Developments in sexing tsetse pupae and new packing materials for shipping live insects

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Atoms for Food and Agriculture: Meeting the Challenge

IAEA
Joint FAO/IAEA Programme

Tsetse SIT

The Insect Pest Control Laboratory conducts applied research in support of tsetse SIT programmes in Member States

Two current issues of interest:

- **Separating the sexes**
- **Transporting live pupae or adults between different African countries**

Tsetse sex separation

Separation of the pupae by sex is required because:

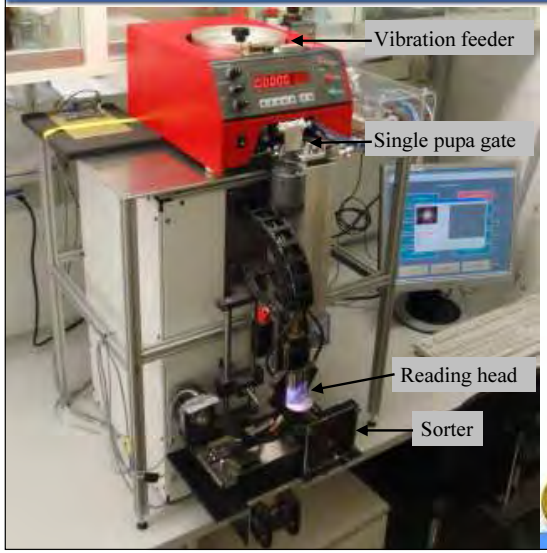
- **Very low reproductive rate – all females are needed for colony maintenance**
- **Females are efficient vectors of trypanosomosis, because they survive much longer than males**

Tsetse sex separation

Separation is possible based on

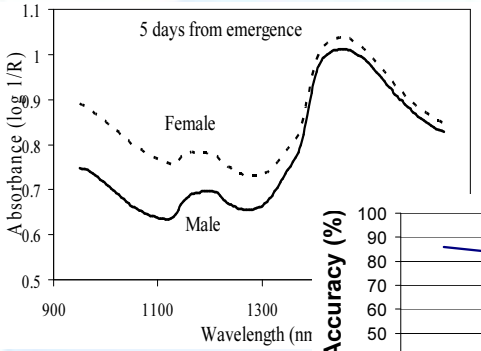
- **Time of emergence as males emerge later than females (SSPC), but**
  - **Male pupae on point of emergence, must be chilled to prevent emergence**
  - **Incomplete separation**
- **Near infra-red reflectance spectrosopy**
  - **5 days before first female emergence**

Near infrared reflectance spectroscopy



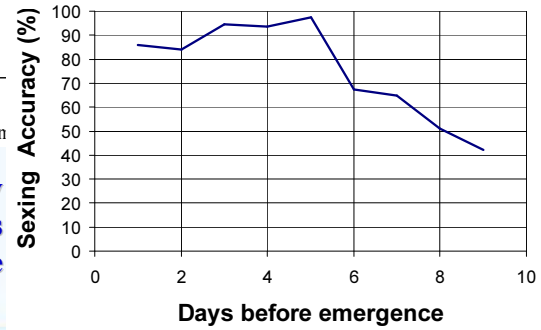
Modified single kernel wheat sorting machine (SKNIR)

Near infrared reflectance spectroscopy



Males and females differ significantly from 5 – 3 days before first emergence

Sexing efficiency peaks at 5 days before emergence



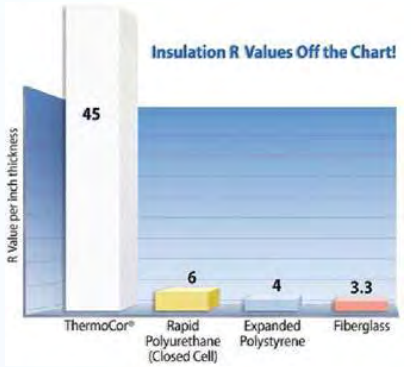
Tsetse transport conditions

For the project in Senegal we need to ship pupae or adults from Bobo Dioulasso, Burkina Faso to Dakar, Senegal.

- **5 hour road journey to Ouagadougou**
- **Plus 2 hour flight to Dakar, customs clearance etc.**
- **Minimum transit time 30 hours**
- **Optimum transport conditions 14-28 ^{o}C, 70-75% rH**
- **Males pupae on point of emergence (SSPC) must be kept below 12^{O}C, but not lower than 6^{O}C**

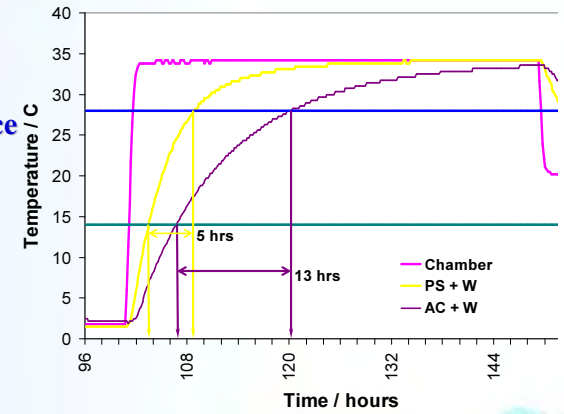
Improved insulation

- **Temperature control can be improved by better insulation**
- **Vacuum panel insulation claims to be 10 times better than EPS**



Vacuum panel insulation

- Actual performance is nearer 2.5 times in practice



PCM temperature control

- Energy is absorbed by materials as they melt and released as they solidify (latent heat of fusion)
- Phase change materials (PCM) provide a substantial temperature buffer over a defined temperature range
- PCMs are available with transition temperatures from -160^{o}C to more than 200^{o}C

