



Novel Technologies in Mass Rearing of Beneficial Arthropods

**Shimon Steinberg, BioBee Sde Eliyahu Ltd.
ISRAEL**

ABIM, Basel, October 2013



BioBee Sde Eliyahu Ltd. Produces, markets and implements comprehensive solutions by means of:



Microbial natural enemies for biological pest control



Bumblebees for natural pollination



Sterile Mediterranean fruit flies for medfly control using Sterile Insect Technique (SIT)



Biopesticides - To complement the natural enemy's package



- **Established 1983**
- **Two hundred employees in Israel and in 3 subsidiaries**
- **The majority of the produce is exported to 100 destinations world-wide**



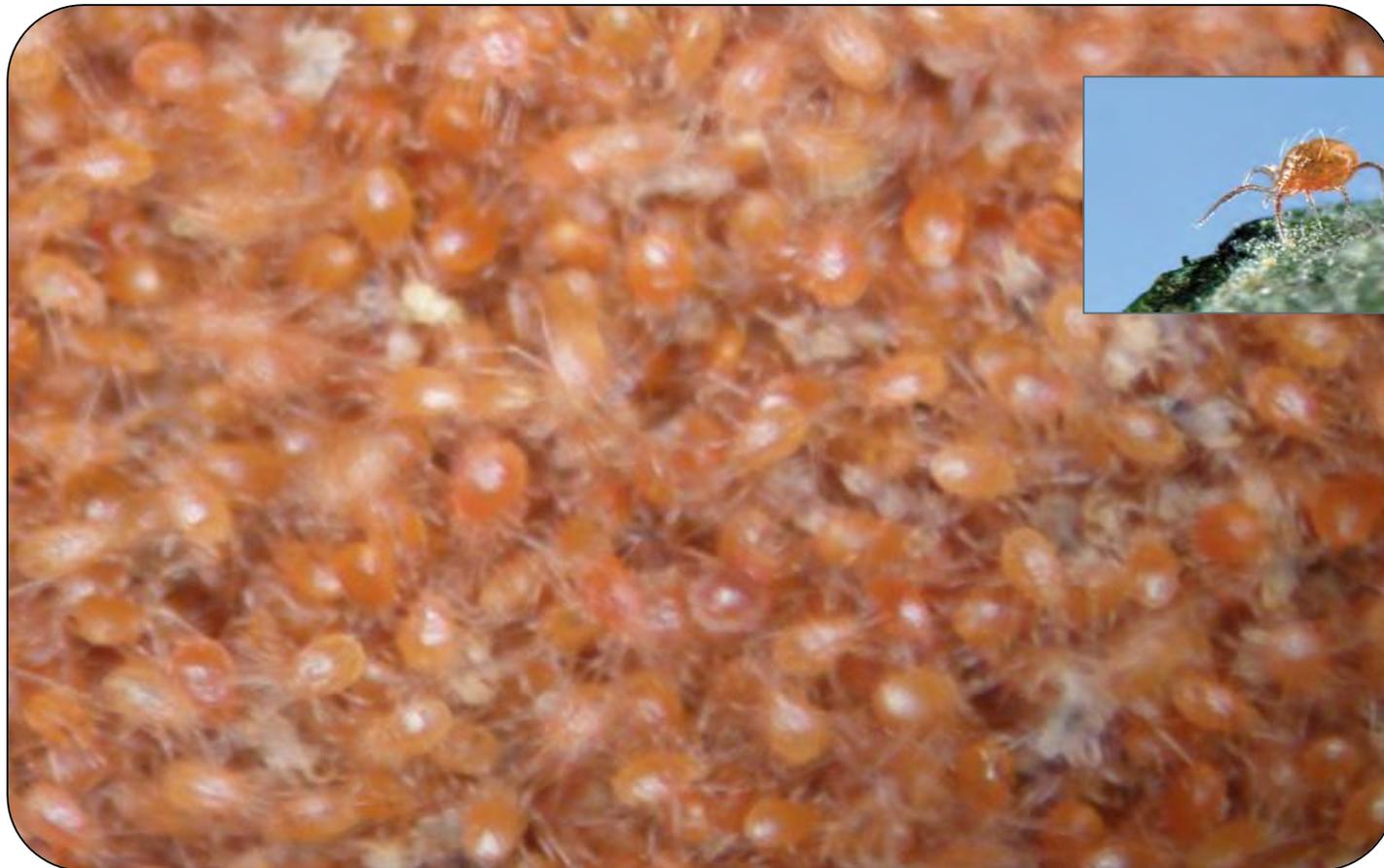
BioBee





Production of *P. persimilis*

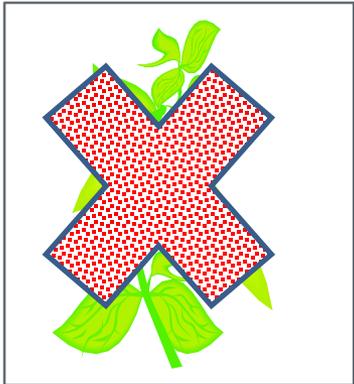
Off-Plant Production of the Predatory Mite: *Phytoseiulus persimilis*





