PLANT PATHOLOGY

4-H Vegetable Judging, Grading and Identification

A N.C. STATE COLLEGE PUBLICATION

INTRODUCTION

This 4-H Vegetable Judging, Grading and Identification Manual was prepared for two reasons. Primarily, it is a study aid to help you prepare for vegetable judging, grading and identification contests which will be held by 4-H Clubs throughout the State. If the material is this booklet is studied carefully, you will be well prepared since you will be tested only on the items included in this booklet.

This manual is also a valuable source of information to aid you in doing a better job with your vegetable, garden and related projects.

In studying this manual you will learn how to distinguish vegetable varieties, and how to identify the more common insects, diseases and weeds that attack vegetable crops.

You will also learn some of the important points in grading vegetables for market, which is just as important as learning to grow good vegetables. In addition, you will learn to judge the quality of some of the important kinds of vegetables through the use of accepted standards.

All of this will help you become a successful vegetable grower, a sound market operator, a wise consumer buyer, and a better 4-H Club member.

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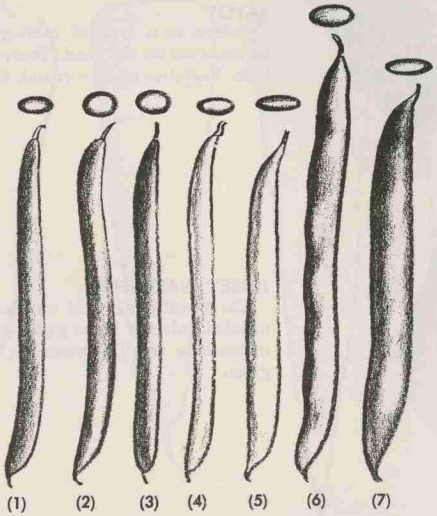
Vegetable Variety Identification



Beans

Bush Snap Beans

(1) STRINGLESS BLACK VALENTINE Oval pods, nearly straight, medium green and stringless. Pods 6½ to 7 inches in length, ⅜-inch in width. Excellent shipping variety. Retains color and texture for several days after harvest. Seed solid black when mature.

(2) TENDERGREEN A stringless, round, dark green podded variety. Pods 6 to 6½ inches long and ⅜-inch wide. Excellent for fresh market and processing. Seed light brown or buff with purple mottling.

(3) WADE Pods similar to Tendergreen but straighter, darker green and distinctively smooth, almost as if waxed. Seeds variable in color from reddish-brown to dark mahogany.

(4) CHEROKEE WAX Pods very closely resemble Stringless Black Valentine except for pod color. Pods oval, golden wax, nearly straight and stringless at all stages. The most prolific wax-podded variety. Seeds black.

(5) SURE CROP WAX Pods thick, flat, golden yellow, stringless, fine texture and quality. Pods 5½ inches long and 7/16-inch wide. Seeds are black.

Pole Snap Beans

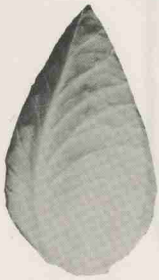
(6) KENTUCKY WONDER Produces long pods in clusters, beans curved and indented, plump, oval to almost round, slightly stringy. Pods 9 inches long and ½-inch wide. Seeds buff brown. Some strains have white seed.

(7) McCASLAN A vigorous, high yielding, flat podded, slightly stringy but good flavored variety. Pods are 7½ inches long and 9/16-inch wide. Not recommended for processing.

Cabbage

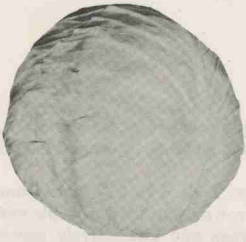
SAVOY

Refers to a type of cabbage having crimped, crinkled leaves, even on the head. There are several varieties of this type. Varieties may be round, flat or pointed.



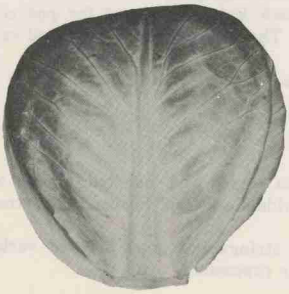
JERSEY WAKEFIELD

Early maturing, very sweet, high quality variety, recommended only for home gardens. Heads are pointed, 7 to 8 inches long, small, average 2½ to 3 pounds. Leaf color, blue-green.



COPENHAGEN MARKET

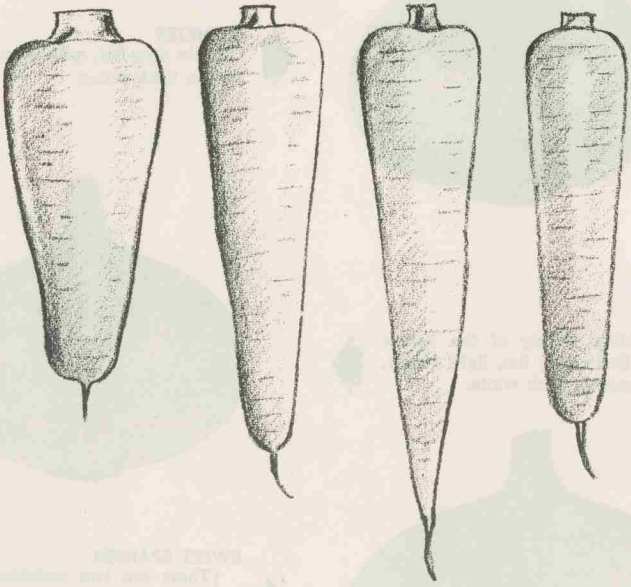
Plant small and compact, heads round, firm, 6 to 7 inches in diameter, weight 3½ to 4 pounds. Few outer leaves, an excellent short-season variety.



OAKVIEW BALLHEAD

Plants short-stemmed and compact. Heads almost round, slightly flattened on top, large and firm. Average weight 8 pounds. Control size by spacing in the row. Excellent late variety, especially for mountains.

Carrots



(1) (2) (3) (4)

(1) CHANTENAY Mid-season in maturity, with a large, strong foliage. Roots 5 to 5½ inches long and 2 to 2¼ inches thick. The shoulders are square to slightly rounded with a groove or depression around the neck. Sides taper gradually to a blunt-pointed or rounded-tip end. Flesh and core are deep yellow.

(2) DANVERS Mid-season in maturity with large, strong foliage. Roots 6 to 7 inches long and 1¾ inches thick. Shoulders are slightly rounded, with sides tapering to a slightly rounded tip. Flesh is deep orange with slightly lighter core.

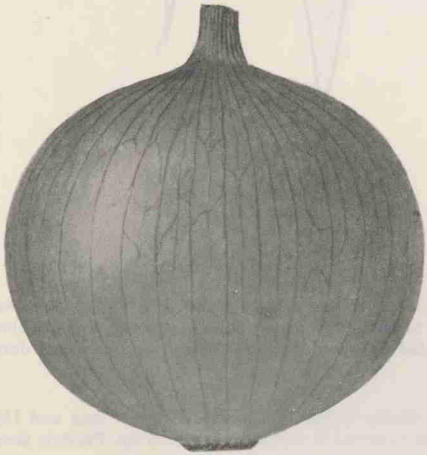
(3) IMPERATOR Mid-season to late in maturity with large, strong foliage. Roots long and slender (7 to 8 inches in length and 1½ to 1¾ inches thick). Shoulders are almost square. Sides taper gradually to a point. Flesh is deep orange throughout.

(4) NANTES Early maturing with small, sparse foliage. Roots are 6 inches long and 1¼ inches in diameter. The roots are nearly cylindrical with rounded blunt ends, neck small. Flesh and core is deep orange.

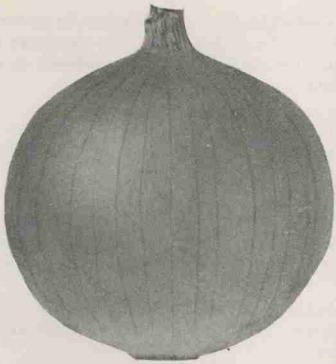
Onions

EBENEZER
Bulbs deep flat, medium size; skin pinkish-brown, flesh yellow.

EXCEL
A heavy yielding variety of the Yellow Bermuda type. Bulbs very flat, light yellow, larger than Ebenezer; flesh white.

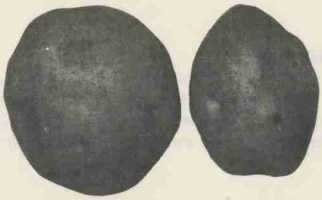


SWEET SPANISH
(There are two varieties—Yellow Sweet Spanish and White Sweet Spanish.) The largest of the onions; bulbs globe-shaped; skin white or yellowish-brown; flesh white.



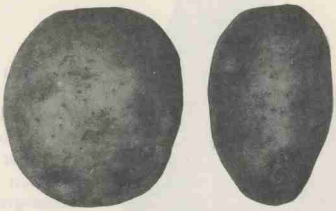
YELLOW GLOBE DANVERS
Bulb globe-shaped, medium large, yellow, very firm and solid. Flesh pale yellow, majority of bulbs 2 to 2½ inches in diameter.

