

What is the problem with worms?

Earthworms play a vital role in the soil system as nutrient recyclers, mixing surface litter with the soil, breaking down organic matter and providing channels for the infiltration of liquids and gases. However, in certain circumstances, earthworm activity in soil under fine turf is not so welcome due to the surface casts produced by some species. These casts have many direct and indirect negative effects on the playing quality of fine turf, some of which are outlined below.

- Produce uneven playing surfaces.
- Result in muddy surfaces which can seal the surface and reduce drainage.
- Provide an ideal seedbed for weed seeds, e.g. daisy and annual meadow-grass.
- Reduce visual quality of the surface.

In British soils there are twenty-five species of earthworm, but only eight have been shown to produce surface casts, with the two major species being *Apprectodea longa* and *Lumbricus terrestris*.

It is the aim of the greenkeeper to keep surface casting at a minimum to ensure playing quality is minimally affected. However, due to the Climate Change predictions of milder, wetter autumns and winters, it is likely that increased incidence of worm casting will be experienced, thus increasing the negative effect on turf playing quality. Whilst we always have to accept a certain amount of casting, when casting rates are high, particularly on fine turf, the disadvantages of casts outweigh the advantages of earthworms and consequently control measures become necessary.



Controlling worm casting—the chemical approach

In the 1920s-1960s control methods largely involved the application of chemical expellants that were applied to irritate the worms, thus bringing them to the surface where they were swept up, e.g. potassium permanganate, Mowrah meal. Other materials were applied to kill the earthworm whilst still underground, e.g. mercuric chloride and lead arsenate, which were both banned due to their very high toxicity.

From 1960-1992, the most popular lumbricide was chlordane. Its success was due to its relative cheapness but also its duration of control (between five and seven years) which could be gained by one application. However, it was the persistence of the product in the soil that resulted in its ban in 1992. Now, only a couple of approved chemical products remain available for the control of earthworms, these are detailed in the current edition of the *BAA Handbook of Amenity Pesticides* and in *The UK Pesticide Guide*. The expense of these materials means that their use tends to be restricted to small, localised areas.

Controlling worm casting—the cultural approach

As chemical control is so limited, and is likely to become even more so in the future due to stricter pesticide legislation, it is important to adopt a more cultural approach to the worm casting problem. Essentially, the cultural control methods for worm casting can be described as follows.

- **Reduce the food source:** Boxing off grass clippings and using inorganic fertilisers will reduce the food supply to worms. However, boxing off clippings from larger areas such as fairways is largely impractical not only in terms of time but also with the disposal of grass clippings. Reduction of thatch and organic matter in the soil by regular aeration and scarification techniques will also reduce the food supply further.
- **Reduce soil pH:** We can manipulate soil pH on alkaline soils. Using an acidifying agent such as iron sulphate or in some circumstances sulphur, we can drive down pH to produce more acid soil conditions and discourage earthworms.
- **Sand top dressing:** The application of sand as top dressing reduces surface casting. As a sand particle is relatively coarse, it is irritable to the worm on passage through its gut. The result of this is to force the worm to migrate away from the sand top dressed area, thus away from the playing surface. Furthermore, in the event of casting, the sandier cast is much easier to disperse. Sanding also has the benefit of diluting thatch/organic matter and improving surface drainage.
- **Recycled glass top dressing:** Research into the application of recycled glass for top dressing (in a similar manner to sand) is underway and has had some positive interim results. The advantage of this method over sand would be the reduced cost, in addition to recycled glass being a more sustainable resource.

Worm casting—the future?

With the Climate Change predictions, the desire for more year-round golf and the lack of approved chemical control for worm casting, it seems the best approach against worm casting will be to adopt a combination of cultural control mechanisms in addition to localised chemical control (if necessary) whilst the products are still available.

One thing is for sure, to retain the quality of turf that golfers have come to expect, it will be necessary to adopt sufficient control methods in the future.