

# Evaluating efficacy of application of entomopathogenic nematodes via a drip line irrigation system.

Brown A. P, Pearce J. P, Piggott S. J, Wright D. J.

Department of Biological Sciences, Imperial College  
London, Silwood Park campus, Ascot, UK  
BeckerUnderwood, Littlehampton, UK

# Outline

- The possibility of integrating EPN application into already existing irrigation systems.
- The problems with this approach.
- Suggestions on how these many be able to be overcome.

# Introduction

- EPN are an expanding tool in biological control of agricultural pests.
- 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 would enable EPN to be placed close to their target.

# Methods

- An 18 m irrigation rig has been constructed to allow accurate sampling of water and EPN emission from set points along the irrigation tape.
- Sampling points were at 0.7, 4.3, 8.8, 13.3, 16.0 and 17.8 m.



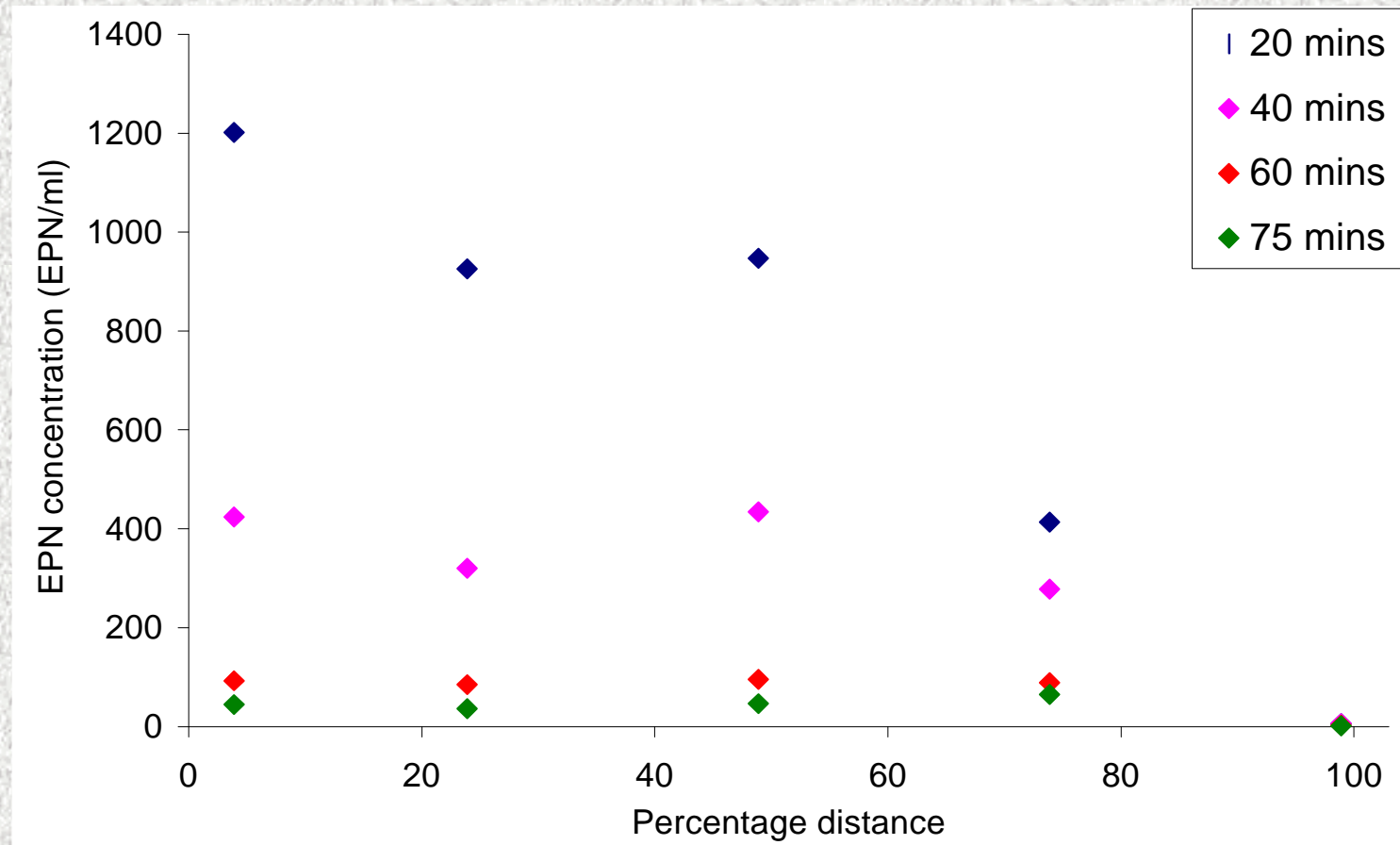
# Methods: the irrigation system



- Nemasys® F (*Steinierenema feltiae*) and Nemaslug® (*Phasmohabditis hermaphrodita*) were passed through the irrigation rig.
- Two systems were used:
  1. 100 l tank with electrical pump (Comet, Italy) and Dosatron® DI16 (ca 2.0 bar).
  2. 18 l Cornelius tank connected to an air pressurised system (0.5 - 4.0 bar).
- By altering potentially important factors affecting EPN distribution, nematode output can be modelled and the main factors affecting EPN output identified.