Irish Potatoes



IRISH COBBLER

Tubers roundish with blunt ends, the stem end often notched rather deeply giving a shouldered appearance to the tuber; eyes shallow to rather deep, particularly in bud eye cluster; skin creamy white; flesh white.

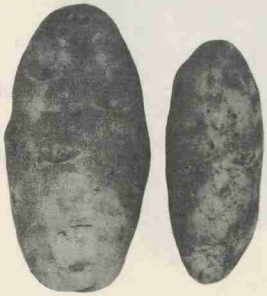


KATANDIN

Tubers very smooth, regular in outline, elliptical to roundish in shape, medium to flat in thickness; few eyes and very shallow, same color as skin; skin dark creamy buff; flesh white.

BLISS TRIUMPH

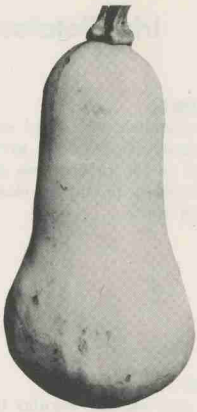
A very early maturing variety with pink to red skin. Tubers round, thick, many deep eyes especially in bud eye cluster; flesh white.



RUSSET BURBANK

Same variety as Idaho Baker and Netted Gem. Tubers large, long, cylindrical to slightly flattened; skin russeted, heavily netted; many shallow and well distributed eyes; flesh white. This variety is not adapted to N. C. conditions.

Winter Squash and Pumpkins



BUTTERNUT

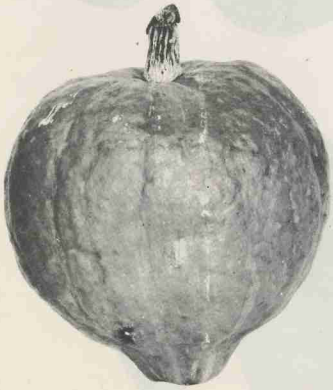
Fruits 10-12 inches long, gourd-shaped with neck about 4 inches in diameter. The small seed cavity is located in the lower bowl-shaped end. Skin hard, light creamy brown; flesh yellow and sweet. Fruits weigh 3 to 4 pounds.

HUBBARD

Fruits large, usually 9 to 10 inches thick and weighing 10-15 pounds; body nearly globular but pointed or lobed at both ends, warted. Skin hard and tough, dark bronze-green. Flesh yellow and sweet.

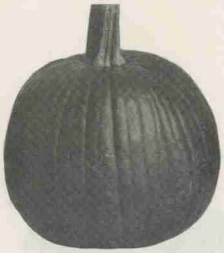
TABLE QUEEN (ACORN)

Fruits oval shaped, ribbed, pointed at blossom end, dark green, 1¼ to 1¾ pounds; usually 4 to 5 inches in diameter and sweet.



DELICIOUS

Fruits top-shaped, usually 7 to 8 inches long and weighs 8 to 9 pounds. Skin very dark green, fairly smooth, slightly ribbed. Flesh thick, bright yellow and sweet.



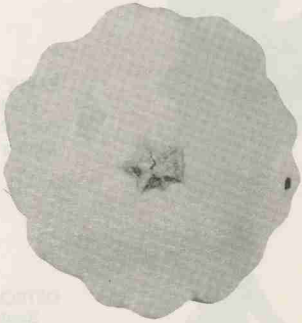
SMALL SUGAR

Fruits round, flattened on both ends; skin hard, smooth, somewhat ribbed, deep orange. Flesh yellow. One of best varieties for pumpkin pies.

CONNECTICUT FIELD

Fruits very large, generally oval-shaped with both ends slightly flattened, 20-pound average weight but sometimes much larger; surface smooth, somewhat ribbed, deep orange in color; flesh thick, orange-yellow and sweet.

Summer Squash



EARLY PROLIFIC STRAIGHTNECK

Fruits straight, thick necked. Skin smooth, lemon-yellow when young and tender but heavily warted and orange when mature; flesh light yellow. Pick when fruit are 5 to 6 inches long.

WHITE BUSH SCALLOP

Fruits pale green when young, becoming creamy white as fruit matures; flat, edges scalloped; should be picked when fruit are 3½ to 4½ inches in diameter.

Celery

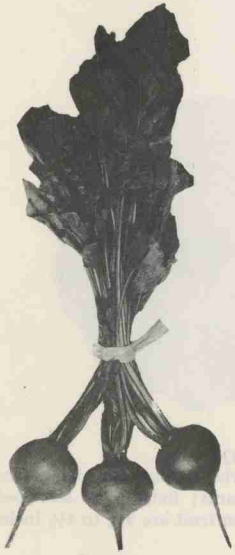
GOLDEN SELF BLANCHING

Light green to yellowish foliage; many leaf stalks and well-developed heart. Leaf stalks thin and sharply ribbed. Blanches to a light golden yellow.

PASCAL

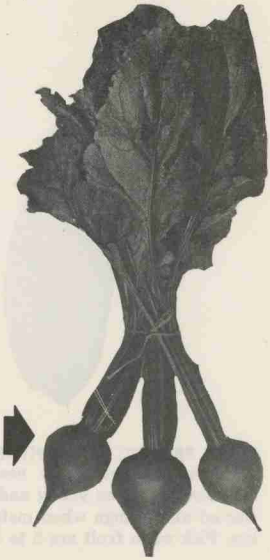
Dark green foliage and leaf stalks. Stalks round, thick and fleshy, smooth ribbed and not as compact as Golden Self Blanching.

Beets



EARLY WONDER

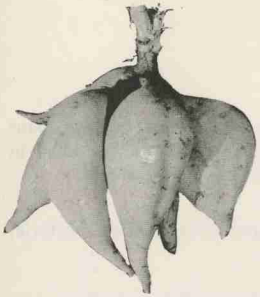
Roots globe-shaped, dark purplish red; flesh dark red with prominent zoning; skin very smooth and glossy.



DETROIT DARK RED

Roots turnip-shaped, smooth and uniform. Skin deep ox-blood red, flesh deep red with slightly lighter red zoning. Excellent for canning, bunching.

Sweet Potatoes

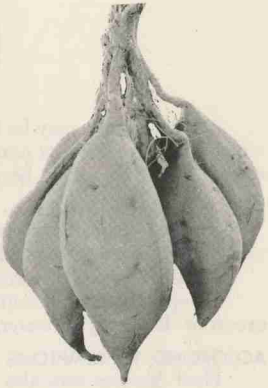


PORTO RICO

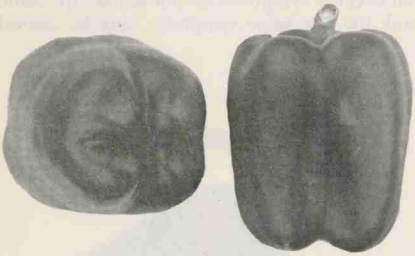
Roots typically spindle-shaped but vary from almost round to very long; skin pink to copper; flesh salmon pink to orange, soft when baked.

JERSEY TYPE

Roots spindle shaped and rather uniform, medium to small size; skin dark russet yellow; flesh yellow to orange, dry or firm when baked.



Peppers

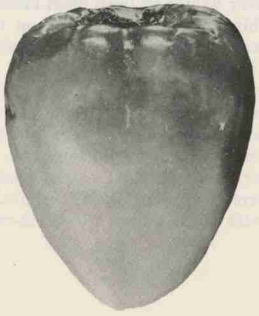


CALIFORNIA WONDER

The leading sweet pepper variety for home garden and fresh market shipment. Fruits 4½ inches long and 3½ to 4 inches thick with little or no taper; deep green, smooth and thick walled, becoming bright crimson when fully ripe.

RUBY KING

Fruit 3 lobed, 4½ to 5 inches long and 2½ inches thick, slightly tapered, dark green turning to bright red when fully ripe; flesh medium thick, mild and sweet.



PIMIENTO

Primarily a canning variety; good also for home use as a sweet pepper. Fruits heart-shaped; very smooth, medium size, dark green turning to very deep red when fully ripe. Flesh extra thick and sweet.

Disease Identification

A plant disease may be broadly defined as any disturbance in the vital functions of a plant which interferes with its normal structure or economic value. Plant diseases may be classified in several ways. They may be grouped according to their causes or according to symptoms.

ACCORDING TO CAUSES

Group I—Parasitic diseases (caused by living organisms called parasites), fungi, bacteria, nematodes, parasitic seed plants

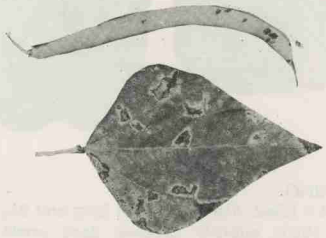
Group II—Virus diseases

Group III—Non-parasitic diseases (those induced by unfavorable conditions such as any excess or deficiency of water, food, light, or temperature, soil too acid or too alkaline, etc.)

