Flower thrips (*Frankliniella* spp.) dispersal into blueberry fields over space and time

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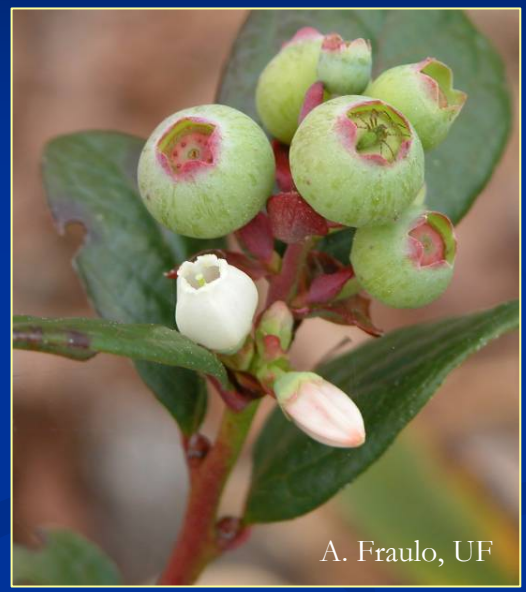
Introduction

Florida's Southern Highbush Blueberries

- fresh market blueberries
- 2008 (USDA, 2009)
  - 9.8 million lbs
  - 3000 acres
  - Average of $5.30 per lb



Flower Thrips

- ~90% of thrips captured in FL blueberries are *Frankliniella bispinosa* (Morgan) (Arevalo, 2006)
- ~1 mm in length
- Bristle-like wings and “punch and suck” mouthparts
- Wide host range

Thrips Injury

- Thrips injure flowers in two ways
  - Feeding

  - Oviposition

Previous research

- Thrips move into tomato and other crops from wild host plant species (Chellemi et al. 1994; Topanta et al. 1996)
  - White clover (*Trifolium repens* L)
- Thrips numbers in blueberry plantings are highly correlated with flower phenology (Arevalo 2006)

Objectives

- 1) To examine thrips dispersal from neighboring flowering plants into blueberry plantings

- **Hypothesis**: Flower thrips will build up their populations in neighboring plants before dispersing into blueberry fields

Objectives

- 2) To examine the effect of temperature, wind speed, and wind direction on thrips population growth in the field

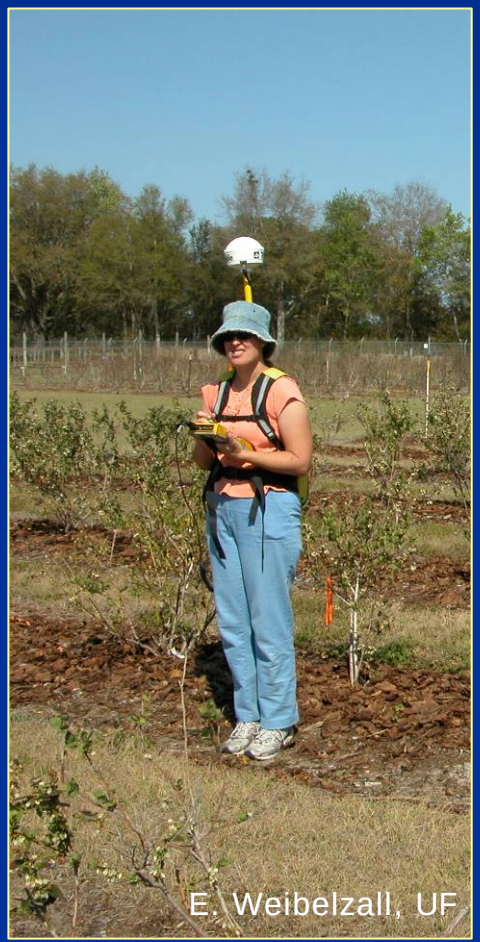
- **Hypotheses**: a) Thrips populations will increase as temperature and wind speed increase and b) spatial distribution patterns will be affected by variation in wind direction