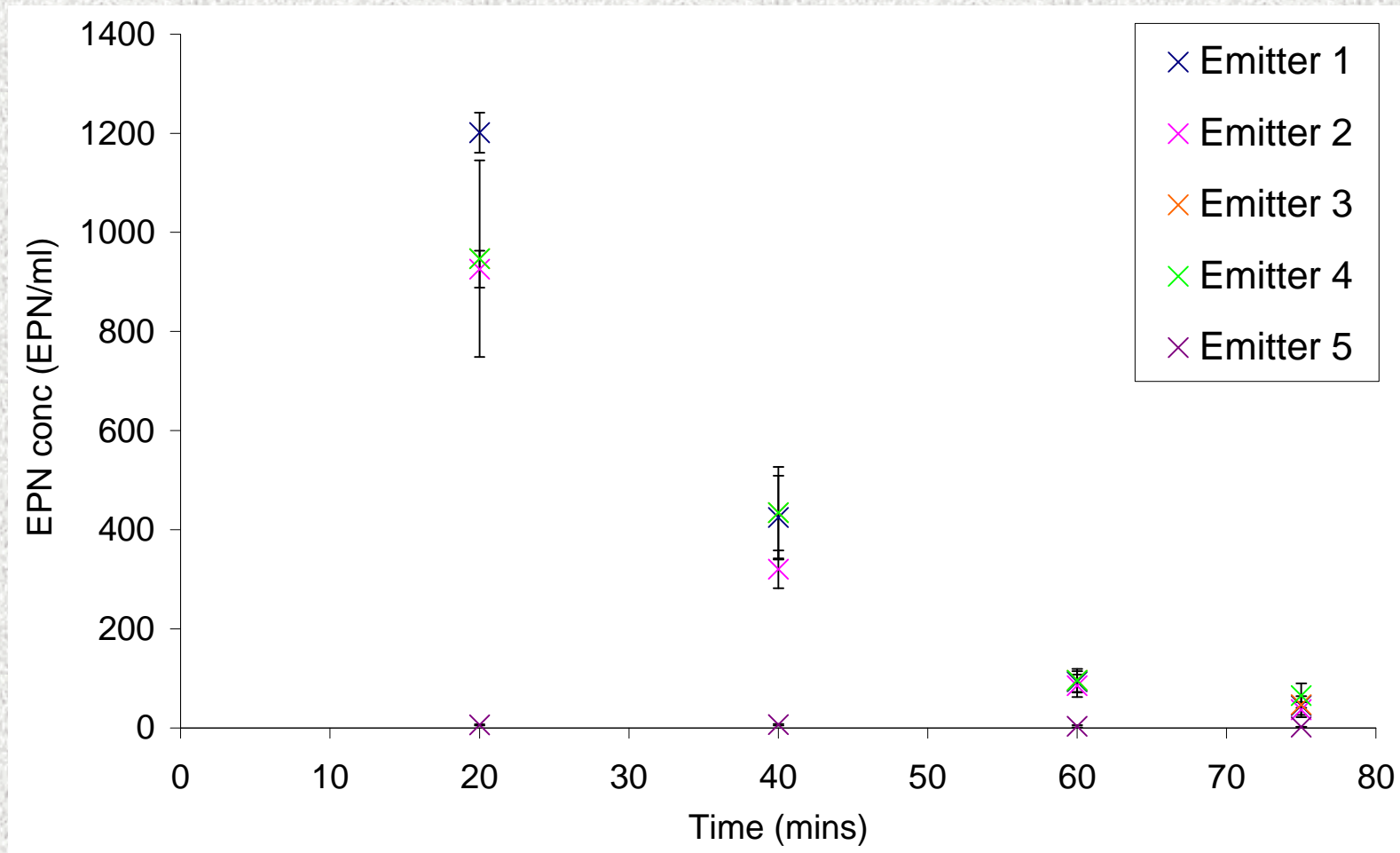
# Results

Fig 1: The effect of distance on EPN release at different times during irrigation.



