Review of 2008 studies on integrated pest management strategies to reduce damage from the sunflower seed maggot

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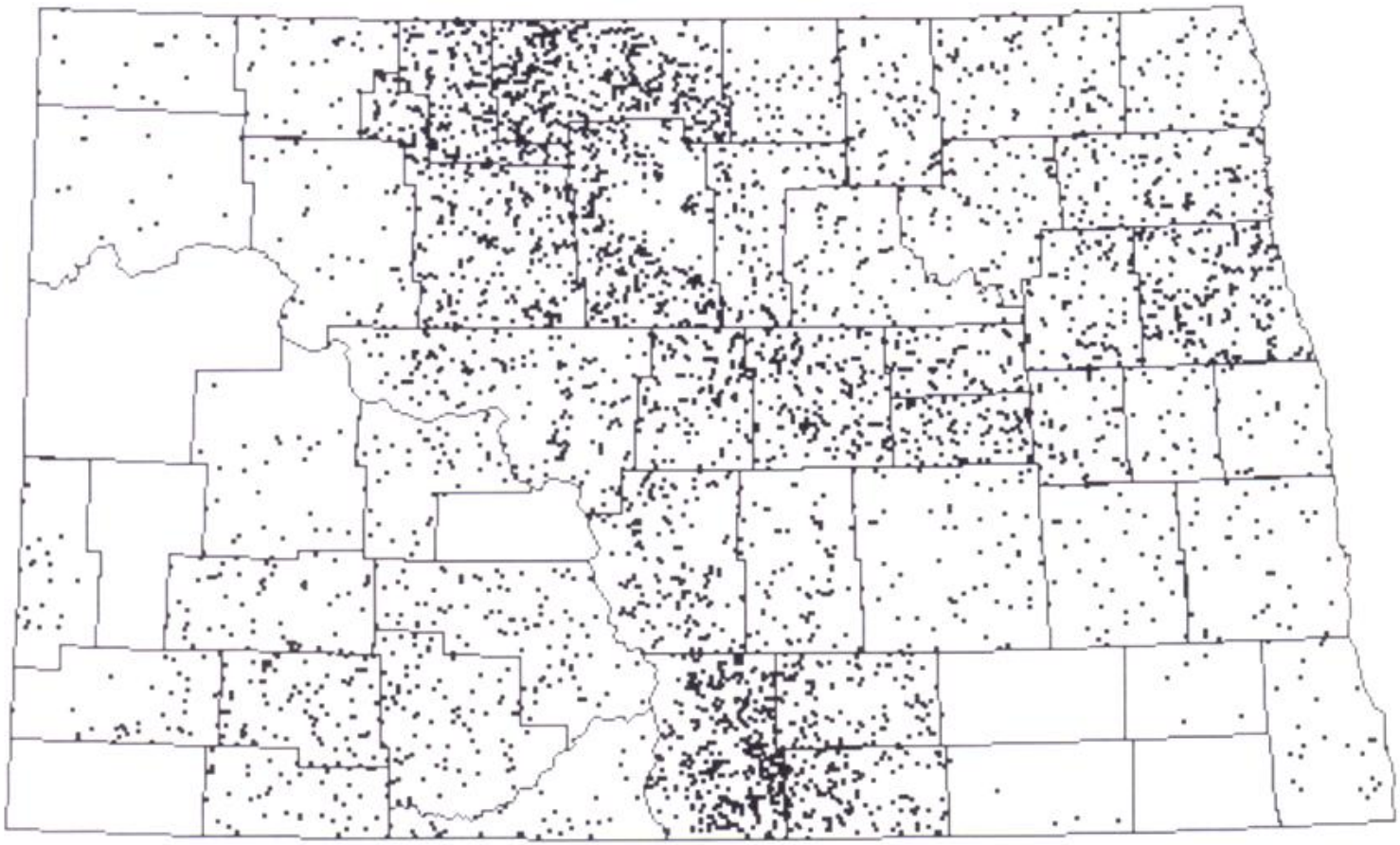
INTRODUCTION

- North Dakota ranked first in the US for sunflower production

- In 2008, 930,000 acres of oil sunflower and 150,000 acres of non-oil sunflower were harvested in ND

Oil Sunflower: Production
North Dakota, 2007



1 Dot = 300,000 Pounds

Dots randomly placed within county.

