Crop Profile for Leafy Greens in Georgia

Prepared, July 2001

General Production Information

- Georgia ranking in U.S. - First
- Georgia's contribution to Total U.S. Production (%) - 42%

Yearly production in:

- acres grown - 16,300
- acres harvested - 15,200
- cash value - $ 42 million
- Production costs (annually): $1,600/Acre

Crop destination (%):

- fresh market - >84%
- processing - <16%
- other (feed, etc.) - 0%

Production Regions:

Most leafy green production occurs in the southern half of the state, although some production is scattered throughout Georgia. Primary production regions in the southwestern and south central part of the state include Colquitt, Tift, Berrien, Cook, Echols and Brooks Counties among others. Other areas that contribute heavily to production include Grady, Worth, Pierce, Toombs, Macon, Turner and Union Counties.

Cultural Practices

The Crop Profile/PMSP database, including this document, is supported by USDA NIFA.

Leafy greens are produced on a wide range of soils including loamy sand to sandy loam soil types in the Coastal Plain area and sandy clay types in the mountain area. Planting dates for greens in the southern part of the state basically run from August to June. Production in the eastern part of the state begins with spring plantings from mid February to late April. Most fall production plantings occur beginning in early August to early September. Northern production usually begins in May to June and the season ends in September to October. All land prepared for leafy greens must be limed to a pH of between 6.0 to 6.5. Planting sites are deep turned and bedded. Preplant fertilizers, usually about 25-33% of total nitrogen and potassium and all phosphorous and minor nutrients are incorporated prior to planting. Remaining nutrients are applied with sidedress applications. A total of 175-250 pounds of nitrogen per acre are used per crop. A total of 90 to 110 pounds of potassium and phosphorous are applied per acre depending on soil test results. Mustard and turnips are almost exclusively direct-seeded. Collards and kale may be either direct-seeded or transplanted. Plant spacings average three feet between rows with 9-12 inches between plants within the row for collards and kale and 3-6 inches between plants for turnips and mustard. Irrigation is supplied as needed with the highest demand just before harvest. Foliar applications of calcium, boron and magnesium are commonly applied to enhance plant growth and reduce the chance of deficiency. Greens are harvested mechanically for processing, but mainly by hand for the fresh market. They are often boxed in the field, top iced and shipped. Yields vary from around 400 to 600 boxes per acre for fresh market.

Note: the Georgia Agricultural Statistics Service has completed a pesticide use survey for leafy greens in Georgia. The data will be available July 16, 2001 at the web site for the National Agricultural Statistics Service www.usda.gov/nass

Weeds

Weed control involves the management of several grasses and broadleaf species. Particularly troublesome weeds include yellow nutsedge and larger-seeded broadleaves.

Chemical Controls:

Bensulide (Prefar)-Collard, Kale and Mustard

Target weeds: Annual grasses and small-seeded broadleaf species.

Percent acres treated: < 5%.

Average rate and frequecy of application:

Prefar 4EC- 5.0-6.0lb a.i./A (5.0-6.0 qt/A), once preplant

Efficacy rating: Fair to excellent.

Sethoxydim (Poast)-Collard, Kale and Mustard

Target weeds: Annual and perennial grasses.

Percent acres treated: 20%

Average rate and frequency of application:

Poast - 0.19lb a.i./A (one pint/A), once postemergence

Efficacy rating: Good to excellent.

Trifluralin (Treflan, others)-Collard, Kale, Mustard and Turnip

Target weeds: Annual grasses and small-seeded broadleaf species.

Percent acres treated: 65%

Average rate and frequency of application:

Treflan - 0.5lb a.i./A (one pint/A), once preplant

Efficacy rating: Excellent.

Alternatives:

Stale seedbed control, which involves allowing weeds to germinate and then killing them with a contact herbicide in the abscence of the crop is one possible alternative. This method is rarely used due to inadequate control for a sufficient time period. Soil solarization has proven to be an inefficient alternative also. Reduced tillage practices generally produce lower quality produce and are not acceptable in leafy greens production at this time.

Cultural Control Practices:

Mechanical control through cultivation is used during the early growing period. Hand hoeing is possible

but not an efficient method. Crop rotation is an important aspect of controlling some persistent weed species and problem weeds such as sicklepod, nutsedge and cocklebur. Stale seedbed control, which involves allowing weeds to germinate and then killing them with a contact herbicide in the abscence of the crop is one possible method for early season control.

