Feasibility of SIT for Lepidoptera

- Limited as Lepidoptera are highly radio-resistant
- Holokinetic chromosomes → High radio-resistance
- Require large doses for 100% sterility
- Associated with somatic damage and behavioural incompetence in P-1(parent generation) that lead to limited success by SIT

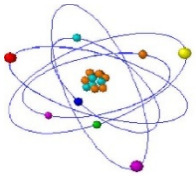
Modified SIT (F-1 Sterility or Inherited Sterility) for Lepidopteran control

A favoured alternative : Employ F-1 Sterility

- ❖Use F-1 progeny of sub-sterile P-1(males)
- ❖Use of less amount of radiation
- ❖Induction of inherited sterility in F-1 insects
- ❖Production of competitive moths.

DIPTERA

Fully Sterile gamma dose



LEPIDOPTERA

Partially Sterile gamma dose

Fully Sterile Insects (S)
[P-1 generation]

S-Males × N-Females

Sperm with altered genome × Ova with unaltered genome

Inviable Zygote

Complete Sterility
(i.e. 100% in P-1)

Sterile Insect Technique (SIT)

Partial Sterile Insects (PS)
[P-1 generation]

PS-Males × N-Females

Sperm with altered genome × Ova with unaltered genome

Inviable Zygotes (exhibiting dominant lethality)

Viable Zygotes (carrier of recessive lethality)

Partial Sterility in P-1

(F-1 Progeny)

F-1 Males × N-Females

Sperm with altered genome × Ova with unaltered genome

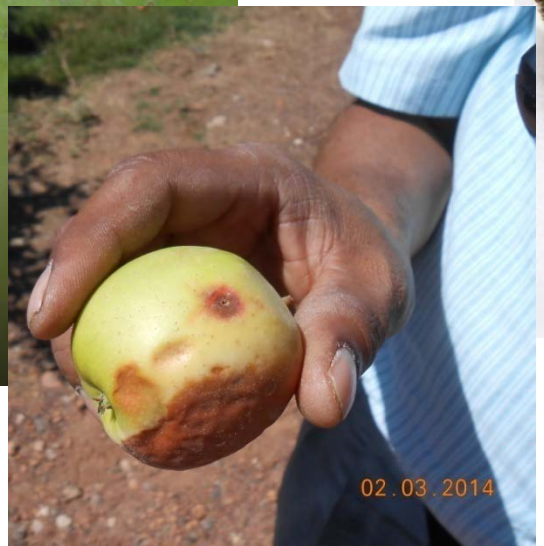
Inviable Zygote

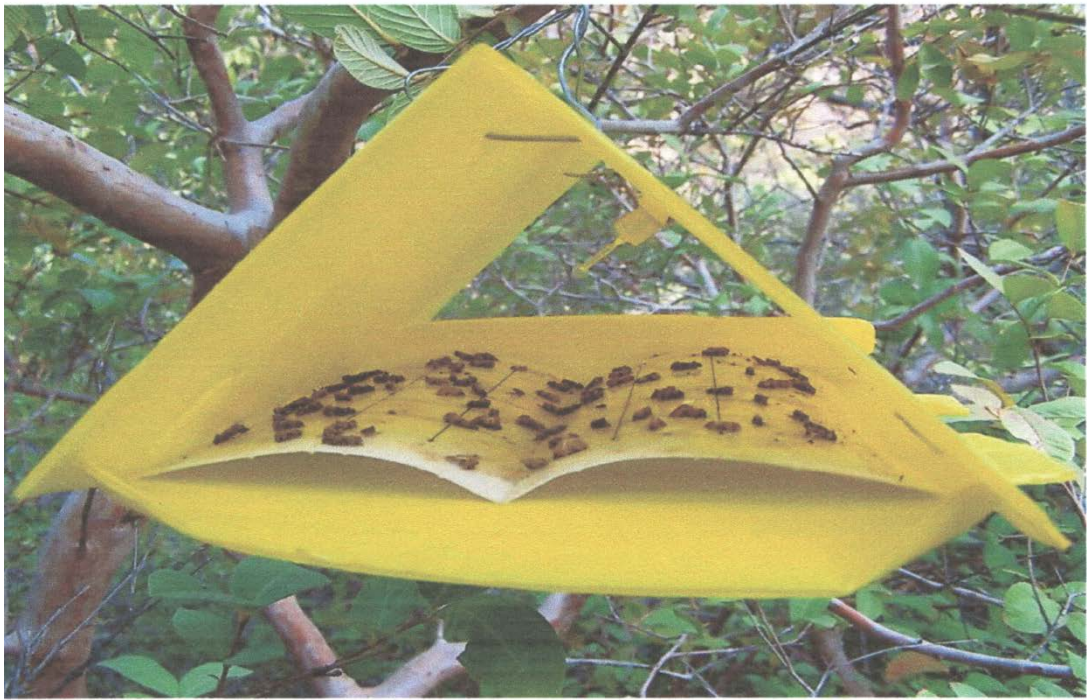
(Enhanced Partial/Full sterility in F-1)