ACCORDING TO SYMPTOMS

Plant diseases may also be distinguished or classified according to their symptoms. (Visible evidence that something is wrong with a plant.) Diseases classified in this manner are given names such as leaf spot, wilt, blight, canker, smut, rust, mildew, etc. We must realize that any classification based on symptoms alone cannot be final because symptoms do not remain the same but change as the causal agent continues to work and, too, the same symptoms may be caused by a number of different organisms.

Beans



ANTHRACNOSE

Bean anthracnose is a seed-borne fungus disease. Infection may occur on any part of the plant above the ground and at almost any stage of growth. Lesions on the stem are oval sunken cankers extending up and down the stem, ranging in color from brown to very dark brown with purplish to brick red borders. Infection on the leaves generally follows the veins on the underside, causing them to become purplish or reddish. Symptoms of this disease are most conspicuous on the pods. Here the lesions begin as very small, reddish brown, elongated spots. These spots gradually become circular sunken spots with rusty brown edges and flesh-colored centers.

BACTERIAL BLIGHT

Bacterial blight is one of the most important diseases of snap beans. This disease is caused by a bacterium carried by infected seed, and can live over winter on dead plant material in the soil, possibly two years. Infection on the leaves first appears as small water-soaked spots on the underside of the leaf that later merge to form large, irregular brown spots surrounded by a light yellow border. Stem infection is first seen as small, water-soaked spots that later enlarge and turn a reddish color. Bacterial blight on the pods first appear as small water-soaked spots that enlarge to form irregular blotches, slightly sunken and dry with reddish brown to brick-red borders.

Cabbage

BLACK ROT

Black rot of cabbage is caused by a bacterium affecting primarily the above ground parts of the plants. Infection may take place during any stage of growth. The initial spread of this disease organism is usually by infected seed or soil. This tiny bacterium may also be carried by insects, spattering rain, and surface drainage water. Infection takes place primarily through the water pores at the margin of the leaf causing V-shaped areas of dead tissue at the leaf margin and later dark brown to black vascular discoloration in the

Corn

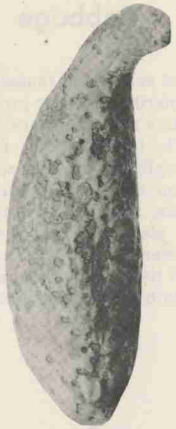
CORN SMUT

Corn smut is caused by a fungus. Because of its conspicuous nature and widespread occurrence, it is perhaps the best known disease of corn. It is found throughout the world wherever corn is grown. The disease may attack any above-ground part of the plant. The galls or swellings caused by the smut fungus vary in size from ¼-inch to 6 inches in diameter. At first the swellings have a silvery white appearance; but soon the interior is converted into a black, powdery mass, which becomes exposed when the outer membrane breaks.

Cucurbits

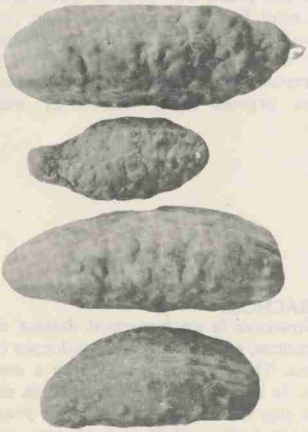
ANTHRACNOSE

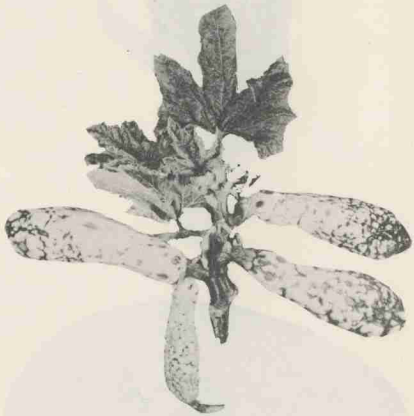
Anthracnose is an important disease affecting watermelons, cucumbers and cantaloupes in North Carolina. This disease is caused by a seed-borne fungus. In addition to being carried on seed, this fungus also survives for at least one year on old plant parts in the soil. It causes brown spots with irregular margins on cucumber leaves. On watermelons, the leaf spots are black. The fruit symptoms are conspicuous, sunken crater-like spots on the fruit—often with pink centers.



SCAB

Scab is important on summer squash and cucumbers in the mountain area of North Carolina. Scab is caused by a fungus which is probably seed-borne and may survive for some time in old plant parts. The most conspicuous symptom is the dark gray to black spotting on the fruits. It also affects the leaves, deforming them and causing irregular spots with yellow margins and brown centers.

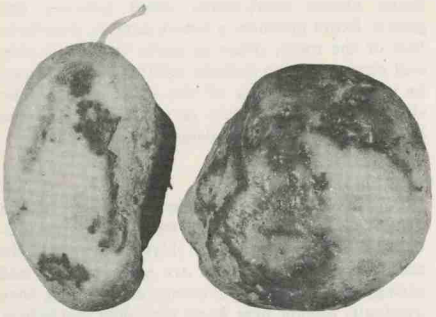




MOSAIC

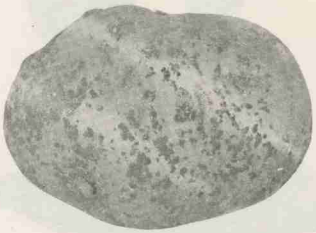
Mosaic is a virus disease which causes stunting and a mottled appearance of the leaves and fruits of cucumbers, cantaloupes, and squash. Some virus diseases are seed-borne and some are spread by aphids and pickers during harvest.

Irish Potatoes



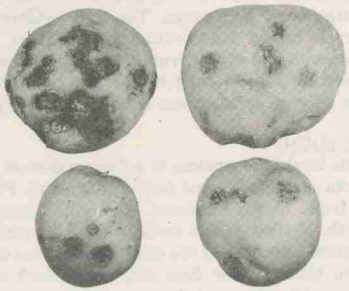
LATE BLIGHT

Late blight causes large, dark spots on the leaves and stems, with a white "downy" fungus growth on the lower surface of the leaf that spreads—causing a complete blight of the foliage. The most characteristic symptom on the tubers is a brownish sunken lesion extending slightly into the tuber flesh as a dry brownish or reddish decay.



RHIZOCTONIA

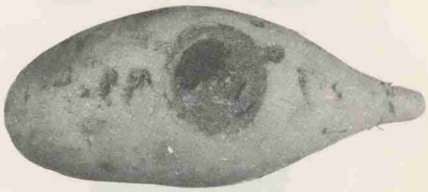
Rhizoctonia is a fungus disease that occurs wherever potatoes are grown. This disease causes brown sunken lesions on underground stems or stolons. The most conspicuous signs on the tubers are the presence of small, shiny brown to black sclerotia on the surface.



SCAB

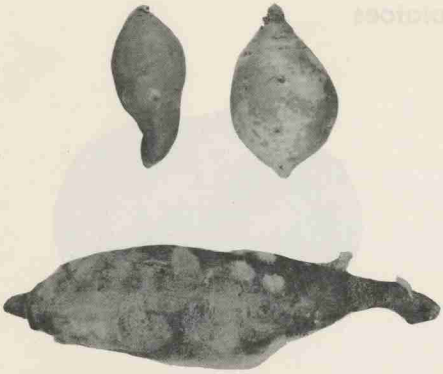
Scab appears wherever potatoes are grown. Scab occurs only on the tubers where it forms small brownish spots which later enlarge to form hard, circular, or irregular corky areas on the surface; or they may be cracked open, extending down into the flesh.

Sweet Potatoes



BLACK ROT

Black rot is a fungus disease that may occur on any underground part of the plant. It produces small black spots on the lower part of the stem, enlarging until the whole stem is rotted off. The disease appears as dark to nearly black, somewhat sunken circular spots on the surface of sweet potatoes. These spots enlarge and often involve nearly the whole sweet potato. The surface of the diseased spot has a metallic luster, and the tissue beneath is a greenish color.



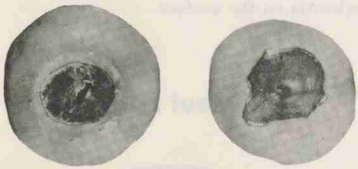
SCURF

Scurf is caused by a fungus and is commonly found almost everywhere sweet potatoes are grown. Scurf produces a brown surface discoloration of the roots, either as spots varying in size and shape with no definite outline, or there may be a uniform rusting of the sweet potato. The skin of the sweet potato is not broken and the brown color is only skin deep.

SOFT ROT

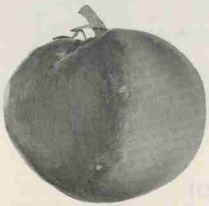
Soft rot of sweet potatoes is caused by a fungus (the bread mold) and is a very destructive disease of sweet potatoes in storage. At first, the soft rot affected potatoes are soft, watery, and stringy. After decay and escape of moisture, they gradually become firm, hard, shrunken and brittle. Soft rot affected sweet potatoes have a sweetish odor at first, later a sour odor.