Biological Controls:

Biological controls do not exist at this time.

Post Harvest Control Practices:

Not applicable.

Other Issues:

The primary reason for a deficiency in effective herbicide options is the small market for which these materials must be produced. The labeling of chemical controls for weed control in leafy greens is simply more expensive than the returns from the sale of such products. Therefore there is little interest in the industry to pursue new materials and new labels.

You can review current herbicide recommendations in the Georgia Pest Control Handbook.

http://www.ent.uga.edu/pest2001/Horticultural_Crops/Vegetable/Commercial_Vegetables_Weed_Control.htm#greens

Insect Pests

Aphids

Several species of aphids may attack leafy greens. The most common and serious is the green peach aphid, *Myzus persicae.* Aphids are most problematic in the fall plantings because populations have had several months to develop. By this time, aphids have been exposed to insecticides in other cropping systems and clonal reproduction of females is prevelant exacerbating the resistance problems. Aphids reproduce at alarming rates and give birth to living young.

Leafy greens are produced for both the fresh market and processing industry. Leafy greens bound for fresh markets have no official threshold for aphid contamination, therefore, rejections for aphids is based on supply and demand levels at the moment. On the other hand, processors have relatively low thresholds for insect contamination and have difficulty suppressing aphid populations.

Estimated total losses including cost of control and damage for thrips in 1997 was $479,000, cost of control at $225,000 and damage at $254,000. This **does not include** estimates for losses from mosaic virus infections transmitted by aphids.

Diamondback Moth(DBM) and Cabbage Looper(CL)

Diamondback moth, *Plutella xylostella,* and cabbage looper, *Trichoplusia ni,* are the two most destructive lepidopteran pests of leafy greens.

The diamondback moth caterpillar (DBM), *Plutella xylostella*, is the single most destructive pest to cabbage and leafy greens worldwide. Insecticide resistance has been documented in every corner of the globe and DBM is the key pest in most crucifer cultures. By definition, a key pest is the species whose presence triggers the initial, often early, inecticide applications. These early applications often destroy the natural enemies of both the key pest and secondary pests. Secondary pests may then become economically important. Biorational compounds that are "soft" on natural enemies and provide adequate control of DBM have found a solid niche in current management strategies.

Except for the adult stage, DBM completes its whole life cycle on the plant. DMB moths lay eggs singly on the underside of leaves. The larvae hatch in a day or so and feed on the underside. The larvae grow as large as 5/8 inch. The larvae is green and hangs by a silken thread when disturbed. They are very active when disturbed. Initial damage is small incomplete holes caused by young larvae and larger complete holes caused by mature larvae. The holes become larger as the leaf develops. The entire plant may become riddled with holes under moderate to heavy populations. Larvae also feed in the developing heads of cabbage, causing deformed heads and encouraging soft rots. The pupae of DBM is green and encased in a netlike cocoon that is attached to the foliage. Pupae reduce quality as a contaminant.

DBM attacks all types of leafy greens and cole crops during all parts of the growing season. DBM is a cold-hardy species, so it can survive cold termperatures in the caterpillar stage. During temperatures below approximately 50F, larvae cease to feed. As the temperature rises above this mark, feeding resumes. The life cycle is retarded during cooler temperatures. In contrast to this, DBM populations may increase dramatically at temperatures above approximately 80F. The life cycle may be as long as 50 days at low temperatures and as short as 15 to 20 days during high temperatures. There may be 10 or more generations during warm years.

The cabbage looper, *Trichoplusia ni*, is the second most destructive pest to cabbage and leafy greens,

and at times is the key pest in Georgia. Biological insecticides are moderately effective and, often, other insecticides are needed for adequate control.

The cabbage looper is most destructive in early summer and fall. The larvae are large worms (up to 1 ½ inches) that eat away large holes in the leaves. Larvae are sluggish and hold on to the plants tenaciously when attempts are made to remove them. This is the only caterpillar pest that has only three pairs of fleshy prolegs near the rear. Except for the adult, the Cabbage looper is like the DBM, spending its entire life cycle on the plant. The eggs are laid on the underside of the leaves and larvae hatch and feed on the underside, with the pupae attached to the underside in a protective cocoon. The pupae is green and two to three times as large as DBM pupae.

Estimated total losses including cost of control and damage for DBM and CL in 1997 was $1,559,000, cost of control at $1,143,000 and damage at $416.000.

