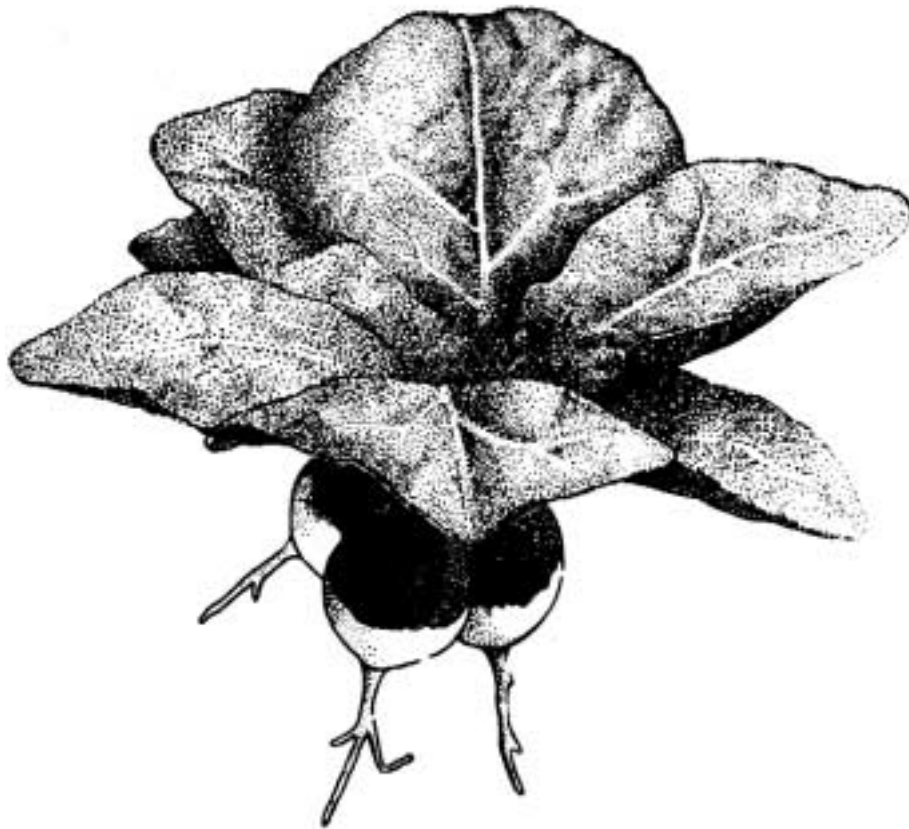


# Commercial Production Of Greens In Mississippi



Mississippi State  
UNIVERSITY  
**Extension**  
SERVICE

Turnip, mustard, collard, and kale are important greens crops in the South. They are members of the Brassica family – along with cabbage, broccoli, and cauliflower. They are valuable in the diet, supplying minerals, calcium, iron, vitamin A, vitamin C, thiamine, and other B vitamins.

Greens may be grown as spring and fall crops, and in the southern part of Mississippi they often can be grown throughout the winter. These crops bolt readily after overwintering and when sown during the cold part of late winter.

## Varieties

### Turnip

**Greens only** —All Top (50 days) has produced excellent yields in south Mississippi trials. Shogoin (42 days), Seven Top (45 days), and Crawford (45 days) all grow well in Mississippi.

**Greens and roots** — Purple Top White Globe (45 days) is a widely adapted, standard variety that produces globe-shaped roots with white bottoms and purple tops.

Royal Globe (50 days) is a newer purple top, white globed type that matures 6 to 10 days earlier than does Purple Top.

Tokyo Cross (35 days) and Just Right (40 days) produce excellent yields of all-white, globe-shaped roots and are earlier than Purple Top. Yield of greens is slightly lower than purple top varieties. Roots of both may be allowed to grow larger than Purple Top White Globe without quality loss.

### Mustard

Florida Broadleaf, the standard variety that matures in 45-50 days, is a smooth-leaved type that produces high yields.

