

# Application of entomopathogenic nematodes via drip irrigation systems

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# Outline

- The use of drip line irrigation systems in UK agriculture.
- Application of EPN via drip line irrigation systems:
  - Problems with this approach.
  - Reasons behind the problems.
  - How these may be overcome in the field.

# Introduction

- Very few EPN specific application devices have been developed for this niche market.
- Many high-value crops, onto which nematodes are applied, have irrigation systems already in place.
- Integration into existing irrigation systems widens the market potential of these products.
- With >80% of invertebrate pests having at least part of their lifecycle in the soil, application via irrigation systems enables EPN to be placed close to their target.

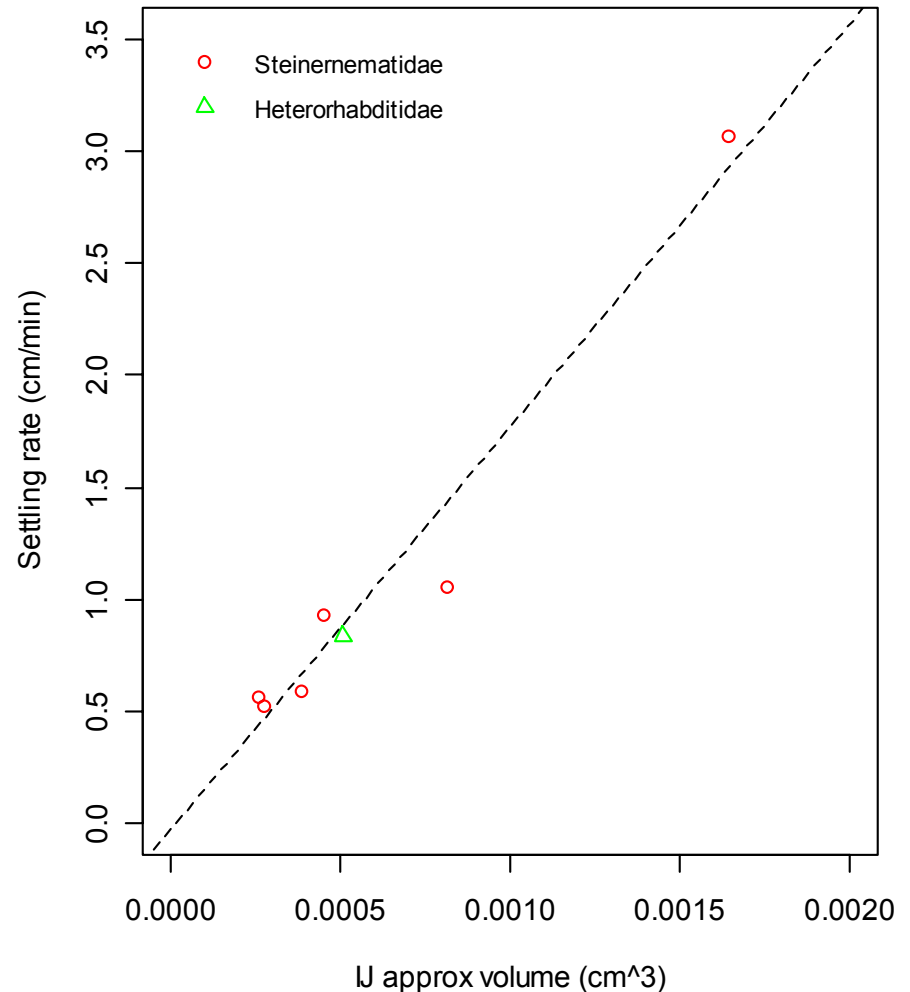
# Field set up of drip irrigation system



**PRIOR TO INTRODUCTION INTO  
IRRIGATION LINE**

# The effect of IJ volume on settling rate

Statistical analysis showed the inter species variation in IJ volume, to have a significant effect on their settling rate (df = 1,  $r^2 = 0.96$ ,  $p = <0.001$ ).



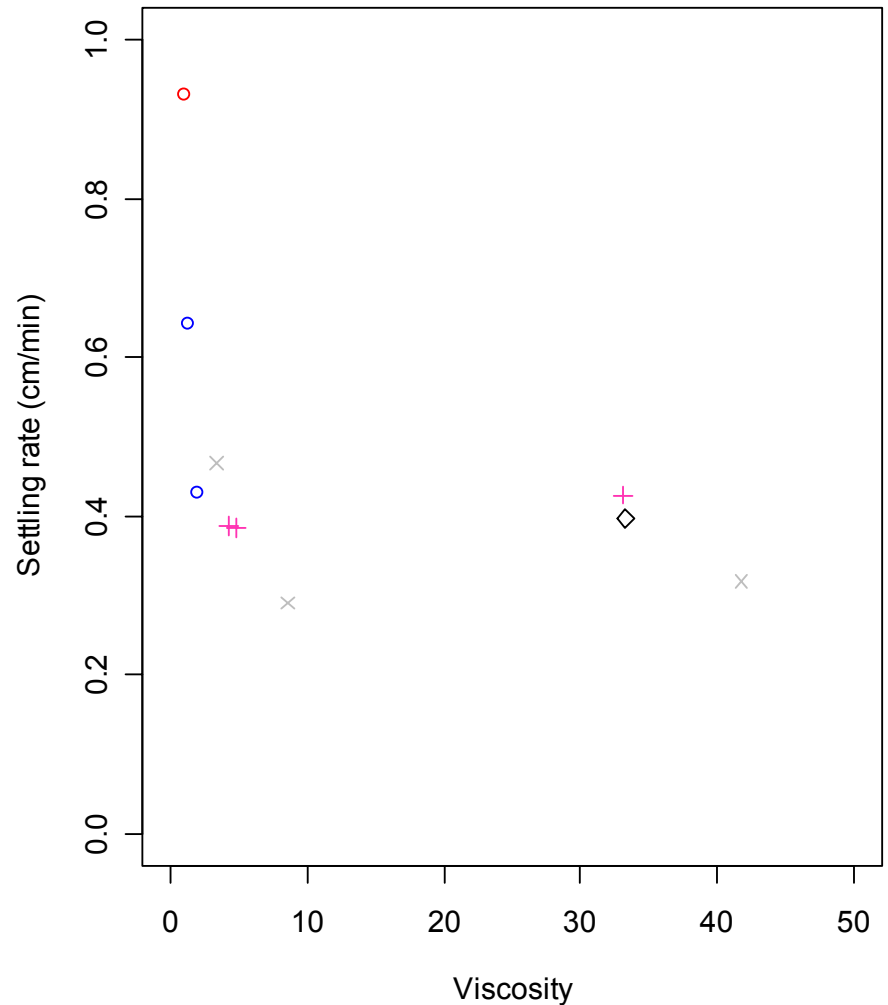
# The effect of thickening agents on the settling rate of *S. feltiae*