Production of *P. persimilis*

Modified Tri-trophic System



Bean



Spider-mite



P. persimilis





Production of *P. persimilis*

- **Indoor (=climate room) controlled rearing system**



Production of *P. persimilis*

- **Indoor (=climate room) controlled rearing system**
- **The product: age distribution includes 30-50% eggs**



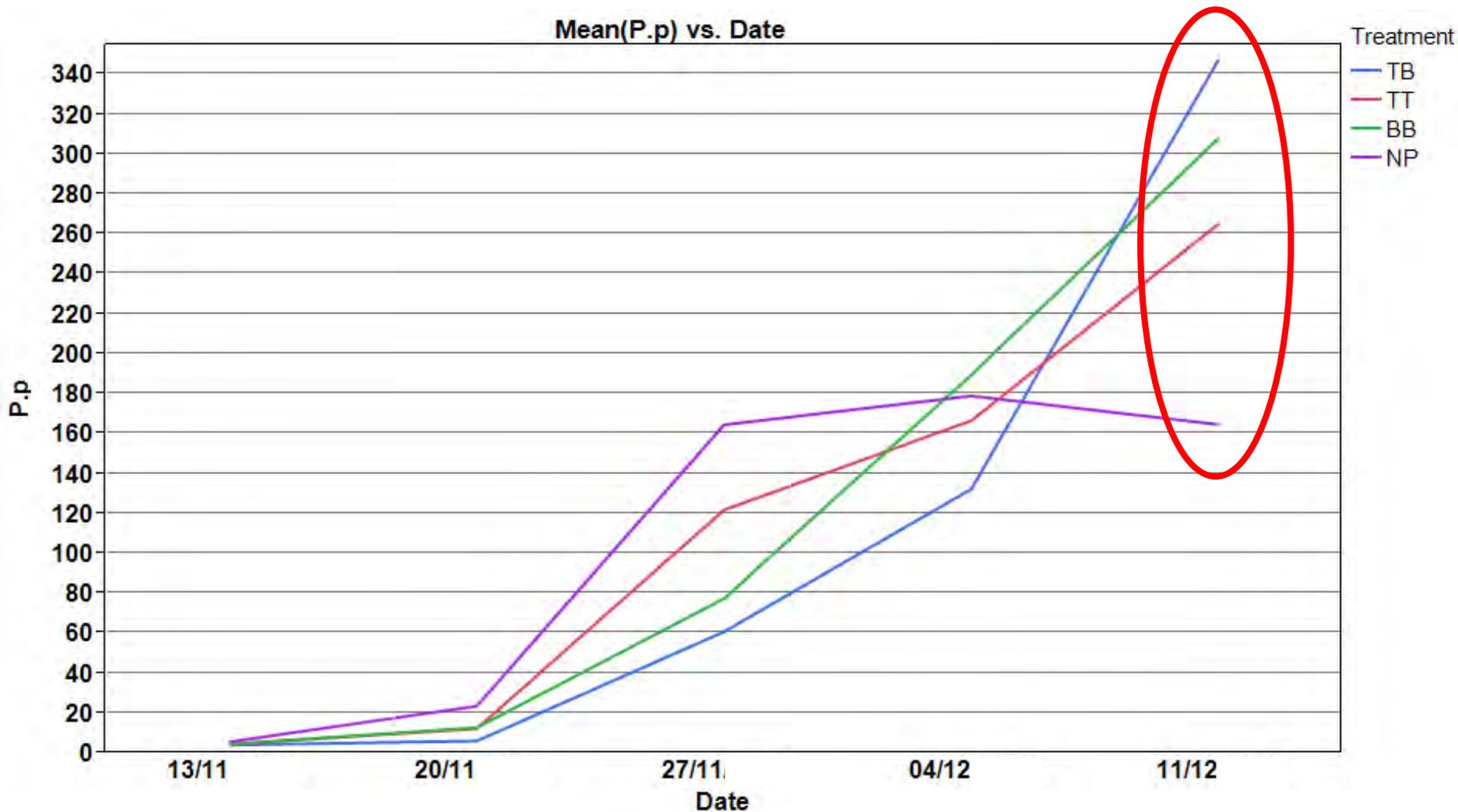
Production of *P. persimilis*

- **Indoor (=climate room) controlled rearing system**
- **The product: age distribution includes 30-50% eggs**
- **The product: well fed gravid females capable of surviving storage and transport and establish rapidly in the field**