Tomatoes



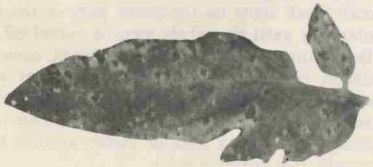
BLOSSOM END ROT

Blossom end rot is a non-parasitic disease of tomato fruits that causes some damage in both field and greenhouse plantings. Fruits are most often affected when ⅓ to ½ grown, but they may be attacked at any stage. The first evidence of injury is brown discoloration of the tissue near the blossom end of the fruit. These spots enlarge and become slightly sunken. The skin of the fruit in the affected area become black and leathery.



LATE BLIGHT

Late blight of tomatoes is a fungus disease that attacks all above-ground parts of the plant. Plants and fruits may be affected during all stages of growth. Rotting of the fruit is the most striking symptom. Infection of the fruit appears as a gray-tan to black, rather firm rot. Large dark spots with a white "downy" fungus growth is seen on affected leaves.



EARLY BLIGHT

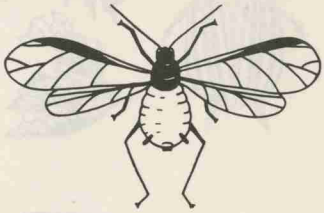
Early blight of tomatoes is a fungus disease that appears on the leaves as irregular brown spots—usually showing concentric rings in a target pattern. On the stems small, dark, slightly sunken spots with light centers are formed. Spots on the fruits are dark, leathery, sunken spots at the point of stem attachment. The fruit spots have concentric markings like those on the leaf.

Insect Identification

The purpose of this section is to help the reader recognize the insects found on vegetable crops. If, after checking this manual, you cannot identify the insects, please send specimens to the Extension Entomologist, N. C. State College, Raleigh, N. C.

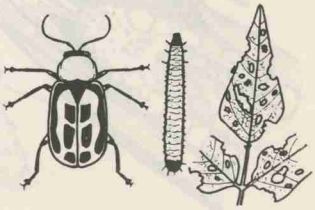
APHIDS

Aphids or plant lice cause damage to most vegetable crops. The major damage is caused by the insects sucking juices from the plant. Many species also spread diseases, especially viruses. The adults are soft-bodied, usually pear-shaped, either winged or wingless. They are green, pink, or even black in color. The nymphs resemble the adults except that they are smaller and never winged. There are several generations per year. Since these pests feed primarily on the undersides of the leaves, thorough application of insecticides is essential for good control.



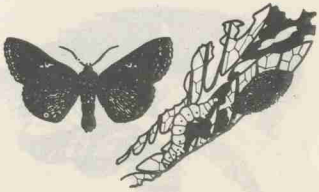
BEAN LEAF BEETLE

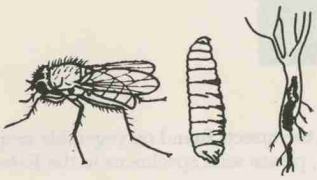
There is considerable variation in the coloring and markings of these beetles. In general, they are reddish to yellowish in color with 6 black spots in the center of the back and a black margin around the outer edge of the wing covers. They are about ¼ inch long. Adults feed on the foliage, making round regular holes. They may also attack the stems of young plants at or slightly below ground level. The females lay eggs on the soil at the base of the plant. These hatch into slender white larvae which feed on the roots of plants.

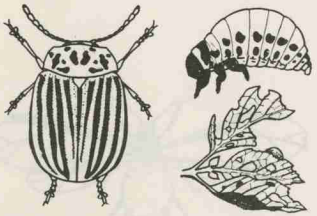


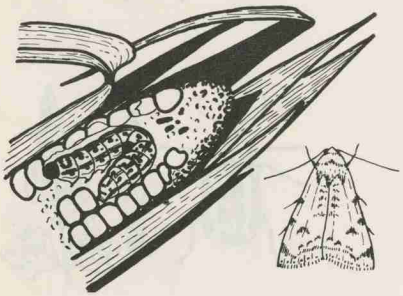
CABBAGE LOOPER

The adult is a brownish colored moth with silver markings on the wings. They have a wing spread of about 1½ inches. These moths lay greenish white eggs on the upper surface of the leaves. The larvae or "worms" reach a size of 1½ inches when full grown. They are greenish with 4 thin white lines along the back and a heavy one on each side of the body. The head is narrower than the thorax. The "worms" move in a "measuring" or "looping" motion, thus the name, cabbage looper. The insect over-winters in a thin cocoon.









CABBAGE MAGGOT

The adult is a grayish two-winged fly somewhat smaller than the housefly and with proportionately longer legs. The flies lay white eggs on soil close to the plants. The eggs hatch into white wedge-shaped maggots which are about ¼-inch long when full grown. The pupal stage is passed in the soil and it is in this stage that the pest overwinters. There appears to be at least 3 full generations per year. This insect does most of its damage in the mountain regions of the state.

COLORADO POTATO BEETLE

Both the adults and larvae feed on the foliage of Irish potatoes. The adults are about ⅜-inch long, ¼-inch wide and very convex. They have 10 black and 10 yellowish longitudinal stripes on their wing covers. The females lay clusters of 20 or more yellowish colored eggs on the undersides of the leaves. These hatch into reddish colored, humpbacked, soft bodied larvae bearing 2 rows of black spots along each side of the body. The larvae reach a length of ½-inch when full grown.

CORN EARWORM

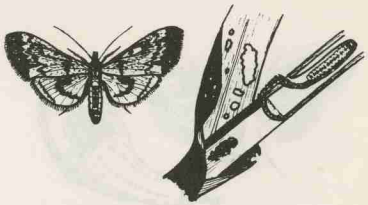
The moths are grayish brown, marked with darker areas near each wing tip, and have a wing expanse of about 1½ inches. Hind wings are light in color with darker areas near the margins. Moths deposit eggs on plants. They are yellowish in color and laid singly. One female can produce as high as 3,000 eggs. Fresh corn silk is a preferred place for depositing eggs. Eggs may hatch in as little as 2 to 3 days. Newly hatched larvae feed on the bud and leaves or on corn silk and then on kernels at the end of the ear. When full grown the "worms" are about 2 inches long, brown, greenish or even pinkish in color. The head is yellowish and the underside of the body always lighter than the back.

CUTWORMS

Many kinds of cutworms attack our vegetables. Most of them cut off stems of plants at or near the soil surface; others climb stalks. The adult is a dull colored moth with a wing expanse of 1 to 1¾ inches. Hind wings are usually light in color. Moths lay eggs which hatch into destructive caterpillars or cutworms. When full grown many are 1½ inches long. They curl up into a tight "C" shape when disturbed. Most cutworms are a dull color and have practically no hairs. The pupal stage is passed in the soil. Most cutworms overwinter in the larval or pupal stage.

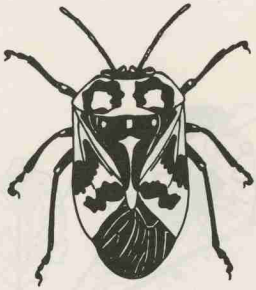
EUROPEAN CORN BORER

Adults are pale yellowish moths, with irregular dark bands running across the wings, which have an expanse of about 1 inch. Males are somewhat darker than females. Eggs are laid in groups of up to 50 on the underside of leaves. They hatch into caterpilars which feed on leaves and in protected areas until about half grown. Then they burrow into the stalk. These caterpillars are nearly an inch long when full grown. They are flesh colored with brown heads and marked with small, round brown spots. Caterpillars go into a pupal stage inside the stalk.



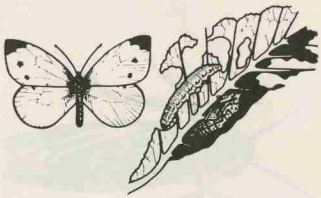
HARLEQUIN BUG (terrapin bug)

This insect feeds on cabbage, collards, etc. by extracting juices from plants. Adults and nymphs have similar habits. The flat, shield-shaped adults are about 3/8-inch long. They are reddish or orange and bear black markings which gives the appearance of a "mask". Eggs are "keg" shaped and are laid in groups. Each egg has two black bands, one near the top and one near the bottom. Nymphs develop through 5 stages, each resembling adults, but they are wingless and smaller. This insect over-winters in the adult stage in any protected area.



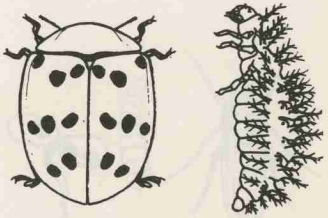
IMPORTED CABBAGE WORM (cabbage butterfly)

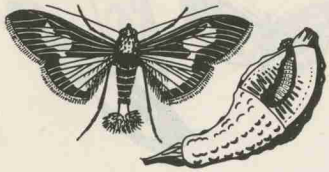
The white butterfly with 3 or 4 black spots on each wing lays eggs on the underside of leaves. These hatch into caterpillars or "worms" which become 1¼ inches long when full grown. They are velvety-green in appearance with 3 indistinct gold colored stripes, one along the back and one on each side. The caterpillar does the actual damage. The pupal or chrysalid stage is brownish-grey in color and has many projections. It holds to the plant by "gluing" its tail in and supporting its middle with a silken loop which encircles the body. This pest over-winters in this stage.

