

Lesson 1

Basics of Vermicomposting: terms and techniques

Learning outcomes

- Trainees know the terms and expressions commonly used in vermicompost production.
- Trainees explain the term of compost.
- Trainees recognize the types of earthworms commonly used in vermicompost production.
- Trainees explain the term of bedding.
- Trainees associate the terms of bed, pile, windrow and pit with vermicompost production.
- Trainees explain the terms of anaerobic and aerobic.
- Trainees know the function of the Bokashi bin.
- Trainees explain the importance of CaCO_3 for vermicompost production.
- Trainees know clitellum, segment and cocoon.
- Trainees explain the difference between compost and vermicompost.
- Trainees explain the term microorganisms.
- Trainees explain the function of protein as a substrate in vermicompost production.
- Trainees explain the terms of vermicast, worm tea, worm casting.

Instructions for the trainer

Trainer, explain to students the terms commonly used in vermicomposting using Supplementary Material 1 (SM-1). The setup of the presentation was designed to

display first the image of vermicompost production and then the term associated with the image.

- The trainer opens the presentation.
- The trainer reflects the image first in order.
- The trainer asks the trainees to give their opinions about the picture they see.
- The trainer expects the trainees to explain the picture.
- The trainer shows the term of the image to the trainees and explains the term.
- The trainer repeats this exercise for all terms.
- The trainer reflects the presentation again from the first image and waits for the trainees to make the correct identification.

Basic requirements: Computer, projector

1. Basics of vermicomposting: terms and techniques

Acid : A liquid that tastes sour and smells somewhat sharp. Acids help dissolve rock and break down food. It is a normal product of decomposition. Redworms do best in a slightly acid soil (pH less than 7) environment. Below pH 5 can be toxic. Addition of pulverized egg shells and/or lime helps to neutralize acids in a worm bin (Figure 1).

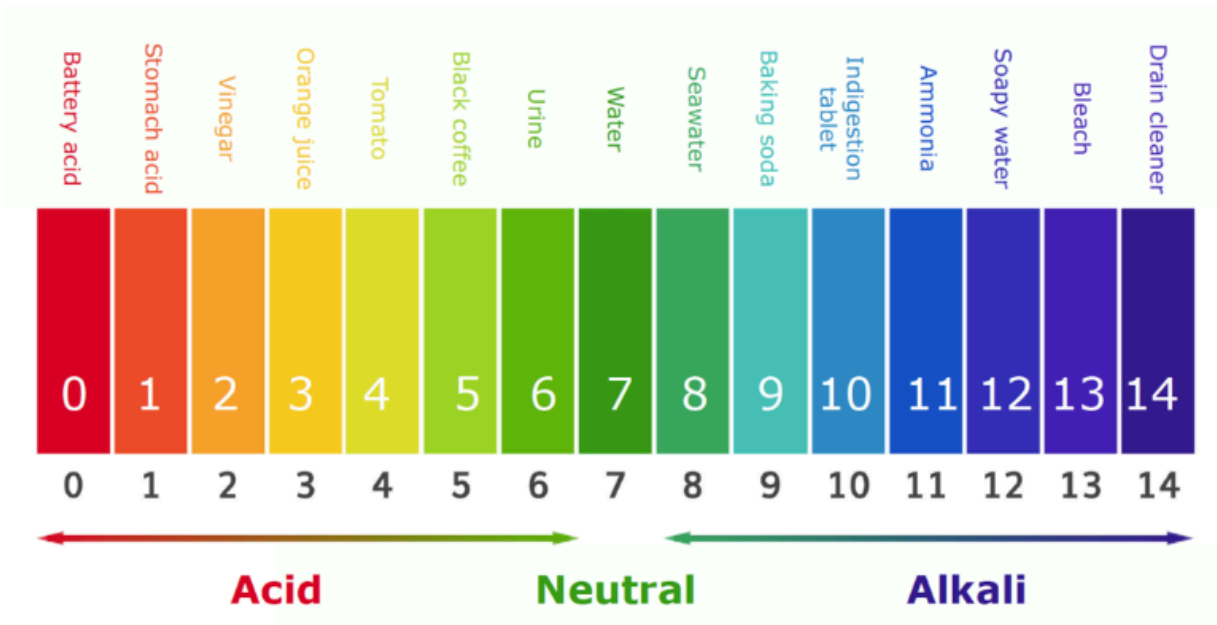


Figure 1. pH scale [\[10\]](#)

Aggregation : Clustering, as when soil particles form granules that aid in aeration and/or water penetration.