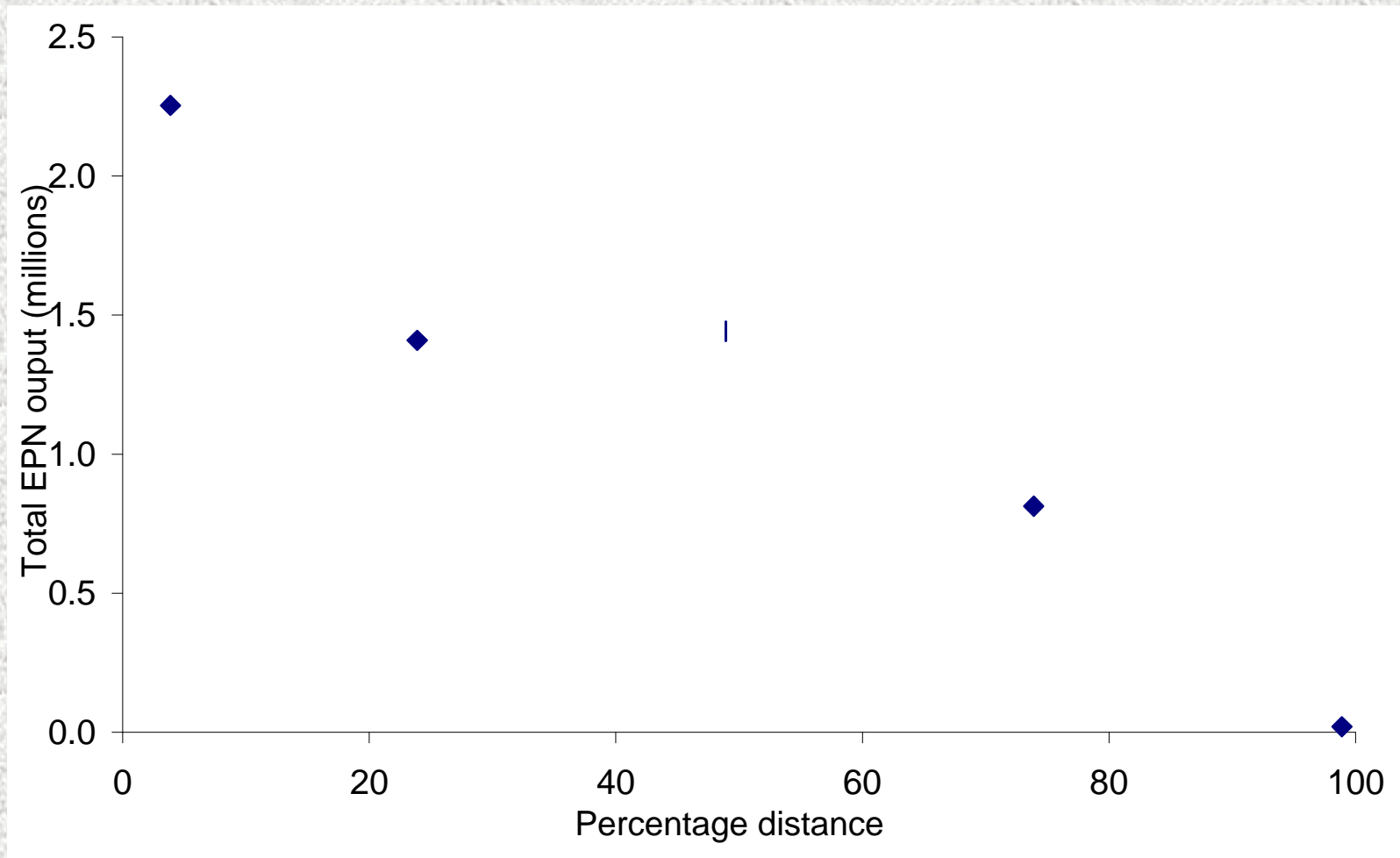
Problem: reduction in EPN output with increasing distance

Fig 2: The effect of time on EPN release.



Reduction in EPN output over time but is this a problem?

Fig 3: Total EPN released along irrigation tape (0 - 75 min).

