MISSISSIPPI STATE UNIVERSITY EXTENSION

Horticulture Bowl Skill-a-Thon Study Guide

The Horticulture Bowl Skill-a-Thon combines horticulture and entomology into a manageable contest. The study guide offers a glossary for each area, explanations of terms and their purpose, and photographs of specimens used to identify plants, fruits, nuts, seeds, and insects.

Horticulture

Plant Environment

Temperature – There are three important temperatures for plants:

- Minimum Temperature – temperature at which the plant will stop growing and injury will occur
- Maximum Temperature – temperature above which a plant will stop growing and permanent injury will occur
- Optimum Temperature – temperature somewhere between these two, where the plant grows best

Light – The green plant is a solar (sun) collector, transferring light energy into energy foods (sugars). Plants respond to light intensity (brightness), quality (color), and duration (photoperiod or day length). Light intensity or brightness affects the amount of photosynthesis that occurs.

Water – Water is important for normal plant growth. Water provides the plant's rigid structure. Water moving into the plant causes it to expand and grow. Water evaporating from the leaf cools the leaf. Water dissolves nutrients from the soil so they can be transferred to the plant, and water is also necessary for photosynthesis. Lack of water can cause serious problems. The plant cannot take up the nutrients it needs without water.

Air – Four main parts of air are important to the plant: carbon dioxide, oxygen, nitrogen, and water.

- Carbon Dioxide – Carbon dioxide occurs in very, very small amounts in the air, but it is essential for photosynthesis.
- Oxygen – Oxygen is needed by all the parts of the plant, but the root system is most likely to suffer from an oxygen shortage.
- Nitrogen – Nitrogen is important for some plants. Nitrogen-fixing bacteria live on the roots of certain plants.
- Water – Water in the air is important because it affects the amount of water the plant will lose in transpiration.

Nutrients – Plant nutrients that most often need replacing in the soil are nitrogen, phosphorus, and potassium (N-P-K). Fertilizers that contain all three are called complete fertilizers.

Horticulture Glossary

Annual – A plant that completes its life cycle within 1 year of germination.

Chlorophyll – A green pigment, present in all green plants

Deciduous – A plant that sheds its leaves annually

Evergreen – A plant that retains its leaves in a living state during the winter.

Growing Medium – Natural or synthetic material in which the root system is grown

Perennial – A plant that lives indefinitely

Photosynthesis – The conversion of light energy, water, and carbon dioxide to sugars in the presence of chlorophyll.

Rhizome – A horizontally creeping underground stem that produces shoots and roots.

Stolon – A shoot at or below the soil surface that produces a new plant at its tip.

Horticulture Judging

In each class to be judged, the four plates will be numbered from 1 to 4. Decide which of the four plates is best. Enter the number of the best plate in the box labeled First Place. Decide which of the three remaining plates is best. Enter its number in the box labeled Second Place. Continue until all four plates are ranked.

Complete this same procedure for each class. Use the point scales given below to determine which characteristics to look for in judging and to determine the relative importance of each characteristic.

Vegetables, Fruits, and Nuts Point Scale

Characteristic	Percent of Score
Condition	35
Color	10
Size	10
Shape	10
Maturity	20
Variety	15
Total	**100**

Ornamental – Cut Flowers Point Scale

Characteristic	Percent of Score
Condition	30
Form or shape	20
Stem/Foliage	20
Color	15
Size	15
Total	**100**

Explanation of Terms (desirable characteristics)

Condition – fresh; clean; blemish free; insect and disease free; no cuts or bruises; no wilted parts

Color – bright, clear, brilliant, uniform, and typical

Foliage – clean, fresh, brilliant color

Maturity – prime condition for beauty or for eating

Shape – uniform; symmetrical; typical of plant type

Size – uniform within class; plant parts in correct proportion to each other

Variety – all specimens in a class should be one variety

Identifying and Judging – Fruits/Nuts Plant List

Item	Foliage/ plant	Bloom	Fruit/nut	Seed/pit
Almond	X		X	
Apple	X		X	X
Pear	X		X	X
Orange	X		X	X
Strawberry	X		X	X

Identifying and Judging – Flowers and Indoor Plants Plant List

Item	Foliage/ plant	Flower	Seed/pod	Bulb/ corm/ rhizome
Amaryllis	X	X		X
Iris	X	X		X
Daylily	X	X		
Pansy	X	X		
Zinnia	X	X		