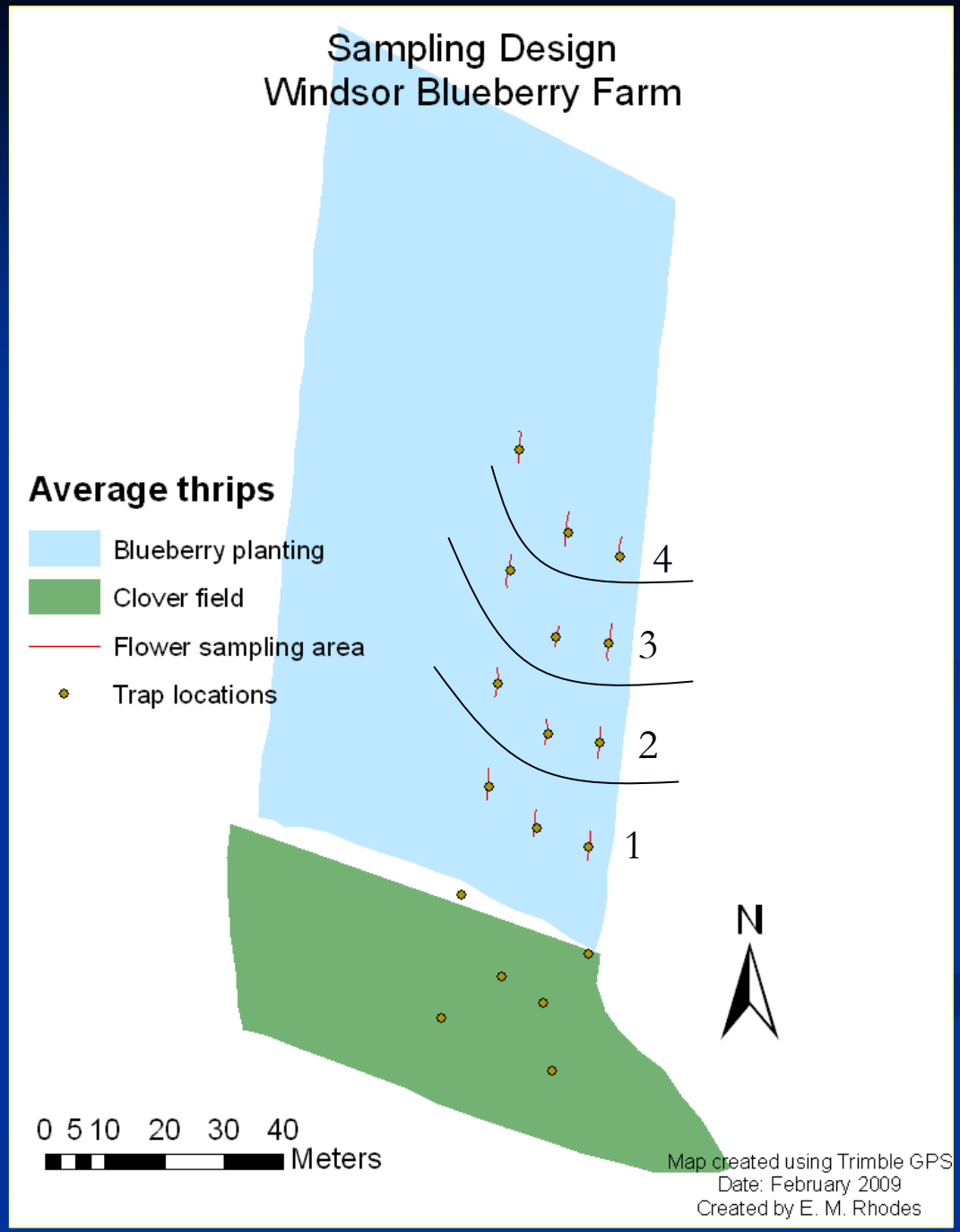
Methods

Sampling

- Sampled over a 5 week period
  - Jan. 31 – March 5
- White sticky traps and flower samples
  - 6 in the white clover
  - 12 in the blueberry planting
    - 4 rows (trts) of 3 traps

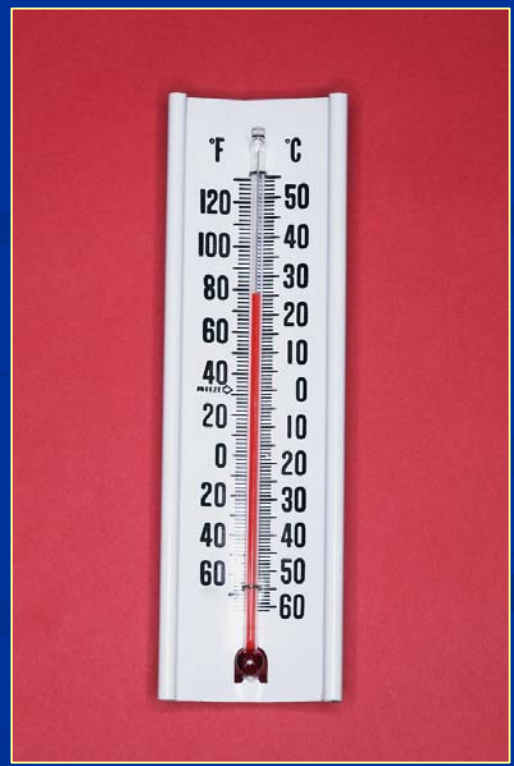
Study Area


E. Weibelzall, UF


Sampling Design
Windsor Blueberry Farm
Average thrips
Blueberry planting
Clover field
Flower sampling area
Trap locations
4
3
2
1
N
0 5 10 20 30 40
Meters
Map created using Trimble GPS
Date: February 2009
Created by E. M. Rhodes

Environmental Data

- Weather station at the Gainesville Regional Airport
  - Temperature
    - Daily mean, max, and min
  - Wind speed
    - Daily mean and max
  - Wind direction



