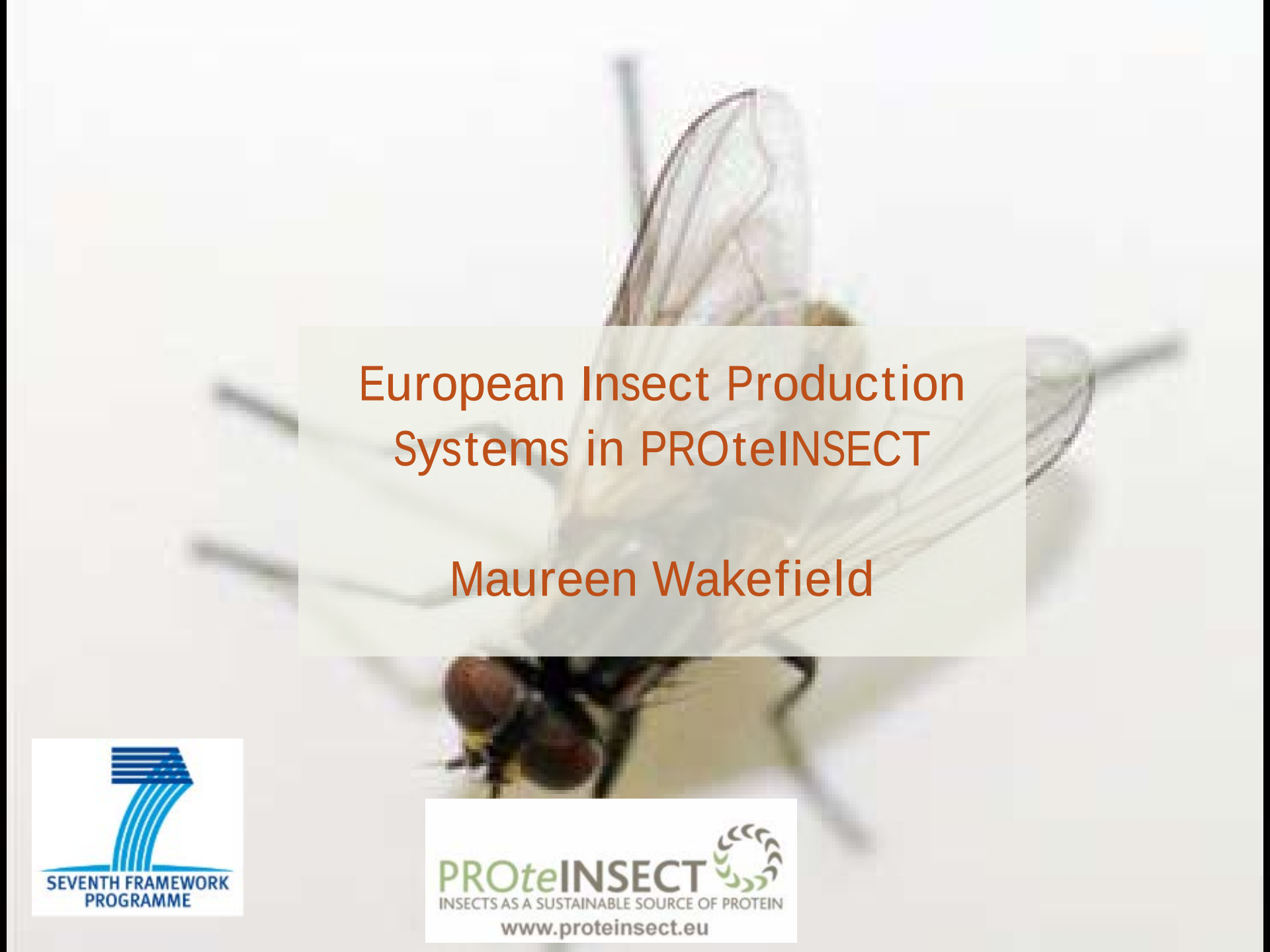


European Insect Production Systems in PROteINSECT

Maureen Wakefield

SEVENTH FRAMEWORK PROGRAMME

PROteINSECT
INSECTS AS A SUSTAINABLE SOURCE OF PROTEIN
www.proteinsect.eu

Which insect species?