Variety of gums investigated:

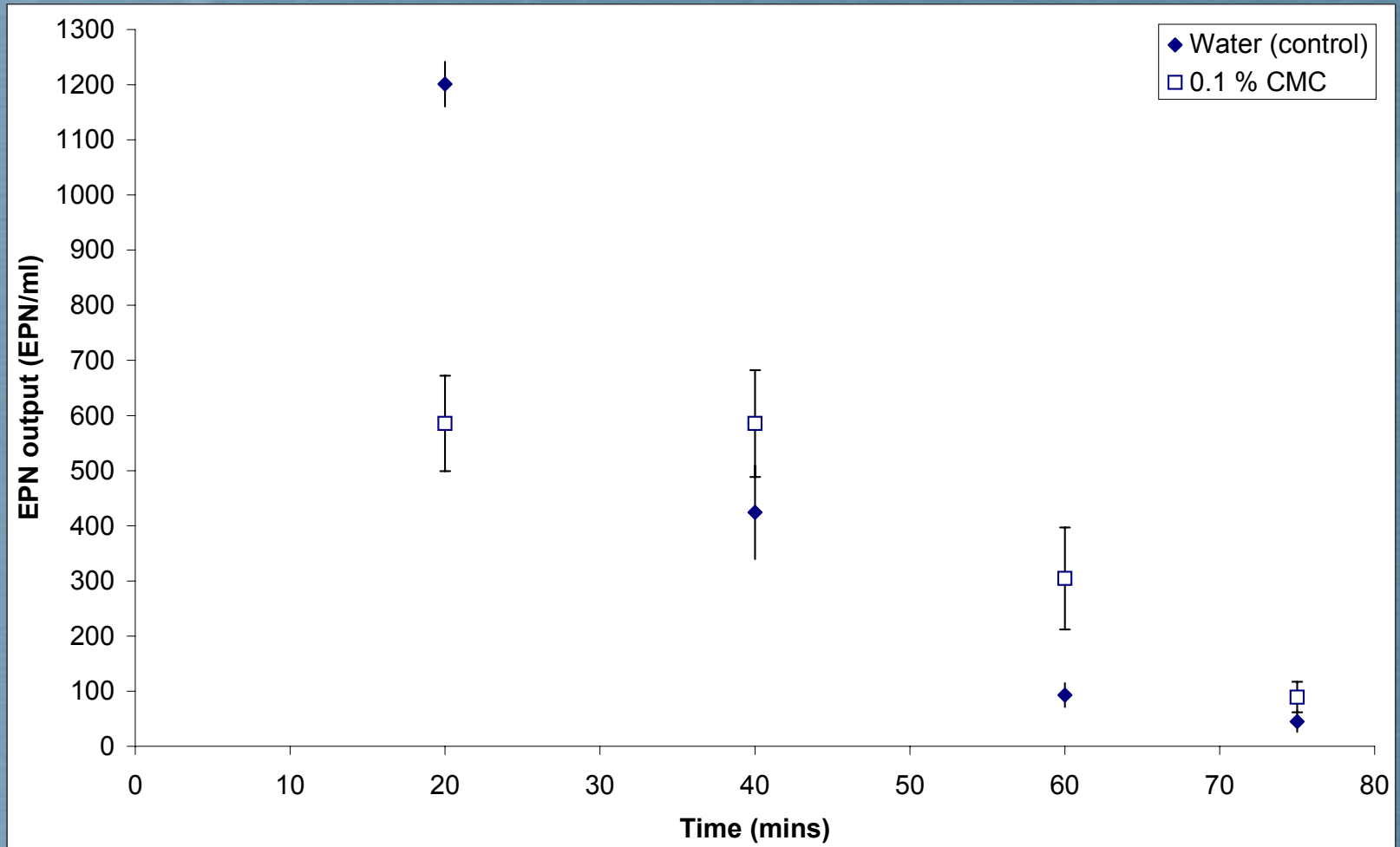
-CMC

-Gum Guar

-Xanthan gum



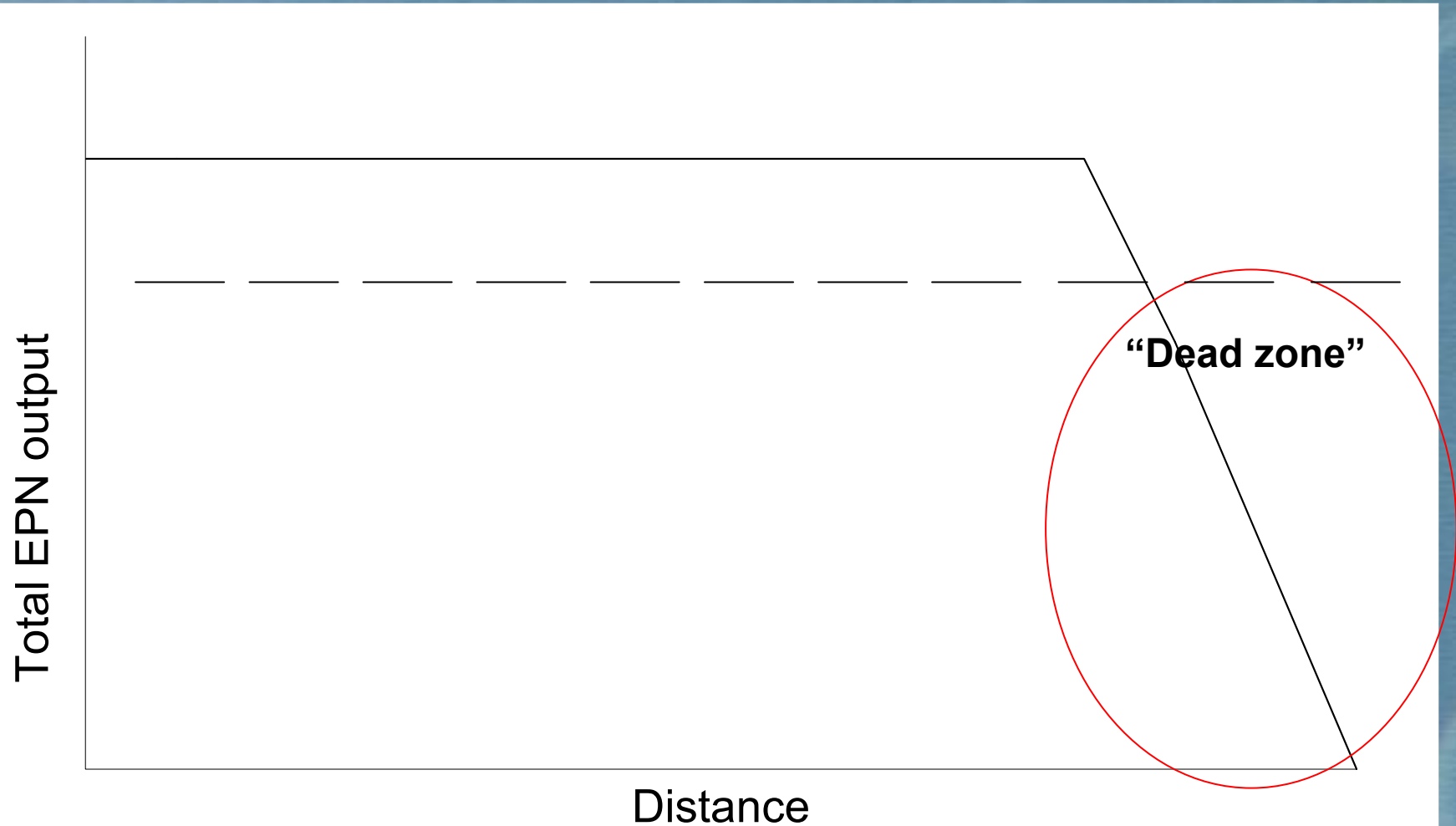
# The output of EPN from the first emitter of a drip irrigation line