F-1 Sterility (Inherited Sterility) Technique

Codling moth

- *Cydia pomonella* (Lepidoptera: Tortricidae)
- Pest of Citrus, apple & pear






MACADAMS
BAKING SYSTEMS

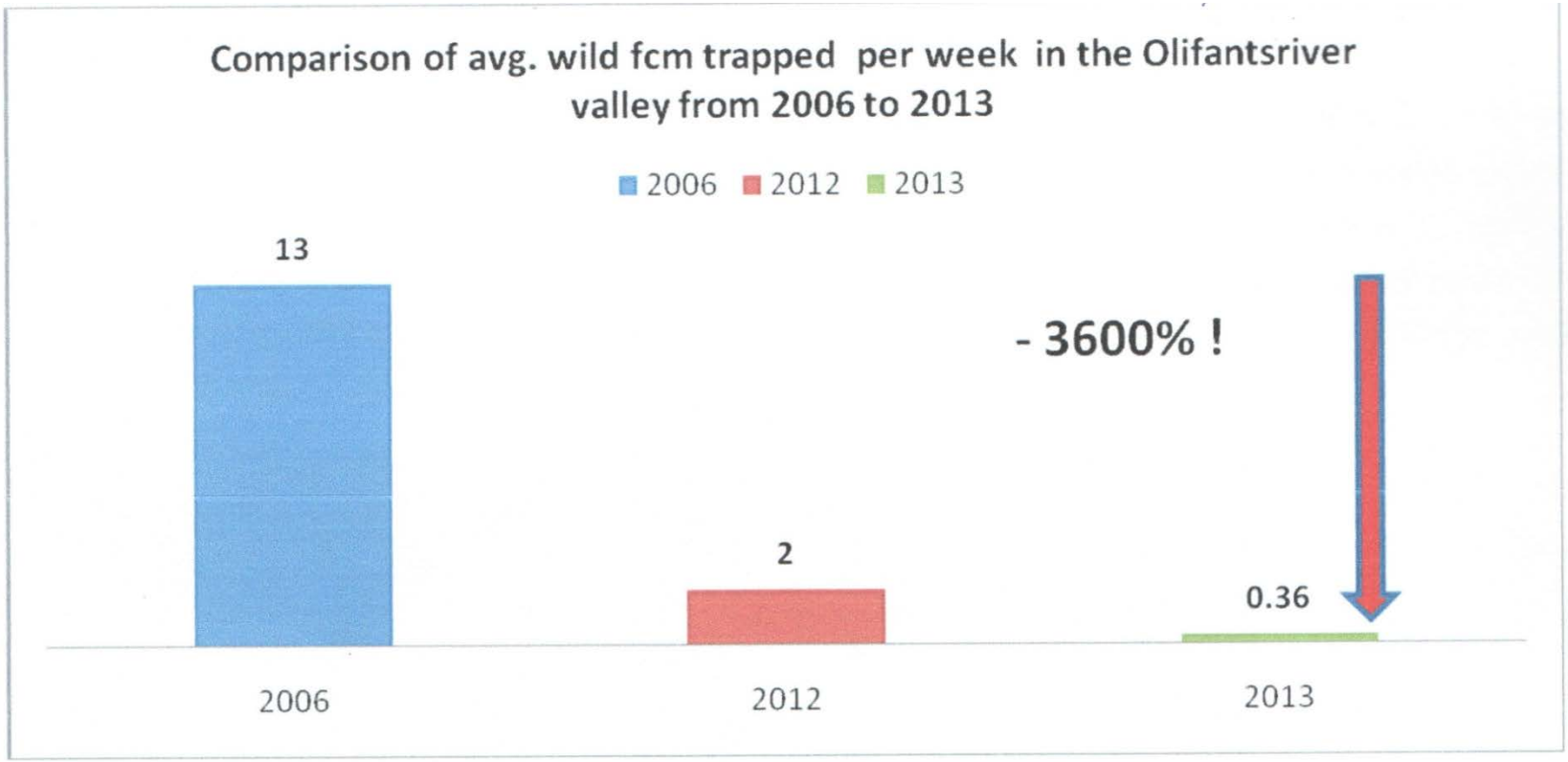
Gamma Cell – 500 : Radiation Unit

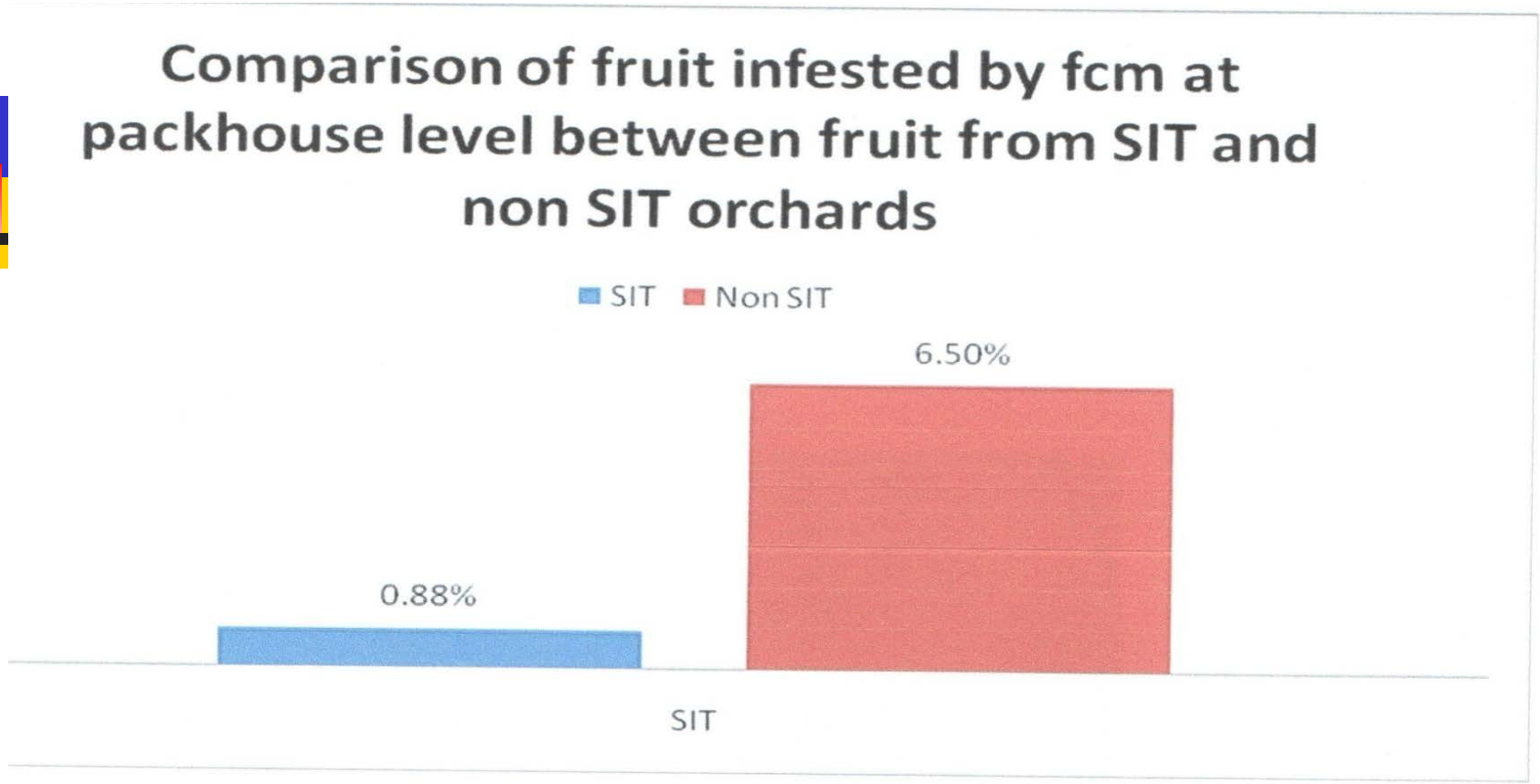

02.03.2014


SAMSUNG

- 2000 moths/ha/week during fruiting season (7-8)
- Mating disruption technique (Shinetsu)
- 7 staff & 2 tech
- Production capacity (60000/day)
- Number of sprays reduced: (12 to 2)
- 100% share from HORTGRO(farmer's owned group)
- 'Entomon' charges R-3000(Rs.18,000)/year/ha

Comparison of the average wild codling moth trapped per week in the ORV from 2006-2013





Comparison of fruit infested by fcm at pack house level between SIT and non-SIT orchards

Efficacy of Pink bollworm eradication programme by SIT

Parameter	Before the programme (up to 2005)	At the end of the programme (2006–2009)	Remarks
Extent of refugia planted	37.4%	~3%	More land for *Bt* cotton and increased yield
Infestation rate on non-*Bt* cotton	15.3%	0.012%	99.9% reduction in infestation
