

Project Title: Narcissus: overcoming the problem of 'soil sickness' with particular reference to the Isles of Scilly

Project number: BOF 50

Project leader: Andrew Tompsett

Report: Final report, June 2006

Previous reports: Annual reports 2002, 2003, 2004, 2005

Location: St. Mary's, Isles of Scilly

Project co-ordinator: Keith Hale, Tremelethen, St. Mary's, Isles of Scilly

Date commenced: 1 April 2001

Date completed: 1 June 2006

Key words: Narcissus, daffodil, marigold, soil sickness, Root lesion nematode (*Pratylenchus*), *Nectria* (*Cylindrocarpon*), *Tagetes patula*, Telone II (dichloropropene), tazetta

## **Grower Summary**

### **Headline**

- Using a combination of *Tagetes* (a bio-fumigant crop) followed by Telone II (a soil sterilising agent) reduced the level of *Pratylenchus* root lesion nematode to an acceptable level and improved vigour in tazetta narcissus crops.

### **Background and expected deliverables**

By sampling soil from affected plantings of Tazetta varieties of narcissus, the project sought to establish the extent and causes of 'soil sickness' on the Isles of Scilly. The suspected causes of soil sickness are pathogenic free-living soil nematodes which then enables secondary infection of the bulbs by fungi. Bulbs on affected sites remain intrinsically healthy but become progressively smaller due to root loss and early senescence.

Research from The Netherlands concluded that growing *Tagetes patula*, variety 'Ground Control' on a site in the year prior to planting a bulb crop reduced the incidence of soil-sickness. The growing of a bio-fumigant crop such as *Tagetes* requires land to be set aside for one year prior to planting whereas Telone II (dichlopropene) only requires a minimum period of three weeks between treatment and planting. However, Telone is a highly toxic substance and the possibility of developing resistance to treatment is possible over time with frequent applications.

This project (BOF 50) compared the effect of planting a biofumigant crop (*Tagetes*) alone, with the standard method of injecting Telone (dichlopropene) into the soil alone, with a combined treatment of *Tagetes* followed by Telone. Experiments were designed to identify treatments for soil sickness of tazetta narcissus that could result in vigorous crops that can be left in the ground for up to four years.

## Summary of project and main conclusions

A survey was carried out in 2001/2 on 20 'problem' sites on farms on the Isles of Scilly. On these fields of varying size (approximately 0.1- 0.4 ha), crops of narcissus grown for flowers and bulbs were showing patches or general areas of depressed growth possibly due 'soil sickness' complex. Soil samples were collected from the affected areas.

- *Pratylenchus* root lesion nematode was detected on 12 of the 20 survey sites.
- The pathogenic fungus *Cylindrocarpum* (Nectrica) was isolated on 11 of the 20 survey sites.
- There was no correlation between occurrence of the root lesion nematode and the pathogenic fungus

Two trials were sited on two of the initial survey sites that were infected by both *Pratylenchus* and *Cylindrocarpum*. Treatments of *Tagetes* and Telone II both alone and in combination were applied on both sites. The four treatments which were replicated six times were:

1. Untreated control
2. *Tagetes*
3. Telone II
4. *Tagetes* followed by Telone II

Narcissus planted on the trial sites in 2004 were observed for two years and their growth recorded. Free-living soil nematode populations were monitored during this period.

On site 1, the untreated plots began to suffer greater root loss and depressed growth in the first growing season compared to plots treated with the combined treatment of *Tagetes* followed by Telone II. They were also found to be free from *Pratylenchus* nematode.

After two growing seasons, the plots combining *Tagetes* followed by Telone II were the most vigorous and still free from *Pratylenchus* nematode in comparison to plots treated with *Tagetes* or Telone alone or the control plots.

Treatment	Site 1		Site 2	
	2005	2006	2006	2006
Control	54	53	67	83
<i>Tagetes</i>	74	64	75	83
Telone II	87	75	75	87
<i>Tagetes</i> + Telone	86	81	75	90

### Financial benefits

Soil sickness, though frequently patchy in its distribution, can cause severe crop damage. However, its unpredictability is a major management problem since a narcissus flower crop which is normally expected to be productive for at least four years may show areas of reduced growth much sooner.

Lifting the bulbs, treating and re-locating them involves considerable cost in addition to the loss of the most productive years of the plantation (usually years 3, 4 and perhaps 5)

Telone II injection at 225 litres/ha. plus plastic coverage costs £1250/ha. *Tagetes patula* 'Ground Control' sown at 5kg/ha. costs £400/ha to which must be added the cost of herbicides (Goltix + Betanal, possibly two applications needed) required to maintain a weed free stand of *Tagetes* plants.

The costs of soil preparation, injecting or drilling are common to either method. Both require suitable equipment.

The *Tagetes* crop, on incorporation, adds to soil organic matter, (up to 85 tonnes fresh weight (20 tonnes dry matter / ha is claimed but in these trials it averaged 40 tonnes fresh weight / ha.)

Trial results after two years suggested that Telone II out-performs *Tagetes* but that the combined use of *Tagetes* and Telone II is superior to either agent alone. Unfortunately this raises the cost of the combined treatment to about £1640 / ha.

Despite this increase in costs, if combined treatment maintains a full crop for at least a 4-year period this is still a viable option as the value of a full crop is comparatively high.

### **Action points for growers**

- As populations of *Pratylenchus* can be unpredictable, soil samples should be collected and sent for identification and density to a diagnostic laboratory before committing to expensive control measures.
- If high populations of *Pratylenchus* are found, growers should consider using a combination of a *Tagetes* 'biofumigant crop', followed by Telone II injection. This appears capable of reducing the effects of 'soil sickness' in a narcissus crop for at least two years and probably longer.