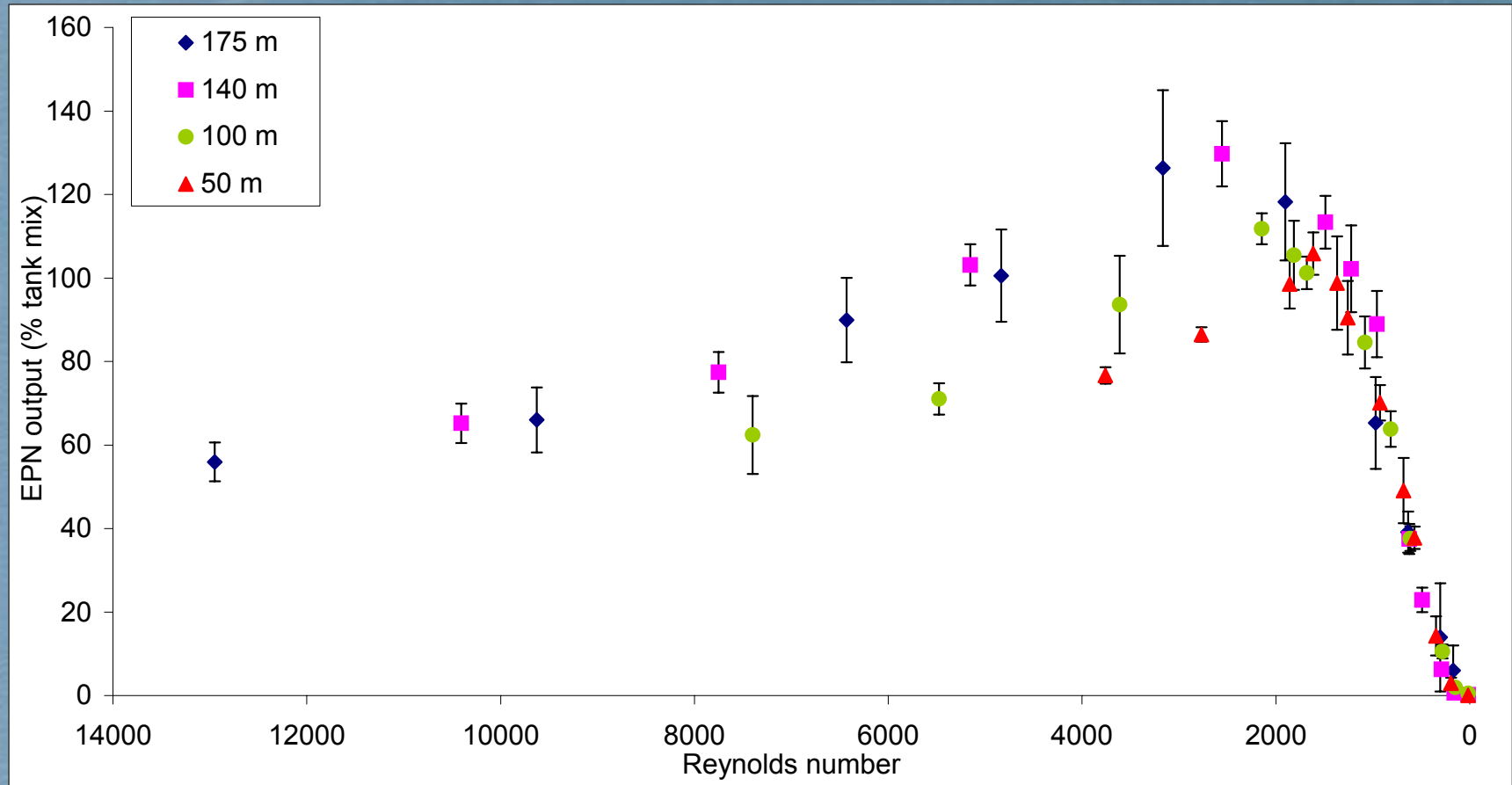
# OUTPUT OF EPN AT THE END OF THE IRRIGATION LINE

# Problem with application via drip line irrigation

General trend in total EPN released along an irrigation tape.