Identifying – Woody Ornamentals Plant List

Item	Foliage/Plant	Flowers/ Bloom	Fruit/Cone/ Seed/Pod
Boxwood	X		
Forsythia	X	X	
Holly	X		X
Oak	X		X
Viburnum	X	X	X

Fruits/Nuts ID Images

Almond

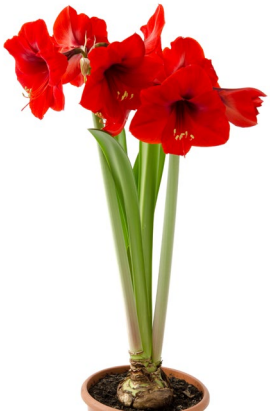
Apple

Pear

Orange

Strawberry

Flowers/Plants ID Images

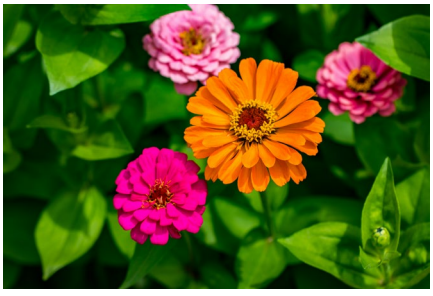


Amaryllis

Daylily

Iris

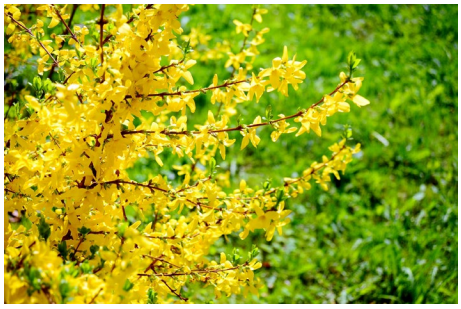
Pansy



Zinnia

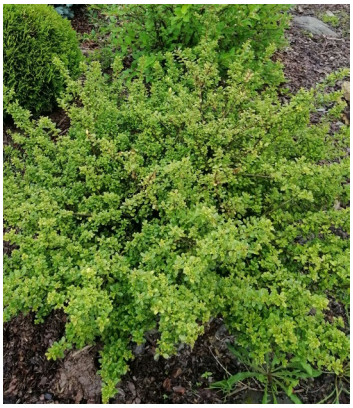
Woody Ornamentals ID Images

Japanese boxwood

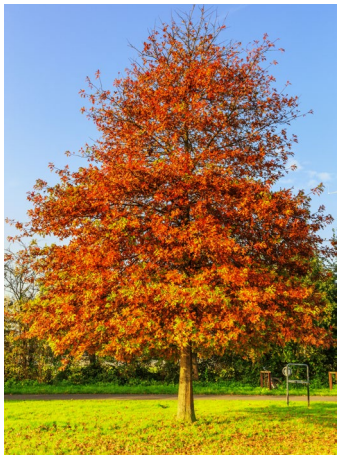


Forsythia

Forsythia fall color



Holly



Pin oak

Leatherleaf viburnum

Vegetables ID Images

Asparagus

Garlic

Okra

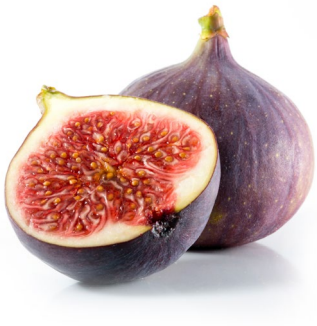
Horseradish

Brussels sprouts

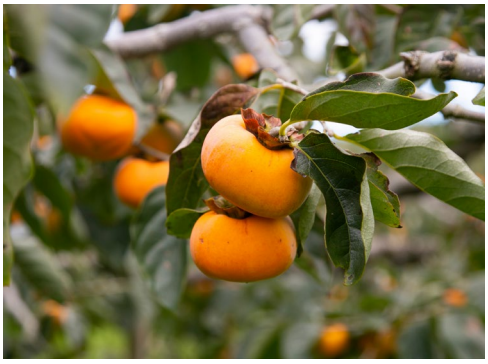
Fruits, Nuts, and Berries ID Images

Avocado

Elderberry



Fig



Persimmon

Pistachio

Seed ID and Judging

Genetic Purity – Varietal mixtures may present such problems as different maturity dates, differences in plant size and growth habits, and differences in quality. These differences can cause problems in planting, cultivation, weed control, and harvesting. So, in most instances, you should avoid varietal mixtures. Varietal mixtures may or may not be obvious by looking at the seeds.