P. persimilis rate of establishment

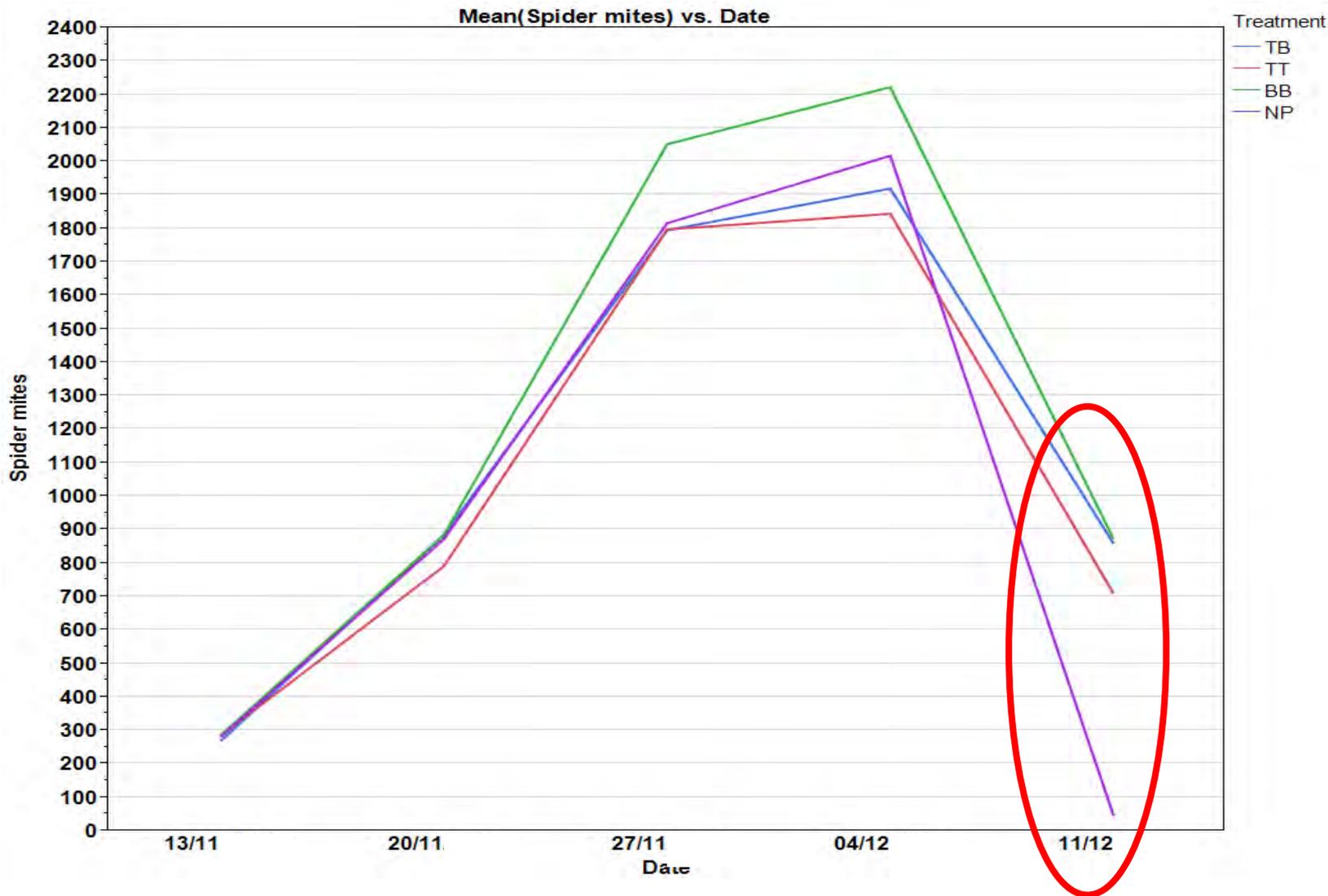
Tomato | 2012





Spider mites population dynamics

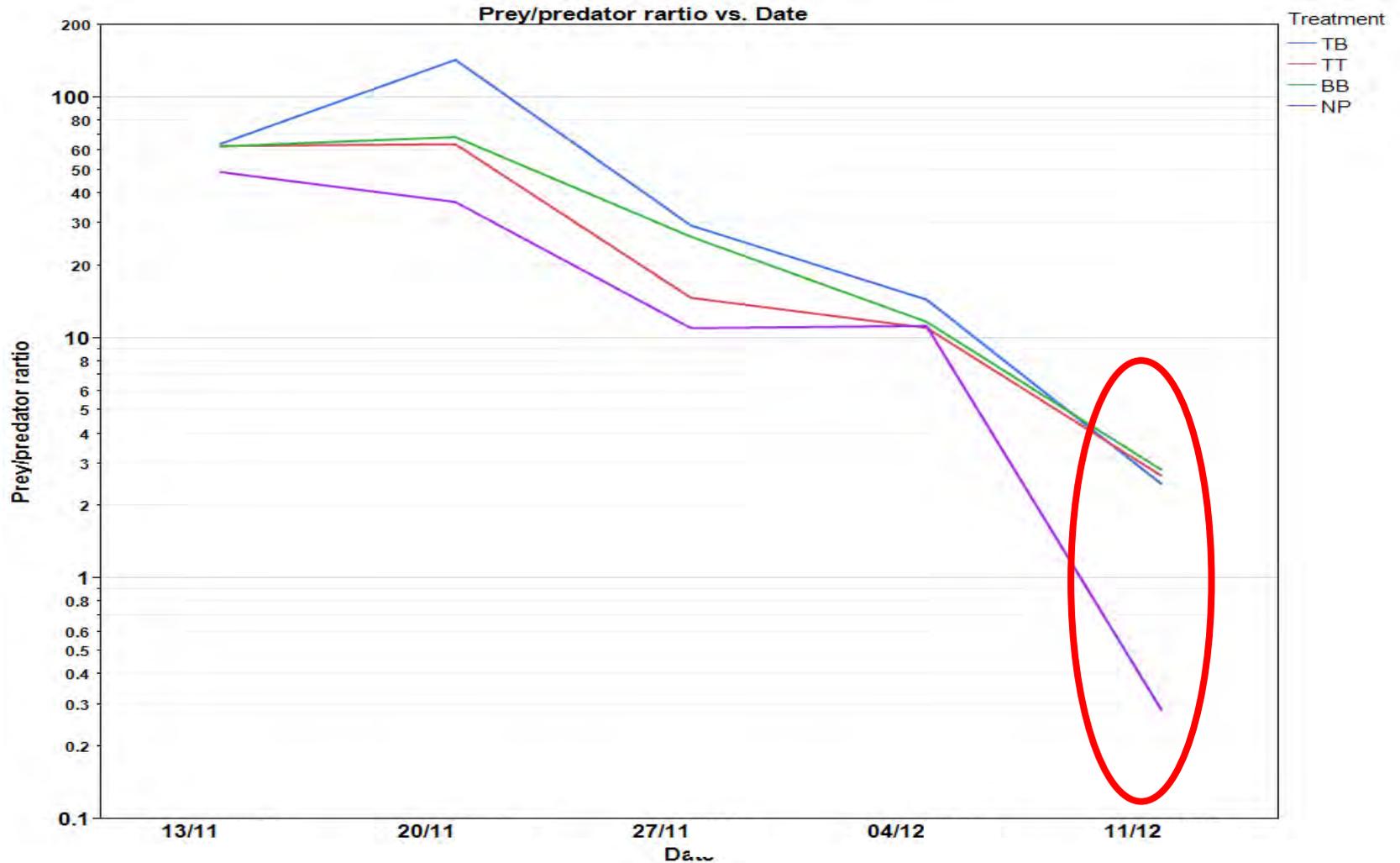
Tomato | 2012





Prey/predator ratio

Tomato | 2012