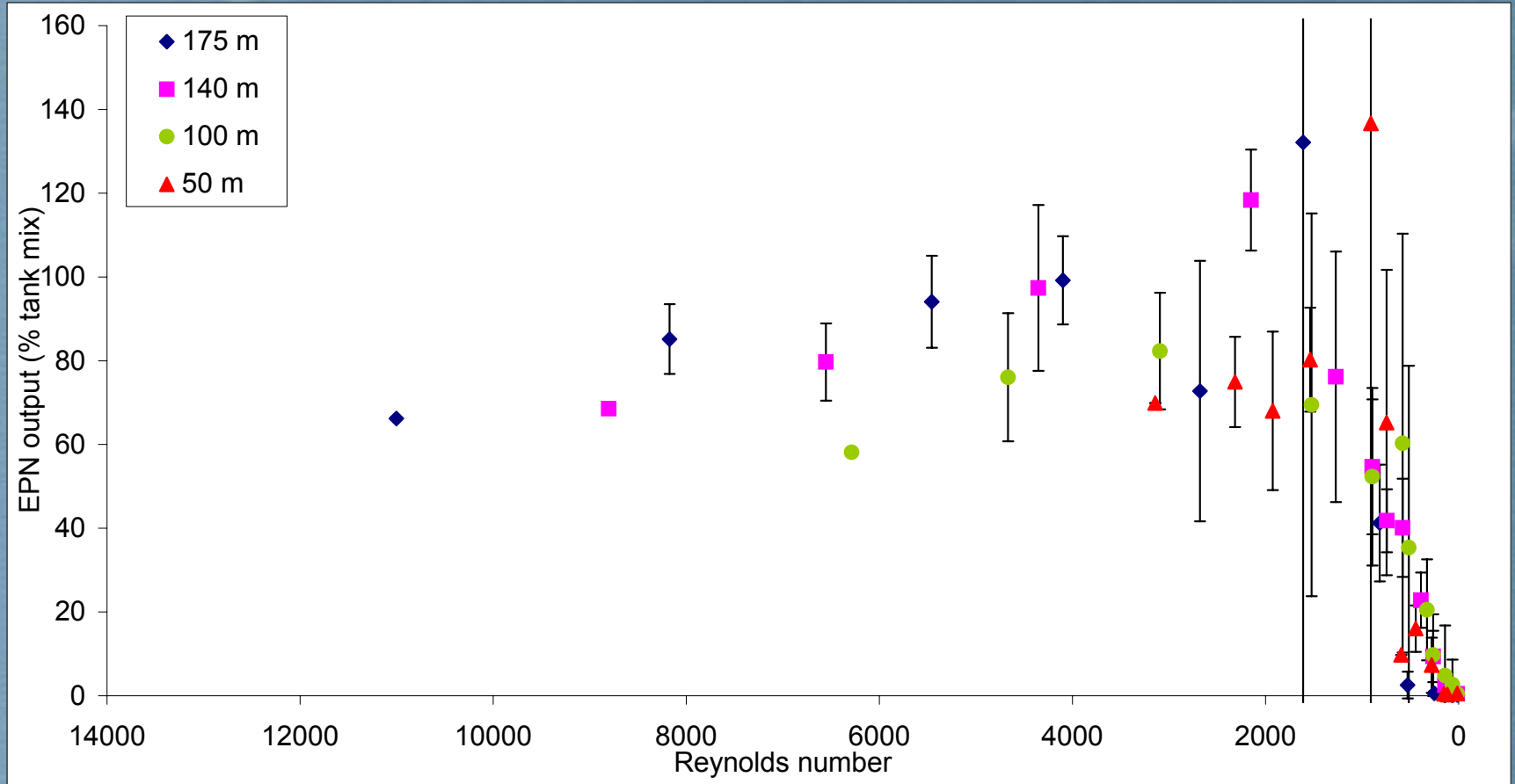


# Effect of total length of line for Netafim Dripnet PC (mean epn output $\pm$ se)



Total length of the irrigation line has no significant effect on the drop off of EPN