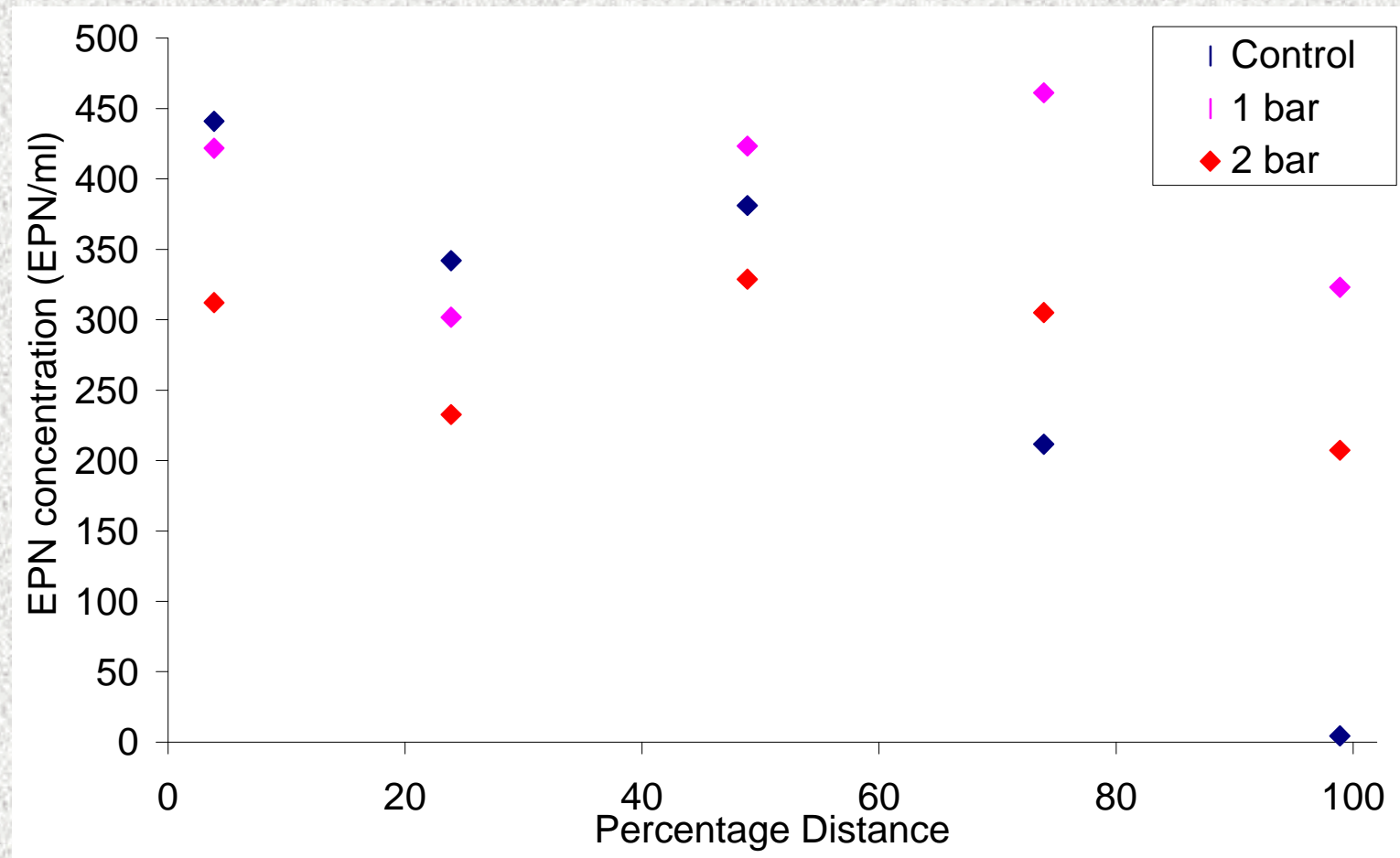


Problem: reduction in total EPN output with increasing distance

Settling of EPN can occur in two places:

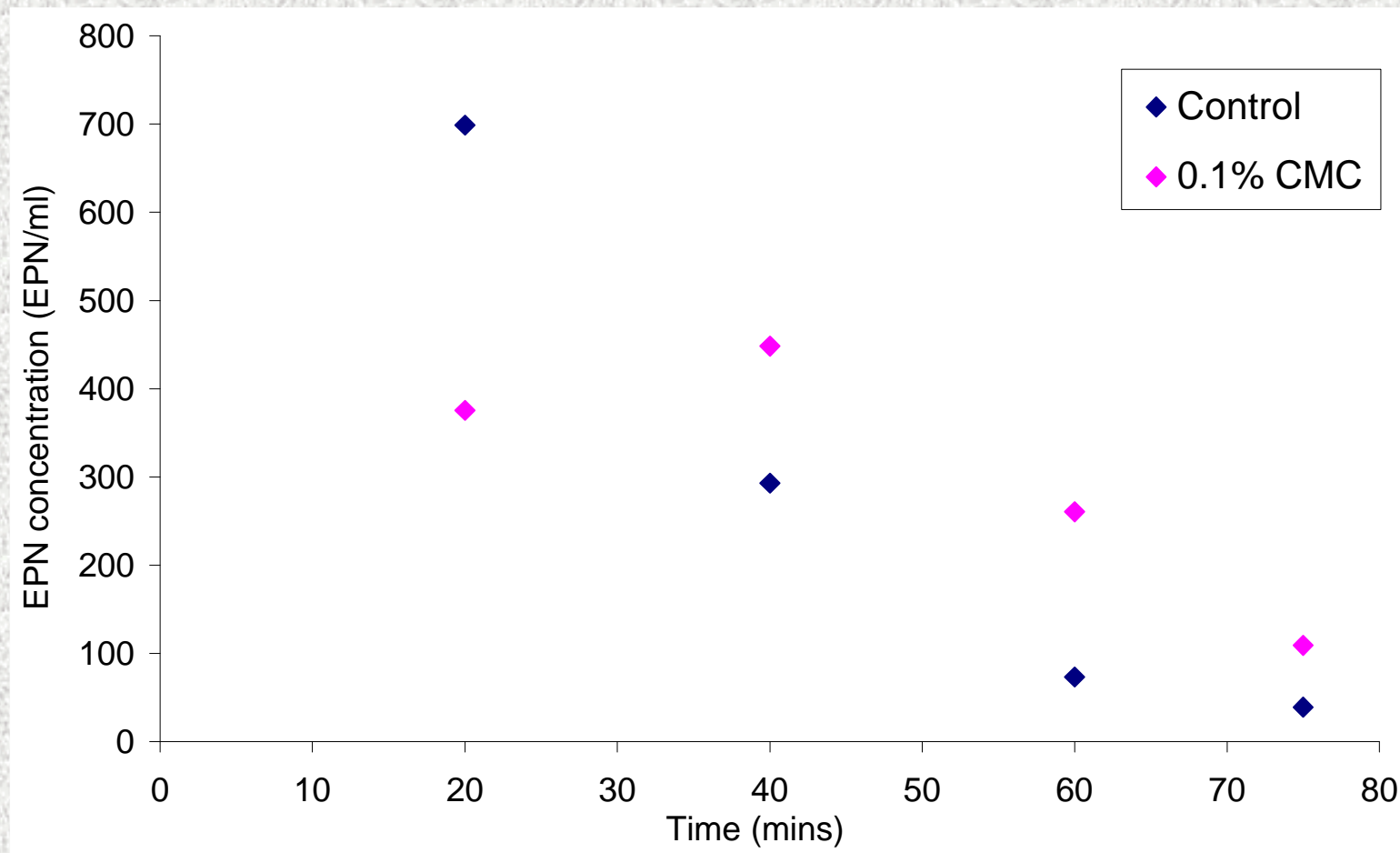
1. The irrigation tape (caused by stagnation of water)

Fig 4: Effect of irrigation tape internal flow rate on EPN distribution.



## 2. Within the tank mix prior to irrigation

Fig 5: The effect of adding carboxymethylcellulose (CMC) to tank mix.