Beet armyworm:

The beet armyworm, *Spodoptera exigua*, may be a pest to fall plantings of collard, kale, mustard and turnip. Heavy populations that have increased on other crops move to greens crops when food sources become scarce. Parasites during this period often suppress populations below an economic level, but occasionally the beet armyworm can devastate a crop. The beet armyworm is one of the most difficult caterpillars to control. It is naturally resistant to most commonly used insecticides. If it develops into very large populations, control might not be regained.

The moth lays masses of eggs on the undersides of leaves. The mass may have up to 150 eggs and is covered with scales off the moth's body, giving the mass a cottony appearance. The larvae are light green to dark olive green and sometimes has stripes of these colors down the back. Above the second pair of legs near the head end is a black spot. Larvae may be 1 1/4 inches long.

Cabbage webworm:

The cabbage webworm, *Hellula rogatalis*, is occasionally a serious pest of collards and kale. When it occurs, growers are usually caught off guard. Because it has a habit of feeding in the bud area, producing moderate to heavy webbing growers have difficulty controlling it.

Mature larvae are about 3/4 inch long and have five dark stripes on a dirty gray body. The head capsule is black with a distinct, white V-shaped mark.

Imported cabbageworm:

The imported cabbageworm, *Pieris rapae*, is rarely an economic pest on cabbage and leafy greens if controls for other worms are being applied. The adult is a common butterfly that lays eggs simply on the leaf surface. The larvae are green and have a velvety appearance. Larvae have a narrow, light yellow stripe down the back.

Cross-striped cabbageworm:

The cross-striped cabbageworm, *Evergestis rimosalis*, is occasionally a pest in the cooler, northern part of Georgia. It is usually not too difficult to control if the crop is being monitored and timely controls are initiated.

The larvae may be slightly longer than 3/4 inch and have black and white transverse stripes down the back. Below the transverse stripes on each side is a black and yellow stripe along the length of the body. Initiate controls when larvae are observed.

False chinch bug:

The false chinch bug, *Nysius raphanus*, is a fragile sucking bug that is primarily a pest on turnip and mustard. False chinch bugs may infest fields in large numbers. Damage is caused by their feeding on the veins on the undersides of the leaves. They inject enzymes during the feeding process, causing a green wilting of the leaf margins. This condition is variable and there is no information on how many bugs cause wilting.

Silverleaf whitefly:

The silverleaf whitefly, *Bemisia argentifolii*, is a sporadic pest of cabbage and leafy greens. The silverleaf whitefly may become a problem in late plantings, but is rarely a problem in spring greens. The adult is smaller than a gnat and is bright white with a yellow head and thoracic region. It is moth-like in appearance and feeds on the undersides of leaves, where it also lays eggs. The larvae hatch and become sessile on the underside of the leaf. The adults fly rapidly from the plant when disturbed.

Heavy feeding can result in small yellow spots on the foliage of the tender leafy greens. When on

cabbage or collards, the whitefly is more a contaminant than an injurious pest. Control for whiteflies is not recommended unless populations in the area are becoming excessively large or honeydew and/or sooty mold is developing on the foliage. Controlling whiteflies in collards is cost prohibitive in high population situations.

Vegetable weevil:

The vegetable weevil, *Listroderes costirostris*, may be a pest of seedling cabbage and leafy greens, especially under the cool growing conditions of the early fall and spring plantings. Adults are about 1/4- to 3/8-inch long with a stout snout. They are brownish-gray with two nondescript whitish marks on the wing covers. The larvae are white legless grubs. The adult weevil and grub feed directly on the foliage and stems of greens. They can cause significant stand reductions on young plantings.

Yellowmargined leaf beetle:

The yellowmargined leaf beetle, *Microtheca ochroloma*, is a small beetle that infests turnips and mustard, especially at field margins. The beetle is black with dirty, yellowmargined wing covers. The larvae are black and alligator-shaped with three pairs of stocky legs. The larvae and adults feed all over the leaves, leaving them with a laced appearance. The pupae may be found in white, round, and loosely woven cocoons near the crown of the plants.

Secondary pests:

Secondary pest are listed below. A few secondary pest were previously described because of their frequency of occurrence.