# Effect of total length of line for Pathfinder 1000 (mean epn output $\pm$ se)

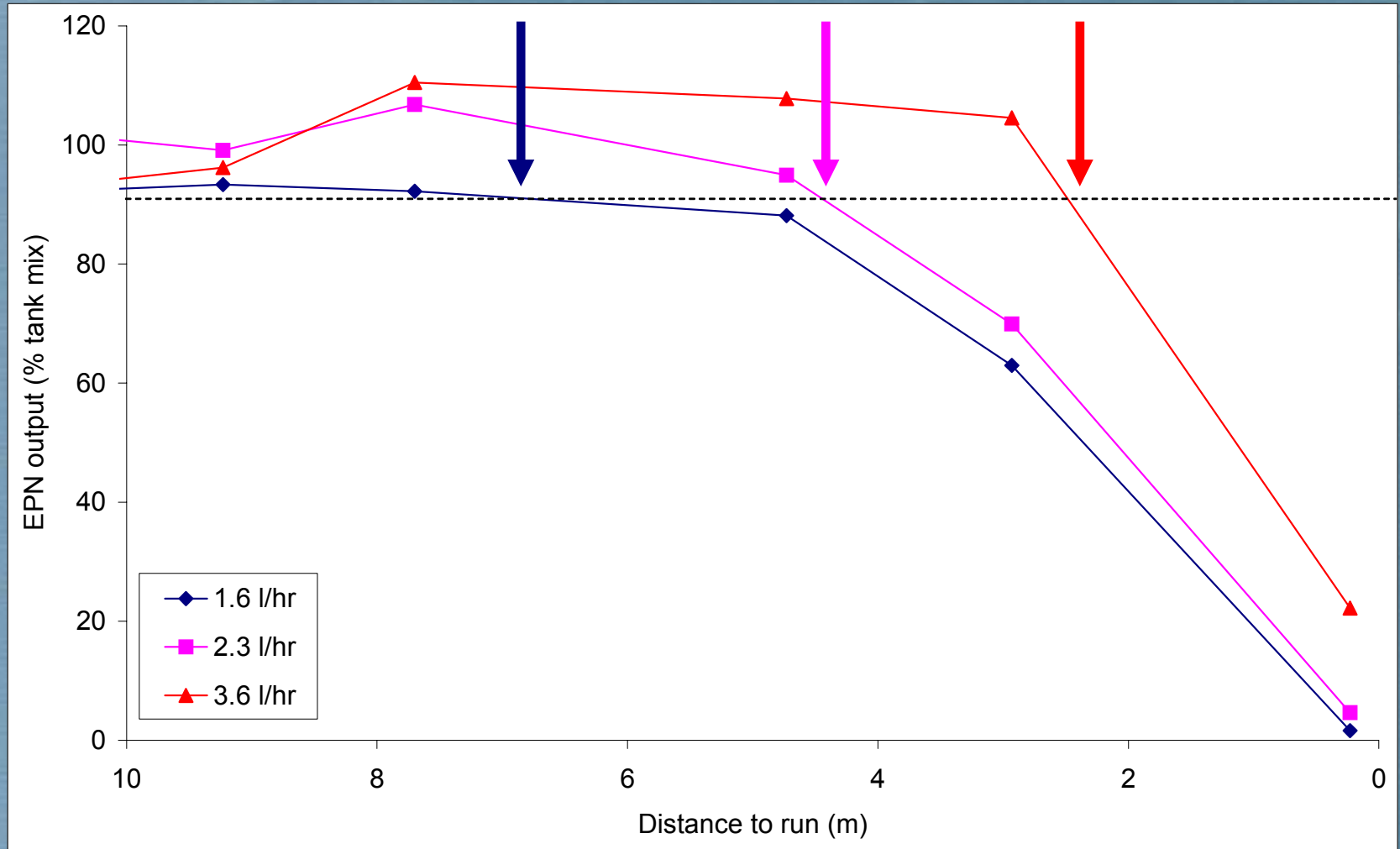


Total length of line has a significant effect on the drop off of EPN

# Potential solutions

- Inserts:
  - Placed in each line to re-suspend settled EPN
- Faster flow rate:
  - Will keep a higher amount of turbulence in pipe for longer length
- Over-run cropped area:
  - Area of line delivering reduced EPN levels is not in cropped area