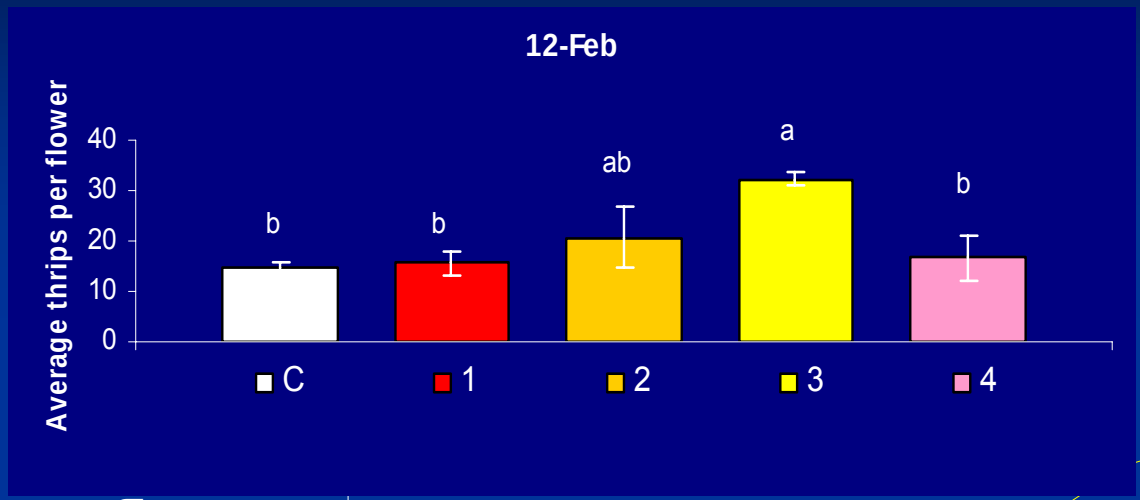
Statistical Analysis

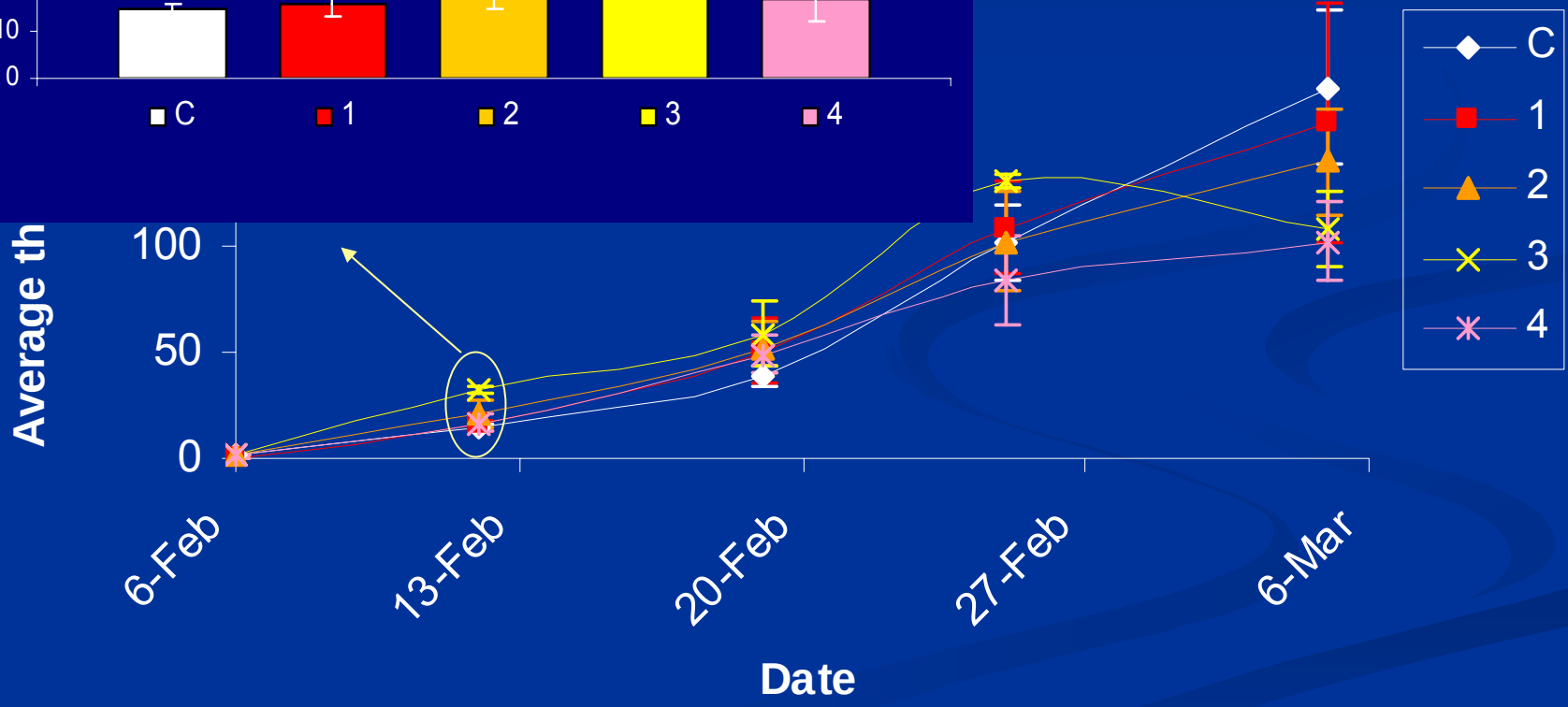
- Objective 1 – Dispersal
  - One-way ANOVA with LSD means separation test
    - Data were transformed as needed to meet the assumptions of the analysis
- Objective 2 – Environmental factors
  - Simple linear regression of Degree Day accumulation vs. thrips and wind speed vs. thrips

Results

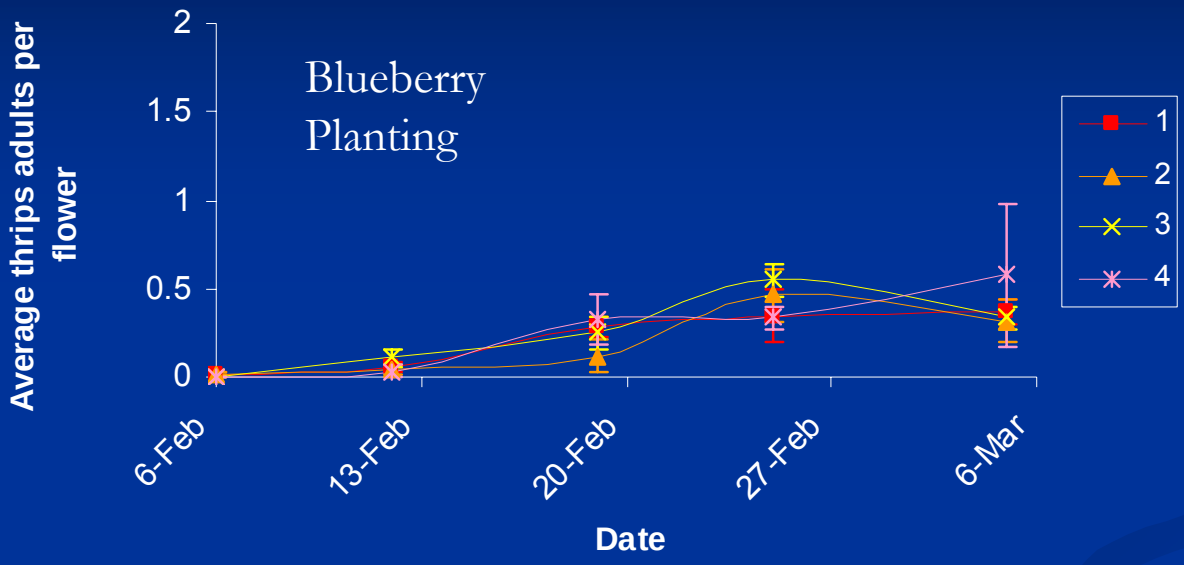
Objective 1 – Thrips dispersal from neighboring clover plants

