



# Farmnote

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## Using twist fungus (*Dilophospora alopecuri*) to reduce the risk of annual ryegrass toxicity

### Farmnote 33/98

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Research has demonstrated that the twist fungus is capable of reducing ARGT nematode and bacterial levels significantly and hence provides a useful reduction in the risk of ARGT. The fungus may be ordered from Agriculture Western Australia (AgWA). This Farmnote presents information on ARGT and the twist fungus, and issues relating to field application of the fungus.

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## Annual ryegrass toxicity

Annual ryegrass toxicity (ARGT) is the poisoning of livestock by toxins contained in bacterially-infected annual ryegrass. The toxins are produced by the bacterium *Clavibacter toxicus*, which is carried into the ryegrass by a nematode *Anguina funesta*. Conditions that favour the development of ARGV are:

- paddocks with moderate to high frequency of cropping;
- high density of ryegrass;
- short growing seasons;
- spread of contaminated materials from ARGV areas;

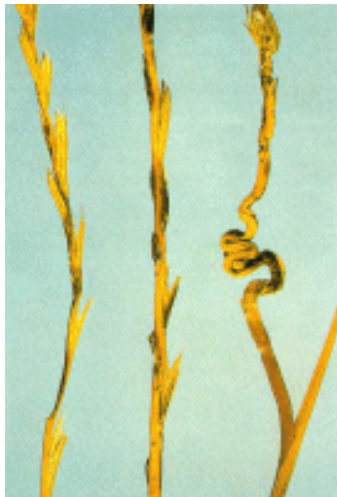
- stock with inadequate supply of water;
- stock under extreme hot and dry weather conditions.

## How the twist fungus reduces the risk of ARGT>

The twist fungus is carried into ryegrass by attaching itself to the same nematode that carries the bacterium. The fungus:

- hinders the movement of the nematode and reduces its ability to invade ryegrass;
- restricts the growth and reproduction of nematodes and bacterium in ryegrass.

The fungus is fast growing. Once inside the ryegrass, the fungus colonises the seedhead and may cause it to become twisted (Figure 1), giving the fungus its common name. In the process, it limits nematode and bacterial development.



*Figure 1. Twist fungus infected ryegrass heads*

Results of field and pot experiments have shown that the fungus is capable of reducing the bacterial population by up to 100 per cent and nematode population by 50-70 per cent, depending on the rate of application and field conditions.

With the Autumn rainfall, ryegrass seeds germinate, nematodes come out of the gall and migrate on the moist surface of the soil towards ryegrass, picking up bacterium (yellow dots) in the process.

When the ryegrass plant starts tillering the nematode larvae 'swim' in the film of moisture to the growing point of the young plant. As the ryegrass flowers begin to develop, the larvae start to feed on the developing ovary and stimulate it to produce a gall in place of a normal seed. In galls where bacterium is present, the bacterium multiplies rapidly, killing the nematodes and filling the galls with densely packed yellow bacterial cells to form a bacterial all. Large numbers of bacterium may appear as a yellow slime covering the ryegrass heads and leaves. The bacterial galls and slime are toxic to livestock. Sheep consuming ryegrass contaminated with high levels of bacterial galls and slime may develop ARGT.

With the introduction of the twist fungus, the number of nematodes entering the ryegrass is reduced as spores of the fungus hinder nematode development. Once inside the ryegrass plant, the twist fungus quickly colonises the plant, limiting the development of the nematode and the multiplication of the bacterium in the process. As a result, the level of nematode and bacterial galls is reduced, lowering the risk of ARGV.

The effect of twist fungus is accumulative. After the inoculation onto a paddock, the twist fungus population gradually builds up, while the nematode and bacterial populations decrease slowly. It may take about three to five years for the risk of ARGV to be substantially reduced, depending on the conditions and the initial inoculation rate.

## Availability of the fungal inoculum

The fungal inoculum comes in granular form (Figure 3) and is available from Agriculture Western Australia on a cost recovery basis. Order forms can be obtained from the Nematology Laboratory, Agriculture Western Australia, South Perth, selected Community Agriculture Centres and Agriculture Western Australia research stations. Inoculum ordered before 31 January each year will be available from April through to early June in the same year. Orders received after 1 February will be supplied the following year. The inoculum will be supplied in boxes of 20 kg.

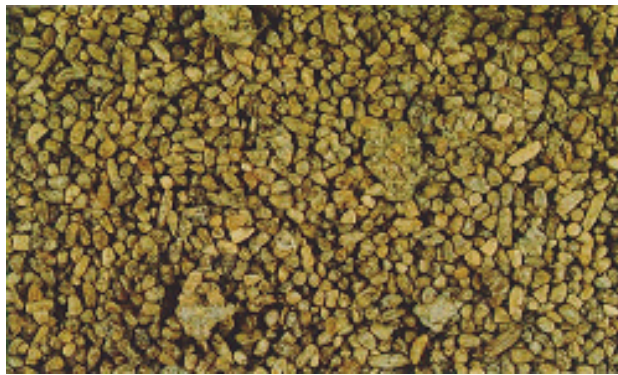


Figure 3. The twist fungus inoculum.

## Inoculum storage

Once received, the inoculum should be stored in a cool, dry place with good ventilation until used. It should not be exposed to direct sunlight during storage. The inoculum is most effective when fresh and should not be stored for more than a few months.

## Paddock selection

The best paddocks for treatment should:

1. have a history of ARGV,
2. be in crop in the year of application, and

### 3. be in pasture the year after application.

Our results have shown that the spread of the fungus during the year of application is best on cropped paddocks. Harvesting and other activities help to spread the fungus around the paddock and farm. Hence, crop paddocks are better for local dispersal of the fungus. If the inoculum is to be applied to a pasture paddock, it should have a moderate to high density of ryegrass. Whether applied to a crop or pasture paddock, it is important the paddock is in pasture the next year as the presence of a reasonable density of ryegrass assists establishment and build up of the twist fungus population.

## Application rate

The minimum recommended application rate is 200 g/ha. For practical reasons, field application is more easily done in bands rather than attempting to cover the whole of the paddock. If bands are spaced at 60 m intervals, one (1) bag (2.6 kg) of inoculum will inoculate a 2000 m band. To achieve an application rate of 200 g/ha, it may be helpful to mix the inoculum with sand or sawdust to dilute it before spreading.

At the recommended minimum application rate, there will be no significant reduction in the risk of ARGV in the year of application. The full benefit of the fungus may take three to five years to be realised. In situations where a more rapid result is desired, a higher application rate should be used.

## Field application of the inoculum

The fungal inoculum should be applied from May to early July. Application after ryegrass tiller elongation is considerably less effective and not recommended. The inoculum is easy to apply in the field. Drying the inoculum after opening the bags for one to two hours in dry warm conditions will assist in its application. Any machinery capable of spreading solid materials can be used. Super spreaders and air seeders have been used with success. For large areas, aerial application may be a viable alternative.

The inoculum must remain on the surface of the soil to be effective. It can not be buried as the fungus produces spores that are spread by rain. Application bands should be run across the slope to facilitate dispersal by surface water flow. Once established, the fungus will persist wherever ryegrass and the ARGV nematode persist and reapplication of the fungus is not necessary.

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