# Faster flow rate

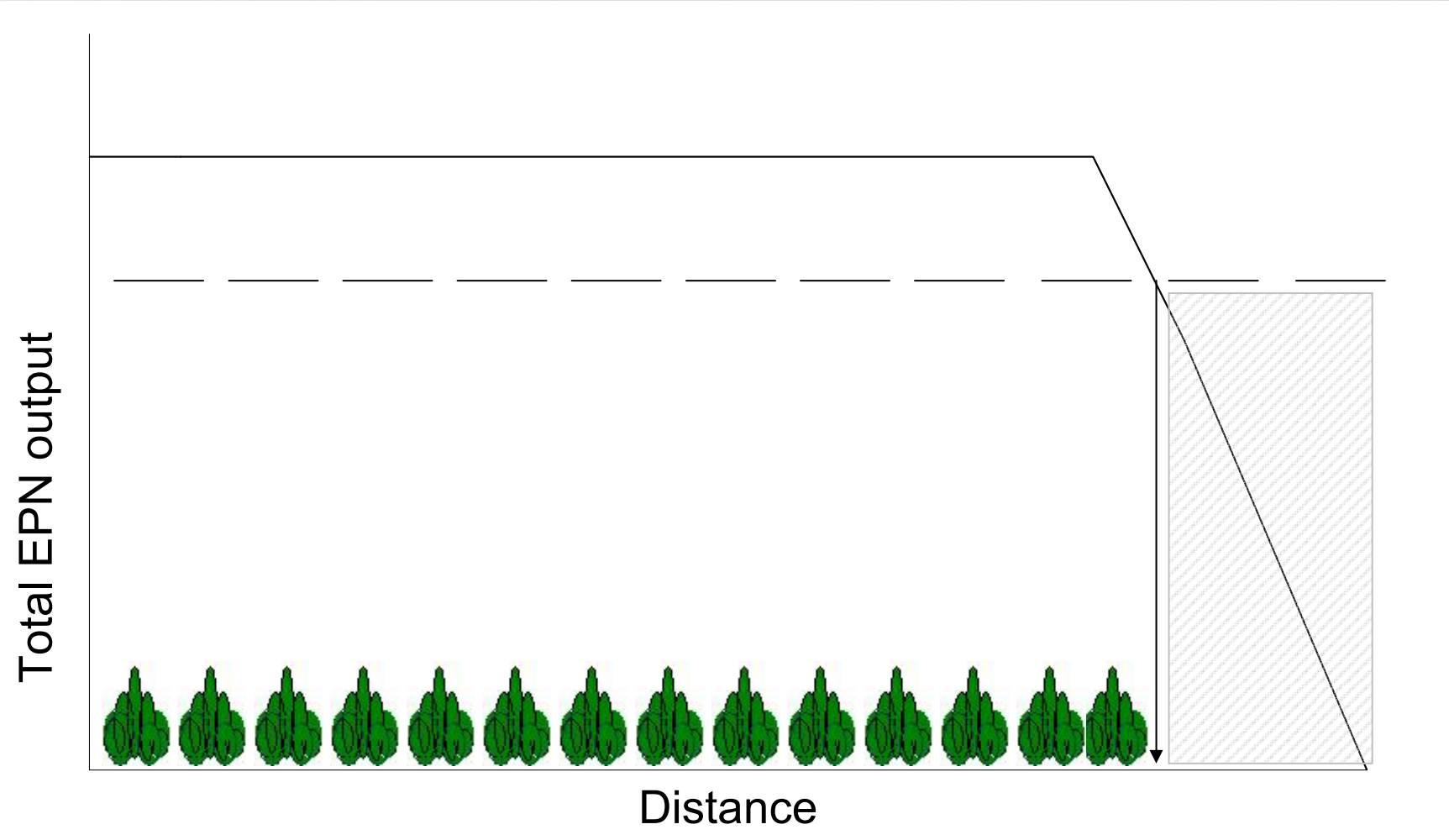


- Increasing flow rate can delay the drop off in EPN output

# Potential solutions

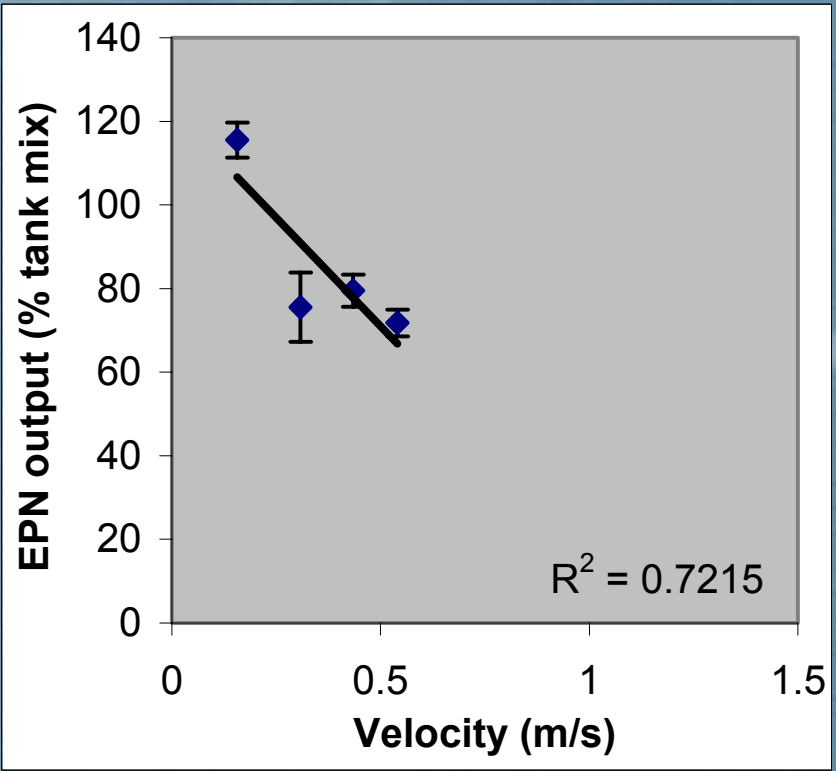
- Inserts:
  - Placed in each line to re-suspend settled EPN
- Faster flow rate:
  - Maintains a higher turbulence in pipe for longer
- Over-run cropped area:
  - Area of line delivering reduced EPN levels is not in cropped area

