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Spotlight on Agriculture

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EARTHWORMS – Nature's tiny humus factories

The smallest horticulturists

"Earthworms are the shock-troops of Nature for the quick production of humus while she is waiting upon her slower processes. Climaxing her millions of years of experimentation, she created in miniature a perfect humus mill, easily adapted to the use of man. In the body of the earthworm we find a complete, high-speed humus factory, combining all the processes (both mechanical and chemical) for turning out the finished product, topsoil, properly conditioned for best root growth and containing in rich proportion, and in water-soluble form, all the elements required of the earth for plant nutrition." (Thomas Barrett 1947)

Eiseria fetida

Types of earthworms

More than 5,000 earthworm species, grouped into three habitat types, can be found on Earth. The first group of earthworms are known as *epigeic* (Greek for "upon the earth"). They live on the surface of the soil, form no permanent burrows, and feed on decaying organic matter. They are easy to breed and are, therefore, quite often used for vermicomposting. *Eisenia fetida* (red worm, manure worm, brandling worm, red wiggler, compost worm) and *Eisenia andrei* (tiger worm, red tiger worm) are members of this group.

The second group of earthworms are called *anecic* (Greek for "up from" or "out of the earth"). They build permanent burrows into the deep mineral layers of the soil and drag organic matter from the soil surface into their burrows for food. *Lumbricus terrestris* (nightcrawler) is a member of this group.

The third group are *endogeic* (Greek for "within the earth"). They build extensive permanent burrows in the upper mineral layer of the soil and feed on organic matter within the soil. They live exclusively in soil and are usually not noticed except after heavy rains, when they come to the surface. They are known to be active down to 3 m below the soil surface.

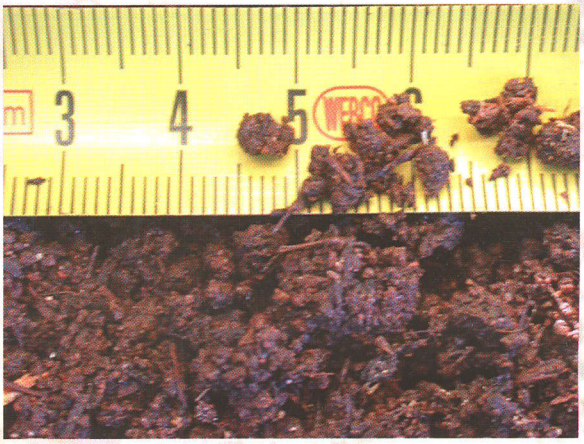
Relative sizes of cocoons and hatchlings

Worm casts, or vermicompost

Worm casts are a convoluted mass of soil, mud or sand thrown up at the surface by a burrowing worm. Also known as vermicompost, worm casts are odourless and can be

Table 1: Biology of *Eisenia fetida*. Source: Reinecke & Viljoen (1991)

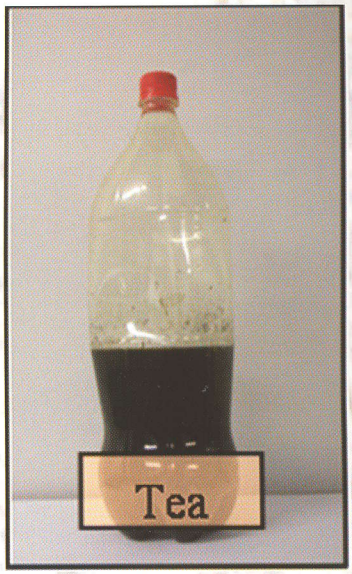
Duration of life cycle (days)	± 70
Growth rate (mg per worm per day)	7
Maximum body mass of an individual worm (mg)	1,500
Maturation attained at age (days)	± 50
Start of cocoon production (days)	± 55
Cocoon production (per worm per day)	0.35
Incubation period (days)	± 23
Hatching success in water (%)	73
Number of hatchlings (per cocoon)	1–9
Mean number of hatchlings (per cocoon)	2.7



Worm casts measure around 3.5 mm on average

used as non-toxic organic fertilisers. They slowly release water-soluble nutrients that can be taken up by plants. These nutrients will not leach out with watering, and will not burn even delicate plants. Worm casts rival chemical fertilisers in their nutrient composition. When added in sufficient amounts, as in 4–10 kg casts/m^2, casts can outperform NPK fertilisers (fertilisers containing nitrogen, phosphorus, and potassium compounds). Worm casts also improve the condition of the soil because they loosen it up – providing good aeration and drainage – and increase its water retention up to four times.

