

Antagonism

Worms are very sensitive to skin antagonism — worms breath via their skin and mucus membrane. If the membrane is damaged, worms 'drown' through lack of oxygen. Products known to affect the mucus membrane are widely available, such as detergents, formaldehyde, certain wetting agents, saponins.

However these products cannot be used to control worms unless they are registered as pesticides. Applying non-registered products for the control of pests is illegal.

The Future

Worms in most soils are regarded as key beneficial species, however, scientists are looking at a wide range of options for the specific problems we have in turf:

- Identification of pathogens which impact casting worms but not the other beneficial species
- Reduction of casting activity

Greenkeepers and groundsmen have to use a combination of the above cultural

Currently the Chemicals Regulation Division (CRD) of the Health & Safety Executive is assessing a number of applications in this area.

Additionally, these products are all non-selective and will impact all species of worms and possibly other fauna. The environmental impact of these products needs to be tested for:

- The impact of removal of all worm species on the health of soil.
- The environmental impact on the species that consume worms.
- The ecotoxicity of these products in water

and nutritional approaches to manage earthworm populations in order to reduce surface casts.

To achieve this objective, we need to know more about the problem worm species and create an environment that discourages their activity.

Work is underway to find a solution to this problem. But until that arises, we ask for the patience of golfers when it comes to worm casts found around the course.

Sources:

(1) Worming your way out of a turfgrass situation. USGA Green Section Record, July–August, 7–8.

Backman, P.A., Miltner, E.D., Stahnke, G.K., and Cook, T.W. (2002)

(2) Biology and Ecology of Earthworms by C. A. Edwards and P. J. Bohlen, 1996 (Chapman & Hall, London, UK)

Relation between chemical indices of soil and earthworm abundance under chemical fertilization

M lordache, I Borza - Plant Soil Environ. 2010



Earthworms

— Turf's casting directors —

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Earthworms are often regarded as the unsung heroes of our soil flora and fauna. Twenty-four of the 28 species of worms in the UK do not produce casts and only four species produce surface casts. However, all are an important element of healthy soil ecology.

Environmental conditions experienced during the summer of 2017 led to a serious increase in the production of casts, and it couldn't have come at a worse time. There are only a few situations where worm casts cause a problem, but sports turf is one of them.

The revocation of carbendazim, a pesticide that suppressed casting earthworms, has left greenkeepers and groundsman with no registered chemical control products in this area. Earthworms are classified as a key beneficial species and, as such, it is highly unlikely any pesticide will be developed for worm control.

Advantages of earthworms

The advantages of having worm activity in the soil are many, as they:

- Improve soil fertility
- Break down organic matter to humus
- Improve crumb structure and soil stability
- Aid aeration of soil profile
- Reduce compaction
- Collect and decompose decaying organic matter that would otherwise build up as thatch
- Improve surface drainage
- Reduce build-up of phyto-toxic gases in the soil
- Increase the activity of soil borne bacteria

Disadvantages of earthworms

The disadvantages, caused by casting earthworms are:

- Unsightly and numerous casts
- Collection on soles of shoes
- Uneven playing surfaces and adversely affected ball roll
- Build up can in the short term ruin playing surfaces
- Casts encourage weed seeds and germination
- Casts can be sticky and slimy
- Problems with machinery
- Damage to bottom blades of mowers
- Casts alter the height of cut, due to build-up on mower front rollers
- Smearing after mowing
- Casts smother finer leafed grasses
- Difficult to control

The ideal solution would be for a product to be developed that only had detrimental effects on the four surface casting species. In order to achieve this, an understanding of the biology of the casting earthworms is required.

Detailed investigation concludes that two of these are Epigeic species and two are Anecic species. The former live near the surface and are adapted to survive the

variable conditions found in this area of the soil. The latter species live deep in the soil profile in permanent burrows. The four species of casting worms all feed on surface litter.

In the absence of a product to control casting earthworms, greenkeepers and groundsman have a range of options that can contribute towards reducing instances of worm casts.

Potential control options:

Cultural practices

The removal of surface litter and collecting clippings will discourage surface feeding worms. Over time, this will reduce the population of the casting species via natural selection. These are labour intensive but achievable options.

Brushing

Brushing or switching prior to mowing helps to alleviate smearing and mowing problems. This can be achieved using manual labour or with brushes mounted in front of the cutting units.

Drainage

Studies¹ have clearly shown that drier soil conditions discourage casting activity and over time reduce total worm populations. The cultural control technique is to improve drainage and introduce freely draining abrasive materials such as coarse sand, which will help create an environment that is less conducive to worms. Use of a range of cultural techniques to improve drainage will help reduce overall worm populations and as a result lower the impact of worm casting.

Keeping the worms lower in the soil profile will significantly reduce surface casting without losing the benefits of worm activity in the soil profile. This is not easy to reproduce in real conditions but not over-irrigating will help. Use of a programme of penetrant-type wetting agents long term can reduce the average soil moisture levels through the profile. This process creates an environment less conducive to worms.

Modification of pH

It has been shown in trials² that the reduction of soil pH to acidic conditions tends to reduce worm populations. The use of acidifying materials is possible but needs further research and has to be carried out very carefully to avoid potential impact on turf vigour and other nutritional problems.

Work is being carried out on turf, on both greens and fairways, to develop a suitable agronomic approach to create an environment in the soil that does not encourage high populations of worms. Various forms of sulphur and acidifying agents are being investigated.