Southern Giant Curled (45 days) and Green Wave are curled-leaf types that produce good yields.

Tendergreen (35 days) and Tendergreen II (48 days) have smooth leaves and a mild flavor. Yields are somewhat higher than Florida Broadleaf and Southern Giant Curled.

### Collards

Vates (75-80 days) has been the standard variety for many years, especially for processing.

Flash and Champion (78 days) are Vates-types that does not bolt readily in the spring.

Georgia Blue Stem (60 days) is a darker blue-green variety with good yields.

Morris Heading is a green, semi-heading variety. Vates and Champion overwinter well. None of the other varieties are recommended for overwintering.

### Kale

Blue Knight (45-55 days) is a Vates-type hybrid that is very uniform.

Dwarf Blue Curled (55 days) is a Vates strain developed in Virginia. It is slow to bolt, does not yellow so readily under cool conditions, and has uniform, finely curled, dark bluish-green leaves. It matures in 55 days.

Siberian (70 days) is grown mostly for stock feed. Leaves are large, coarsely frilled, deep green with a bluish bloom.

Siberian Improved (65 days) has thick, large blue-green leaves with coarsely frilled edges. Hanover Salad is a Siberian kale selected for early harvest.

## Site Selection

These crops grow well in soils that range from sand to clay. Selecting sandier soils for growing turnip roots and/or greens that are to be pulled and bunched makes harvesting, washing, and packing easier and more efficient. Clay soil holds plants more firmly and is more difficult to wash off. Turnip roots grown in clay soils are more likely to be distorted in shape than are those grown in sandy soils.

Choose a field that drains well. This makes spraying and harvesting easier — both critical in these fast-growing, quick-maturing crops.

### Fertilizer

Well ahead of planting, lime soils to a pH of 5.8 to 6.8. Apply lime and fertilizer according to soil test results.

As a general recommendation, broadcast 65 to 85 pounds of nitrogen, 80 to 100 pounds of phosphorus, and 60 to 80 pounds of potash per acre. Add 1 to 2 pounds of boron per acre with broadcast fertilizer to prevent boron deficiency. Symptoms of boron deficiency include death of growing points, shortened and hard stems, and distorted leaves. Turnip roots exhibit water-soaked areas when cut open. Brown spots and cracks may be apparent inside the root. Boron is required in small amounts. Excessive application can be toxic to plants.

Sidedress with 30 to 40 pounds of nitrogen per acre when plants are 2 to 3 inches high during warm weather; when 4 to 5 inches high during cold weather.

When greens are cut above the lowest two to three nodes, new growth occurs and a second crop can be harvested 2-3 weeks later. Apply 20-30 pounds of nitrogen per acre immediately after the first cutting.

## Irrigation

Irrigation is essential to maximum yield and quality, particularly on lighter soils and where high plant populations and maximum fertilization are used. Fall plantings during warm weather often need water immediately after seeding. Greens may require as much as 2 inches per acre per week as they approach maturity. Kale and collards are not as vigorous as turnip and mustard and regular watering schedules may not be as critical.

## Soil Preparation

Turnip and mustard germinate and emerge quickly (2-3 days) in warm fall weather; collards emerge in 4-6 days.

Uniform stands and emergence are essential for maximum yields of top-quality greens. Thus, beds should be well-pulverized, free of trash and clods, uniformly firm, and moist at planting.

A 36- to 48-hour delay in emergence of all planted turnip and mustard can leave areas significantly "out of time" with the rest of the field, resulting in less than optimum use of pesticide sprays, fertilizer applications, and irrigation as well as delays and inefficiencies in harvest. Two days difference in emergence in warm mid-September to mid-October weather may be accompanied by as much as a 4- to 6-day delay in harvest in November.