Vigor – Vigor is a measure of the physiological quality of a seed. Seeds that are alive and capable of germination may not all have the same vigor. Seeds may lose vigor (become weak) but still be capable of germinating when conditions are very good. Low-vigor seeds may not produce a strong, healthy plant in the field or may not produce a plant at all. We know that strong, vigorous seeds germinate faster, produce plants that grow faster, are less susceptible to disease, and will produce a normal plant even when field conditions are not ideal. For optimum vigor, seeds must be harvested and stored properly.

Insect Damage – Insect damage reduces the value of seeds for planting. If the damage is severe enough, the seeds may be completely worthless for planting.

Uniform Size – Uniform size is particularly important with large seeds, when setting planters to get a uniform planting rate is important. Seeds that vary widely in size make setting planters to plant at a consistent rate almost impossible.

Germination – Percentage germination indicates the number of seeds that are alive and capable of producing a normal plant under favorable conditions. A high percentage of a seed lot must be capable of germination if seeds are to be considered high quality. Germination is one measure of the physiological quality of the seed.

General Information

Seed Structure – A seed is a living organism—a tiny, embryonic plant in a resting stage with a small amount of food to supply the young plant for a short time when germination begins.

Seeds can be placed into one of two major groups: monocotyledons (monocots) or dicotyledons (dicots). Monocots have one cotyledon; dicots have two cotyledons. Examples of monocots are grasses. Dicots include trees, shrubs, nearly all vegetables, and broadleaf weeds.

Cotyledons are sometimes referred to as "seed leaves." They are not always visible in dry seeds or when a seed germinates. Cotyledons supply food for the young plant until it can develop roots and leaves and manufacture its own food.

Germination – All seeds require moisture, oxygen, and a favorable temperature for germination. Some seeds also require light.

Germination occurs in several steps. The first is the absorption of water (imbibition). Water is necessary for the biochemical reactions of growth to begin, but too much water may inhibit germination. Oxygen is also necessary for the beginning of growth. Most seeds require air, but some seeds can germinate and begin growth under water. There are critical high and low temperatures at which seeds will not germinate.

As the seed absorbs water, it swells, and germination begins. Some seeds swell much more than others. Cells begin to enlarge and divide as growth starts. The first evidence of growth is the root breaking through the seed coat. Growth of the upper portion of the seedling differs with different plants.

Seed Glossary

Cotyledon – Food storage tissues, sometimes called seed leaves or embryonic leaves; first to appear.

Embryo – The tiny plant formed in a seed.

Genetic – Characteristics or traits that are inherited and passed on from parents to offspring.

Germination – The beginning development of the parts of the embryo that are necessary for the development of a normal plant.

Noxious Weed Seeds – Seeds from any plant considered to be extremely harmful to agriculture, habitats, humans, or livestock.

Physiological – Dealing with the processes of living organisms.

Seed Coat – The protective covering of the embryo.

Seed Lot – A uniformly blended quantity of seeds identified by a proper mark or number.

Variety – A group of plants within a species that have similar characteristics but are different from others of the same kind (for example, Granny Smith and Gala apples).

Seed ID Images

Lettuce

Sunflower

Pumpkin

Green bean

Radish

Corn

Zinnia

Buckeye

Winged fruit from a maple

Entomology

Insect Orders

There are 31 orders of insects, but most of the insect species in the world belong to one of six orders. If you learn these six orders, you will be able to quickly classify most of the insects you encounter to the order level. Learning the orders is the key to learning entomology because insects that belong to the same order share many common traits. In particular, they all have the same type of life cycle and the same type of mouthparts. Once you know which order an insect belongs to, you know a lot of other information about that insect.