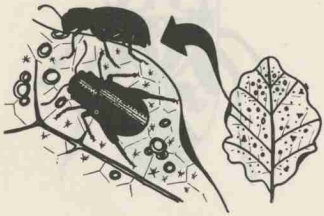


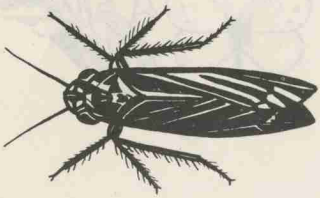
MEXICAN BEAN BEETLE

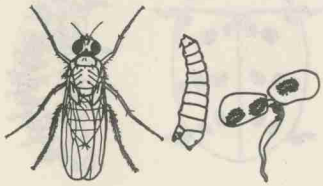
The brownish colored adults have 16 black spots arranged in 3 rows across their backs. They are ¼ to ⅓-inch in length. The beetles lay lemon colored eggs in groups of 25 or more on the undersides of leaves. These eggs hatch into yellowish larvae which have 6 rows of black-tipped, branched spines. The larval stage is the growth stage, therefore we have larvae of all sizes from ⅛-inch at time of hatching to ⅓-inch when full grown. Both adults and larvae feed on both sides of leaves. Pupae are yellowish in color and usually have traces of the last larval skin at the end of the body attached to the leaf.











PICKLEWORM

The adult is a moth having a wing-spread of about 1 inch. Wings are fragile looking, having white centers and yellowish-brown margins. The tip of the body has a brush of long dark scales. Moths deposit eggs both on fruit and on vines. Eggs hatch into white, then greenish, black-spotted caterpillars. These brownish headed "worms" become ¾-inch long when full grown. Sawdust-like excrement of larvae is readily seen. Winter is passed in the pupal stage in a silken cocoon on crop refuse. There are at least 4 generations per year. Muskmelon, cucumber and squash are most seriously damaged. Early in the season severe damage is done to growing tips of the vines and blossoms.

POTATO FLEA BEETLE

Adults are small beetles about 1/16-inch long and nearly black with brownish colored legs and antennae. Hind legs are well developed, allowing them to jump like fleas. Eggs are laid in soil at the base of the plants, and hatch into cylindrical, brown headed, white larvae about 1/5-inch long. The pupal stage is passed in soil. These insects over-winter as adults under trash. There are 3 or more generations per year. The most obvious damage is caused by the beetles feeding on leaves, where they chew out round holes. Larvae feed on the under-ground parts of plants and can cause severe losses in Irish potatoes.

POTATO LEAFHOPPER

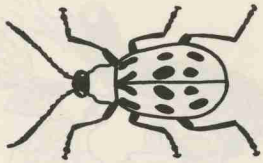
The pale-green, wedge-shaped adult is about ⅛-inch long. Females insert elongated eggs into the plant tissue by means of an egg laying mechanism. These eggs hatch into greenish colored nymphs which resemble adults except they are smaller and wingless. There appear to be at least 3 generations per year. Both the nymphs and adults suck plant juices. On beans this causes a stunted, crinkled, down-curled leaf. On Irish potatoes the saliva injected causes a deadening and upcurling of the tissues called "hopperburn".

SEED CORN MAGGOT

Adults are grayish brown flies about 1/5-inch long. Females deposit white eggs in the soil close to plants. These eggs hatch into cream colored, wedge-shaped maggots about ¼-inch long when full grown. The maggot stage does the actual plant damage. These maggots are legless and the mouth parts are located at the narrow end. The pest over-winters in the pupal stage which is passed in the soil in a brown capsule-like case about 1/5-inch long. Damage may occur in seed pieces of Irish potatoes, sprouts of such crops as corn, beans, peas, watermelons, etc.

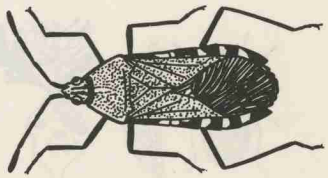
SPOTTED CUCUMBER BEETLE

The overwintering stage is a yellowish-green beetle about ¼-inch long with 11 black spots. The head and antennae are black. Females deposit their eggs around the bases of plants. These eggs develop into yellowish-white, brown headed larvae which may reach ¾-inch in length. These larvae tunnel the roots. There appear to be two generations per year. This insect feeds on over 200 different plants and may be found on many vegetable crops such as beans, cucurbits, corn, potatoes, peas, beets, tomatoes and turnips.



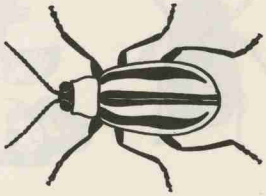
SQUASH BUG

Both adults and nymphs cause injury by sucking sap from plants. Usually damage can be detected by the drooping of an occasional leaf. Adults are about 5/8-inch long and brownish-black or gray in color. They are flat across the back. Overwintered females mate in the spring and soon reddish-brown eggs are laid on the leaf. Eggs are laid in rows which come together at an angle. Each cluster contains 15 or more eggs. These hatch into nymphs which are light gray in color, wingless and smaller than adults. There is probably only one generation per year. These pests suck juices from curcubits only, especially squashes and pumpkins. Destruction of crop residues soon after harvest aids in control.



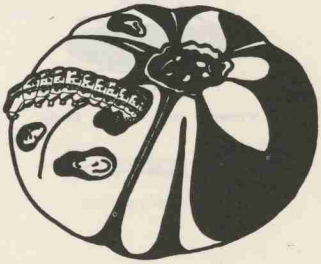
STRIPED CUCUMBER BEETLE

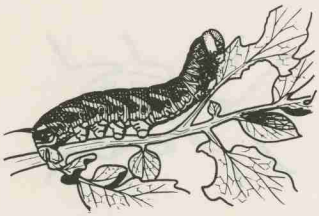
These beetles about 1/5-inch long, are yellow with 3 wide black longitudinal stripes. Besides causing damage by feeding on leaves, stems and fruits, these beetles also carry the organisms causing bacterial wilt of cucurbits and cucumber mosaic. Adults lay yellowish colored eggs at the base of the plants. These hatch into whitish larvae which reach a size of ⅓-inch when full grown. They feed on the underground parts of plants. There are at least 2 generations per year. In addition to cucurbits, they feed on beans, peas and corn.



TOMATO FRUITWORM

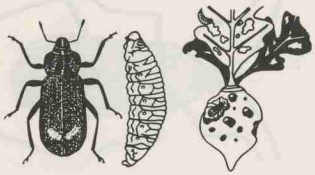
This insect is described more fully under the name of corn earworm. The larvae attacks tomato fruits from the time they form until they ripen, boring into the sides and near the stem end. Sometimes a small, black entrance hole is the only visible sign that a large worm is working within. Injury to tomatoes is most common on very early tomatoes and fall grown tomatoes. Start treatment as soon as damage is noted.





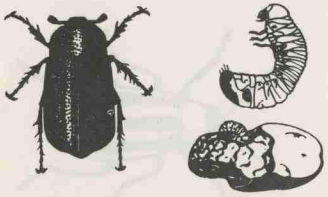
TOMATO HORNWORM

Adults are large, grayish moths with white and dark mottlings on front wings. Hind wings are lighter and have two zig-zag lines across each. There are 5 yellowish orange spots along each side of the body. These moths have a wing expanse of 4 to 5 inches and fly mainly about dusk. Each female lays eggs singly on plants. They are spherical in shape and greenish-white in color. Larvae which hatch from these eggs are green with 8 "L" shaped, white markings along each side of the body. The horn at the rear is bluish-black. These "worms" reach a length of 3 to 4 inches when full grown.



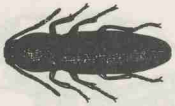
VEGETABLE WEEVIL

Adults are grayish snout beetles about ⅓-inch long. They have two white markings arranged in a "V" shape on the rear half of the wing covers. These adults lay eggs in the crowns of plants. When eggs hatch, greenish colored, slug-like larvae are seen. They are about ½-inch long when full grown. Both larvae and adults feed on leaves and also on roots of such plants as potatoes and turnips. It appears that this pest goes into a resting stage during the hot part of the year.



WHITE GRUBS

There are several species of these pests, but the following general comments may be made. Adults are hard-shelled light brown to almost black colored insects, about 1 inch in length, commonly called May or June beetles. They usually feed on foliage of trees at night. During the day they hide in grass and lay eggs. These spherical shaped, pearly white colored eggs hatch into white "C" shaped grubs with brown heads. Grubs feed on roots of grass or other crops that may be present. The pupal stage is passed in the soil.