# Over run cropped area

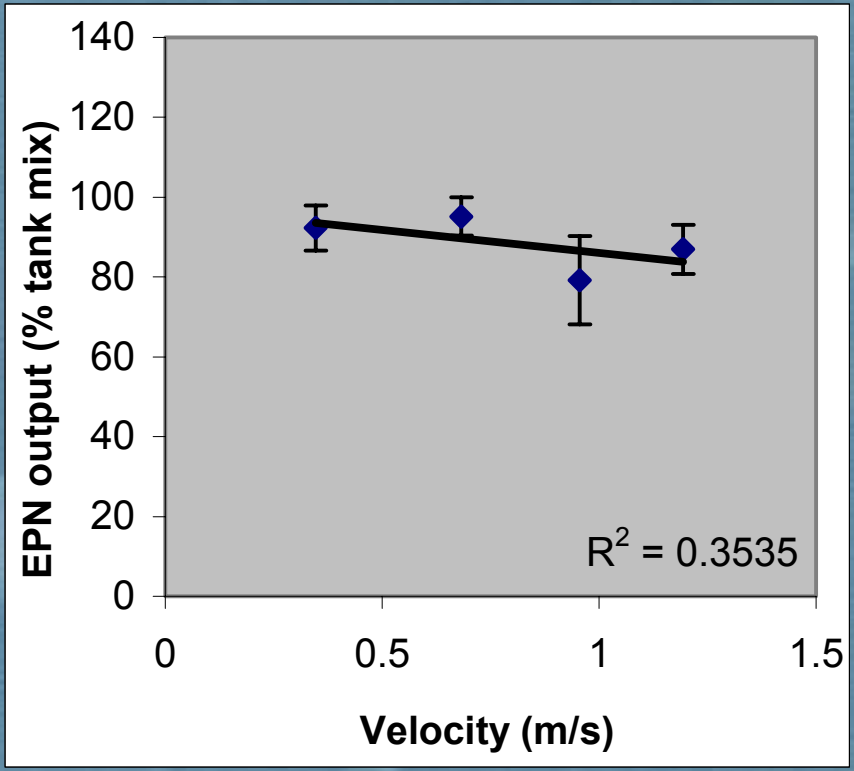


# OUTPUT OF EPN AT THE START OF THE IRRIGATION LINE

## 1. Netafim™ Streamline



## 2. Netafim™ RAM17



- Increasing the length of the line will increase the velocity of the water at the start of the pipe.
- If the velocity is great enough it reduces the ability of the IJ to enter the emitter structure.

# FIELD OBSERVATIONS

# Field work

Product: Nemaslug® (*Phasmarhabditis hermaphrodita*)

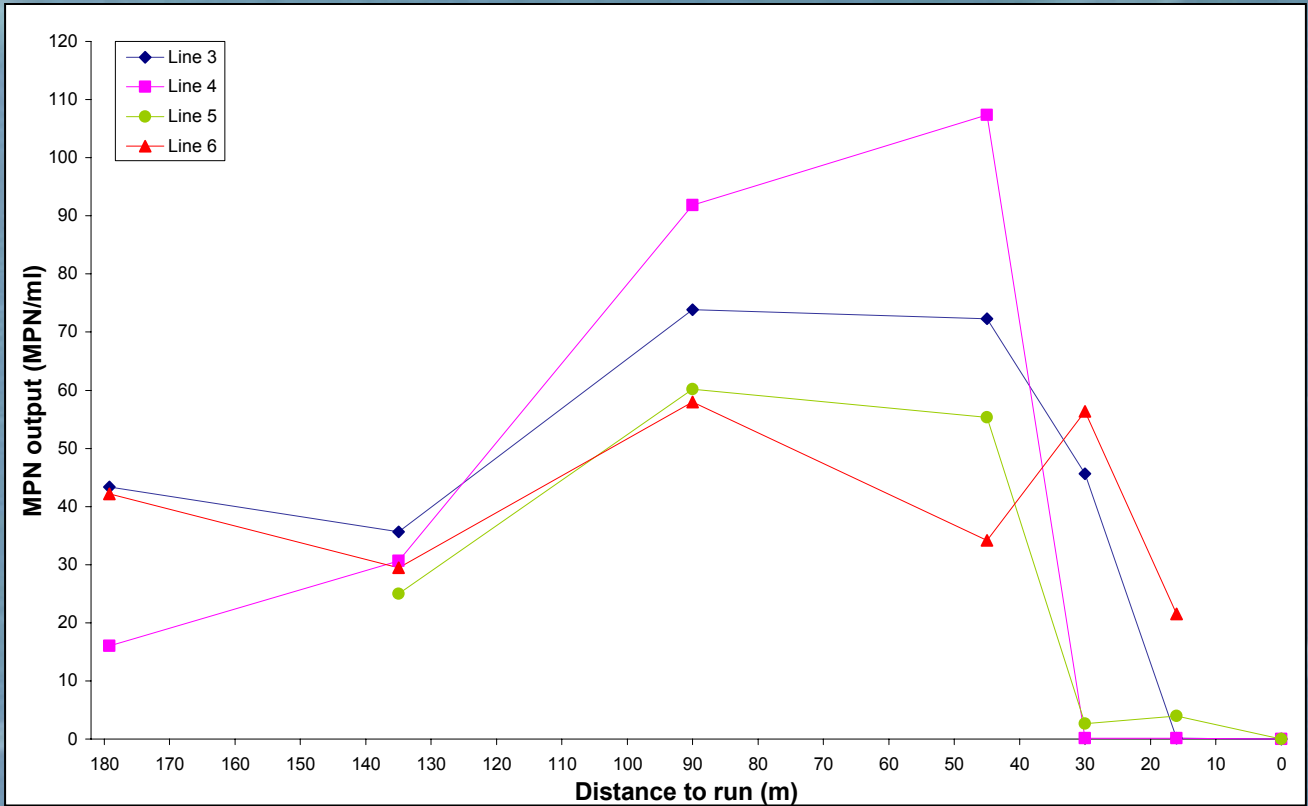
Pest: Grey field slug (*Deroceras reticulatum*)

Crop: Lettuce and celery

Location: Southern England

Irrigation line: Netafim™ Streamline

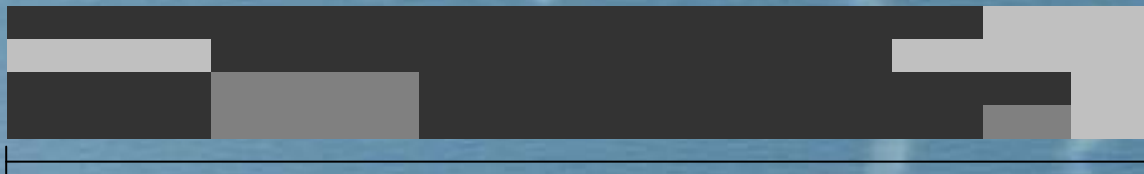





**Key:**

Colour            Predicted control obtained

	Good control
	Variable control
	Little/No control



Field length 180 m

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## Welcome to Nemasys

Welcome to [nemasysinfo.com](http://www.nemasysinfo.com), the site dedicated to providing information about pest control using nematodes to remove your worst enemies in the garden - slugs, vine weevils, chafer grubs and leatherjackets. Nematodes are renowned biological control products, which provide many benefits over traditional gardening chemicals and are a key ally for organic gardeners. Use the links to find out more about these garden pests and how the Nemasys range of nematodes (including Nemaslug) can help you.