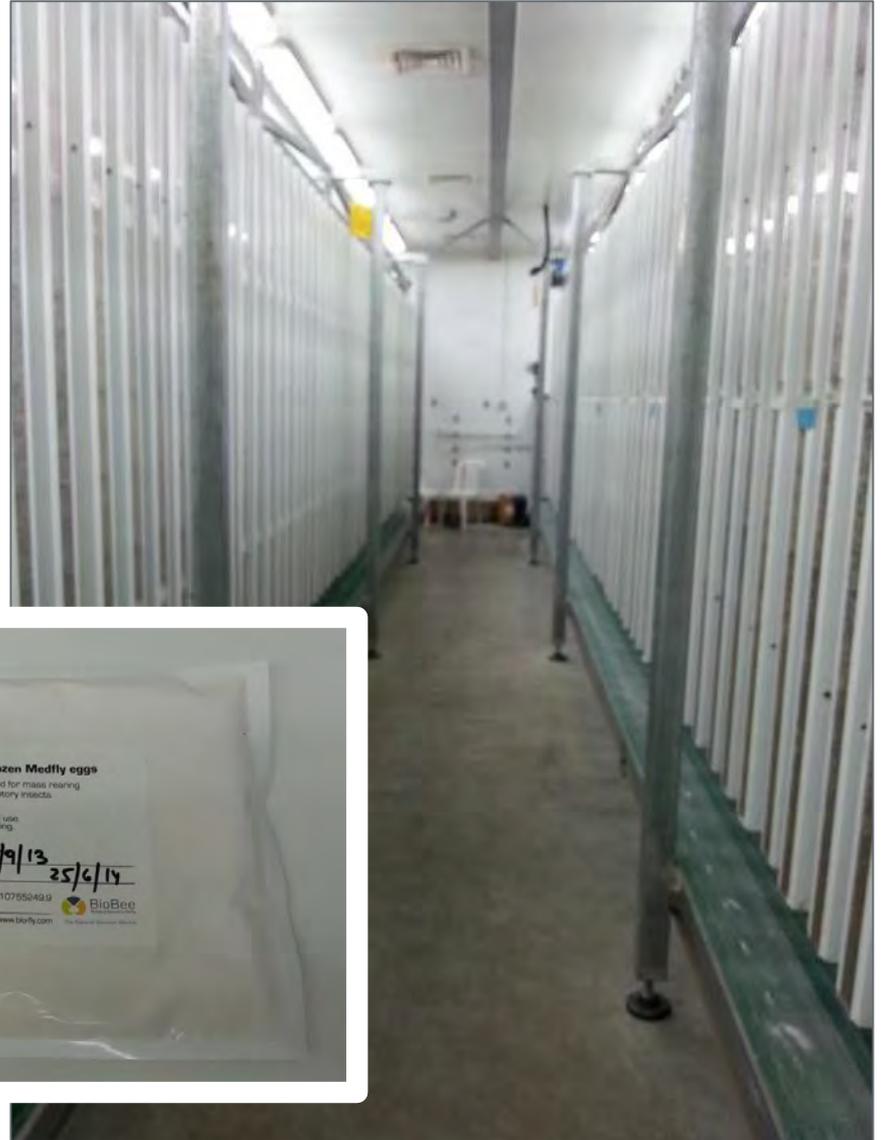
BugFeed[®]

Inactivated Frozen Medfly Eggs





BugFeed[®]





- **Alternative to *Ephestia* eggs as feed for mass rearing of predatory bugs, predatory beetles, others?**