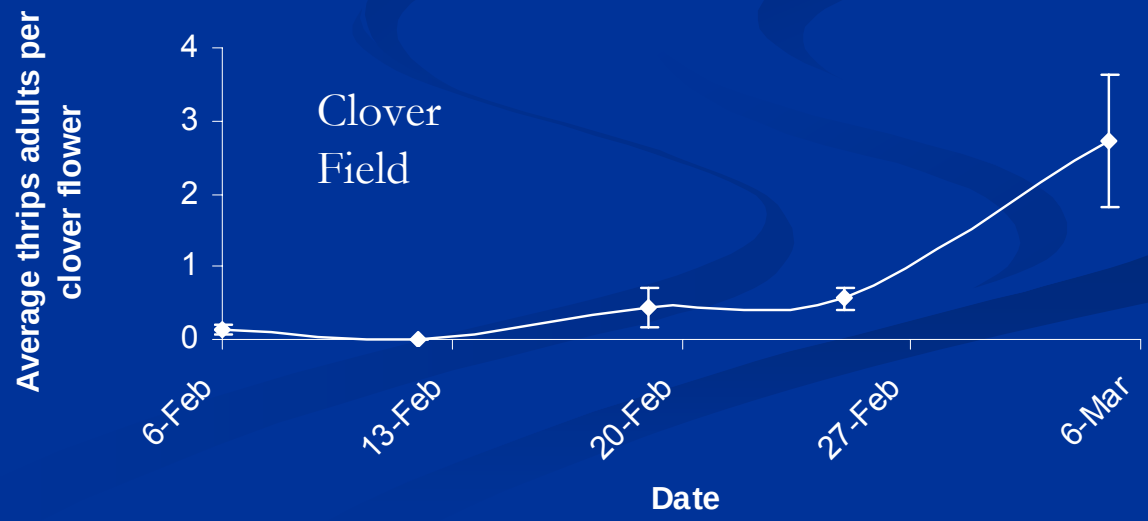
Thrips Dispersal: White Sticky Traps



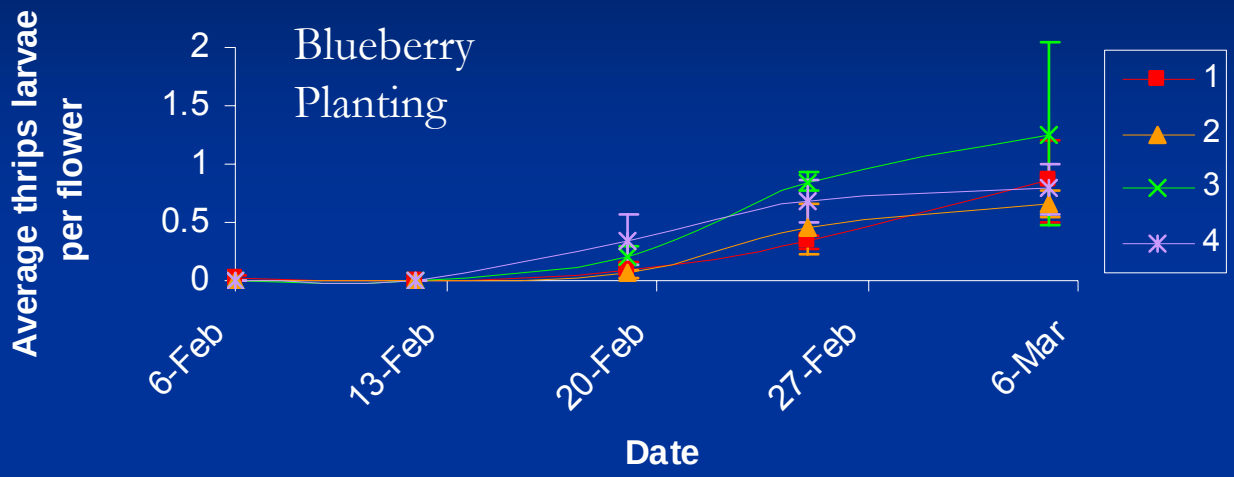


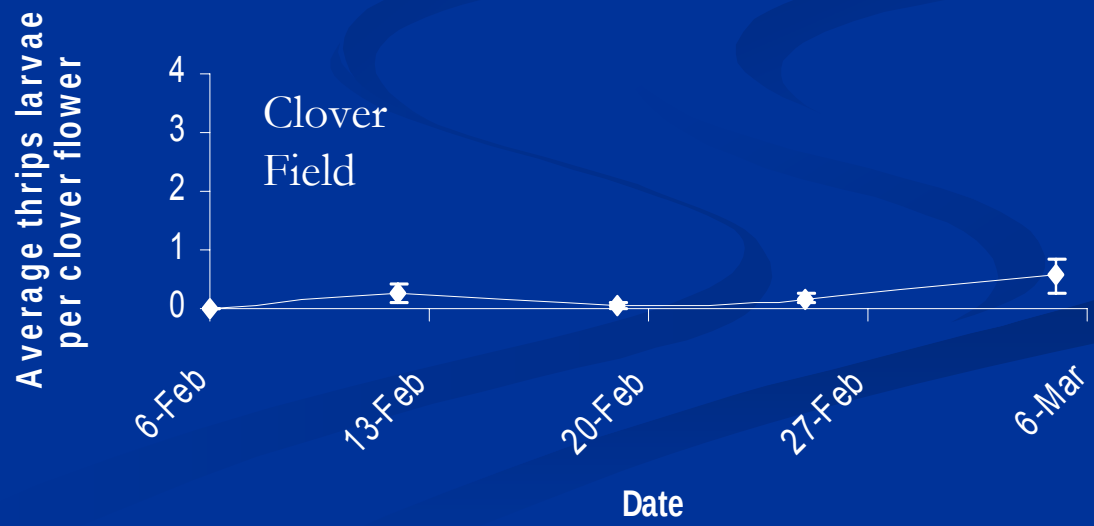
Thrips Dispersal: Adults per Flower





Thrips Dispersal: Larvae per Flower