Blank counties represent none harvested or undisclosed data.

INTRODUCTION

- Sunflowers are attacked by an extensive number of insect species
- More than 150 insect species
- Mainly for food, pollen, and nectar

(Charlet et al. 1997)

INTRODUCTION

- Most important and damaging pests are head feeding insects
- Only six species consistently cause economic damage to sunflower

(Charlet et al. 1997)

INTRODUCTION

- Banded sunflower moth
- Sunflower moth
- Red sunflower seed weevil
- Gray sunflower seed weevil
- Sunflower midge
- Tarnished plant bug

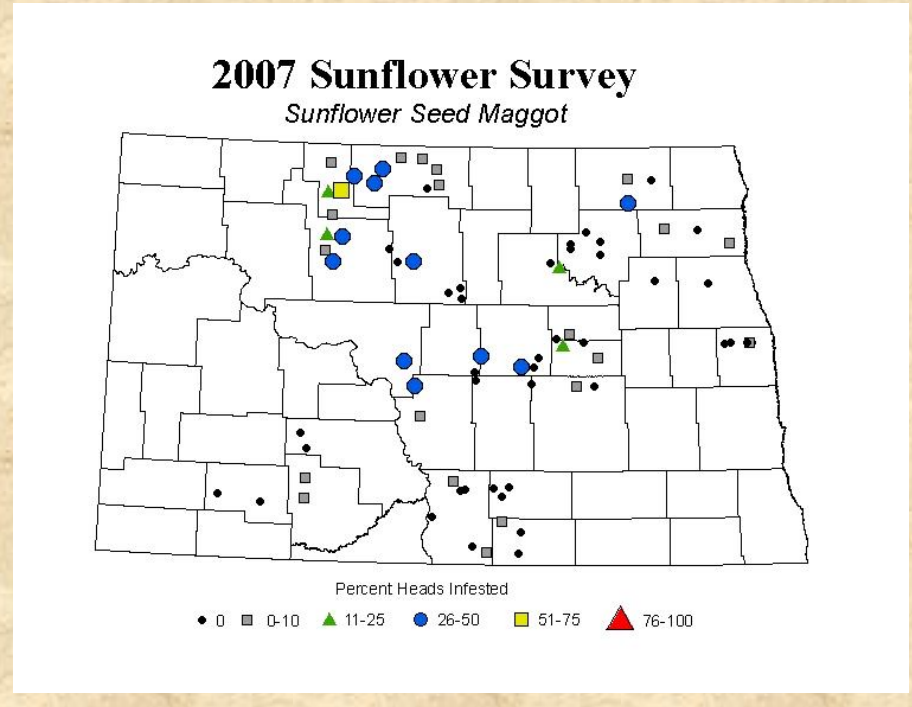
Sunflower Seed Maggot – *Neotephritis finalis*