– Planting Dates –		
	Spring set plants	Fall sow seeds
Coastal Counties	Jan. 15 - Feb. 15	Aug. 15 - Sept. 15
South Central	Jan. 15 - March 1	Aug. 10 - Sept. 10
Central	Jan. 20 - March 15	Aug. 5 - Aug. 20
North Central	Feb. 5 - March 20	Aug. 1 - Aug. 15
North	Feb. 10 - April 1	July 25 - Aug. 5

## Successive Sowings

A general rule of thumb often used in scheduling plantings (fall and winter) is to make each successive planting when the previous planting is about 50 percent emerged. This should be about 3-5 days apart for warm fall plantings and as much as 8-15 days for February and early March plantings of turnip and mustard, with longer intervals for collards.

## Planting Spacing

Row-bed configurations must be compatible with equipment available.

Use four rows 12 to 13 inches apart on a 6-foot bed. Sow 12 to 16 seeds per foot of row for greens; 5-6 seeds per foot of row for turnip roots. Collard growers sometimes sow 5 to 8 seeds per foot of row when the crop is to be pulled and bunched (fresh market).

Collards are sometimes sown or transplanted 9 to 12 inches apart in the row and allowed to produce a strong central stalk. Larger leaves are cut or broken from the stalk, bunched, and marketed. This system allows several harvests from the stalk over a 6- to 10-week period.

## Roots

For turnip roots, sow seeds at the rate of 5 to 7 per foot of row. Between-row spacings are similar.

## Seeding Rates

When using precision planters, you need 1 to 2 pounds of turnip and mustard and 2 1/2 pounds of collard seed for each acre. Approximately 4 pounds per acre are needed for kale production.

## Weed Control

### Kale and Mustard

**Roundup (glyphosate)** — Depending on weed species, use 0.5 to 5 pounds active ingredient (a.i.) per acre. Apply before crop emergence. Roundup controls most emerged annual and perennial grasses and broadleaf weeds. It provides top kill plus destruction of underground plant parts, including rootstocks and rhizomes. It is not a residual herbicide.

Apply in 30 to 40 gallons of water per acre. Do not allow Roundup to contact desirable plants. Do not mix with fertilizer solutions. Do not mow or till before Roundup treatment. Do not apply if rainfall is imminent.

**Kale, mustard, collards, turnip greens for processing** — Apply from 1 to 1.5 pints per acre of Treflan 4EC (0.5 to .75 pounds a.i. trifluralin), depending

on soil type. Apply and incorporate before planting. Treflan controls grass seedlings, pigweed, and purslane.

**All greens**—Apply 4 to 8 pounds a.i. per acre of Dacthal (DCPA) (depends on soil type for control of germinating grass seedlings, purslane, wild verbena, and chickweed). Apply immediately after planting to a weed-free soil. Thorough agitation is required.

## Disease Control

White Spot, caused by a fungus, is the most severe disease that occurs on turnip and mustard greens, collards, and kale. At first, the leaves have many small spots that enlarge, killing portions of the leaf; eventually, the entire leaf dies. The spots range in color from pale green to gray and are sometimes white with brown edges. As the spots increase in size and number, the tissue around them turns yellow and brown.

Each spot produces spores that are blown by the wind. The disease is more prevalent during the fall when the moisture is high and the temperature is 71 to 86 °F.

Cercospora Leafspot is similar to white spot. The center of the spots is slightly darker gray and the margins are a darker brown. They may increase in number until they kill the foliage.

Anthrachnose may occur on all above-ground parts of mustard and turnip. At first the leafspots are watersoaked and later become light colored in the center with a dark margin. The center of the spot may fall out. Elongated brown to gray lesions appear on the midrib, petiole, and stems. The leaves may become heavily spotted, turn yellow, and die. The roots of turnips can be affected in storage.

Control measures are similar for all diseases. A crop rotation period of at least 2 years should be followed, using any crop besides leafy greens.

Leafspot diseases may be transmitted by seed, so obtain disease-free seed.

## Insect Controls

Leafy greens are attacked by a number of foliage-feeding insects, including imported cabbage worms, cabbage loopers, and diamondback moths and aphids. Repeat applications are often necessary for the control of these pests, especially for aphids and imported cabbage worms.