Although colder weather is here there are still things to be done in the garden that will reap benefits next year.

For example, using **Nemaslug** to kill slugs now means that there won't be so many ready to attack plants in the spring, or laying their 300 eggs. Did you know that a Grey Field Slug can have 90,000 grandchildren? **Nemaslug** can be applied at any time when the soil is above 5°C. **Nemasys Vine Weevil Killer** can be applied at any time if you are growing undercover or in a conservatory. For outside use the soil just needs to be above 5°C for the nematodes to be active.

Join our [discussion forum](#) to share information and ideas about garden pests and how to control them in an environmentally friendly and natural way. Nematodes are a key ally for organic gardeners.





- about T-Systems
- Tape Products
  - T-Tape Drip Tape
    - Selecting T-Tape
    - Product Catalog
- Authorized Dealers
- Common Questions
- Photo Gallery
- Success Stories
- Company Literature
- Tradeshows
- Industry Links



### Strawberries

**Commonly used T-Tape diameter:**  
5/8" (16mm)

**Commonly used wall thicknesses:**  
4 Mil, 5 Mil, 6 Mil, 8 Mil, 10 Mil (0.125-0.250mm)

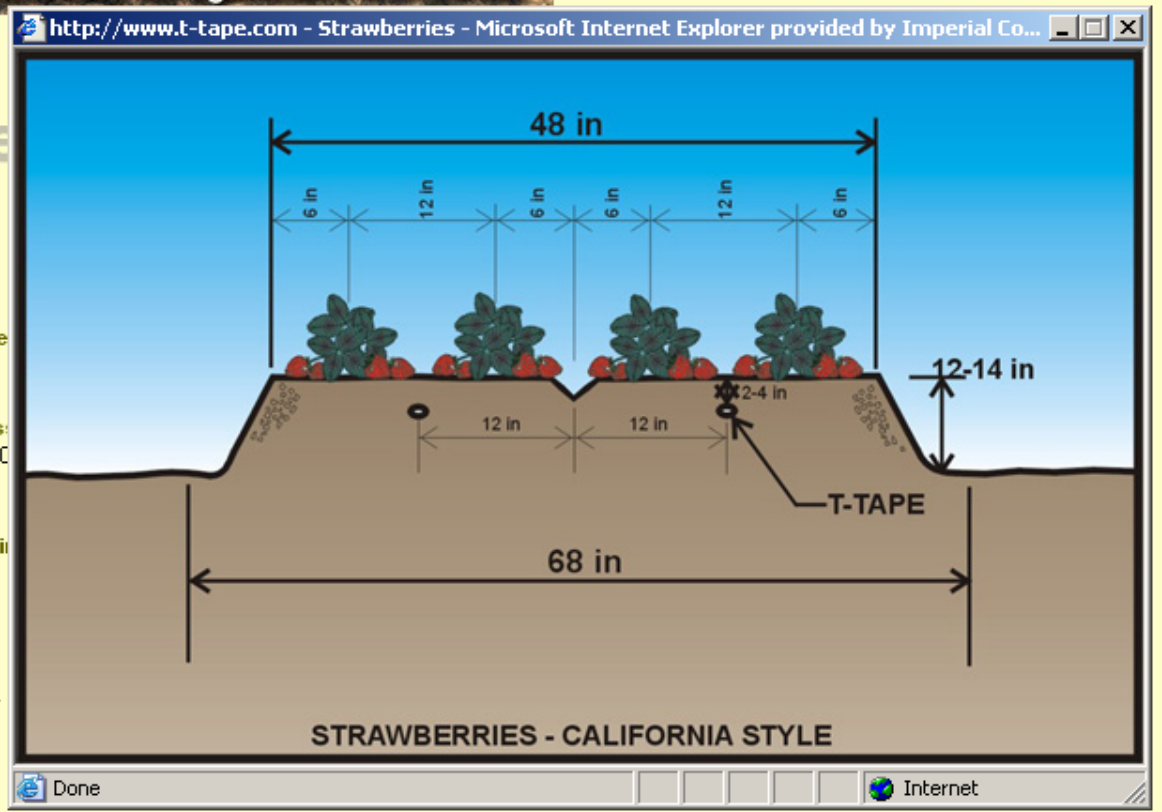
**Commonly used emitter spacings:**  
08"- .670\* (20cm-500\*\*)  
08"- .340 (20cm-250)  
12"- .450 (30cm-340)

\*gallons per minute per 100 ft.  
\*\*liters per hour per 100m

#### T-Tape placement

Depth: 2"-4" (5-10cm)  
Lateral spacing: 24" (60cm) with two rows per bed

T-Tape placement and model selection depend on soil conditions, slope, water quality, crop(s) planted and cultural practices. The T-Tape placement information included on this site is just one representation of tape placement and is not necessarily a recommendation for your field. Consult your local T-Tape dealer to determine the correct T-Tape model and placement for your application.



# Use of computer based programme for predicting size of dead zone



## Dead zone calculator



Irrigation model

Total length of line (m)

Emitter Spacing (m)

Internal Diameter (m)

Emitter flow rate (l/hr)

Size of dead zone (m)

Dead zone proportion of field (%)

What is this?

# Conclusions

- Problems with application method which need to be overcome.
  - Tank mix settling
    - Overcome by agitation
  - Drop off at end of line
    - Overrun crop
    - Inserts
    - Different model of irrigation line
  - Increasing velocity decreases EPN output at start of line
  - Complicated which is why there is need for usable interface for growers/agricultural consultants

# Acknowledgements

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