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Relative Abundance of Tephritid Fruit Flies on Capsicum Ecosystem in North Eastern Hill Region of India

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Introduction

Capsicum is a popular vegetable in Mizoram

Area of 29,140 ha. during 2012-2013

Production: 153350 MT during 2012-2013

Adapted to variable climatic conditions

Production and productivity limited by pests

Yield loss can approach 30-40%.

Objectives

1. Per cent infestation
2. Life cycle
3. Development of para-pheromone traps
4. Monitoring with para-pheromone traps
5. Development of prediction model

Material and Methods

Cultivars: Indra and Picador

Spacing: 60 × 60 cm

Standard agronomy practices followed

No plant protection measures

1. Per cent infestation

Studied in both cultivars, Indra and Picador

% infestation: 200 fruits of both cultivars

Per cent Infestation

Indra

70 to 75 %

Picador

55 to 60 %

2. Life cycle

% adult emergence

Sex ratio (Male : Female)

% Pupal mortality

Abundance of Tephritid fruit flies in different cultivars of capsicum

Cultivars	Pupa	Emerged	Male	Female
Indra	103	52	30	20
Picador	67	30	14	16

Cultivars	% adult emergence	% pupal mortality	Sex ratio (M : F)
Indra	50.5	49.5	1 : 0.75
Picador	44.8	55.2	1 : 1.25