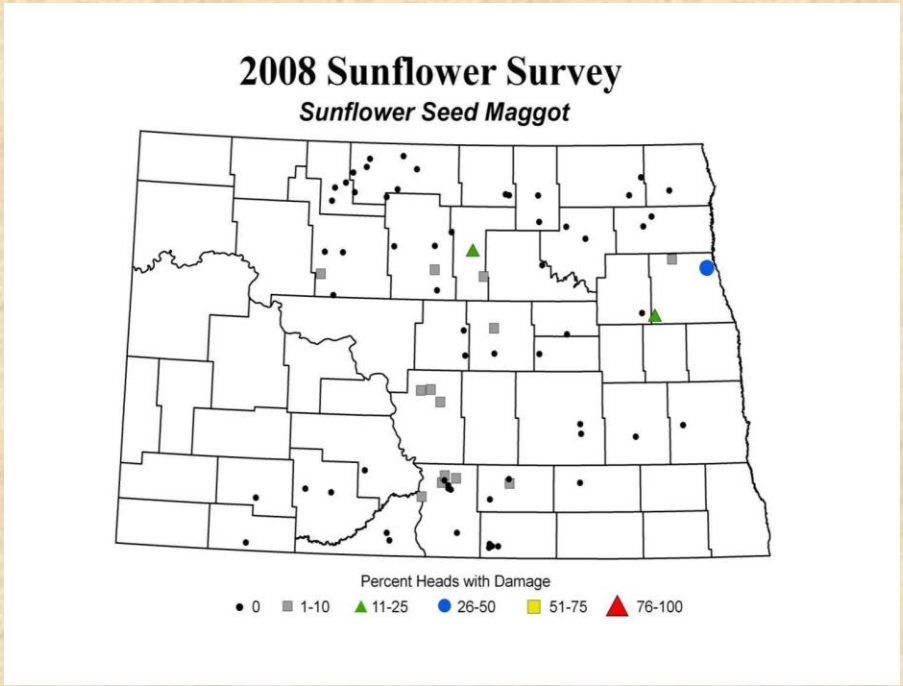
- An emerging pest in North Dakota
- A serious pest in some parts of US and Canada
- In 1970s- Most destructive pest in north Georgia
- Diptera: Tephritidae
- A head feeding insect

USA Sunflower Survey

Partnership of University, USDA & Industry

Sunflower Survey



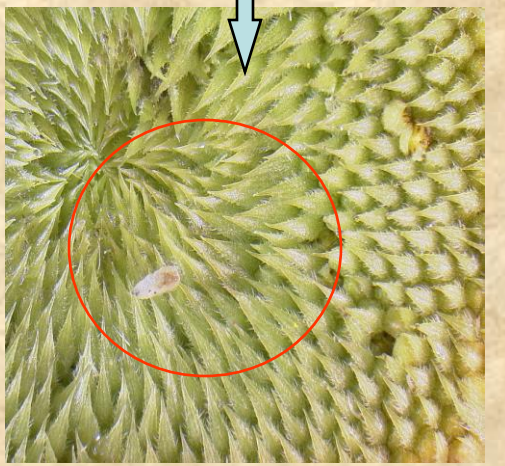


National Sunflower Association

Life Cycle of Seed Maggot

Two generations per year. (64-87 days)

All stages (R1-R6) 4 days



8-9 days **Overwinters???** **14-16 days**

Damage

- Caused by larvae (maggots)
- Newly hatched larvae tunnel through the young ovarian walls and destroy seeds
- Mature larvae feed on older heads

Objectives

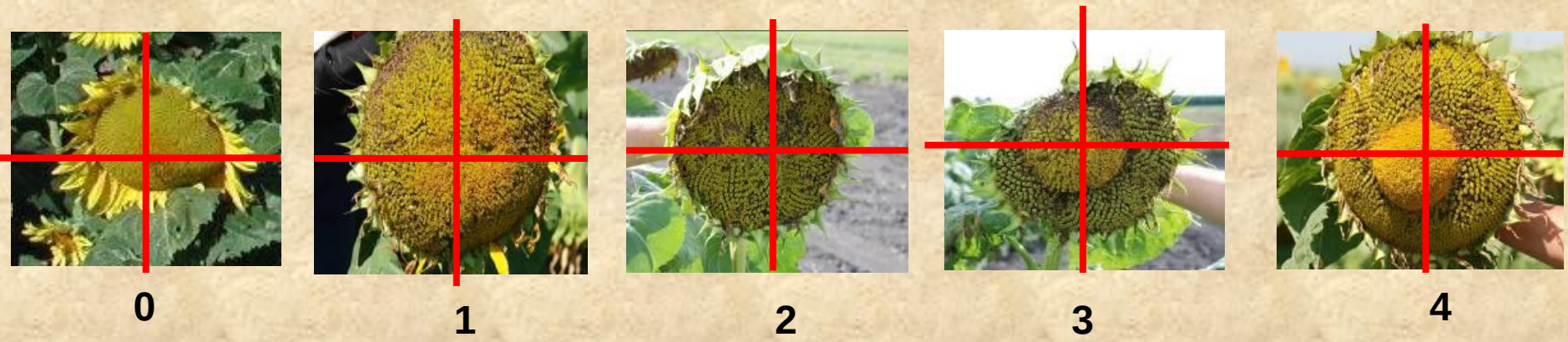
1. Determine the impact and economic threshold for sunflower seed maggot
2. Evaluate planting date as a pest management strategy
3. Evaluate the efficacy and application timing of insecticides