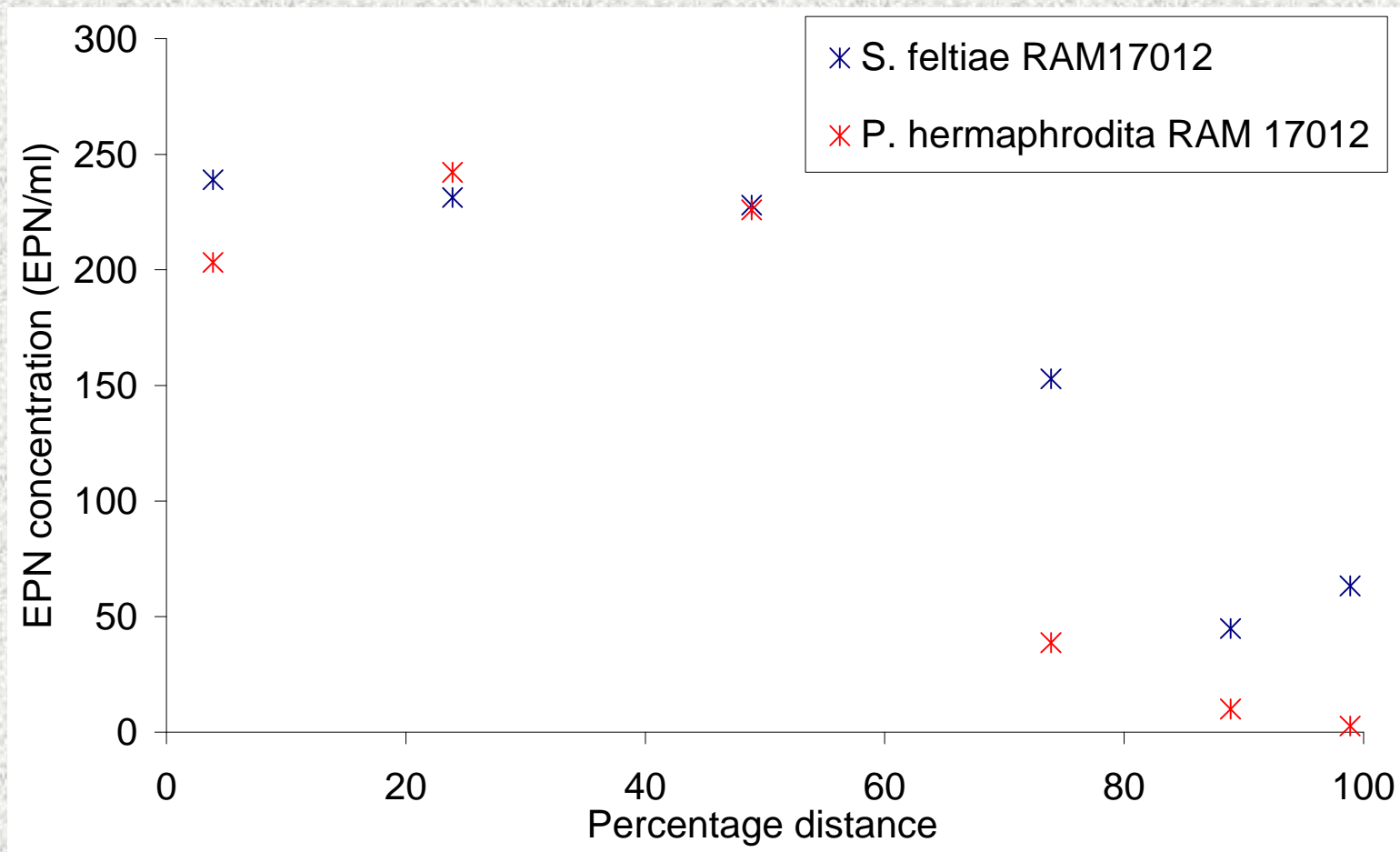


More detailed study using 18 l Cornelius tank system:



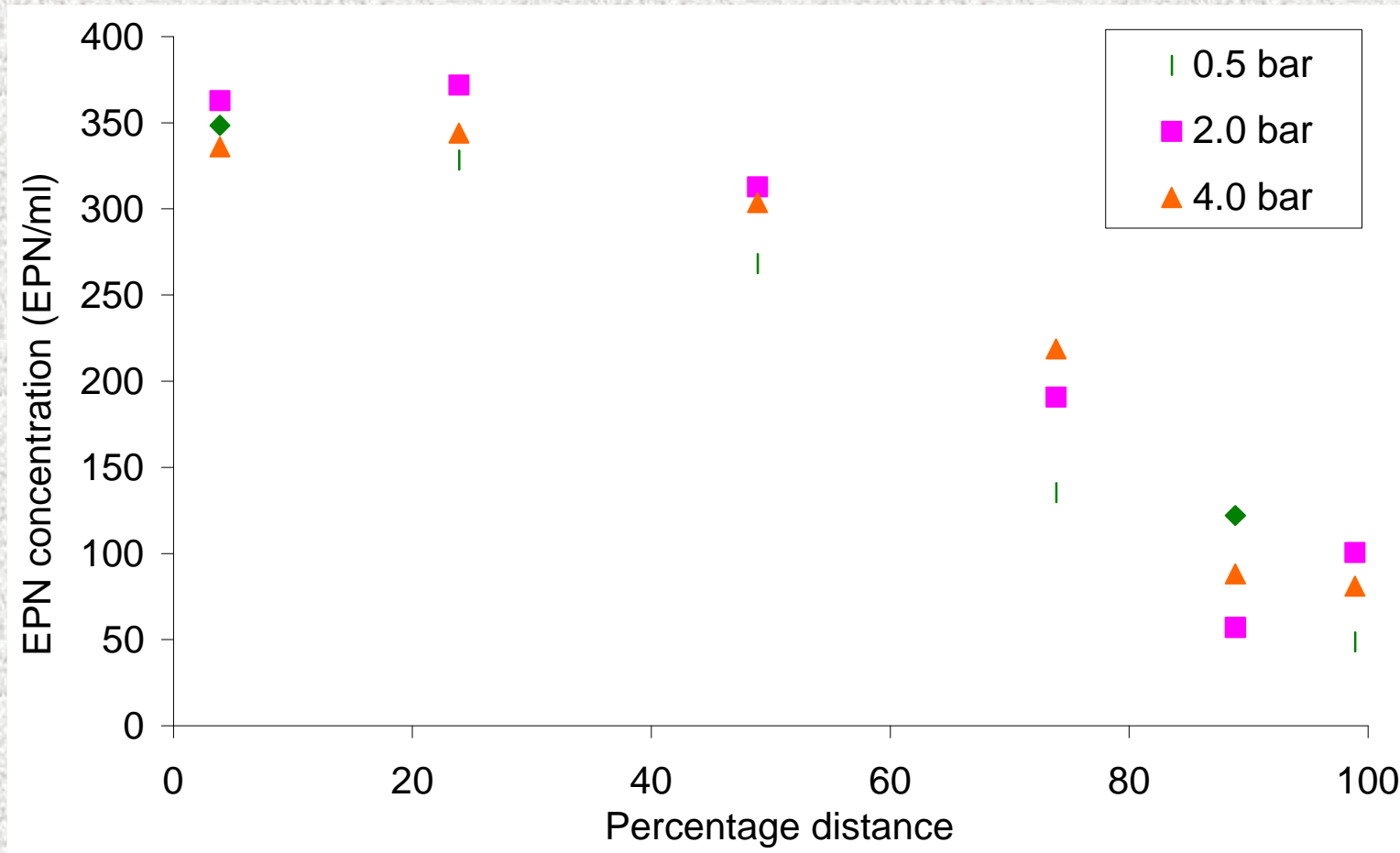
# 1. Nematode species

Fig 6: The effect of nematode species on output distribution.