Life cycle

1-3 days

9-35 days

7-15 days

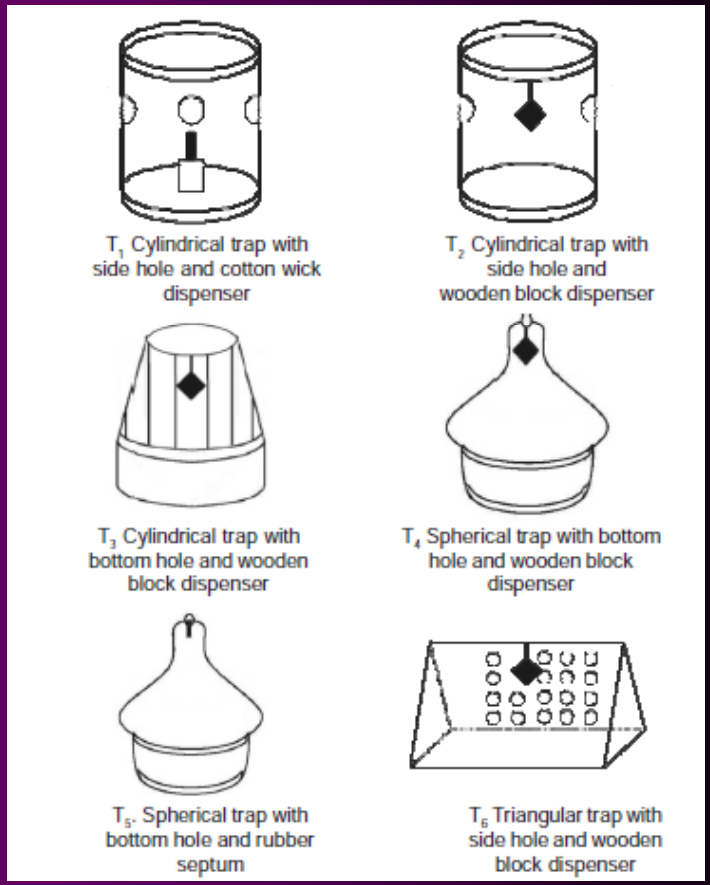
3. Development of para-pheromone traps

1. Trap designs:

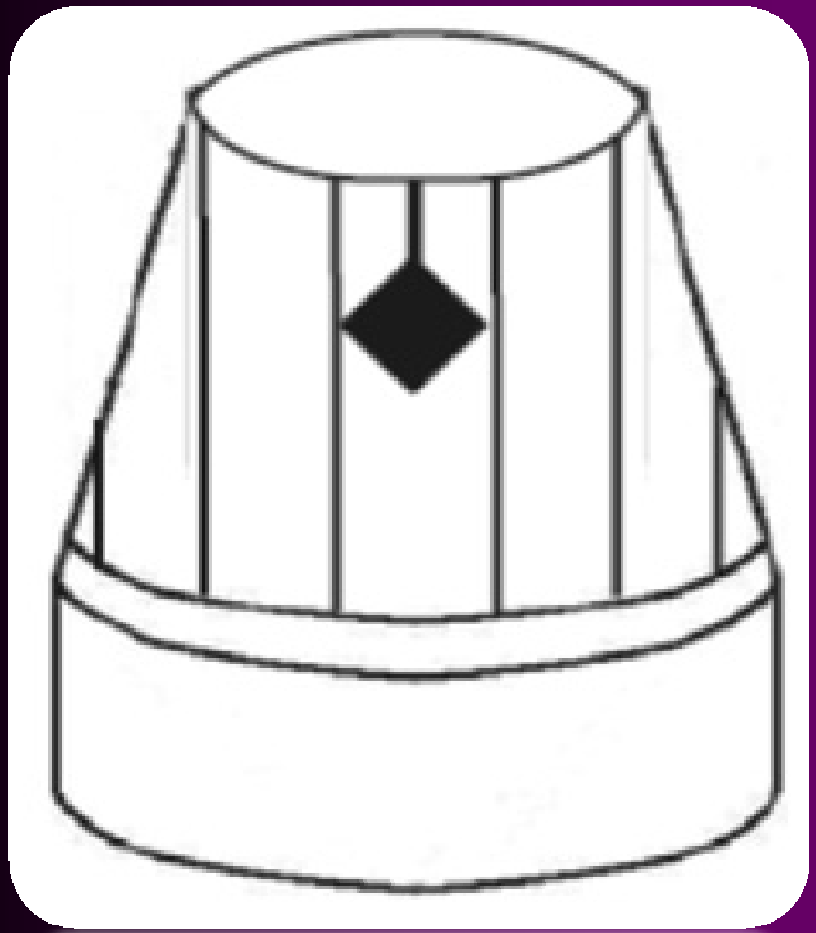
Cylindrical, spherical and triangular

2. Dispensers:

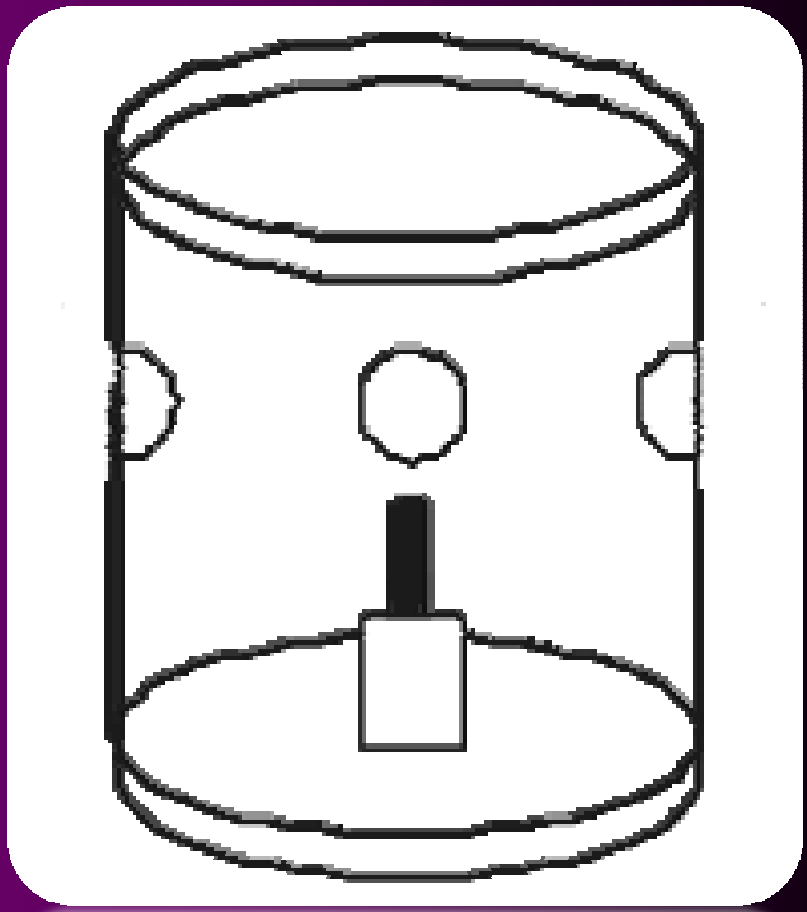
Wooden block, cotton wick & chalk piece



Development of Para-pheromone Traps



Use and through type

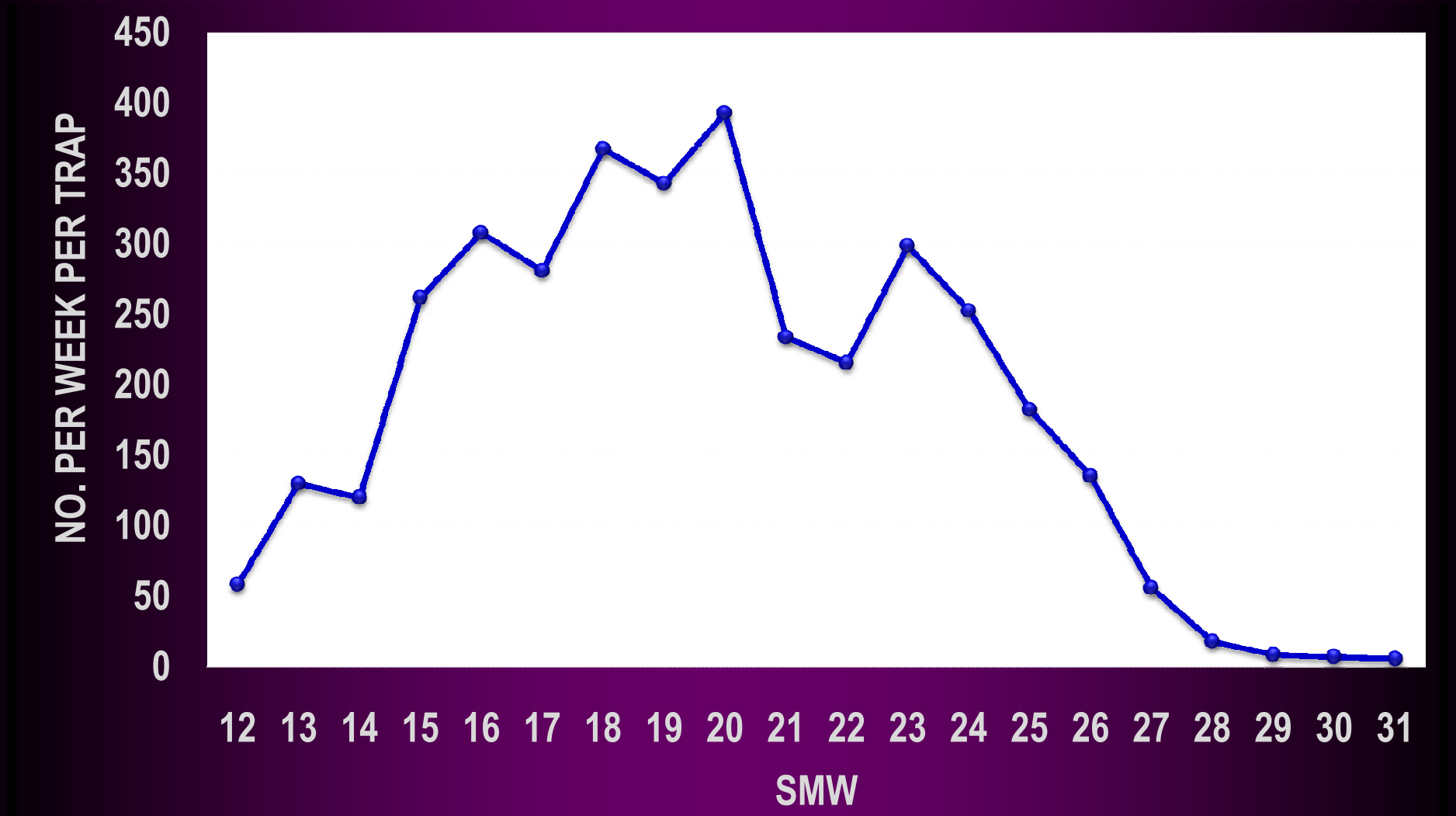


Permanent type

4. Monitoring and Mass Trapping with Para-pheromone Traps

- Three traps were maintained
- Traps height: 1.5 m above ground level
- Traps loaded with a cotton wick
- 16 ml of methyl eugenol and malathion (3:1)
- Solution changed once in three months
- Catches were recorded weekly for five months

Weekly tephritid fruit flies catches in capsicum ecosystem



5. Prediction model

Correlation analysis: Average weekly weather data and fruit flies catches

Measured the present variability in fruit flies catches

A step-wise regression procedure applied to select the most crucial weather factors

Goodness-of-fit, co-efficient of determination (R^2) helps in development of models

Relationships Between Weekly Weather Parameters and Fruit Flies Catches

Meteorological parameters	Correlation coefficient (r)
Minimum temperature (^{0}C)	-0.398ns
Maximum temperature (^{0}C)	0.457*
Minimum relative humidity (%)	-0.257ns