Wireworm adult or Click Beetle

Wireworm or larva

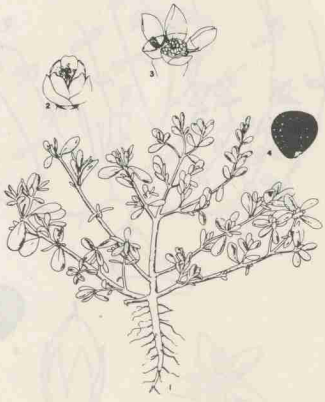
WIREWORMS (Click Beetles)

The adults are hard shelled, dull colored beetles varying in length from ½ to 1½ inches. These "streamlined" adults have a loose flexible joint in the thorax just ahead of the wings. The females lay eggs in the soil around the roots of grass plants. The eggs hatch into larvae commonly called wireworms. These are yellowish, tough bodied creatures ranging in size from ½ to 2 inches when full grown. These larvae feed on the underground parts of plants. The pupal stage is passed in the soil. The larval and adult stages winter over in the soil.

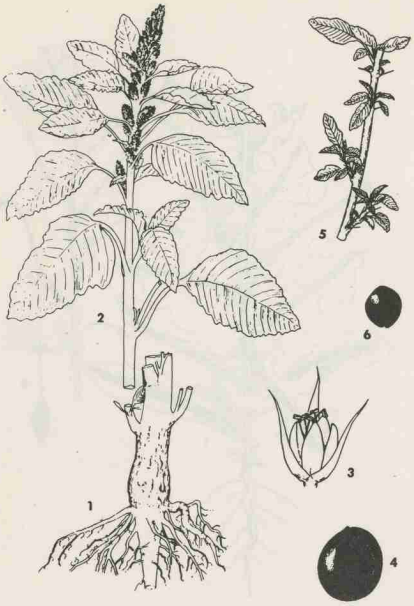
Weed Identification

You are responsible for being able to identify each and give the common name of the 14 common weeds shown in this manual. You are not required to know the botanical (Latin) names. I am sure you have had to fight most of these weeds at one time or another, but did not know the correct names of many of them.

PRICKLY LETTUCE *(Lactuca scariola).*
1, lower portion of plant showing roots, stems and leaves; 2, upper portion of plant with small yellow flowers; 3, seed. May reach 5 feet in height. A fairly common winter annual throughout the state in fence rows, roadsides and waste places.

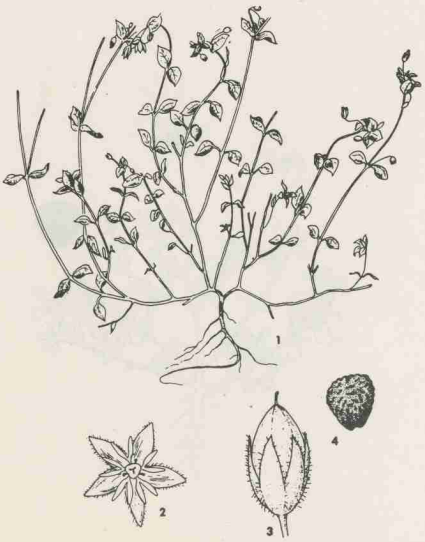


PURSLANE *(Portulaca oleracea).*
1, whole plant showing fleshy stems and leaves and low growing habit; 2, small yellow flower; 3, seed pods; 4, seed. Semi-erect stems may form a mat 1 foot across. A summer annual found in the Coastal Plain and Piedmont in gardens, truck crops and other cultivated fields as well as waste places.



ROUGH PIGWEED *(Amaranthus retroflexus)*
1, lower portion and flower clusters; 3, small green flower; 4, dark purple to black seed. About 2 or 3 feet high; sometimes 6 feet high. Summer annual commonly found in Coastal, Piedmont and Mountain cultivated land, barn lots, fence rows and waste places.

SPINY PIGWEED *(Amaranthus spinosus).*
5, portion of stem showing leaves and "spines" 6, seed. Stems not generally erect, may be 3 or 4 feet long. Not so common as *ROUGH PIGWEED* and generally found in Coastal Plain and Piedmont on sandy soils.



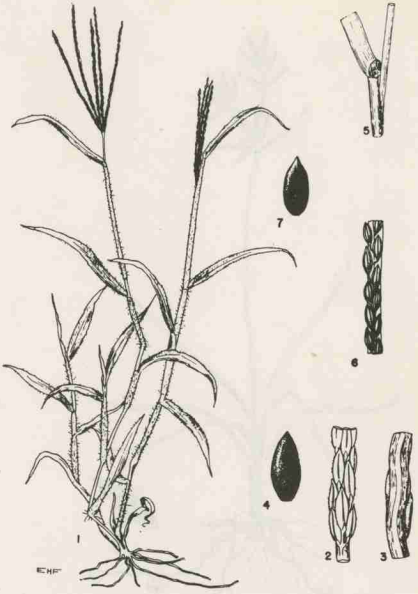
COMMON CHICKWEED *(Stellaria media).*
1, flowering plant; 2, white flower; 3, seed pod; 4, seed. A winter annual which occurs commonly throughout the state in fertile gardens, lawns, alfalfa, strawberries and nurseries.

CRABGRASS *(Digitaria sanguinalis).*

1, entire plant showing general growth habit and hairy appearance; 2, section of flower, stalk showing spikelets; 3, reserve side of flower stalk; 4, grain or "seed". Partially creeping stems may be 3 feet long. A very common summer annual plant throughout the state in crop land, pastures, gardens, lawns and waste lands.

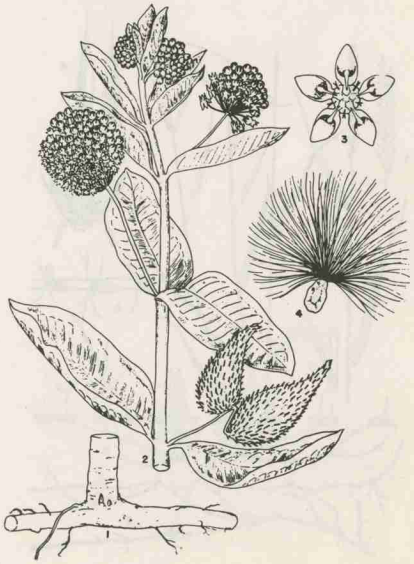
SMALL CRABGRASS *(Digitaria ischaemum).*

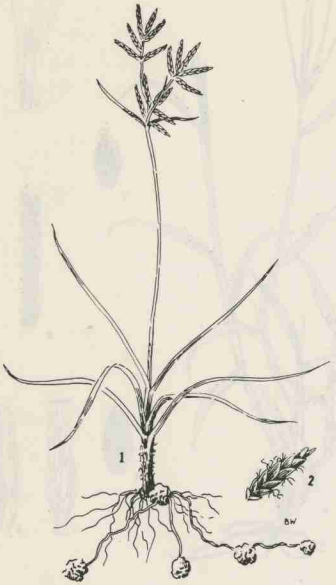
5, part of smooth stem and leaf; 6, section of flower stalk showing spikelets; 7, grain or "seed". Grows at the same time and in the same places as *CRABGRASS* but is not generally so large and abundant.



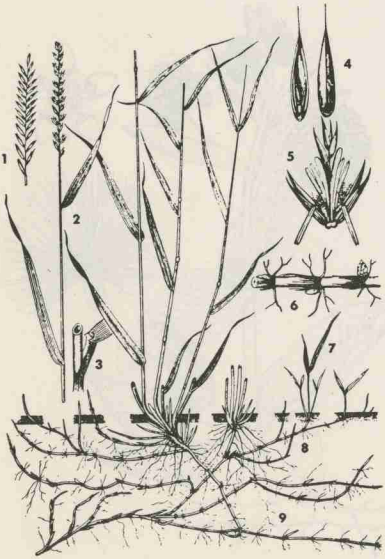
COMMON MILKWEED *(Asclepias syriaca).*

1, lower part of stem and rootstock; 2, upper part of stem with flower cluster and seed pod; 3, individual pinkish-white to purple flower; 4, seed. Stems are from 2 to 4 feet high. A reasonably common perennial weed of the Piedmont and Mountains in pastures, cultivated fields and roadsides.

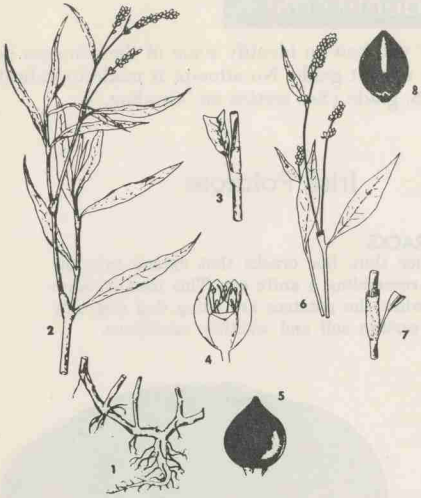




NUTGRASS *(Cyperus rotundus).*
1, the entire plant showing roots and "nut-like" tubers, leaves, and seed stalk with purplish-red seed head; 2, spikelet from seed head. Commonly 12 to 18 inches tall. A common perennial pest of the Coastal Plain and lower Piedmont in cultivated fields, gardens, lawns and abandoned areas.
YELLOW NUTGRASS *(Cyperus esculentus)* is similar to nutgrass but is usually larger with a more compact yellow to golden-brown flower.