Order	Members	Life Cycle	Type of Mouthparts
Coleoptera	beetles	complete	chewing
Lepidoptera	butterflies and moths	complete	chewing (caterpillars), siphoning (adults)
Diptera	flies	complete	chewing (immatures), sucking or sponging (adults)
Hymenoptera	ants, bees, and wasps	complete	chewing or chewing and sucking
Hemiptera*	true bugs, cicadas, leafhoppers, fulgorids, aphids, whiteflies, scales	gradual	piercing/sucking
Orthoptera	crickets and grasshoppers	gradual	chewing

*Earlier books divide the Hemiptera into two orders: Hemiptera (true bugs) and Homoptera (cicadas, leafhoppers, fulgorids, aphids, whiteflies, and scales).

Insect Life Cycles

In the insect world, the process of development is referred to as metamorphosis, meaning change in form or appearance. We may simply refer to this change as the life cycle. The two most common types of life cycles are gradual and complete. Insects with a gradual life cycle go through three stages of development: egg, nymph, and adult. Some insects with this type of development are cockroaches, crickets, stink bugs, and chinch bugs. Insects with a complete life cycle have four stages of development: egg, larva, pupa, and adult. There is a great difference between the immature stages and adults. The larval stage is very active and in many cases is the damaging stage. The pupal stage is the inactive, or resting, stage. Some common insects with this type of development are beetles, butterflies, moths, bees, wasps, and flies.

Insect Mouthparts

All insects do not feed in the same way. Some feed on plants by eating the leaves or by boring through fruit, stems, or trunks. Others feed on plants by sucking sap, and still others feed on animals by sucking blood. Moths and butterflies use siphoning mouthparts to suck nectar from flowers through a long, thin proboscis. Some flies have sponging/sucking mouthparts, and some adult insects do not have working mouthparts at all because they do not live very long and do not feed as adults. Knowing what type of mouthparts an insect has can help you know what type of damage it will cause. If it is a pest insect, the mouthparts can even help determine which kinds of control will work best. For purposes of this contest, we will refer to the following three types of mouthparts:

Chewing (C) – Distinguished by a pair of strong mandibles and a smaller pair of maxillae. Characteristic of beetles, caterpillars, and several other orders.

Piercing/sucking (P/S) – Distinguished by an elongate, hollow proboscis used to pierce the plant, animal, or insect being fed upon and suck up sap or blood. Characteristic of the Hemiptera and many flies, such as mosquitoes.

Chewing and sucking (C&S) – Distinguished by having chewing mandibles as well as other mouthparts modified for sucking. Characteristic of bees.

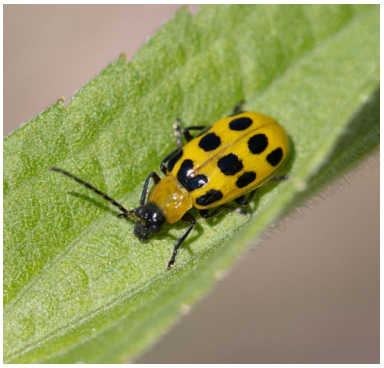
Insect ID

Insect identification is important for anyone who is involved in horticulture. Insects play several roles in horticulture—some are beneficial and others are pests. The insects included in this section are relevant to horticulture in one way or another. Pictures of the following insects can be found in the next section of this guide.

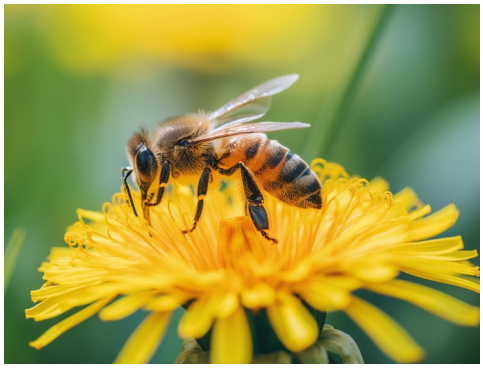
Insect	Order	Host	Life Cycle	Mouthparts	Interesting Facts	Role in Horticulture
Aphid	Hemiptera	succulent plants	gradual	piercing/ sucking	Females usually give live birth.	pest
Colorado potato beetle	Coleoptera	potatoes and eggplants	complete	chewing	Larvae and adults both feed on leaves.	pest
12-spotted cucumber beetle	Coleoptera	general garden feeder	complete	chewing	Grubs are known as southern corn rootworms	pest
Green lacewing	Neuroptera	predator (i)	complete	chewing	Eggs are laid on stalks	beneficial
Honey bee	Hymenoptera	feeds on pollen and nectar	complete	chewing and sucking	The honey bee converts nectar to honey	beneficial
Imported fire ant	Hymenoptera	insects and seeds	complete	chewing	This non-native ant has a painful sting	pest
Lady beetle	Coleoptera	predator (i)	complete	chewing	Larvae are also predators	beneficial
Squash bug	Hemiptera	cucurbits	gradual	piercing/ sucking	Squash bugs overwinter as an adult	pest
Stink bug	Hemiptera	developing fruit and seeds	gradual	piercing/ sucking	The stink bug has a distinctive odor	pest
Tobacco hornworm (i)	Lepidoptera	tomato leaves (i)	complete	chewing (i)	The horn on the rear is harmless	pest