Methods

- Location – Prosper, ND (NDSU Ag. Research Site)
- Three separate studies
    1. injury ratings
    2. impact of planting date
    3. evaluation of insecticides and application timing
- Oilseed ‘Advanta Pacific 6111’

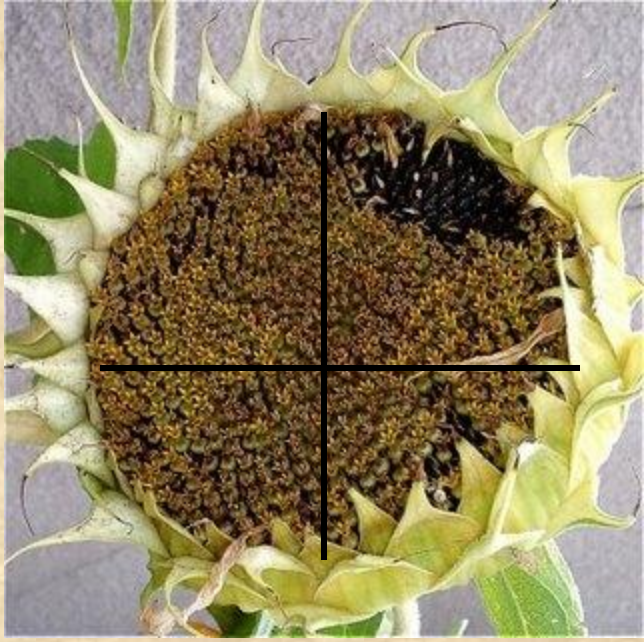
1. Injury ratings

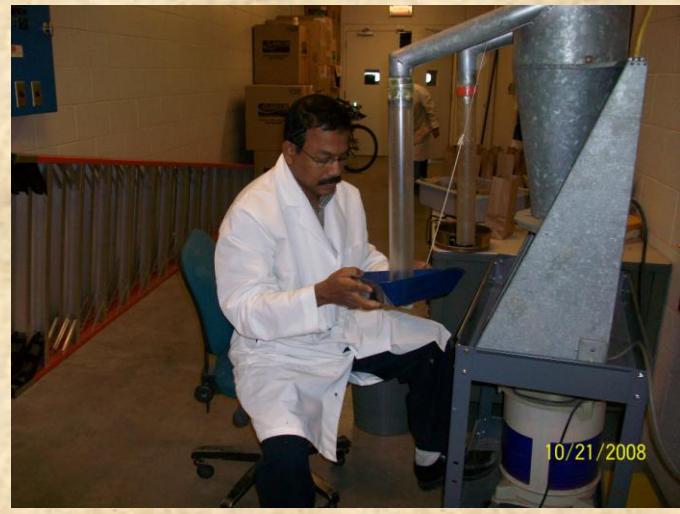
- 100ft x 100ft plot
- Planted on 25 May 2008
- Damage rating scale 0-4