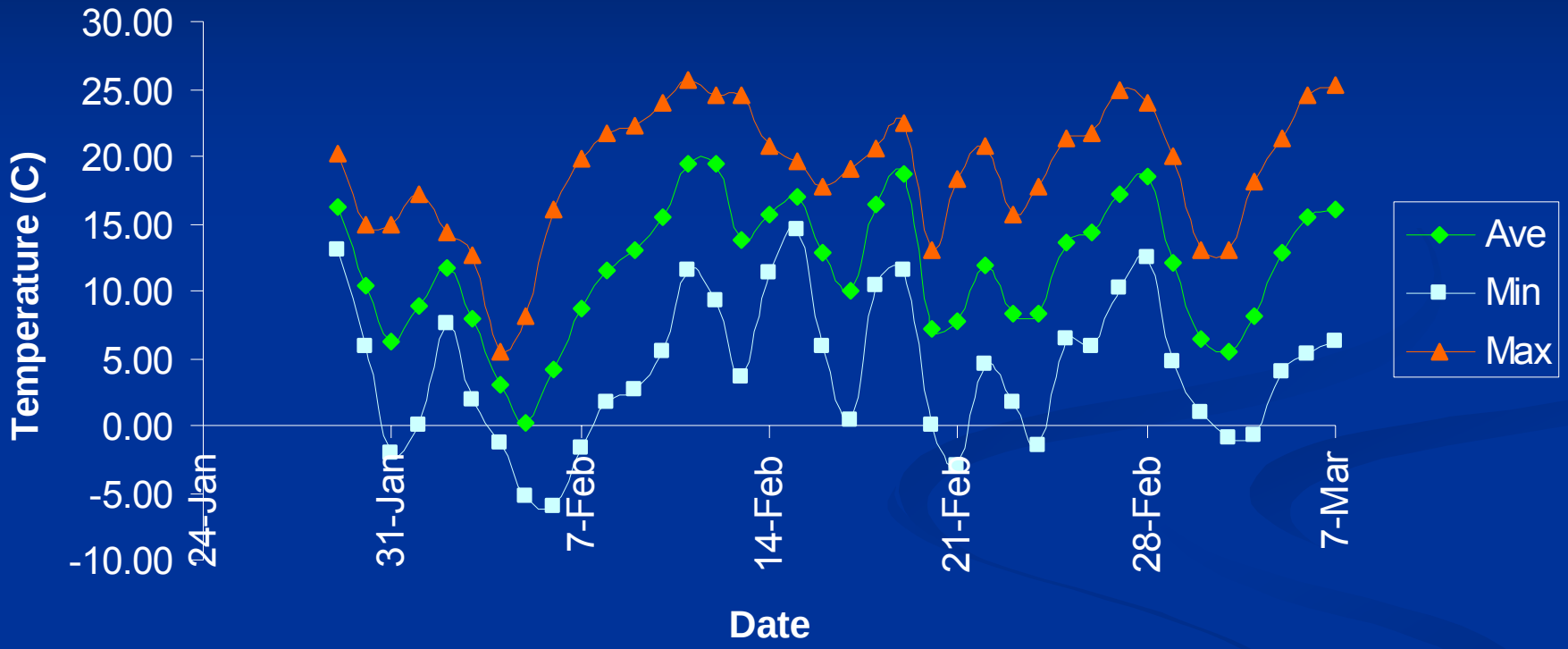




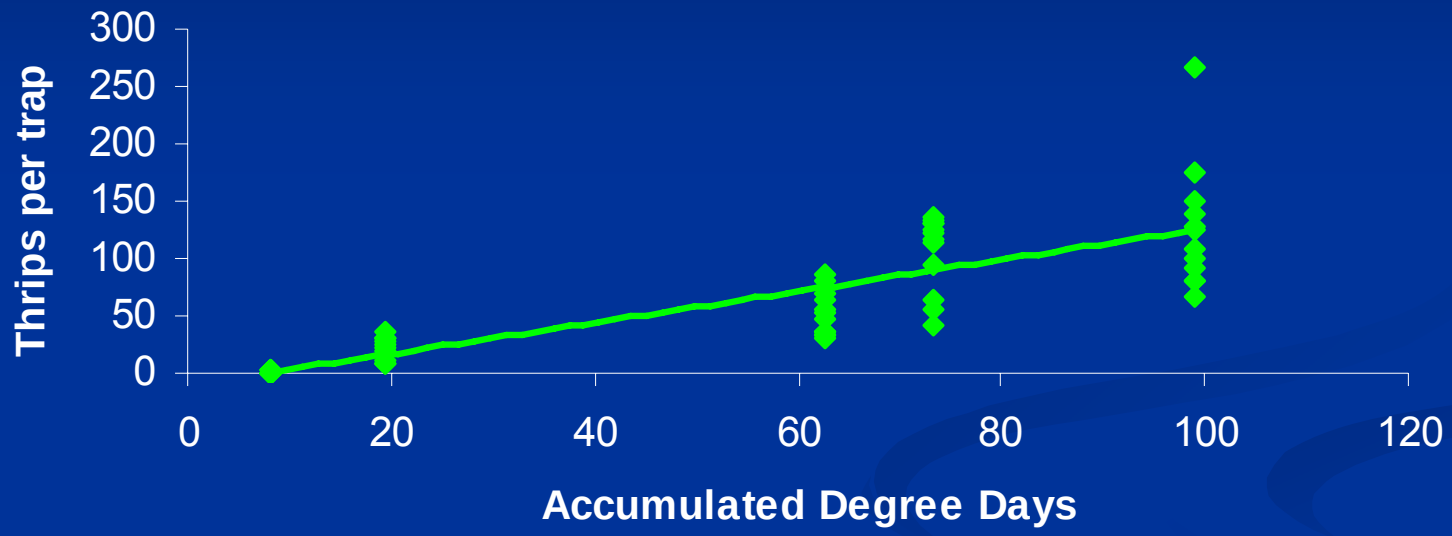
Results

Objective 2 – Effect of environmental factors

Temperature



Temperature vs. Thrips per trap



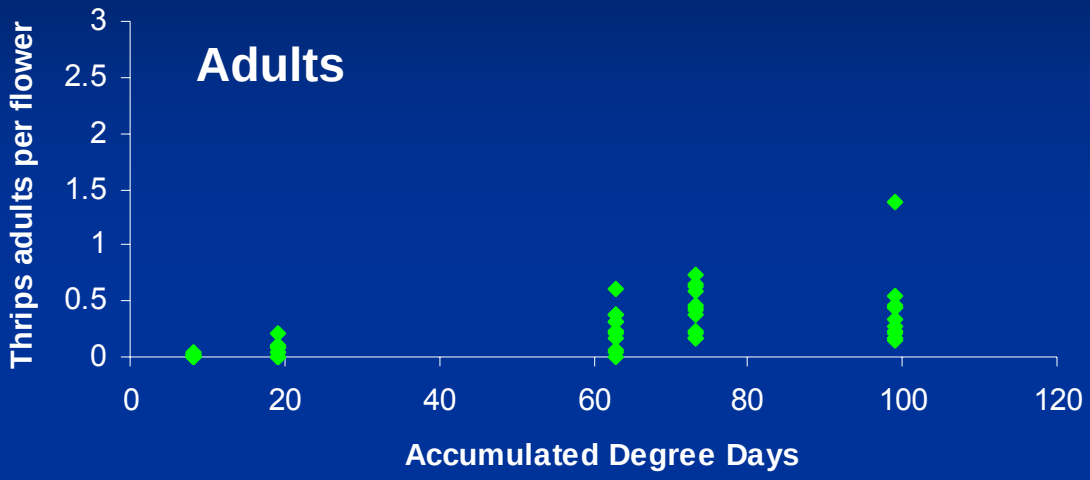
$\sqrt{\text{thrips per trap}} = 0.10149DD + 1.56661$