(i) = The host or type of mouthparts listed are for the immature stage. If the common name is followed by an "(i)," you should be able to identify either the adult or the immature stage.

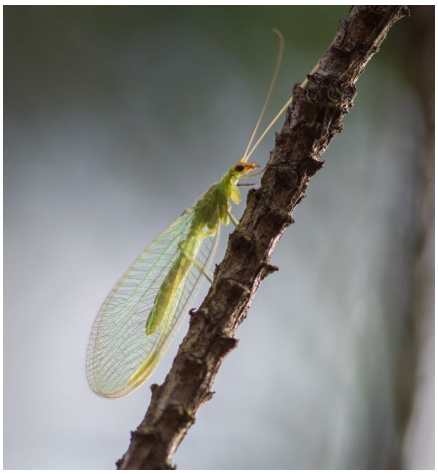
Insect ID Images



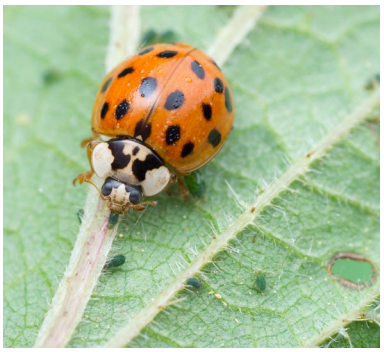
Spotted cucumber beetle



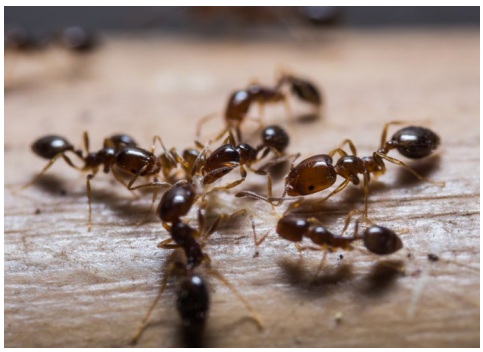
Honey bee



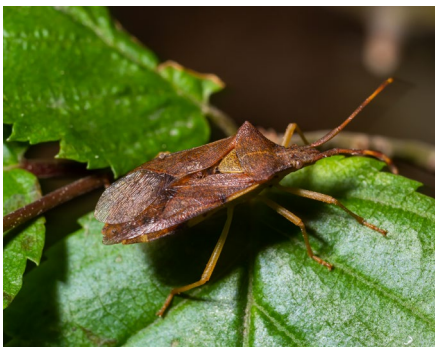
Green lacewing



Lady beetle

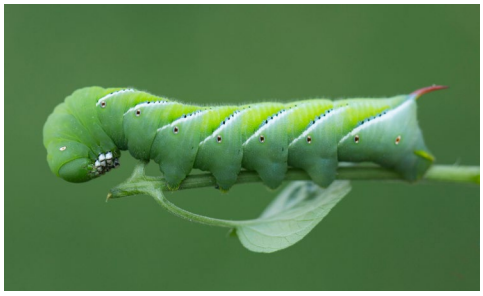


Imported fire ant

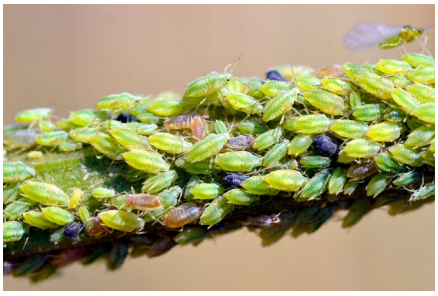


Squash bug

Stink bug



Tobacco hornworm



Aphid

Colorado potato beetle

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