Number of wild male PBW caught per trap per week	26.7	0.0054	99.98% reduction
Mean number of insecticide sprays per hectare per year	2.7	0	Increased profits and associated benefits (cleaner health and environment)
Mean annual cost of yield losses and plant protection	US$ 18 million	US$ 0.17 million	Increased net profits




SIT / Inherited Sterility
Work done in India

Sterile Insect Technique(SIT)

Phthorimaea operculella **(Potato tuber moth) (BARC)**
Spodoptera litura **(Tobacco caterpillar) (Delhi Univ)**
Culex pipiens fatigans **(WHO, MRC, DRDO)**
Rhyncophorus ferrugineus **(Red palm weevil) (BARC)**
Tribolium castaneum **(Rust flour beetle) (NRL)**

Inherited Sterility [F-1 Sterility]

[Specifically designed for Lepidopteran control]

Phthorimaea operculella **(Potato tuber moth) (BARC)**
Spodoptera litura **(Tobacco caterpillar) (Delhi Univ)**
Maruca vitrata (Redgram Webber) (UAS, Raichur)

OTHER POTENTIAL APPLICATIONS of *RADIATION* in Applied Entomology

- **Irradiation for dis-infestation of stored food commodities**
- **Radiation Hormesis**
- **Light Activated Pest Control**: *Allelochemicals as Phototoxins (Potent and Safe Insecticides)*
- **Radiation in Ecological and behavioural studies**
- **Radiation in Toxicological studies**

DISINFESTATION OF STORED AGRO-COMMODITIES

- **Radiation as a disinfestation measure of stored product insect pests, viz.,**

  Rhyzopertha dominica, Sitophilus oryzae, Tribolium confusium, T. castaneum, Lasioderma serricorne, Ephestia cautella, Anagasta kuhniella, Plodia interpunctella, etc.

- **0.5 KGy suggested as a safe dose for the treatment of a wide range of commodities to practically control the pests**

- **0.6 - 0.7 KGy as a recommended dose for control of noxious stored products mites**

QUARANTINE

Irradiation as a useful and unique quarantine tactic for Disinfestation against Acarina, Thysanoptera, Coleoptera, Lepidoptera and Diptera

Radiation as a quarantine treatment for tropical fruitfly (fam.Tephritidae) in fresh fruits or vegetables.

10 KGy dose approved by FAO/WHO, as safe for use on any food (Codex Alimentarius Commission 1984).

1 KGy approved for disinfestation of fresh fruits, vegetables.