- **Alternative to *Ephestia* eggs as feed for mass rearing of predatory bugs, predatory beetles, others?**
- **One year storage capacity**

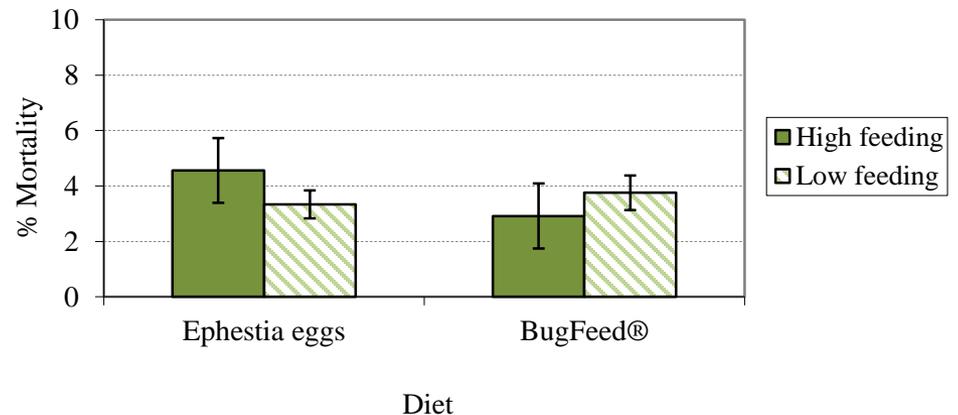
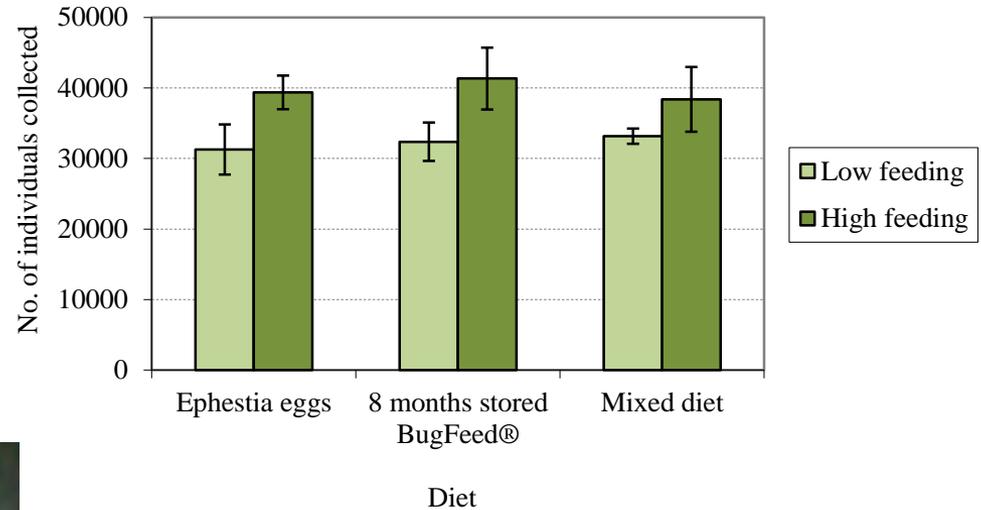