- Beet armyworm
- cabbage webworm
- imported cabbageworm
- cross-striped cabbageworm
- false chinch bug
- silverleaf whitefly
- vegetable weevil
- yellowmargined leaf beetle
- cabbage aphid
- seedcorn maggot

- turnip root aphid
- thrips
- stink bugs
- harlequin bug
- chinch bug
- corn earworm

Chemical Controls:

DBM resistance to the pyrethroids, carbamates and most organophosphates in the late 80's and early 90's played an important role in shifting to management with *Bacillus thuringiensis*, **Bt**. Gradually DBM resistance levels have reversed so that the third generation pyrethroids are moderately efficacious, but not preferred as primary control agents. Growers have also recognized that absolute control is not necessary for producing marketable leafy greens. This is significant when utilizing **Bt**. Growers are keenly aware that excellent coverage of plant surfaces are necessary for achieving adequate levels of control of the major and secondary pests of leafy greens. New insecticide chemistry has given growers the advantage temporarily in controlling the cabbageworm complex. Spintor and Avaunt have been added to the arsenal. Both can be in an alternation resistance management approach or as cleanup insecticides when the populations of cabbageworms increases beyond the expected control efficacy of the **Bt's**.

Review insecticide recommendations for leafy greens in the Georgia Pest Control Handbook.

http://www.ent.uga.edu/pest2001/Horticultural_Crops/Vegetable/Vegetables.htm

Diseases

Leafy green crucifer crops are susceptible to several diseases which are capable of causing severe losses in quality and yield. Disease prevention through cultural practices, and timely fungicide applications must be implemented and integrated for successful production of leafy greens. As with most pests, proper identification and knowledge of the biology of the pest are essential to implementing any disease management strategies.

Root Knot Nematode (*Meloidogyne* spp.)

Nematodes are small, slender, microscopic round worms which live in the soil. The root-knot nematode is the most common type affecting leafy greens in Georgia. If not managed, this pest can cause serious damage in light, sandy-textured soils.

Symptoms

Root-knot nematodes enter young feeder roots during their common feeding process, causing the roots to swell. The most common below-ground symptom is the formation of galls or knots on the roots. Nematode injury interferes with the uptake of water and nutrients, thus giving the top portion of the plants an appearance which resembles a lack of moisture or a fertilizer deficiency. Stunting, yellow, irregular growth of plants in the field and rapid decline are also above ground symptoms of nematode injury.

Management Options

Rotating leafy greens with a grass crop, such as rye, is somewhat beneficial in controlling root-knot, but this practice is no substitute for nematicidal fumigants if nematode levels are high. Nematicides currently used are methyl bromide (180-240 lb./Acre), Telone II (95 lb./Acre), Telone C-17 (80 lbs. 1,3-dichloropropene and 17 lbs. chloropicrin/Acre), chloropicrin (300-500 lb./Acre) and metam sodium (Vapam or Sectagon) at 159-318 lb./Acre. Depending on weather conditions, nematicidal fumigants must be applied 10 days to 3 weeks prior to planting to avoid phytotoxicity to young plants.

Damping-off (*Pythium, Rhizoctionia*)

Damping-off is caused by several soilborne diseases which attack leafy greens in the seedling stage. Significant stand losses due to *Pythium* can occur during periods of cool, wet weather. Losses to *Rhizoctonia* are more prevalent during warmer periods.

Symptoms

Symptoms usually occur as sunken, water-soaked or reddish brown lesions at or near the soil line. Young plants generally collapse and die very rapidly. Plants that do survive will be stunted and less vigorous than healthy plants.

Management Options

Cultural practices such as deep turning and rotation behind grain or pasture crops can reduce inoculum levels. Frequent irrigation during peroids of hot, dry weather will reduce the incidence of damping-off caused by *Rhizoctonia.* Ridomil Gold (0.5 lb. ai/Acre) may be incorporated into the soil prior to planting to suppress damping-off due to *Pythium.* Terraclor (.85-1.15 lb. ai/1000 row ft.) may be used in Georgia

to reduce damping-off due to *Rhizoctonia*.

Black Rot (*Xanthomonas campestris* pv. *campestris*)

Black rot is one of the most serious diseases of leafy greens. This disease is caused by a bacterium which can contaminate seed or transplants. Disease spread and severity is more evident during warm moist conditions. Dry, cool conditions seem to greatly inhibit the spread of the disease.

Symptoms

The most typical symptom associated with black rot infection is a large V-shaped necrotic lesion which extends back towards the midrib of the leaf. The necrotic area is usually surrounded by a chlorotic halo. Veins within and leading from lesions are typically dark brown to black. Infected plants generally deteriorate and collapse.