Black soldier fly *Hermetia illucens*

•mean wt 0.2 g/ larvae

House fly: *Musca domestica*

•mean wt 0.02 g/larvae

PROteINSECT
INSECTS AS A SUSTAINABLE SOURCE OF PROTEIN
www.proteinsect.eu

Substrate

Potential substrates include:

- Animal manures (poultry, pig)
- Organic industrial, domestic wastes (e.g. brewery and supermarket, food processor wastes)
- Anaerobic digestate

Annually in Europe

- EU member states produce 1.4 billion tonnes of manure
- Potential conversion to > 17.5 million tonnes of insect protein

Annually in the UK

- Poultry manure = 4.4 million tonnes (Defra: 2008)
- Pig manure England & Wales 10 million tonnes (2000)

Insect production in the UK

- Research in the UK focussed on:

- Setting up a new production system for *Musca domestica* in the UK and provision of larvae for feeding trials (Grantbait Ltd)

- Laboratory studies to examine factors related to insect production
  - Pig and poultry manure as a substrate
  - Use of other fly species
  - Potential for re-use of substrate

PROteINSECT
INSECTS AS A SUSTAINABLE SOURCE OF PROTEIN
www.proteinsect.eu

Maggot farming in the UK

- Several sites produce ca. 20 tonnes of maggots weekly (ca. 5 tonnes dry weight)
- Achieved in small areas (<0.2 ha.)
- Non-optimised procedures - offset by high returns on angling maggots
- With optimal procedures a significant increase in productivity per unit area is feasible

PROteINSECT
INSECTS AS A SUSTAINABLE SOURCE OF PROTEIN
www.proteinsect.eu

System development

- Choice of substrate
- Addition of other materials
- Adult production methods
- Separation of larvae
- Drying methods

PROteINSECT
INSECTS AS A SUSTAINABLE SOURCE OF PROTEIN
www.proteinsect.eu

Development of production system at Grantbait

PROteINSECT
INSECTS AS A SUSTAINABLE SOURCE OF PROTEIN
www.proteinsect.eu

PROteINSECT
INSECTS AS A SUSTAINABLE SOURCE OF PROTEIN
www.proteinsect.eu

Factors assessed

- Adult rearing
  - Inputs (food and water)
  - Estimate of fly numbers
- Egg collection
  - Substrate and presentation
- Production of larvae
  - Method, inputs/outputs

PROteINSECT
INSECTS AS A SUSTAINABLE SOURCE OF PROTEIN
www.proteinsect.eu

Feeding trial production

- Over 500 kg larvae (approx 130 kg dry weight) produced for use in European feeding trials for poultry, pigs and salmon

Musca domestica production (laboratory conditions)

- *Musca domestica* reared at 25°C
- Evaluation of moisture content of substrate, density, separation methods etc
- Larval mass approx. 20 - 40 mg
- Yield approx. 300 - 400 g wet weight of larvae per gram of eggs
- Emergence starts after 4 days

PROteINSECT
INSECTS AS A SUSTAINABLE SOURCE OF PROTEIN
www.proteinsect.eu

Alternative fly species

- Tests conducted with *Calliphora vomitoria* and *Lucilia sericata*
- Oviposition substrates investigated
- Development on manure assessed