- **Alternative to *Ephestia* eggs as feed for mass rearing of predatory bugs, predatory beetles, others?**
- **One year storage capacity**
- **Patent granted. Product on sale**



BugFeed[®] | as Good as *Ephestia* Eggs

Orius laevigatus mass rearing





Mealybugs' Mummies

Mealybug Parasitoid's Mummies



Leptomastix algerica

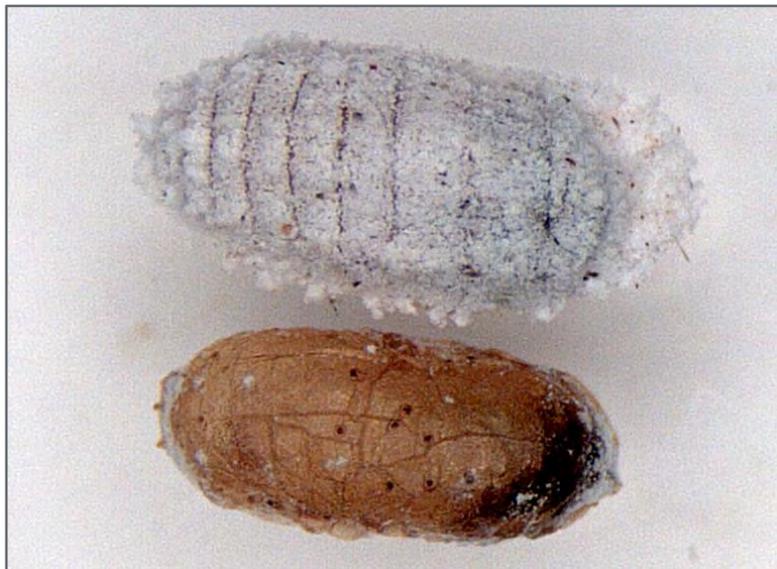


Anagyrus pseudococci





Mealybugs' Mummies





Mealybugs' Mummies

- **A robust rearing system that can be applied to a number of mealybug parasitoids**



Mealybugs' Mummies

- **A robust rearing system that can be applied to a number of mealybug parasitoids**
- **A breakthrough in delivery of mealybug parasitoids' commercial products to the field**