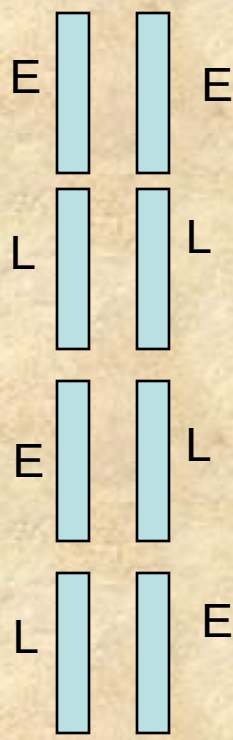
1. Injury ratings

- 20 heads from each rating were harvested randomly
- Heads were dried
- Two diameters of each head were measured
- Heads were threshed
- Healthy seeds were separated
- Weight and volume were measured





2. Planting date



- Two planting dates: Early and Late
- Early – 25 May 2008 Late - 18 June 2008
- Randomized complete block design
- Four row plot with 10ft x 30ft dimensions
- 10 heads from each plot were harvested, dried, and threshed
- Weight and volume of healthy seeds were measured

3. Insecticide Timing

- Randomized complete block design
- Six treatments:
  - Untreated check
  - Asana XL at R1
  - Asana XL at R3
  - Asana XL at R5.1
  - Cruiser seed treatment (ST) alone
  - Cruiser ST + Asana XL at R5.1
- 5.8 fl oz/acre using handheld boom and backpack CO_2 sprayer

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Insecticide Timing

- 10 heads from each plot were harvested
- Heads were dried and threshed
- Healthy seeds were separated
- Weight and volume of the healthy seeds were measured

Data Analysis

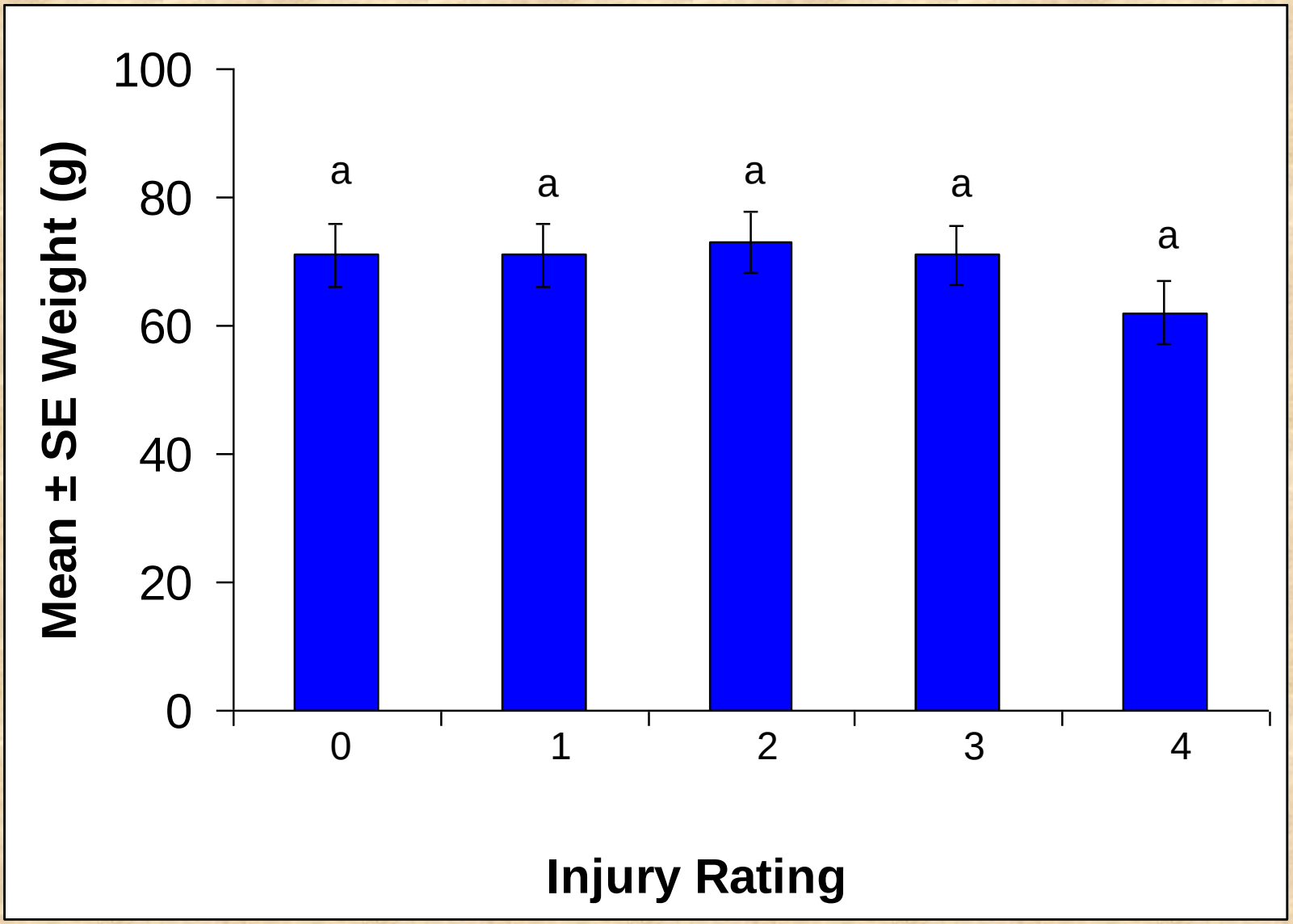
- Data were analyzed using SAS 9.1.3
- ANCOVA was performed using average diameter as covariate