Adjusted $R^2 = 0.7995$

$P_{intercept} = 0.0004$

$P_{slope} < 0.0001$

Temperature vs. Thrips per Flower



Adults

Log_{10}(thrips adults per flower) = 0.00726DD – 0.97745

Adjusted R^2 = 0.6163

$P_{intercept} < 0.0001$

$P_{slope} < 0.0001$

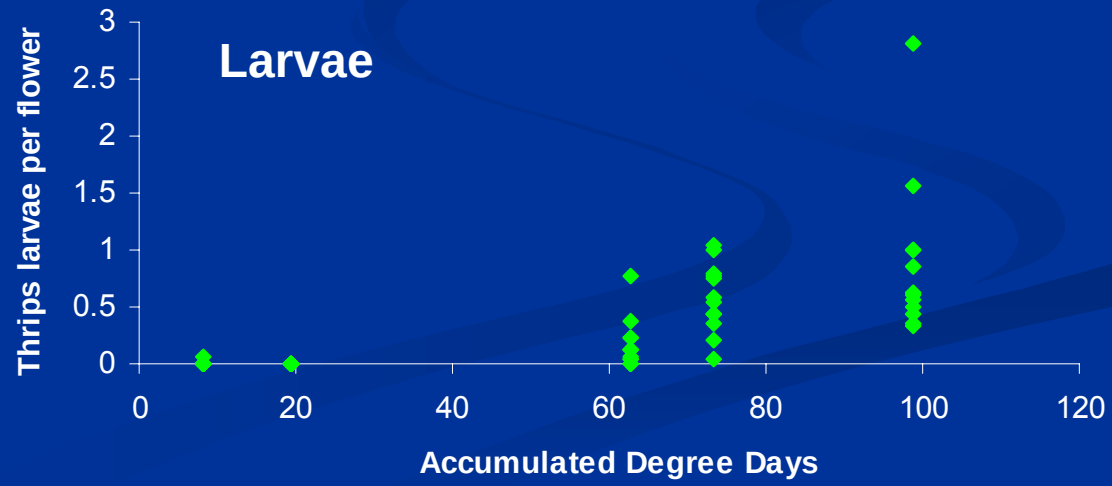
Larvae

1 / √thrips larvae per flower = -0.02418DD +3.45777

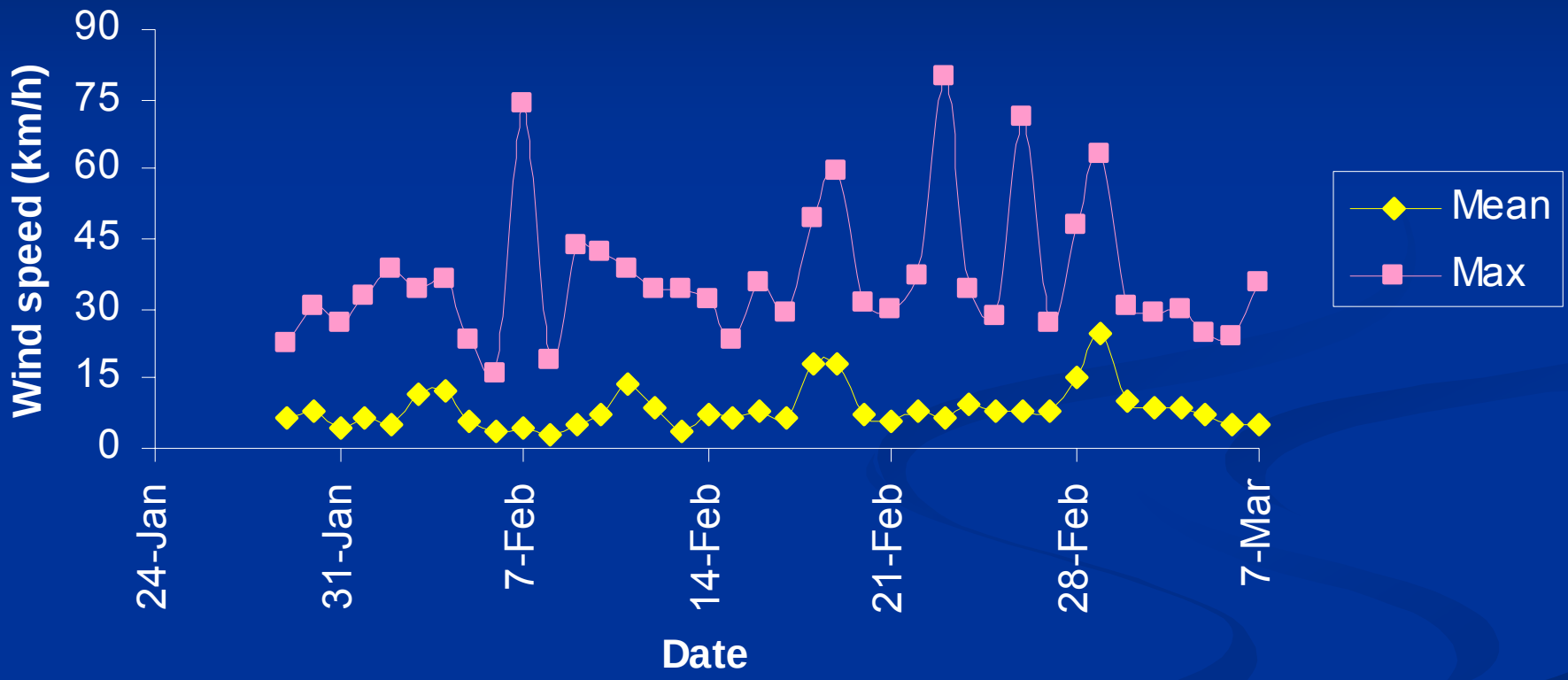