Management Options

Management of black rot depends heavily on preventing the introduction of infected seed or transplants to commercial fields. Therefore, using disease free seed and transplants is the major line of defense against black rot infestations. Avoid introducing contaminated equipment or irrigation water to non-contaminated fields.

Leaf Spot Diseases (*Alternaria brassicae, Colletotrichum higginsianum, Cercospora brassicola, and Cercosporella brassicae*)

Fungal leaf spots are a major problem on leafy greens and can cause serious losses if left uncontrolled. As with most diseases, cool, moist conditions are favorable for the development of disease.

Symptoms

With *Alternaria,* the intial symptoms appear as small, dark spots on the leaf surface. Spots enlarge to form irregular shaped lesions in which can be found a concentric ring pattern which is indicative of diseases caused by *Alternaria* spp. Spots continue to expand during periods of favorable weather and can defoliate plants if left uncontrolled. *Colletotrichum* or anthracnose is characterized by small, pale gray, desiccated circular spots. Spots will develop spores which later fall to turnip roots where they cause sunken, dry spots. *Cercospora* causes a necrotic, "frogeye" leafspot which is surrounded by a yellow halo. *Cercosporella* causes an angular pale green to grayish white lesion which may or may not have a yellowish brown halo or border.

Management Options

Since spores and fruiting bodies of these fungi may overwinter on infected crop debris, deep turning and rotation are important cultural control strategies in managing these diseases. The most effective and practical management strategy for suppression of these diseases is the use of fungicides applied on timely schedule throughout the season. Maneb (1.12-1.6 lbs. ai/Acre and with maximum of 3.6 lbs. ai/ Acre/season) is used pursuant to a Section 24C (supplemental state label) in Georgia and Tennessee for Mustard, Turnips, and Collards. Benlate (0.75 lb. ai/Acre) has been issued a similar label for AL, AR, FL, GA, KY, LA, MS, NC, OK, SC, TN, TX and VA for turnip tops only. Several copper containing fungicides are also used at various rates but have limited efficacy on this disease.

Downy Mildew *(Peronospora parasitica)*

Downy mildew can be a serious problem on leafy greens during periods of wet, cool weather and overcast conditions.

Symptoms

This disease produces small necrotic specks surrounded by yellow areas on the upper side of diseased leaves. The underside of the leaves may show a pale, whitish-gray mold during cool, moist periods. The diseased spots may enlarge rapidly during warm, moist weather, causing the leaves to wither and die.

Management Considerations

Sanitation by removing or destroying infected green tops is a good way to prevent spread both temporally and spatially. Timely fungicide applications of Aliette (1.6-4.0 lb. ai/Acre) tank mixed with Maneb (1.12-1.6 lbs. ai/Acre) is the most effective fungicide option for downy mildew suppression. Several copper containing compounds are used at various rates but have limited efficacy on this disease.

Virus Diseases [Turnip Mosaic Virus (TuMV), Cauliflower Mosaic Virus (CaMV)]

Plant viruses may cause sporadic losses to leafy green crops each year. Losses are usually attributed to the time of infection with more loss being associated with earlier infection.

Symptoms

TuMV causes primarily mottling, stunting and leaf distortion. CaMV symptoms are expressed as a mosaic pattern and vein clearing.

Management Considerations

Virus incidence is much greater in late summer and fall planting because the aphid populations are much higher and virus carrying hosts plants are more available. Early spring plantings usually have less incidence of virus infected plants. Insecticides which suppress aphid populations may delay the spread of either virus.

Review recommendations for disease management of leafy greens in the Georgia Pest Control Handbook.

http://www.ent.uga.edu/pest2001/Horticultural_Crops/Vegetable/Vegetables.htm

HARVESTING AND POST-HARVEST HANDLING

Many leafy greens (including, collards, kale, mustard and turnips) are cut by hand and packed directly in the field for the fresh market. Yellowed, brownish or damaged leaves are removed as the plants are picked, and before they are tied into bunches and placed into containers. Field labor must be adequately trained and supervised to harvest only optimum maturity and/or sized leaves or rooted plants to meet potential buyer's quality standards.

Field sanitation is very important to reduce the spread of disease among plants. Cutting tools are a primary source of disease carryover. Knives should be routinely sanitized to keep disease inoculum from building on their surfaces and infecting other plants. Workers' knives should be collected at the end of a harvest day and placed in a bucket of sanitizer (use one ounce of household bleach per gallon of water).