Results

1. Injury Ratings

	DF	F	P ≤ 0.05
Injury Rating	4	0.75	0.56
Ave. Diameter	1	133.05	<0.0001
Ave. Diam. x Injury Rating	4	0.50	0.73

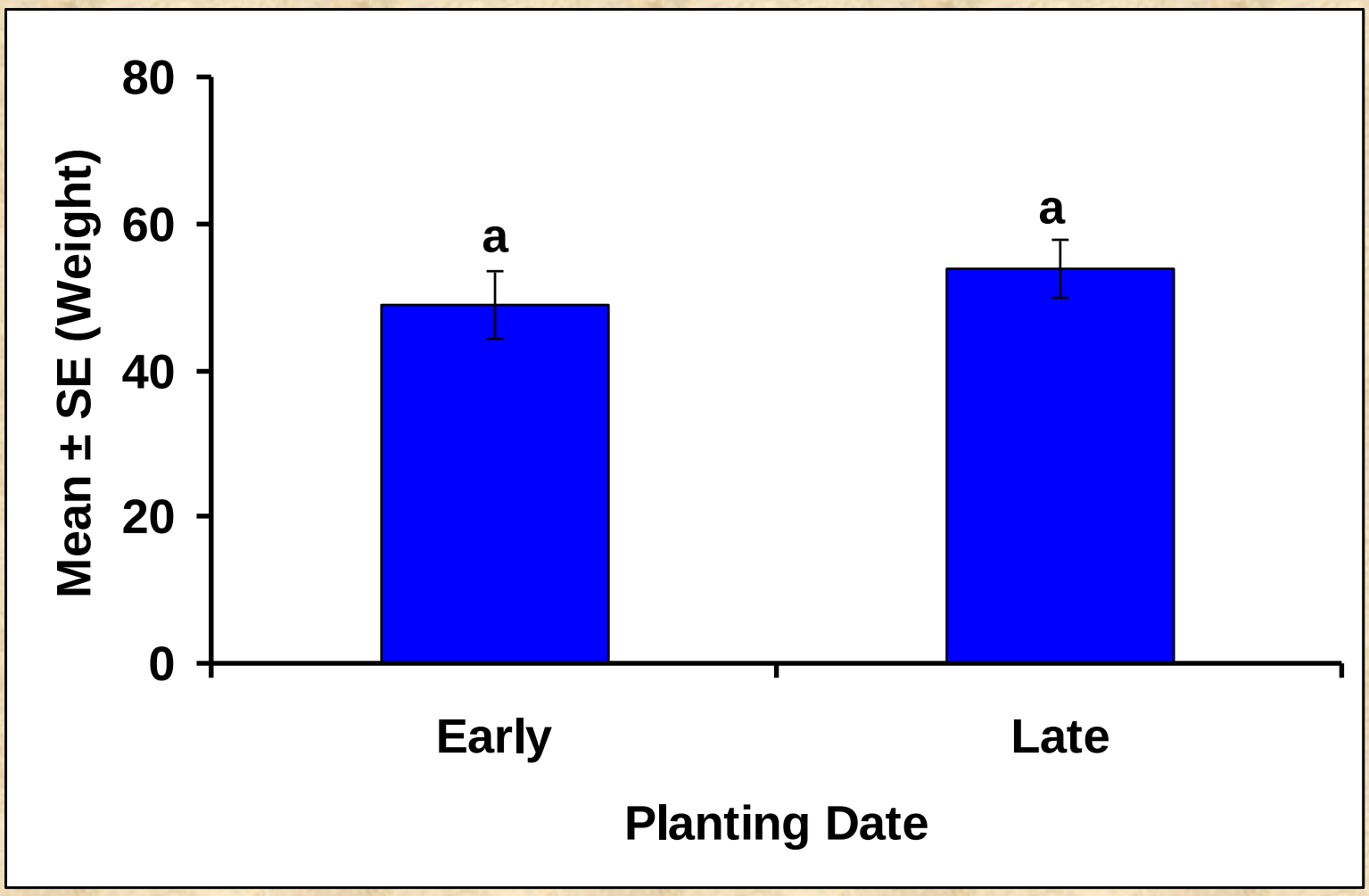
Injury Ratings vs. mean seed weight



2. Planting Date - Prosper

	DF	F	P ≤ 0.05
Treatment	1	3.91	0.053
Ave. Diameter	1	135.31	<0.0001
Ave. Diam. x Treatment	4	3.76	0.58