## 2. Input pressure

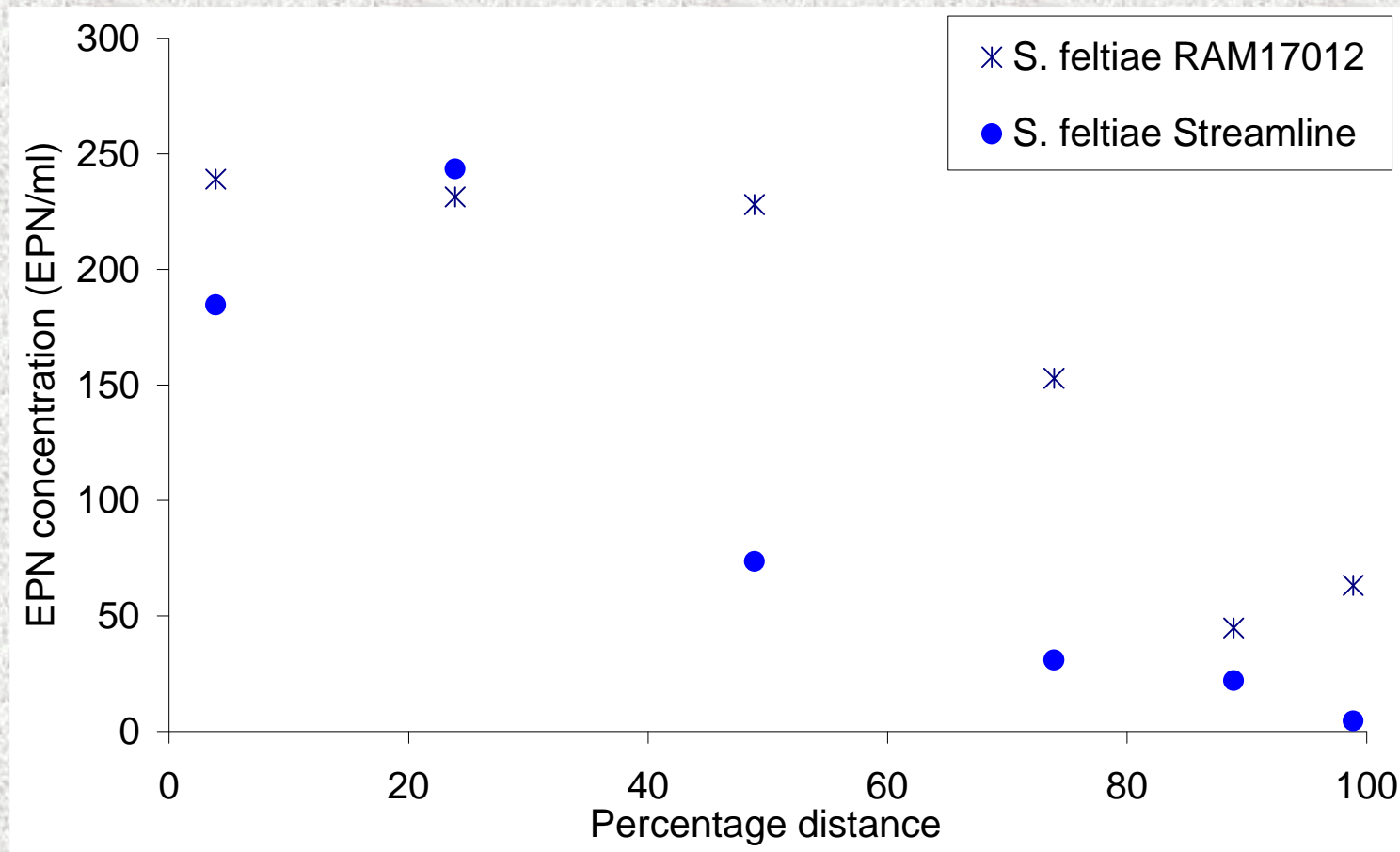
Fig 7: The effect of input pressure on EPN distribution (Netafim RAM17012)



If used within manufacturers recommendations (e.g. input pressure 0.5/4.0 bar) there appears to be no difference in EPN concentration output.

### 3. Irrigation line type

Fig 8: The effect of irrigation tape type on EPN distribution.