Aeration : Exposure of a medium to air which allows exchange of gases.

Aerobic : Pertaining to the presence of free oxygen. Organisms that utilize oxygen to carry out life functions.

Air : Mixture of atmospheric gases, including nitrogen, oxygen, carbon dioxide, and other gases in smaller quantities.

Albumin : A protein in cocoons that serves as a food source for embryonic worms. Found in egg whites.

Anaerobic : Pertaining to the absence of free oxygen. Organisms that can grow without oxygen present.

Animal : A living being capable of sensing its environment and moving about. Animals live by eating the bodies of other organisms, whether plant or animal.

Annelid : Term for a member of the Phylum Annelida containing segmented worms.

Anterior : Toward the front.

Aquatic : Living in or upon water.

Arctic : Pertaining to the region around the North Pole.

Bacteria : Plural for bacterium, a one- celled organism which can be seen only with a microscope. Bacteria may be shaped like spheres, rods or twisted springs. Some bacteria cause decay; others may cause disease. Most bacteria are beneficial because they help recycle nutrients.

Barrier : A geographic zone such as an ocean, desert, or glacier which would prevent the migration of an earthworm. Barriers may be different for other kinds of animals.

Bedding : Moisture- retaining medium which provides a suitable environment for worms. Worm bedding is usually cellulose- based, such as newspaper, corrugated cartons, leaf mold, or compost.

Bio-degradable : Capable of being broken down into simpler parts by living organisms.

Biologist : A scientist who studies living things.

Biological control : Management of pests within reasonable limits by encouraging natural predator/prey relationships and avoiding use of toxic chemicals.

Blood : A liquid medium circulating in the bodies of many animals. Blood carries food and oxygen to the tissues and carries waste products, including carbon dioxide, away from the tissues. Earthworms and humans both have a red, hemoglobin-based blood for oxygen transport.

Breathe : To carry on activities to permit gas exchange. Humans and land-dwelling vertebrates do this by expanding the lung cavity to draw air in, and reducing it to force air out. Worms conduct gas exchange through their moist skin, but do not actually breathe.

Breeders : Sexually mature worms as identified by a clitellum.

Bristles : Tiny rigid structures on most segments of earthworms which serve as brakes during movement. Known as setae, the patterns they form are a major distinguishing characteristic of earthworms.

Burrow : Tunnel formed when an earthworm eats its way through soil, or pushes soil aside to form a place to live and move more readily through the earth.

Carbon dioxide : Gas produced by living organisms as they utilize food to provide energy. Also produced through the burning of fossil fuels.

Castings : See worm castings.

Castings tea : A solution containing nutrients which dissolve in water in the presence of worm castings.

Cellulose : An inert compound containing carbon, hydrogen, and oxygen; a component of worm bedding. Cellulose is found in wood, cotton, hemp, and paper fibers.

Classify : To organize materials, organisms, or information based upon a defined set of characteristics.

Climate : The prevailing or average weather conditions of a place over a period of years.

Clitellum : A swollen region containing gland cells which secrete the cocoon materials. Sometimes called a girdle or band, it is present on sexually mature worms.

Cocoon : Structure formed by the clitellum which protects embryonic worms until they hatch.

Cold-blooded : Having blood that varies in temperature approximating that of the surrounding air, land, or water. Fishes, reptiles, and worms are cold-blooded animals.

Compost : Biological reduction of organic waste to humus. Used to refer to both the process and the end product. One composts (verb) leaves, manure, and garden residues to obtain compost (noun) which enhances soil texture and fertility when used in gardens.

Consumer : An organism that feeds on other plants or animals.

Contract : Action of muscle as it draws up, or gets shorter.

Culture : To grow organisms under defined conditions. Also, the product of such activity, as a bacterial culture. Vermiculture is growing worms in culture.