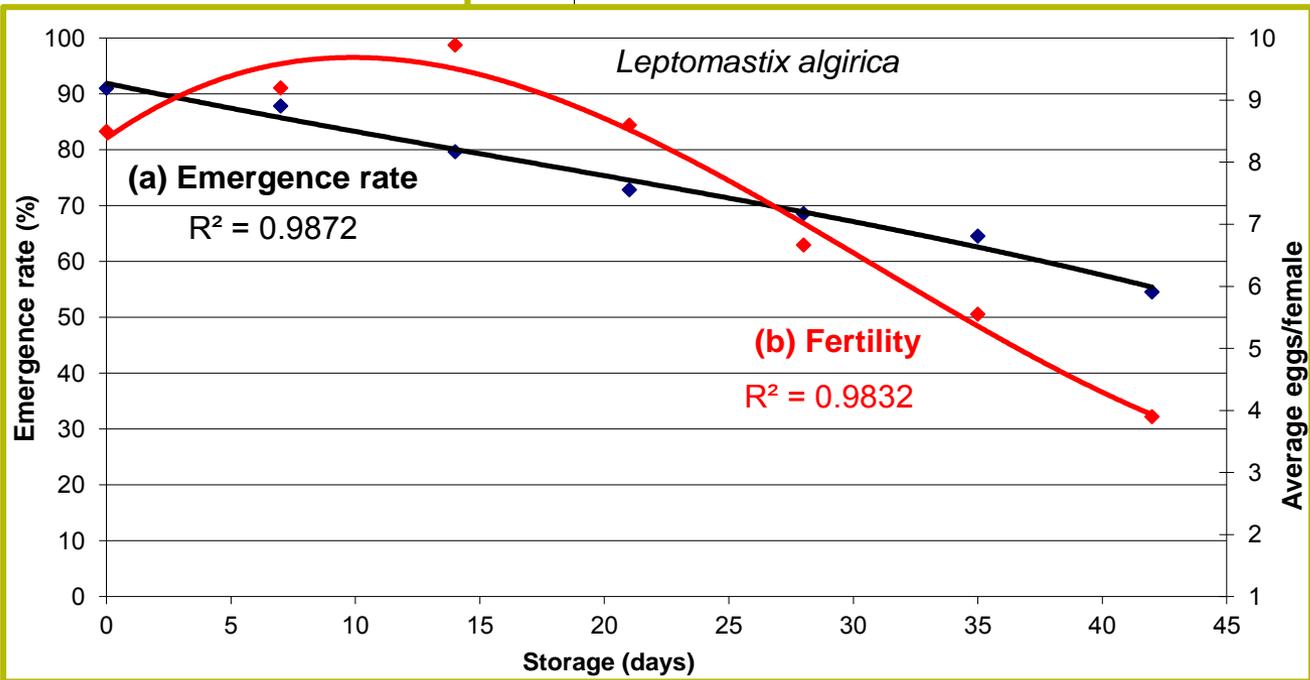
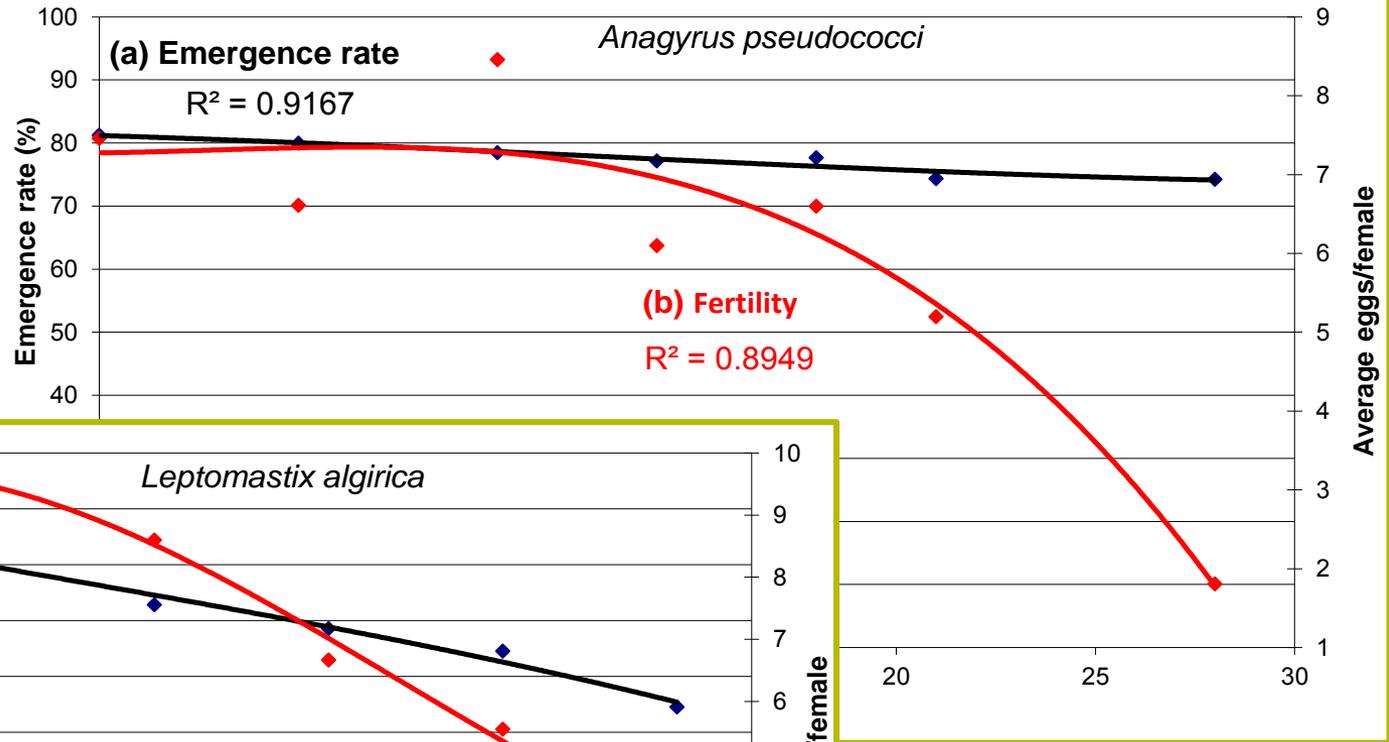
Mealybugs' Mummies

- **A robust rearing system that can be applied to a number of mealybug parasitoids**
- **A breakthrough in delivery of mealybug parasitoids' commercial products to the field**
- **Patent granted (national phase).
Two products on sale**



