

# Earthworm Control

## INTRODUCTION

NZ Sports Turf Institute has prepared three submissions to date for ERMA on behalf of the turf industry as to why endosulfan should be retained. As this fact sheet goes to publication, the fate of endosulfan is entering its final phase, namely Public submission and then a determination by ERMA as to whether it remains on the NZ market.

The good news for the turf industry and ***subject to the public appeal process***, ERMA has recommended that endosulfan be retained for use by the turf industry and that the following new controls are applied:

1. endosulfan be limited to 1 application/year.
2. endosulfan shall be watered in immediately after application.
3. In the case of the facility being used for ground contact sports, or being a public area, the facility shall be closed for 48 hours after application.
4. A 100m no spray buffer zone between the treated areas and any waterways.
5. HSNO classifications changed as follows:
  - 6.1C changes to 6.1A
  - 6.3B changes to 6.3A
  - 9.2C changes to 9.2A

**Once a final determination has been made on endosulfan, we will inform the turf industry.**

The issue for golf clubs is how do we manage earthworms and preserve playing quality particularly during winter and spring for our golfers. The following Fact Sheet summarises the presently available options.

## EARTHWORMS – WHY ARE THEY A PROBLEM?

Earthworms unlike other pests do not directly damage the turf plants. The problem with earthworms is that their casts adversely affect the playing surface especially in the cooler, wetter periods of the year.

At this time of the year, the worm casts remain soft and result in the surface becoming smeared and often puggy due to surface sealing. Overall the playing surface for golfers is softer and of a poorer quality.

## ENDOSULFAN – YOUR LEGAL REQUIREMENTS

Inevitably, some golf clubs will have stockpiled endosulfan. It is essential that where the Club has stockpiled significant quantities of endosulfan, they comply fully with the requirements of HSNO, namely:

- Appropriate signage.
- Appropriate number of fire extinguishers.
- Where the total quantity of all products held on site with 6.1A, 6.1B, 6.1C classification exceed 100L, a Level 3 Emergency Management Plan is required. This will involve the preparation of an Emergency response plan and spill containment (e.g. bunding).

## FUTURE MANAGEMENT STRATEGIES FOR EARTHWORMS



If or perhaps when endosulfan is removed from the New Zealand market, strategies for suppressing earthworms will include:

### Chemical Control

Interestingly, there are a number of pesticides that are known to be toxic to earthworms (refer to <http://www.oxfordcroquet.com/care/worms/index.asp>). However, the effectiveness of these products is presently unknown under New Zealand conditions. Presently the only pesticide registered internationally for earthworm control is carbendazim. However, feedback from Sports Turf Research Institute advisors, indicate carbendazim produces variable and inconsistent results. The main chemical options other than endosulfan are summarised in table one.

Table 1: Chemical Options for Controlling Earthworms

Product	Rate/ha	Comments
Carbaryl 500gai/L Acute oral LD50 400mg/kg rats Acute dermalLD50 500mg/kg rats	10-30L	<ul style="list-style-type: none"> <li>▪ Although there has been limited field use of carbaryl to date our experience has shown it to provide inconsistent or partial control of earthworms.</li> <li>▪ Research<sup>3</sup> has shown carbaryl to be less effective and provide a shorter duration of control than carbendazim.</li> <li>▪ Best results are generally achieved with spring applications.</li> </ul>