Adjusted R^2 = 0.7783

$P_{intercept} < 0.0001$

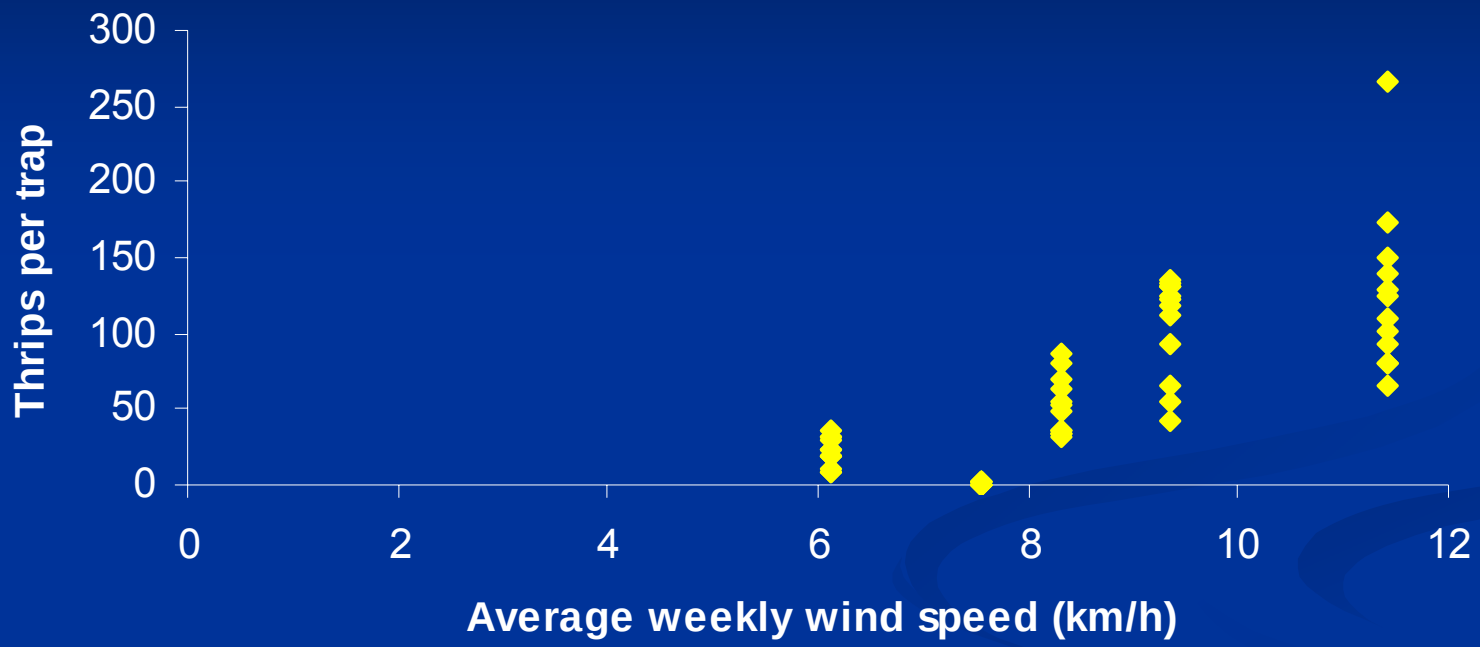
$P_{slope} < 0.0001$



Wind Speed


Wind speed (km/h)
90
75
60
45
30
15
0
24-Jan
31-Jan
7-Feb
14-Feb
21-Feb
28-Feb
7-Mar
Date
Mean
Max

Wind Speed vs. Thrips per Trap



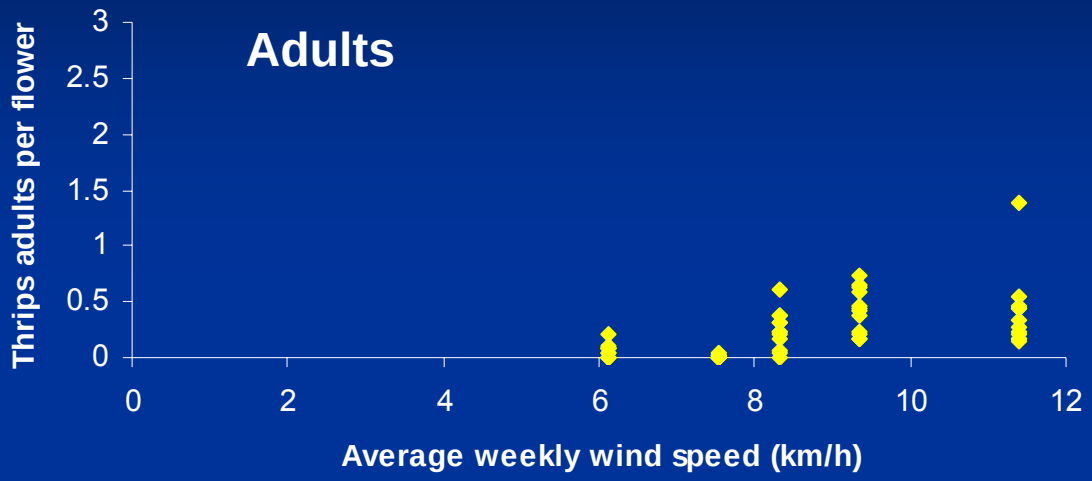
$\sqrt{\text{thrips per trap}} = 4.19271(\text{wind speed}) - 11.16742$