QUACKGRASS *(Agropyron repens).*
1, spike; 2, stems, leaves and flower head; 3, section of stem and leaf; 4, seed; 5 spikelets; 6, rhizome with buds; 7, new shoots from rhizome or underground stem; 8, beginning of new shoots; 9, roots and rhizome. From 1½ to 3 feet tall. A highly undesirable perennial in crop lands of upper Piedmont and Mountains. Found also in pastures and waste places.

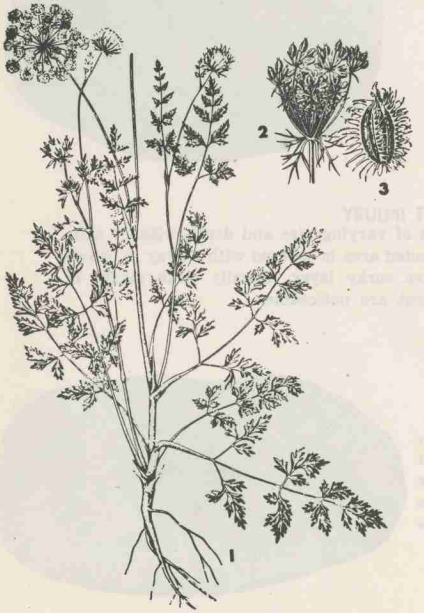


PENNSYLVANIA SMARTWEED *(Polygonum pennsylvanicum).*

1, lower stem and roots; 2, upper part of plant showing leaves and flowering spike; 3, section of stem, leaf and leaf sheath; 4, pink or rose flower; 5, mostly black, smooth, flattened seed with some triangular shaped. Produces a dense clump of leaves and stems 2 to 3 feet high. A summer annual, common throughout the state in cultivated fields, waste places and along ditches.

LADY'S THUMB *(Polygonum persicaria).*

6, upper part of plant showing leaves with dark spots and pink or light purple flower spike; 7, part of stem, leaf and leaf sheath; 8, seed. Stems 6 inches to 3 feet in length. Not so common as *PENNSYLVANIA SMARTWEED.* Found mainly in wetter soils.



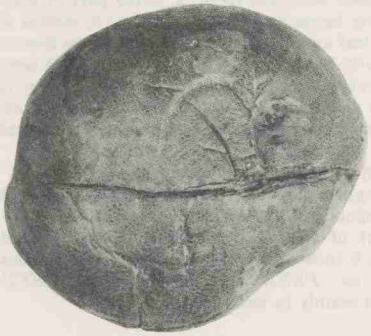
WILD CARROT

1, entire plant showing white to pale purplish flower on upper left; 2, mature seedhead; 3, seed. Commonly 12 to 24 inches tall. A very common biennial through most of the state in pastures, annual hay crops and along roadsides.

Grade Defect Identification

This section is written and illustrated to show you how to identify some of the common defects of vegetables that, if present, will affect their market grade. No attempt is made to indicate the amounts of each that are tolerated in each U. S. grade (See section on "Grading.")

Irish Potatoes



AIR CRACKS

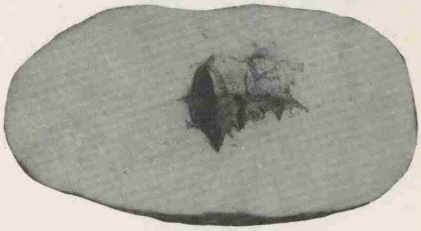
Rather thin, fine cracks that extend into the tuber, resembling a knife cut. This usually takes place when the potatoes are being dug and only under certain soil and weather conditions.

GROWTH CRACKS

Wide, deep cracks, edges of which heal over. This takes place in the ground during the growing season.

RODENT INJURY

Areas of varying size and depth without skin. The affected area is covered with a gray to brown protective corky layer. Usually teeth marks of the rodent are noticeable.

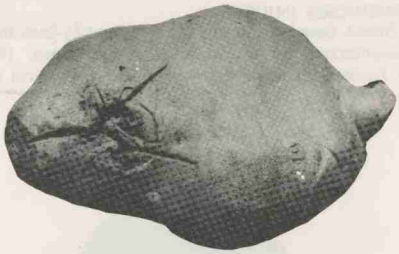


HOLLOW HEART

An irregular shaped cavity of variable size, usually in the center of the tuber. It is often found in very large tubers. Symptoms of hollow heart cannot be detected on the surface of the tuber. The tuber must be cut to see this condition.

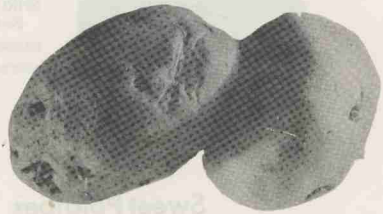
MECHANICAL INJURY

May show up as cuts, bruises or even cracking or a combination of these. If due to an impact against flat or sharp objects a shattering type of cracking is usually the result. The cracking takes place in somewhat of a radial pattern from the center of impact.



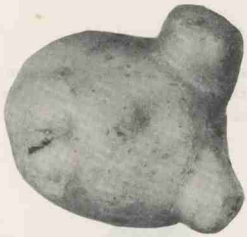
MISSHAPEN

Abnormally shaped — such as pointed, dumb bell or lop-sided—so that it affects the over-all appearance of a package or requires excessive time or loss in peeling.



SECOND GROWTH

Sometimes called "knobs," such tubers have protrusions resembling small potatoes. This is caused by growth stopping then starting again.



WIREWORM INJURY

Small holes in the tuber usually about the size of the head of a kitchen match. They vary considerably in depth from just penetrating the skin to extensive tunneling through the tuber. The edges of the affected area are usually smooth and healed over. Damage takes place in the soil. (See section on Insects for identification of the wireworm.)

FREEZING INJURY

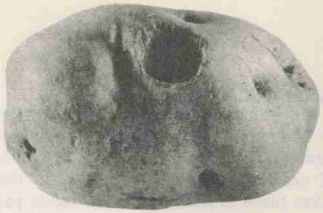
Irregular, spongy area with water oozing from a cut tuber. If left for a few hours the cut surface develops a dull, glassy or watery appearance. Sometimes there is a purplish-red band at the edge of the uninjured tissue. If completely frozen, the tubers usually rot within a few days after thawing.

SUNBURN

The affected part of the tuber has a dark green skin. When cut the green color extends slightly into the flesh. It is caused by tubers being exposed to the sun. Commonly referred to as "greenheads."

GRUBWORM INJURY

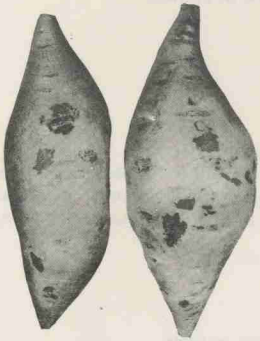
Broad, deep holes in the tuber (about ½-inch in diameter) characterized by overhanging rough edges. (See section on Insects for identification of the grubworm.)



SHRIVELING

Soft, flabby, spongy, wrinkled condition of the tubers caused by loss of moisture and solids. It is usually found in stored potatoes.

Sweet Potatoes



BRUISED

Dark brown to black, slightly sunken areas on the surface of the root. The surface of the affected area is very hard and scabby when the potato is cured.

GROWTH CRACKS

Deep, wide cracks in the root which usually heal over before harvest time. It is usually caused by abnormal growing conditions.

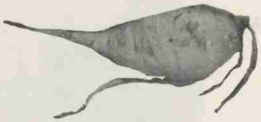
VEINY

Ridges on the surface of the root that give it the appearance of protruding veins of a human.

MECHANICAL INJURY
Usually referred to as roots that are cut or broken in the process of harvesting, as distinguished from bruising.

MISSHAPEN
Abnormally shaped roots (crooked, lopsided, etc.) to the extent that it affects the overall appearance of a package or requires excessive time or loss in peeling.

RODENT INJURY
Areas of varying size and depth without skin. The affected area is covered with a gray to brown protective corky layer. Usually teeth marks of the rodent are noticeable.

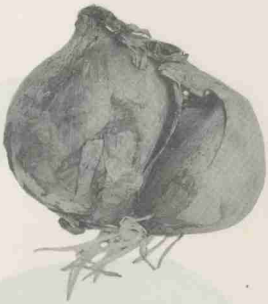


SECONDARY ROOTLETS
Small fleshy roots growing from the side of the sweet potato. They should be removed when the crop is harvested.