Product	Rate/ha	Comments
Carbendazim 500gai/L  Acute oral LD50 6400mg/kg rats Acute dermal LD50 >10000mg/kg rabbits	4 -8L	<ul style="list-style-type: none"> <li>▪ Product labels overseas (e.g. Scotts Turfclear) requires this to be applied every 3 months in at least 1000L of water/ha.</li> <li>▪ Research<sup>2</sup> indicates that carbendazim, will suppress the amount of casting that occurs by approximately 35% for 3 months and thereafter the level of control will taper off with time.</li> </ul>
Thiophanate methyl 400gai/L  Acute oral LD50 7500mg/kg rats Acute dermal LD50 >10000mg/kg rats	12.5L	<ul style="list-style-type: none"> <li>▪ For best results, these products should be applied in conjunction with light rain.</li> <li>▪ Within Britain a <u>compatible wetting agent</u> is mixed with carbendazim, to improve penetration of the fungicide into the soil profile.</li> <li>▪ Resistance to benzimidazole group of fungicides and in particular Benlate™ to Dollar spot and Fusarium is well documented on New Zealand<sup>4</sup> turf facilities. Furthermore cross resistance within the benzimidazole group of fungicides is well documented. Repeated drenches of carbendazim will increase the risk of resistance to a range of fungi.</li> </ul>

## Fertility

Earthworms are sensitive to acidic soil conditions particularly where the pH falls below pH 5.0. Regrettably the adoption of inappropriate fertiliser practises in the past on a number of golf clubs has aggravated problems with earthworms.

Key considerations are:

1. Have a full understanding of the grass type that you are growing and the implications that the required management programme for this grass type will have on earthworms. For example the higher pH required by ryegrass and its clump type growth habit means it is both more susceptible to earthworm activity and the short term damage from casting (smearing/smothering of the plant) is generally more severe.
2. The use of organic fertilisers (which act as a food source for earthworms) such as Poultry manure, etc should be used sparingly and concentrated during the late spring – summer.
3. Lime should be used sparingly and its requirements based on soil testing. A common misnomer on turf is the necessity to raise the pH of the profile. For browntop the dominant grass on many golf courses, an acidic pH is recommended and any pH adjustment is primarily required within the surface 20mm to assist with infiltration and managing thatch.
4. Where required, acidic nitrogen sources (ammonium sulphate) are recommended during autumn – winter when earthworms are most active.

## Surface Acidification

The primary goal (depending on the grass type grown) is to lower the pH within the surface 50 -75mm and thereby create an environment that is less conducive to earthworm activity. This will take time and consequently in the short term surface acidification is suggested as a means of suppressing surface casting. There are two main fertiliser options that can be considered for re-acidifying fairways and the like, namely iron sulphate or sulphur.

The following process is suggested:

- i. Soil test the fairways (0-25mm and 25 – 75mm deep samples) to assess your soil pH.
- ii. With iron sulphate:
  - a. Initially apply 25 – 40kg/ha in 700 – 900L of water in conjunction with rain during April when reliable rainfall is anticipated.
  - b. Follow up at 6-8 weekly intervals (May – August) using 10 – 15kg/ha of Iron sulphate.
- iii. Sulphur programmes are more risky and would typically involve 2 – 3 applications of wettable sulphur (for example: Kumulus DF 800gai) applied at 25kg/ha in 700-900L of water during April (with cool temperatures and reliable rainfall), June and August.

### Caution:

Total annual sulphur rates of > 150kg Sulphur/ha (>187kg of an 80% sulphur formulation/ha/year) can be damaging to *Poa annua*. The use of sulphur on poor draining situations, particularly thatchy or sandy situations can increase the incidence/severity of Black layer. Applications of sulphur during hot or sunny conditions can result in burning/death of the turf.

## Sanding

For sand facilities, research<sup>1,3</sup> has shown that firstly:

- Heavy and regular applications (37.5mm/year) can suppress the severity of casting.
- In the absence of spraying for earthworms additional sanding is required to counter the effects of casting and maintain porosity (drainage) within the sand profile.

## REFERENCES

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2. Baker, S.W., Binns, P.J., Kirby, E.C. (1998). *Reduction in rates of earthworm casting on turf areas using carbendazim, carbaryl, gamma-HCH + thiophyrate methyl*. Journal of the Sports Turf Research Institute. Vol. 74, pg 25-39.
3. Gibbs, R.J. (2003). *Managing contamination of the sand carpet layer of slit drained sports fields*. Proceedings of the 2<sup>nd</sup> Sports Turf Conference and Trade Show. Pg 139-148.
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