Adjusted $R^2 = 0.5551$

$P_{intercept} < 0.0001$

$P_{slope} < 0.0001$

Wind Speed vs. Thrips per Flower



Adults

Log_{10}(thrips adults per flower) = 0.29615(wind speed) – 2.53205

Adjusted R^2 = 0.4154

$P_{intercept} < 0.0001$

$P_{slope} < 0.0001$

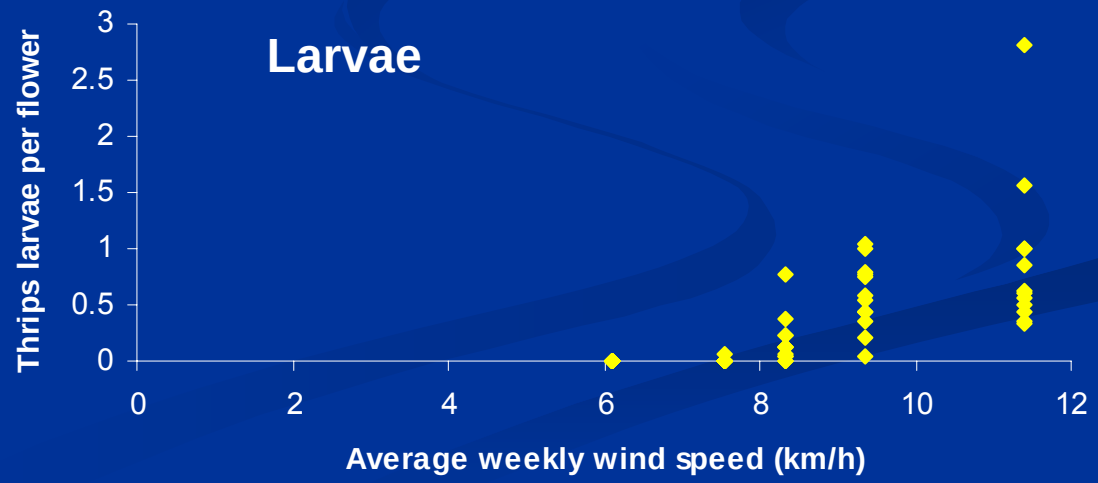
Larvae

1 / √thrips larvae per flower = -1.14378(wind speed) + 9.59579

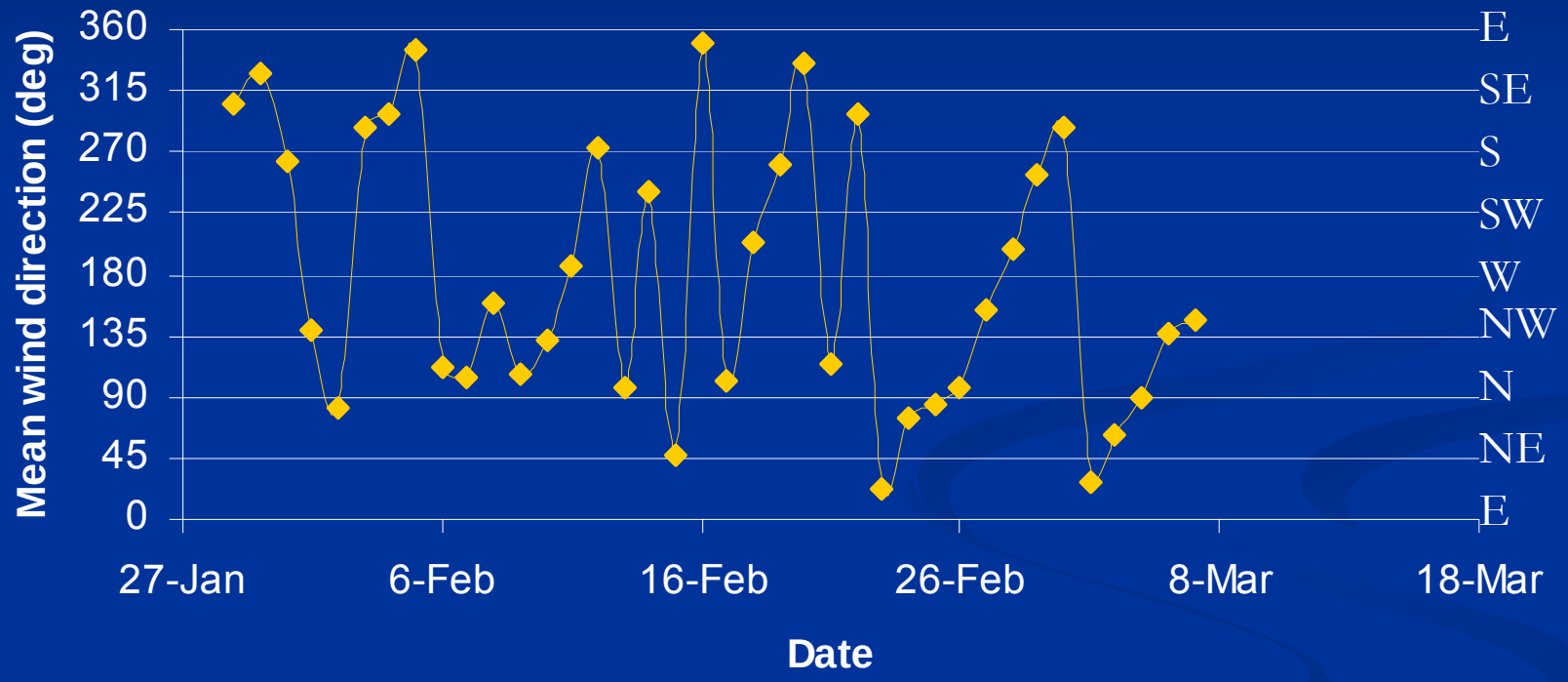
Adjusted R^2 = 0.7141

$P_{intercept} < 0.0001$

$P_{slope} < 0.0001$

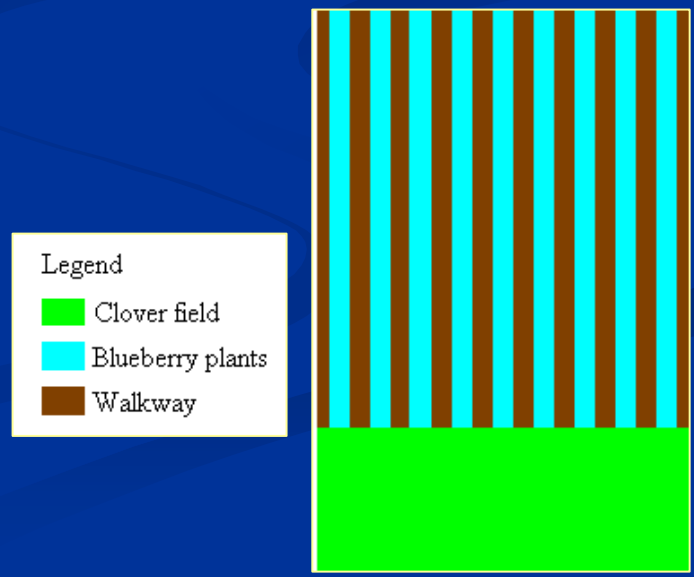


Wind Direction



Summary and Discussion

- Flower thrips developed in the clover field and blueberry planting simultaneously
  - Extreme (for Gainesville) low temperatures
    - Strong positive linear relationship between flower thrips numbers and both accumulated degree days and wind speed
  - Field layout
  - Highly variable wind direction



Future Research

- Experiment will be repeated Spring 2010
  - Two additional replicates
  - Begin putting out traps in mid-January
  - Flower phenology will be recorded
    - Multiple regression model with flower phenology, temperature, and wind speed

Acknowledgements

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Questions?