Other concentrations are available on most of the insecticides listed. If one of these is used, check the label for the correct rate. The number in parenthesis following the product name is the "number of days from the last application until harvest." Greens destined for harvest

during warm weather make about 50 percent of their growth during the 7-8 days before harvest. Careful planning and observation of insecticide-waiting periods are essential.

## Harvesting

Greens wilt quickly after harvest, even on cold, sunny days. Shade them immediately after harvest and remove from the field within the hour.

Pulled plants and cut leaves should be bunched in the field, using soft string or rubber bands. Remove decayed and yellow leaves from plants.

Uniform bunches (3 to 5 inches in diameter and weighing 1 to 2 1/4 pounds) can be packed in crates or stacked on trailers or truck beds for hauling from the field. Generally, bunches are removed from the field crate, washed (on conveyor belts with spray nozzles or by hand), and repacked in clean crates or boxes for shipping.

Washing greens can remove field heat and freshen slightly wilted leaves. Use fresh water or chlorinate wash water to 25 ppm with calcium hypochlorite (wash 2 minutes and rinse) or to 55 to 70 ppm with sodium hypochlorite (dip and rinse).

## Grades

Kale, mustard, collard, and turnip greens are graded as U.S. No. 1 or unclassified. U.S. No. 1 quality has greens of similar varietal characteristics that are fresh, fairly tender, fairly clean, and free from decay or damage caused by seedstems, discoloration, freezing, foreign material, disease, insects, or equipment.

Kale also has a U.S. Commercial grade that differs from U.S. No. 1 in that a bronze or slightly yellowish color on the edges of the leaves is permitted, provided these edges are not dried.

Turnip roots are packed in 3 ways: bunches (tops are full length or not less than 6 inches), with short-trimmed tops (leafstems not more than 4 inches in length), and topped (tops removed to not more than 3/4 inch in length).

U.S. No. 1 consists of turnips of similar varietal characteristics. The roots are well trimmed, firm, fairly smooth, fairly well shaped, fairly clean, and free from soft rot and from damage caused by cuts, discoloration, freezing, growth cracks, pithiness, woodiness, watercore, dry rot, other disease, insects or rodents, or equipment.

Root diameter will not be less than 1 3/4 inches unless otherwise stated.

U.S. No. 2 are similar to No. 1, except that roots must not be excessively rough nor seriously misshaped.

## Containers

Details of bunch size and containers should be worked out with the buyer before the harvest.

Greens for fresh market are often gathered in 1- to 2-pound bunches and placed in a basket, crate, or carton containing 24 bunches.

Greens for processing are mechanically cut and conveyed or blown into trailers for direct shipment to the processing plant.

Turnip roots may be placed in 25-pound film bags, 50-pound film or mesh bags or packed in cartons containing 24 film bags containing 1 pound of turnips each.

## Storage

The processes of respiration proceed rapidly after harvest, generating considerable heat. Greens that have been tightly bunched and/or tightly packed in closely stacked shipping containers build heat rapidly and spoil within a short time.

Warm temperatures accelerate these heat-producing chemical reactions (respiration). Thus, it is imperative that they be packed with this in mind—kept cool and well-ventilated.

Cool greens to 32 °F as soon as possible and hold at that temperature in 90 to 95 percent relative humidity—this is sometimes achieved with ice or by placing in forced-air cold storage. When using the latter, make sure cold air is forced to circulate around each crate or box of greens. Greens last from 10 to 14 days under these conditions. Slightly higher storage temperatures reduce storage life.

## Production Costs

The costs in Tables 1 and 2 should help you work out your own production expenses. The pesticides named in the table are used as examples only. Other chemicals cleared for use on turnip greens may be just as effective.

Estimates of harvest labor, grading, and hauling are based on a yield of 400 dozen bunches per acre. You will need to adjust figures for different yields.