Cyst : A sac, usually spherical, surrounding an animal in a dormant state.

DDT : A toxic pesticide found to accumulate in the food chain and cause the death of animals which were only indirectly exposed.

Decompose : To decay, to rot; to break down into smaller particles.

Decomposer : An organism that breaks down cells of dead plants and animals into simpler substances.

Decomposition : The process of breaking down complex materials into simpler substances. End products of much biological decomposition are carbon dioxide and water.

Digestive tract : The long tube where food is broken down into forms an animal can use. It begins at the mouth and ends at the anus.

Dissect : To cut open in order to examine and identify internal structures.

Dissolve : To go into solution.

Dorsal : The top surface of an earthworm.

Earthworm : A segmented worm of the annelid group which contains some 3500 species. Most earthworms are terrestrial that is, they live in the ground. Earthworms have bristles known as setae which enable them to burrow in the soil. Earthworms help to aerate and enrich the soil.

Ecology : The science of the interrelationships between living things and their surroundings.

Egg : A female sex cell capable of developing into an organism when fertilized by a sperm.

Egg case : See cocoon.

***Eisenia fetida* :** Scientific name for one of several redworm species used for vermicomposting. Color varies from purple, red, dark red to brownish red, often with alternating bands of yellow in between segments. Found in manure, compost heaps, and decaying vegetation where moisture levels are high. Frequently raised in culture on earthworm farms.

Environment : Surrounds, habitat.

Excrete : To separate and to discharge waste.

Experiment : To conduct research by manipulating variables to answer specific questions expressed as statements known as hypotheses.

Feces : Waste discharged from the intestine through the anus. Manure. Worm castings.

Fertilize : To supply nutrients to plants, or, to impregnate an egg.

Food chain : The sequence defined by who eats whom, starting with a producer (green plant).

Food web : The sequence defined by who eats whom, starting with producers and progressing through various levels of consumers, including decomposers and predators. Many organisms may be more than one level of consumer, depending upon whether they eat a plant, a microorganism which has consumed a plant, or an animal which ate the microorganism which ate the plant. A food web describes more complex linkages and interrelationships than a food chain.

Fungi : A large group of organisms which reproduce by spores. The group includes mushrooms, toadstools, molds and mildew.

Fungus : The plural of fungus is fungi.

Genus : A category of classification which groups organisms with similar characteristics. These are more general than species characteristics.

Heart : Muscular thickening in blood vessels whose valves control the direction of blood flow. Earthworms have several (commonly 5 pairs) of these blood vessels which connect the dorsal to the ventral blood vessels.

Heavy metal : Dense metal such as cadmium, lead, copper, and zinc which can be toxic in small concentrations. Build up of heavy metals in garden soil should be avoided.

Hemoglobin : Iron containing compound in blood responsible for its oxygen carrying capacity.

Humus : Complex, highly stable material formed during breakdown of organic matter.

Immigrate : To move into a region.

Inoculate : To provide an initial set of organisms for a new culture.

Larva : Early form of any animal that changes structurally before becoming an adult. A caterpillar is an insect larva which becomes a moth or butterfly as an adult.

Leach : To run water through a medium, causing soluble materials to dissolve and drain off.

Leaf mold : Leaves in an advanced stage of decomposition.

Lime : A calcium compound which helps reduce acidity in worm bins. Use calcium carbonate, ground limestone, egg shells, or oyster shells. Avoid caustic, slaked and hydrated lime.

Litter (leaf) : Organic material on forest floor containing leaves, twigs, decaying plants, and associated organisms.

Lumbricidae : Name of family group to which several redworm and nightcrawler species of earthworms belong.

***Lumbricus rubellus* :** Scientific name for a redworm species. Color is ruddy-brown or red- violet, iridescent dorsally, and pale yellow ventrally. It has been found in a wide variety of habitats, including under debris, in stream banks, under logs, in woody peat, in place rich in humus, and under dung in pastures. Grown in culture by worm growers.

Lumbricus terrestris : Scientific name for large burrow- dwelling nightcrawler. Also known as the nightcrawler, Canadian nightcrawler, or dew worm.