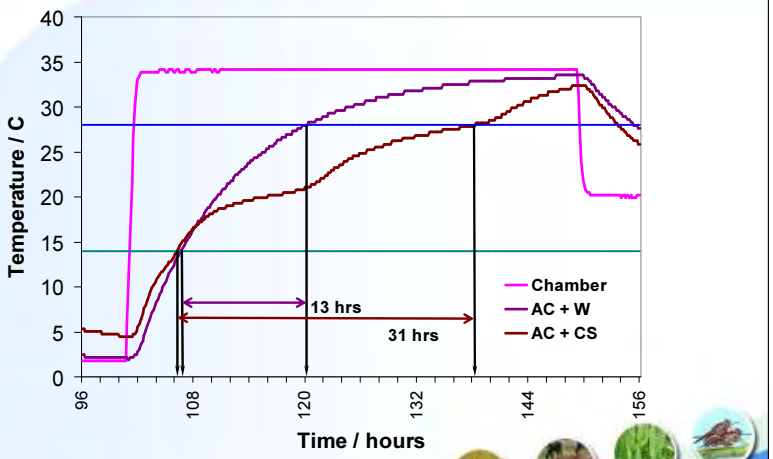
PCMs

- PCMs are available in two main varieties
  - Salt hydrate

PCMs

- And organic (hydrocarbon)
  - Organic PCM can be formulated in a

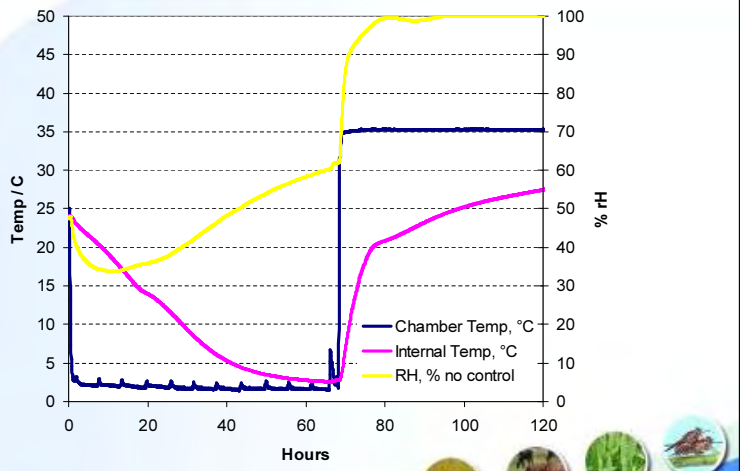
PCMs



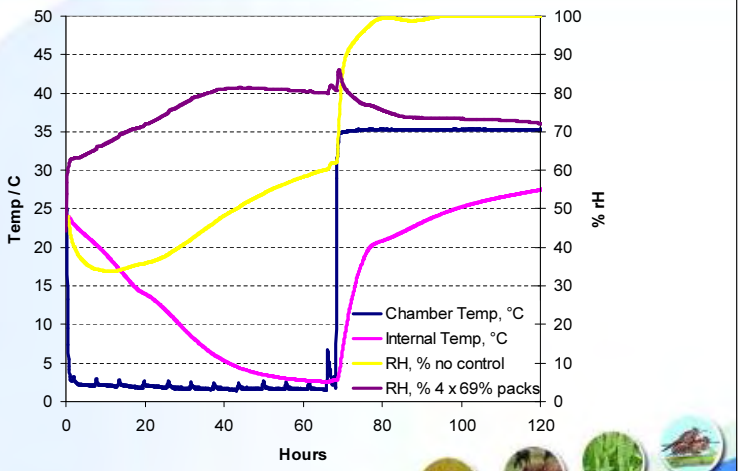
Humidity control

- Humidity can be controlled by saturated salt solutions
- Recent product in semipermiable sachet
  - Various humidities from 60-80% rH
  - Various sizes from 7g up

Humidity control

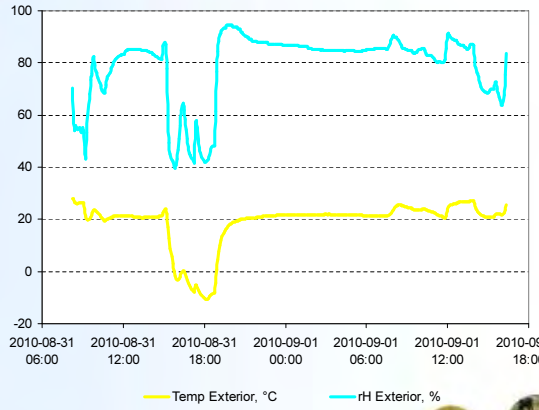


Humidity control



Insulation, temperature and humidity control

Pupal shipment to Senegal 31/8 - 1/9/2010



Insulation, temperature and humidity control

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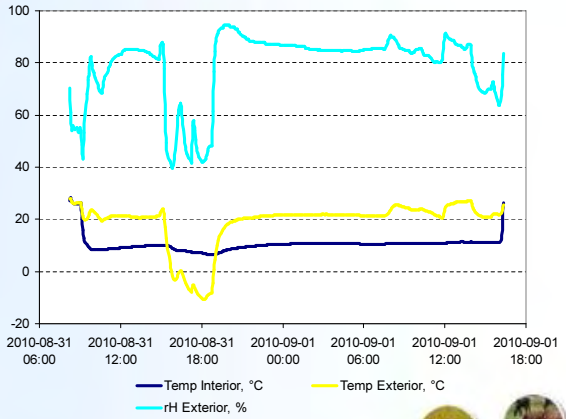

Insulation, temperature and humidity control

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