### Collards - Kale - Mustard\* - Turnips

Insect	Material	Formulation per acre
Aphids	Diazinon 50WP* (10)	1 lb
	Cygon 4EC (14)	0.5 pt
Caterpillars**	Methomyl 1.8SL (10)	2 to 4 pt
	<i>Bacillus thuringiensis</i>	
	Dipel 4L (0)	1 pt
	Thuricide HPC (0)	8 oz
	Bactospeine (0)	3 pt
	SOK-BT (0)	1 qt
Flea Beetles		
Harlequin Bug	Sevin 80S	1 1/4 lb

\***Diazinon does not have label clearance on mustard.** For control, make foliar applications when aphids appear; repeat weekly as needed.

\*\*Caterpillars may include the imported cabbage worm, cabbage looper, or diamondback moth larvae. The addition of a spreader-sticker may be helpful when using the BT formulations or when collards are being sprayed. DO NOT apply methomyl to collard plants less than 10 inches tall or if temperatures are below 50 °F. If the 1-quart rate of phodrin is used on collards or kale, wait 7 days before harvesting; otherwise, wait 3 days.

**Table 1. Estimated costs per acre, turnip greens, fresh market, Mississippi, 2001**

Item	Unit	Price	Quantity	Amount	Your Farm
		Dollars		Dollars	
<b>Direct Expenses</b>					
<b>Fertilizer</b>					
Lime (Spread)	ton	29.08	0.4950	14.39	_____
Fert 13-13-13	cwt	10.35	6.0000	62.10	_____
Amm Nitrate (34%)	cwt	9.91	1.0000	9.91	_____
<b>Fungicide</b>					
Kocide	lb	2.41	6.0000	14.46	_____
<b>Herbicide</b>					
Treflan	pt	3.07	1.5000	4.60	_____
<b>Insecticide</b>					
Malathion 57EC	pt	2.71	4.0000	10.84	_____
Dipel	pt	5.13	1.0000	5.13	_____
<b>Seed/Plants</b>					
Turnip	lb	1.80	3.3000	5.94	_____
<b>Other</b>					
Stacking Bins	each	2.00	20.0000	40.00	_____
Ice	cwt	7.10	12.0000	85.20	_____
Hauling	trip	25.00	3.0000	75.00	_____
Boxes Waxed	each	1.25	545.0000	681.25	_____
<b>Operator Labor</b>					
Implements	hour	8.66	0.1600	1.38	_____
Tractors	hour	8.66	2.5460	22.04	_____
<b>Hand Labor</b>					
Labor (grade and pack)	hour	6.91	12.0000	82.92	_____
Labor (harvest)	hour	6.91	78.0000	538.98	_____
Labor (marketing)	hour	6.91	9.0000	62.19	_____
<b>Diesel Fuel</b>					
Tractors	gal	0.97	9.8275	9.53	_____
<b>Repair and Maintenance</b>					
Implements	acre	3.32	1.0000	3.32	_____
Tractors	acre	7.04	1.0000	7.04	_____
<b>Interest on Op. Cap.</b>	acre	16.82	1.0000	16.82	_____
<b>Total Direct Expenses</b>				1,753.07	_____
<b>Fixed Expenses</b>					
Implements	acre	7.52	1.0000	7.52	_____
Tractors	acre	17.44	1.0000	17.44	_____
<b>Total Fixed Expenses</b>				24.97	_____
<b>Total Specified Expenses</b>				1,778.05	_____

Note: Cost of production estimates are based on last year's input price

**Table 2. Estimated break-even price on total direct expenses per acre, turnip greens, fresh market, Mississippi, 2001**

Item	Breakeven (dollars)	Unit	Quantity
Turnip greens, fresh market	3.26	48	545

Table 3. Estimated resource use and costs for field operations, per acre, turnip greens, fresh market, Mississippi, 2001