Macro organism : Organism large enough to see by naked eye.

Membrane : A tissue barrier capable of keeping some substances out and letting others in.

Microorganism : Organism requiring magnification for observation. microscope, dissecting - an instrument permitting magnification of organisms too small to see clearly with the naked eye, but too large for a light microscope.

Mineral : A naturally occurring substance found on the earth which is neither animal nor plant. Minerals have distinct properties such as color, hardness, or texture.

Mineral soil : Soil that is mainly mineral material and low in organic material. Its bulk density is greater than organic soil.

Mold : A downy or furry growth on the surface of organic matter, caused by fungi, especially in the presence of dampness or decay.

Molecule : The smallest particle of an element or compound that can exist by itself. Two atoms of oxygen make up a molecule of oxygen. Two atoms of oxygen and one atom of carbon make up a molecule of carbon dioxide.

Mucus : A watery secretion, often thick and slippery, produced by gland cells. One function is to keep membranes moist.

Nematodes : Small (usually microscopic) roundworms with both free-living and parasitic forms. Not all nematodes are pests.

Nitrogen : An odorless, colorless, tasteless gas which makes up nearly four fifths of the earth's atmosphere. When it combines with oxygen through the action of nitrogen-fixing bacteria, it can become incorporated into living tissue as a major part of protein.

Nocturnal : Coming out at night.

Nourish : To promote or sustain growth.

Oligochaeta : Name of the class of annelids to which earthworms belong, characterized by having setae.

Optimal : Most favorable conditions, such as for growth or for reproduction.

Organic : Pertaining to or derived from living organisms.

Organic matter : Material which comes from something which was once alive.

Organism : Any individual living thing.

Oxygen : Gaseous element in the earth's atmosphere essential to life as we know it.

Pest : An organism which someone wants to get rid of.

Pesticide : A chemical, synthetic or natural, which kills pests.

pH : An expression for degree of acidity and alkalinity based upon the hydrogen ion concentration. The pH scale ranges from 10 to 14, pH of 7 being neutral, less than 7 acid, greater than 7, alkaline.

Posterior : Toward the rear, back, or tail.

Protein : Complex molecule containing carbon, hydrogen, oxygen, and nitrogen, a major constituent of meat. Worms are approximately 60% protein.

Protozoa : Plural for protozoan, a one-celled organism belonging to the animal kingdom. Most protozoa live in water and can be seen only with a microscope. Some move by means of tiny hairs called cilia, others by a whip-like tail called a flagellum, and others by false feet called pseudopodia like amebas have.

Redworms : A common name for *Eisenia fetida* and also *Lumbricus rubellus*. *Eisenia fetida* is a common worm used for vermicomposting, although in some parts of North America, *Lumbricus rubellus* is more common.

Respire : To exchange oxygen and carbon dioxide to maintain bodily processes.

Secrete : To release a substance that fulfills some function within the organism.

Segments : Numerous disc-shaped portions of an earthworm's body bounded anteriorly and posteriorly by membranes. People identify

earthworm species by counting the number of segments anterior to the position of structures such as the clitellum, ovaries, or testes. Segmentation is a characteristic of all annelids.

Species : Basic category of biological classification, characterized by individuals which can breed together.

Springtail : A small, primitive insect with a turned-under projection on its abdomen which causes it to spring about. Springtails are often found in worm bins.

Stress : To produce conditions which cause an organism to experience discomfort.

Subsoil : Mineral bearing soil located beneath humus-containing topsoil.

Ventral : Term for the underneath surface of an earthworm.

Vermicompost : Mixture of partially decomposed organic waste, bedding, worm castings, cocoons, worms, and associated organisms. As a verb, to carry out composting with worms.

Vermiculture : The raising of earthworms under controlled conditions.

Vibration : A rapid, rhythmic motion back and forth. Earthworms are sensitive to vibration.

Worm bedding : The medium, usually cellulose-based, in which worms are raised in culture, such as shredded corrugated cartons, newspaper, or leaf mold.

Worm bin : Container designed to accommodate a vermicomposting system.

Worm casting : Undigested material, soil, and bacteria deposited through the anus. Worm manure.