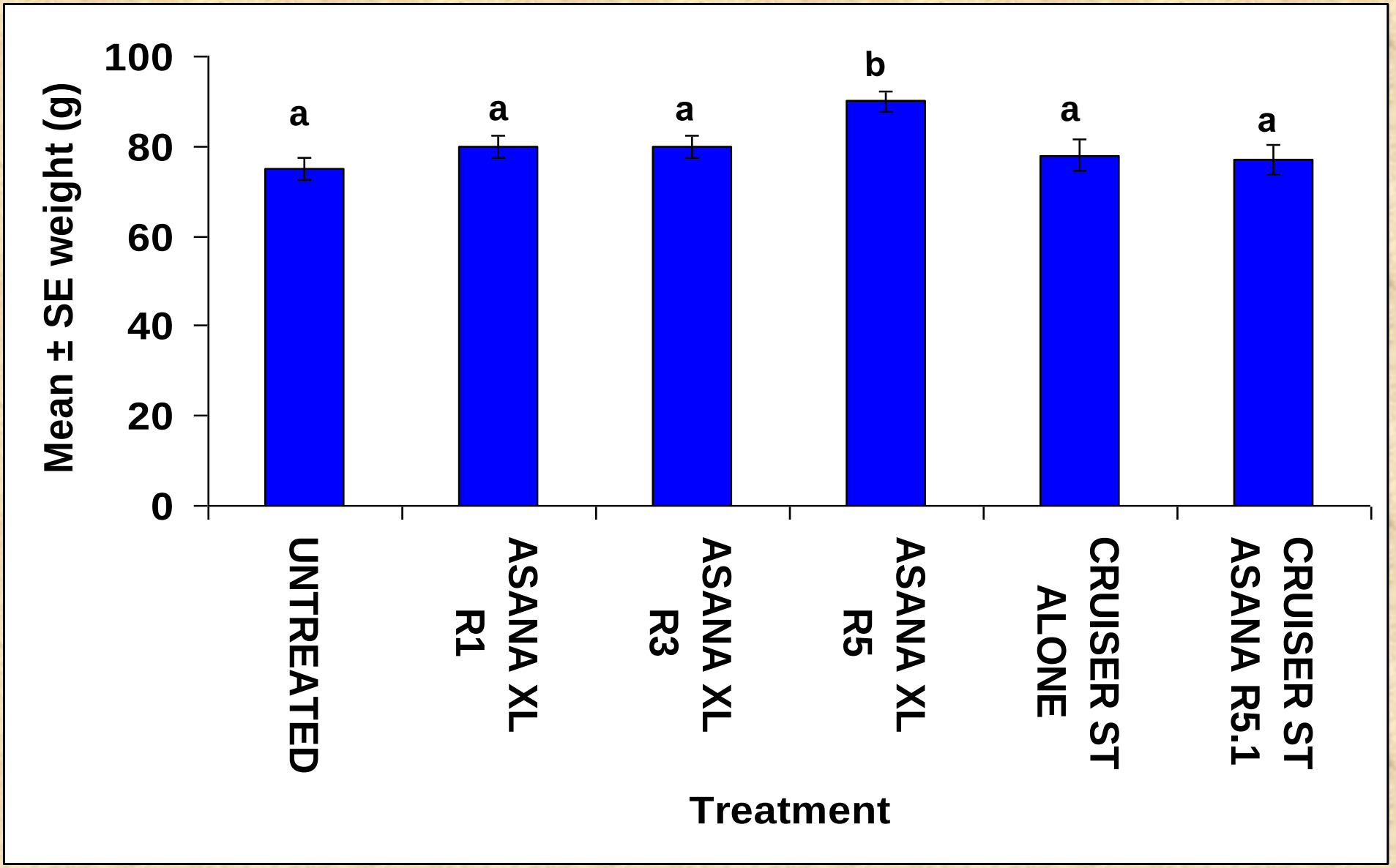
Planting date vs. mean seed weight



3. Insecticide Timing

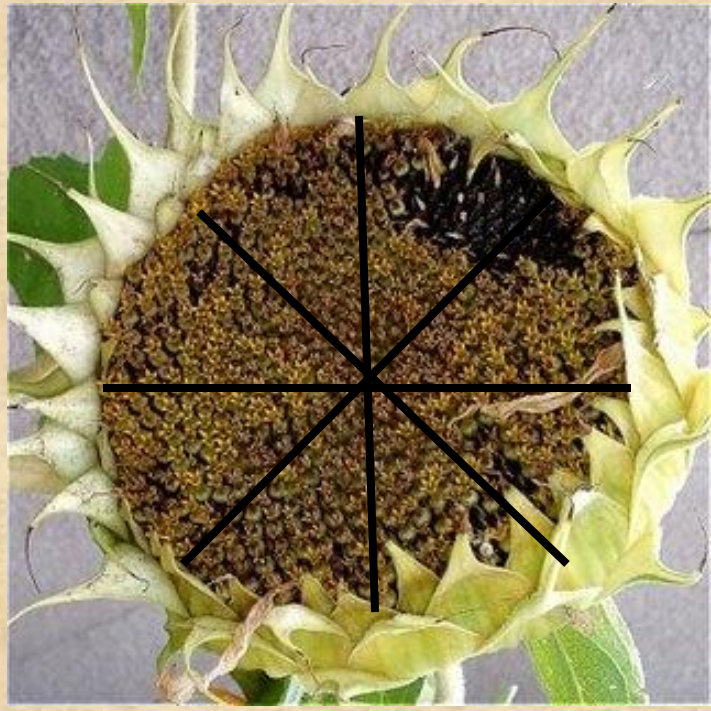
	DF	F	P ≤ 0.05
Treatment	5	3.84	0.0024
Ave. Diameter	1	312	<0.0001
Ave. Diam. x Treatment	5	0.20	0.96

Insecticide treatment vs. mean seed weight



Future Directions

- Quantify the categories
- Exclude other insects
- More locations
- Larger sample size
- Measure the length of crease



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Thank You!