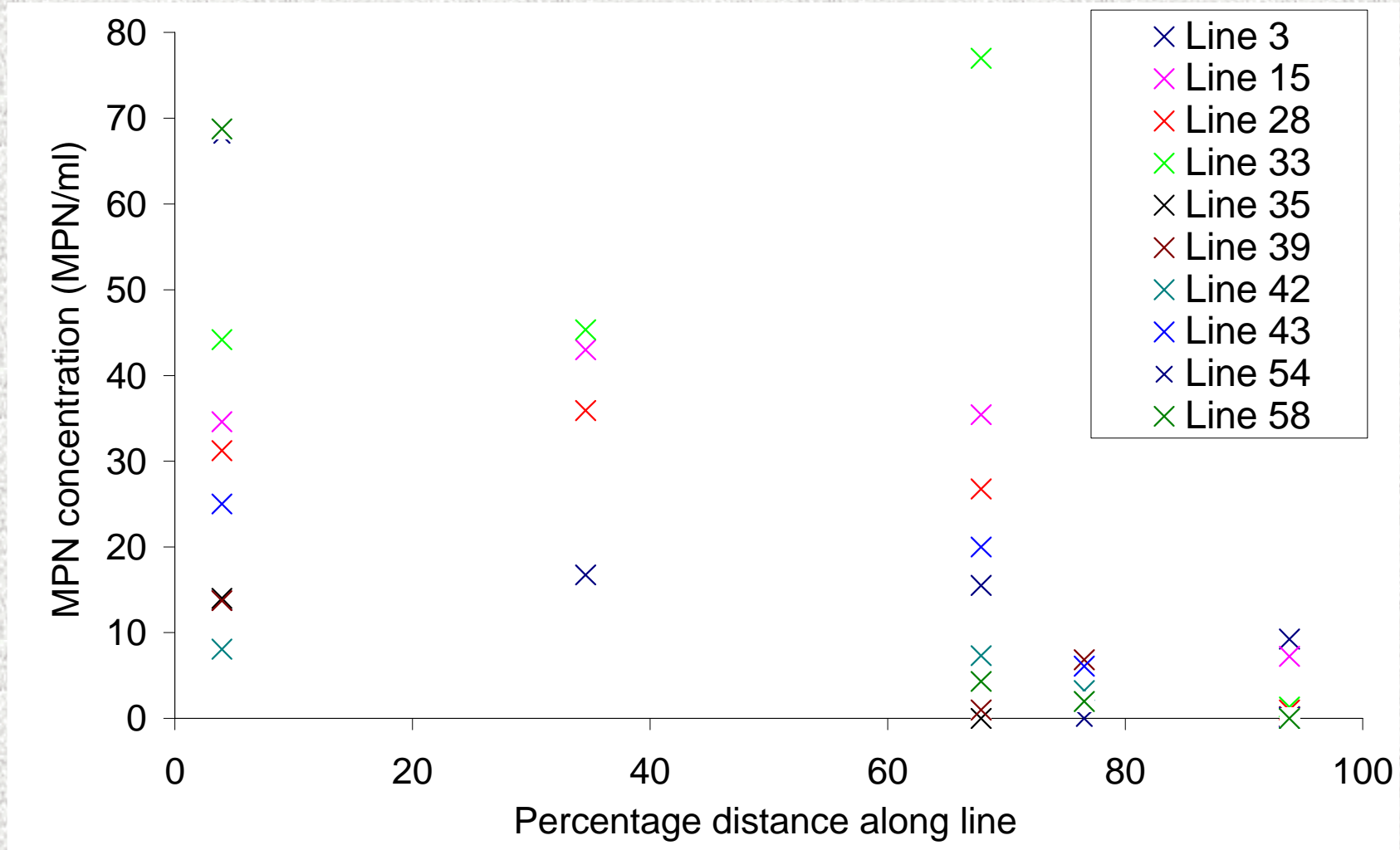
Variation in tape design such as pressure compensation mechanisms (e.g. labyrinth®) will affect EPN output.

# Field observations

- Field recordings of nematode output were taken along an 81 m irrigation line applying Nemaslug® to a lettuce plantation.
- Irrigation tape used – Netafim Streamline.
- Nemaslug® applied at a rate of 125 million/ha.
- Water applied at 0.5 bar at a rate of 10,000 l/ha.



Fig 9: Nematode distribution from field observations.



# Conclusions

- There is an exponential decrease in EPN output with increased time.
- EPN release decreases with time.
- Nematode species does not affect output distribution.
- Key factor affecting EPN distribution is the irrigation tape type.
- For a particular tape type EPN output is similar when being used within the irrigation manufactures recommendations.
- Distribution release is regular except for the “Dead zone” (in 18 m and 81 m tapes = ~ 25%?)

# Acknowledgements

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Email: [Andrew.Brown@imperial.ac.uk](mailto:Andrew.Brown@imperial.ac.uk)