When harvesting leafy greens, field crews should minimize bruise damage and leaf punctures. Leaves of leafy greens are crushed if they are overpacked into field boxes. Improperly used cutting tools will puncture leaves. Cuts or breaks in the leaves or heads will cause excessive wilting and provide avenues for decay pathogens.

Leafy greens should be harvested during the coolest part of the day to minimize shriveling and field heat accumulation. If delays occur during packing, shade greens from direct sunlight.

Leafy greens should be cleaned before marketing. Bunches of collards and leaves of mustard, turnip and kale tied in 1/2 dozen bundles are laid on a flatbed trailer and hauled from the field station. A straight line packing belt conveys bunches beneath spray washers where greens are cleaned to remove sand and dirt, and refreshed to improve their appearance. Workers place bundles coming off the end of the belt

onto racks and into a storage cooler. Direct field packing of boxed leaves is also done without washing at the request of the buyer. Leafy greens should be precooled before shipping. Leafy greens (collards, kale, mustard and turnips) should be rapidly cooled using one of the methods above. In addition, most buyers require icing for these greens to provide needed moisture for freshness and crispness. Following the field boxing of leaves, the greens may be taken to the shipping location where a shovel of ice is added to greens in each box.

Quality Grade Standards

Collard

U.S. standards for collard greens provide for one grade - **U.S. No.1**. This consists of greens of similar varietal characteristics, which are fresh, fairly tender, fairly clean, well-trimmed and of characteristic color for the variety or type. Also, greens shall be free from decay, damage caused by coarse stems and seedstems, discoloration, freezing, foreign material, disease, insects, or mechanical or other means. Tolerances for grading collard greens are based on product weight in a container (see Table 1 for defect percentages).

Kale

U.S. standards for kale provide two grades - **U.S. No.1** and **U.S. Commercial**. Buyers customarily use U. S. No.1, which requires plants to be of one type, well-trimmed, not stunted, free of decay and of damage caused by yellow or discolored leaves, seedstems, wilting, bud burn, freezing, dirt, disease, insects, or mechanical or other means. Tolerances for grading kale are based on product weight in a container (see Table 1).

Mustard & Turnip

U.S. standards for mustard greens and turnip greens provide for one grade - **U.S. No. 1**. This consists of greens of similar varietal characteristics that are fresh, fairly tender, fairly clean and free of decay and of damage caused by seedstems, discoloration, freezing, foreign material, disease, insects, or mechanical or other means. In order to allow for variations incident to proper handling and grading, defect tolerances for each are provided (see Table 1).

Packaging

Collards are sold in bunches of two or three plants. Collards are bulk loaded into trucks or packed into wirebound boxes. Depending on market demand, bunches are packed 12 to 24 bunches per box or sold by the dozen bunches. Collards are top iced for sale.

Kale leaves are stripped from the plant and tied into bunches for marketing. Usually, 12 to 16 leaves compose a bunch and bundled leaves are sold as 1/2 dozen bundles per box. Kale is iced before sale.

Mustard greens are marketed as bundled leaves. Freshness and lack of wilt are important marketing factors. Bundles of 12 to 16 leaves are packed into wirebound or waxed cartons (18 to 20 pounds, excluding ice) depending on market demand. Leaves are iced before sale.

Turnip greens are sold as rooted plants and leaves. If marketed as plants, they should be harvested when the roots reach 1 1/2 to two inches in diameter and bunched as two or three plants, similar to collards. Depending on market demand, turnips are packed into 25- or 50- pound cartons or by the dozen as bunches in wirebound crates. Turnip leaves are tied into bundles and sold, with 1/2 dozen bundles per box. Rooted plants and leaves are top iced during packaging.

Table 1. U.S. grade standards based on allowable defect levels (Note: Some buyers expect higher quality than these limits.)

Commodity	Grade	Tolerances, by weight	Size Requirement	Trim Requirement
All	U.S. Commercial	25% total, including 10% serious damage and 2% soft decay		
Kale	U.S. No. 1	10% total, including 1% wet decay	Size not a requirement of grade	Kale must be well trimmed
Collard, mustard, turnip	U.S. No. 1	10% total, including 5% serious damage and 2% decay	Size reported as "small, medium or large leaves"	Mustard and turnip greens have no trimming requirements. Collards must be well trimmed.

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