Operation/ Operating Input	Size/ Unit	Tractor size	Perf rate	Times over	MTH	Tractor cost		Equip cost		Alloc labor		Operating input		Total cost	
						Direct	Fixed	Direct	Fixed	Hours	Cost	Amount	Price		Cost
						dollars		dollars		dollars		dollars			
Lime (Spread)	ton			0.33	Jan							0.4950	29.08	14.39	14.39
Chisel Plow	9 ft	75 hp	0.208	1.00	Aug	1.35	1.42	0.14	0.36	0.208	1.80				5.09
Disk Harrow	10 ft	75 hp	0.320	2.00	Aug	4.16	4.38	1.09	2.18	0.640	5.54				17.37
Cyclone Spin	600 lb	75 hp	0.200	1.00	Aug	1.30	1.37	0.08	0.41	0.200	1.73				4.90
Fert 13-13-13	cwt											6.0000	10.35	62.10	62.10
Disk + Incorporate	10 ft	75 hp	0.320	1.00	Aug	2.08	2.19	0.78	1.56	0.480	4.15				10.77
Treflan	pt											1.5000	3.07	4.60	4.60
Multipacker	12 ft	75 hp	0.120	1.00	Aug	0.78	0.82	0.04	0.24	0.120	1.03				2.92
Precision Plant	2-Row	75 hp	0.300	1.00	Sept	1.95	2.05	0.53	1.31	0.300	2.59				8.45
Turnip	lb											3.3000	1.80	5.94	5.94
Cyclone Spin	600 lb	75 hp	0.200	1.00	Sept	1.30	1.37	0.08	0.41	0.200	1.73				4.90
Amm Nitrate (34%)	cwt											1.0000	9.91	9.91	9.91
Spray-TR Mount-3Pt	21 ft	75 hp	0.078	3.00	Sept	1.52	1.60	0.26	0.48	0.234	2.02				5.90
Kocide	lb											6.0000	2.41	14.46	14.46
Spray-TR Mount-3Pt	21 ft	75 hp	0.078	2.00	Sept	1.01	1.06	0.17	0.32	0.156	1.35				3.93
Malathion 57EC	pt											4.0000	2.71	10.84	10.84
Spray-TR Mount-3Pt	21 ft	75 hp	0.078	1.00	Oct	0.50	0.53	0.08	0.16	0.078	0.67				1.96
Dipel	pt											1.0000	5.13	5.13	5.13
Stacking Bins	each			1.00	Oct							20.0000	2.00	40.00	40.00
Trailer - Vegetables	75 hp		0.090	1.00	Oct	0.58	0.61	0.02	0.05	0.090	0.77				2.06
Labor (harvest)	hour									78.000	538.98				538.98
Labor (grade & pack)	hour				Oct					12.000	82.92				82.92
Ice	cwt											12.0000	7.10	85.20	85.20
Labor (marketing)	hour			1.00	Oct					9.000	62.19				62.19
Hauling	trip											3.0000	25.00	75.00	75.00
Boxes-Waxed	each											545.0000	1.25	681.25	681.25
<b>Totals</b>						<b>16.57</b>	<b>17.44</b>	<b>3.32</b>	<b>7.52</b>	<b>101.706</b>	<b>707.52</b>			<b>1,008.82</b>	<b>1,761.22</b>
<b>Interest on operating capital</b>														<b>16.82</b>	
<b>Unallocated labor</b>														<b>0.00</b>	
<b>Total specified cost</b>															<b>1,778.05</b>

Note: Cost of production estimates are based on last year's input prices.

Revised by **David Nagel, Ph.D.**, Extension Horticulturist, **John Byrd, Ph.D.**, Extension Weed Scientist, and **J.H. Jarratt, Ph.D.**, Extension Entomologist.

Mississippi State University does not discriminate on the basis of race, color, religion, national origin, sex, age, disability, or veteran status.

**Publication 1557**

Extension Service of Mississippi State University, cooperating with U.S. Department of Agriculture. Published in furtherance of Acts of Congress, May 8 and June 30, 1914. RONALD A. BROWN, Director (rev-500-10-00)