Maximum relative humidity (%)	0.074ns
Rainfall (mm)	-0.290ns
Rainy days	-0.173ns

Results of statistical models along with goodness of fit statistics

Model types	Multiple regression
Full regression model (All weather parameters)	Standard Error : 22.59 (X_1), 22.066 (X_2), 2.67 (X_3), 3.177 (X_4), 0.838 (X_5), 23.74 (X_6) T-value : -1.81ns (X_1), 3.14** (X_2), -0.00ns (X_3), 0.76ns (X_4), -1.73ns (X_5), 0.21ns (X_6) F value : 3.08* **R^2 : 0.59*** Regression equation : Y= -1088.03 - 41 (X_1) + 69 (X_2) - 0.01 (X_3) + 2 (X_4) - 1.5 (X_5) + 5.03 (X_6)
Optimized model (using minimum and maximum temperature only)	Standard Error : 13.93 (X_1) and 16.93 (X_2) T-value : -3.43** (X_1) and 3.13** (X_2) F value : 7.41** **R^2 : 0.47**** Regression equation : Y= -346.35 - 48 (X_1) + 53 (X_2)

ns,*,** non-significant or significant at $P \leq 0.05$ or $P \leq 0.01$

Y = Mean number of fruit flies, X_1 = minimum temperature (^{0}C), X_2 = maximum temperature (^{0}C), X_3 = morning relative humidity (%), X_4 = evening relative humidity (%), X_5 = rainfall (mm), X_6 = rainy days

Summary

New records of fruit flies infesting capsicum

This model predicted fruit flies catches

Model can be used for decision making in IPM

Future validation is needed

Future

Species identification

Species diversity

DNA Barcode

Validation of model for 3 years data


Thank U