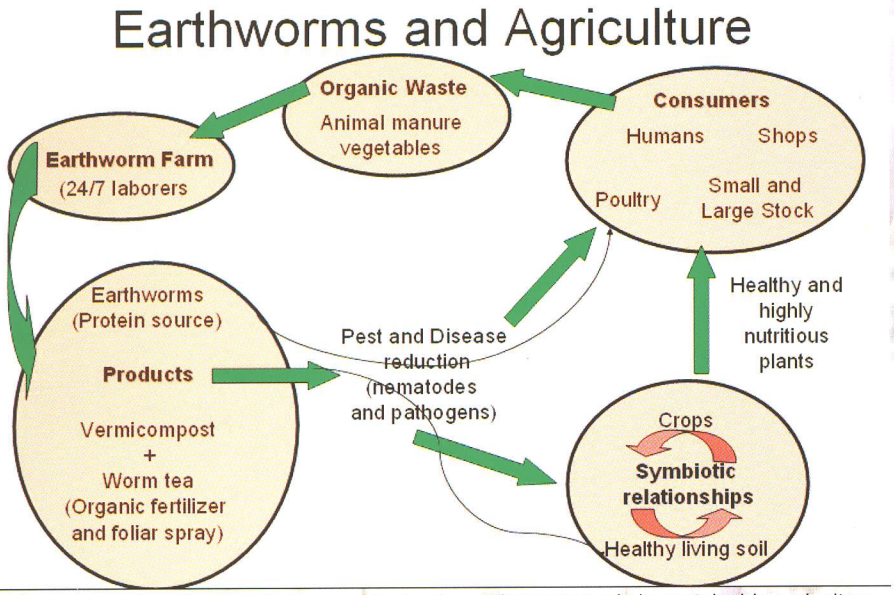
The real benefits of vermicompost (and worm tea, see below) do not lie in the amount of macronutrients it contains, but in the micro-organisms living in it. These micro-organisms produce hormones, vitamins, nutrients, enzymes, amino acids and minerals. Micro-organisms in vermicompost also play an important role in the reduction of soil pathogens like nematodes.



Worm tea

Worm tea

Worm tea is brewed from worm casts. The tea is used as a liquid fertiliser, a foliar spray, an insecticide, to suppress airborne pathogenic fungi, and as a remedial treatment for soil that has been harmed by agricultural chemicals. Worm tea can also sequester heavy metals not required by plants. After brewing, dilute one part worm tea to 50 parts water. The diluted tea can then easily be applied through irrigation systems.



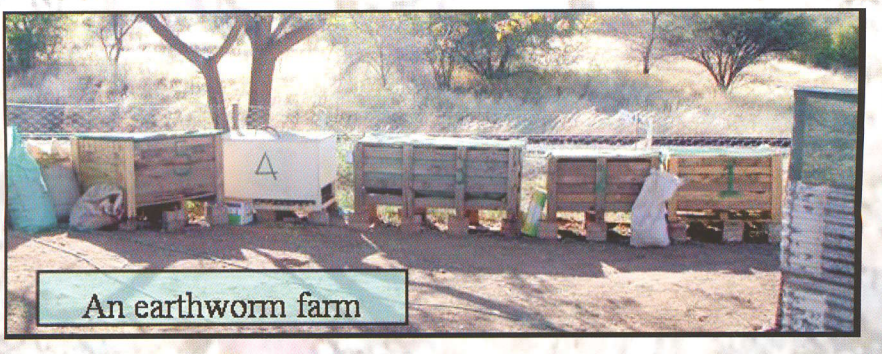
Earthworms and earthworm-derived products play an important role in sustainable agriculture

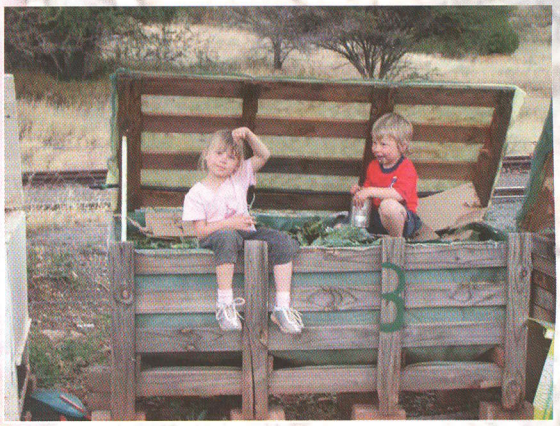
An earthworm farm

Breeding epigeic earthworms is simple and inexpensive. Earthworms should be kept in a dark, moist environment with inside temperatures between 12 °C and 25 °C. Care should be taken that they are far away from any ants – the earthworm's main enemy.

Typical epigeic earthworm foods are horse manure, cattle manure, food waste, used tea and coffee, cardboard boxes, woodchips, sawdust, compost, paper, a little bit of soil for the digestive system, and small amounts of sweet substances for weight gain. Earthworms cannot eat sour substances like citrus.

2 kg of worms should be used for 1 kg of food waste per day.




Earthworm housing

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