Mealybugs' Mummies

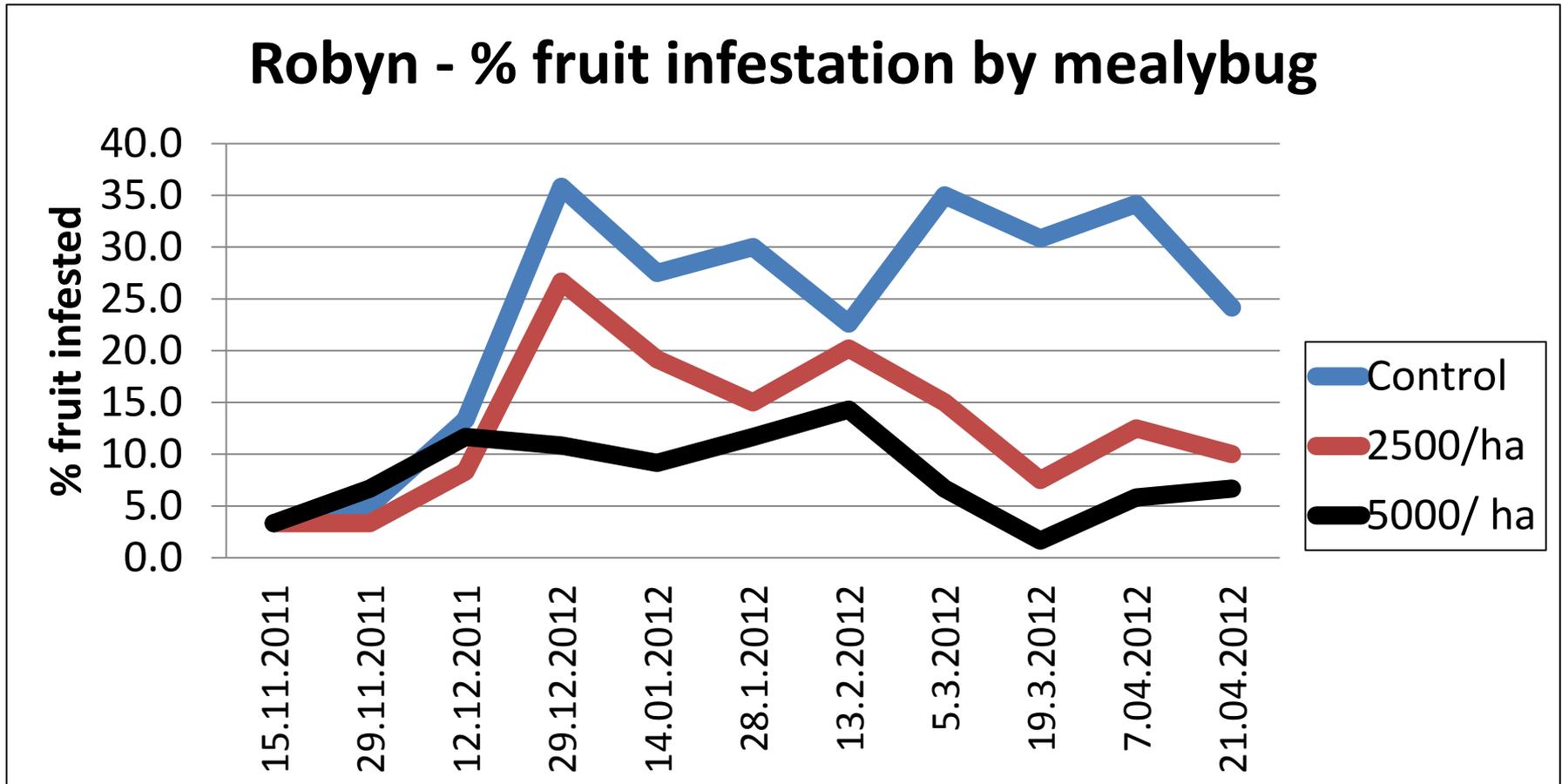
Post-storage capacity | @12°C





Mealybugs' Mummies

Anagyrus field trials in citrus | Western Cape, S.A





Mealybugs' Mummies

***Anagyrus* field trials in citrus | Western Cape, S.A**

Conclusion

Augmentation with *Anagyrus* sp. nr *pseudococci* should be conducted at a rate of at least 5000 parasitoids per ha in the first year, and possibly a lesser quantity from the second year onwards.



Take Home Message

Mass rearing of macrobial biocontrol agents is an everlasting challenge

BioBee has developed novel rearing techniques which contribute significantly to its commercial products' Availability-Consistency-Quality



Thank you!

www.biobee.com