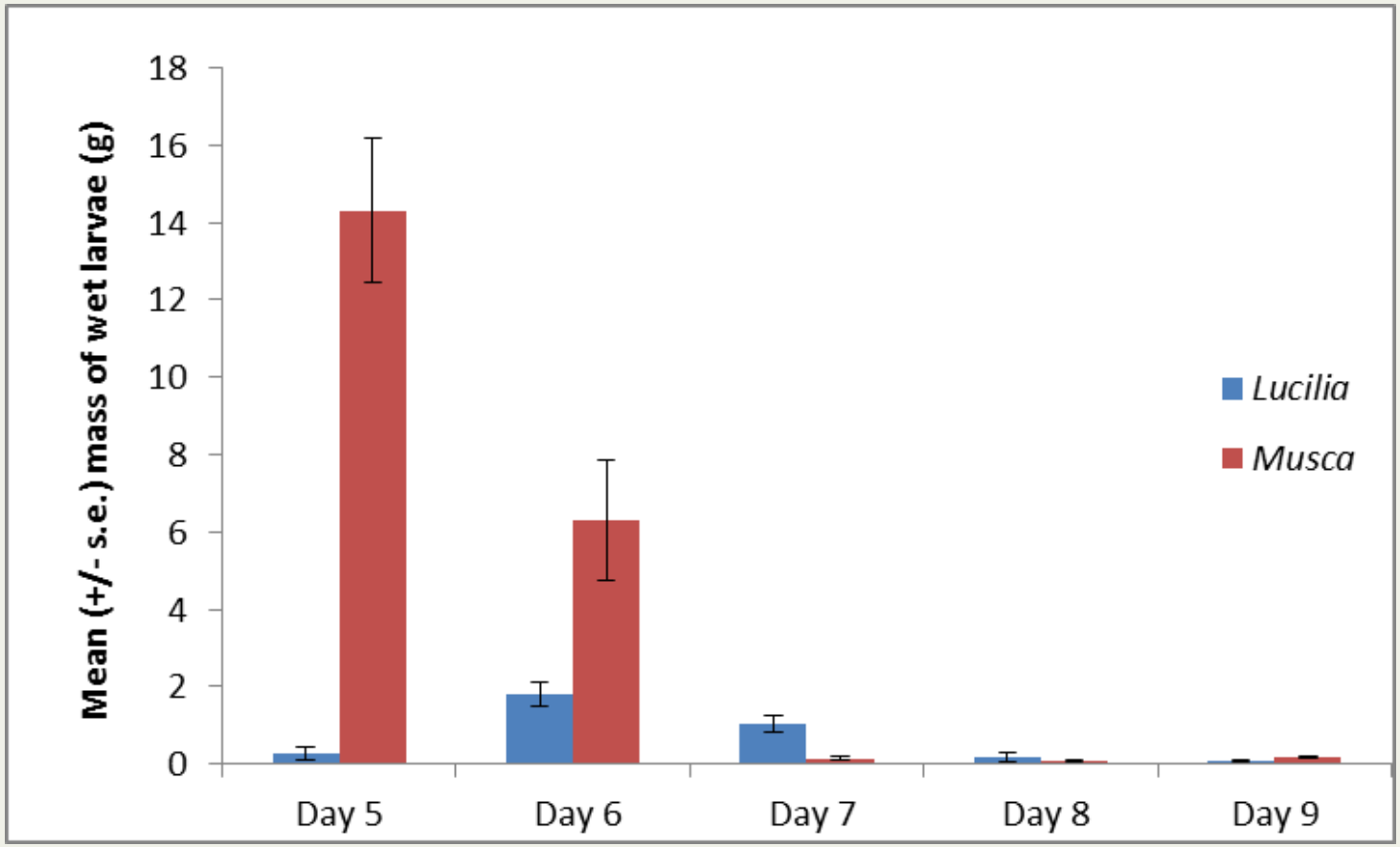
PROteINSECT
INSECTS AS A SUSTAINABLE SOURCE OF PROTEIN
www.proteinsect.eu

Alternative fly species

- Poultry litter is not a reliable substrate for *Calliphora vomitoria*
- *Calliphora vomitoria* will develop on pig manure, but much slower than *M. domestica* or *L. sericata*
- *Lucilia sericata* will develop on pig and poultry manures, but development is slower than *M. domestica*

PROteINSECT
INSECTS AS A SUSTAINABLE SOURCE OF PROTEIN
www.proteinsect.eu

Lucilia and *Musca*



- *Musca* – main emergence Day 5
- *Lucilia* - main emergence Day 7 and Day 8
- *Calliphora* - main emergence Day 14

Recommendations

- As insect production can be labour intensive, automation of the system is required for commercial scale production.
- Suitable waste substrates for rearing of the larvae need to be fully evaluated in terms of the availability and cost of the substrate within the geographical location, the yield of the larvae and potential regulatory requirements.
- Further research is needed to ensure consistency of the selected rearing substrate.
- The likelihood of egg production as a system bottleneck needs to be fully assessed and suitable methods developed to ensure sufficient egg production.
- Energy consumption needs to be considered and mitigated through the use of insulated infrastructure, energy recycling or use of low cost renewable energy sources.
- Standards need to be defined for insect production units to ensure biosecurity measures are in place to maintain healthy insect populations

PROteINSECT
INSECTS AS A SUSTAINABLE SOURCE OF PROTEIN
www.proteinsect.eu

Acknowledgements

- Grantbait – Mick Grant and Ben Hopper

- Fera – Damian de Marzo, Jessica Prickett, Katherine Robinson

Thank you for listening

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration

PROteINSECT
INSECTS AS A SUSTAINABLE SOURCE OF PROTEIN
www.proteinsect.eu