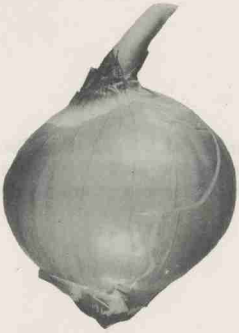
WIREWORM
Similar to effects on Irish potatoes.

Onions

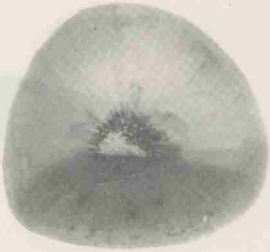
DOUBLE
An onion which has developed into more than one bulb. The two are joined only at the base.



SPLIT
An onion that has divided during growth. It is joined at the base but is at least partially covered by an outer scale.

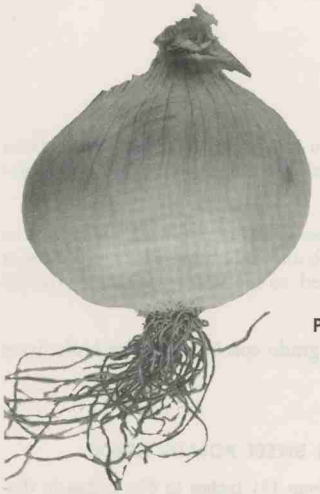


SPROUTING
New top growth from the neck or top of a mature bulb.



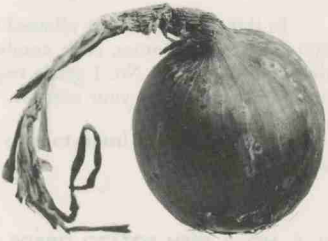
MISSHAPEN
Badly lopsided or pointed beyond that characteristic of the variety.

BOTTLENECK
Bulbs with large thick necks but bulbs nearly normal in shape.



ROOTS
Those bulbs which have all or most of their dried roots.

POORLY TOPPED
Those having more than 2 inches of the dried top remaining on the bulb.



Cabbage

(1)

(2)

(3)

(1) **SOFT OR PUFFY HEADS** Heads that appear normal in size and color but are very light in weight. Such heads are not firm and hard. This is caused by the leaves not folding over each other tightly to form a hard head.

(2) **BURST HEADS** Heads which have split open exposing the inner leaves. This is due to over-maturity.

(3) **POORLY TRIMMED** Heads having more than 6 outer (wrapper) leaves or stems extending more than ½-inch below the point where the outermost leaves are attached.

Grading

Vegetables must be properly graded if they are to bring you top prices. Standards have been set by the U. S. Department of Agriculture for each of the vegetable crops. For most vegetables the most popular standard (grade) is U. S. No. 1.

In this contest you are allowed to grade either Irish potatoes or sweet potatoes. There will be 100 individual potatoes, each numbered. You will examine each and determine whether it does or does not meet U. S. No. 1 grade requirements. You will be timed, so the faster you can do the job accurately the better your score.

The following is listed to help you learn the U. S. No. 1 grade specifications for both sweet and Irish potatoes.

U. S. NO. 1 IRISH POTATO GRADE

The following rules will apply in grading individual tubers.

1. Variety—Each tuber must be of the same variety or of similar varietal characteristics.
2. Size—Must be at least 1⅞ inches or longer in diameter—No maximum size.
3. Shape—Fairly well shaped (means those other than pointed, dumbbell, excessively elongated or otherwise ill-formed).
4. Free from blackheart, blight, freezing injury, soft rot or wet-breakdown damage.
5. Dirt—Free from damage.
6. Sunburn, growth cracks, second growth—Not more than 5% by weight of the potato may be removed in peeling due to one or all of these defects.
7. Hollow heart, internal discoloration pitted scab—Not more than 5% by weight may be removed due to injury.
8. Cuts, Shriveling—Free from damage. Not spongy or flabby. Cuts over 1½ inches in diameter on 6 to 8 ounce potato throws it out of grade.
9. Common Scab—Not over 5% of the potato surface may be affected.
10. Dry Rot—Not over 5% of the tuber can be affected.
11. Wireworm or grass roots—Not over one hole ¾-inch long or 2 or more holes totaling more than 1¼ inches is allowed.

U. S. NO. 1 SWEET POTATO GRADE

1. Size—From 1¾ inches to 3¾ inches in diameter and 3 to 10 inches in length. Regardless of size and length a single root can not weigh over 1¼ lbs. (20 oz.)
2. Variety—All roots in a package must be the same variety. Dry type cannot be mixed with moist type. Red or purple skinned strains cannot be mixed with copperskin strains.
3. Cuts, bruises, broken ends, scars—Appearance or keeping quality cannot be materially affected. If necessary to remove damaged area, waste can not exceed 5% of the root. A broken end larger than a nickel is sufficient to throw a root out of this grade.
4. Black root, decay, freezing injury—None allowed.
5. Scurf—Not over 25% of the surface of the potato can be affected or the general appearance of a lot materially injured.
6. Wireworm, grass roots—Not more than one hole ¾-inch long or two or more holes totaling more than 1¼ inches is allowed.
7. Growth cracks—Free from damage—appearance of a lot cannot be materially affected.
8. Secondary rootlets—Roots not badly affected.
9. Shape—Not more than slightly misshapen. Cannot be bad enough to badly affect general appearance of a lot.
10. Smoothness—Fairly smooth, not badly veined or rough.

Judging

A complete manual could be written on this subject alone if all of the vegetable crops were included. Only sweet potatoes, Irish potatoes, onions, and carrots will be judged in this contest. You should be prepared to judge 11 plates of each of the vegetables listed above and decide whether a plate is Excellent, Good, Worthy, or Unworthy.

Pointers that must be considered if you are to place these vegetables correctly are:

EXCELLENT

1. Clean
2. Free from injury—Not over 2% trim waste and not more than slightly affecting the appearance.
3. Uniform in size, shape and color—Not over 10% variation.
4. Best market size and quality.
   a. Sweet Potatoes—2¼ to 2¾ inches in diameter and 5 to 7 inches in length.
   b. Irish Potatoes — Each potato 6 to 8 ounces.
   c. Onions—Over 2 inches in diameter.
   d. Carrots—1 to 2½ inches in diameter.
5. True to variety type.

GOOD

1. Clean
2. Free from damage—Not over 5% waste and not materially affecting the appearance.
3. Fairly uniform in size, shape and color—Not over 25% variation.
4. Good market size and quality.
   a. Sweet potatoes—2 to 3 inches in diameter and 4 to 8 inches in length.
   b. Irish potatoes—over 5 and under 12 ounces (each potato).
   c. Onions—Over 1¾ and under 3½ inches in diameter.
   d. Carrots—¾ to 2¾ inches in diameter.
5. Fairly true to variety type.

WORTHY

1. Fairly clean.
2. Free from serious damage—Not over 10% waste.
3. Fairly uniform in size, shape and color—Not over 50% variation.
4. Fair market size and quality.
   a. Sweet potatoes—1⅞ to 3⅜ inches in diameter and 3 to 9 inches in length.
   b. Irish potatoes — over 4 and under 14 ounces.
   c. Onions—over 1½ inches.
   d. Carrots—¾-inch to 3 inches.
5. Not off-type enough to be disqualified for lack of uniformity.

UNWORTHY

1. Dirty
2. Seriously damaged by disease, insects, mechanical injury or other means.
3. Extreme difference in size, shape, and color. (Plate unworthy if largest specimen is twice the size of the smallest on that plate—also below or above size limits for worthy.)
4. One or a combination of the above points will cause the plate to be classed as Unworthy.

References

1. *Control Stem Anthracnose of Lima Beans*— Experiment Station Special Circular No. 11.
2. *Cabbage Production Guide*—Extension Folder No. 89.
3. *Dusting Cucumbers to Control Downy Mildew*—Experiment Station Bulletin 362.
4. *Cucurbit Diseases in North Carolina and Their Control*—Experiment Station Bulletin 380.
5. *Cucurbit Disease (Cucumber, Cantaloupe, Watermelon, Squash) Control*—Plant Pathology Information Note No. 23.
6. *Tomato Wilt Diseases*—Extension Folder No. 92.
7. *Control Tomato Late Blight*—Extension Circular No. 331.
8. *Two Wilt Diseases of Tomato*—Plant Pathology Information Note No. 13.
9. *Pepper Diseases in North Carolina and Their Control* —Plant Pathology Information Note No. 34.
10. *The Irish Potato Late Blight Story*—Extension Circular No. 368.
11. *Ways to Fight Potato Late Blight*—Reprint, Research and Farming, 1951.
12. *Grow Quality Sweet Potatoes*—Extension Circular No. 353.
13. *Scab of Summer Squash*—Experiment Station Special Circular No. 18.
14. *Some Important Diseases of Vegetable Crops in North Carolina*—Plant Pathology Information Note No. 24.
15. *Leafspot Diseases of Turnip Greens*—Plant Pathology Information Note No. 11.
16. *Methyl Bromide for Treating Vegetable Plant Beds*—Plant Pathology Information Note No. 37.
17. *Farm and Home Garden Manual*—Extension Circular No. 122.

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