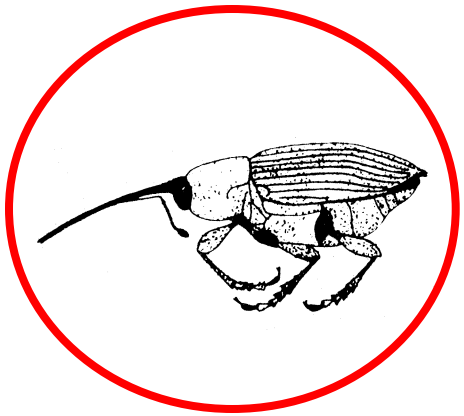
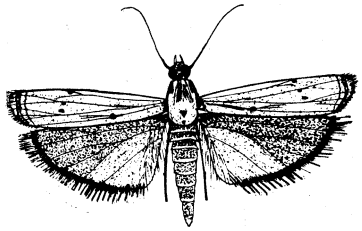
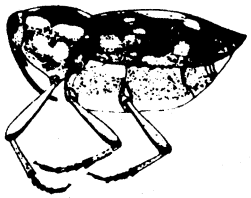
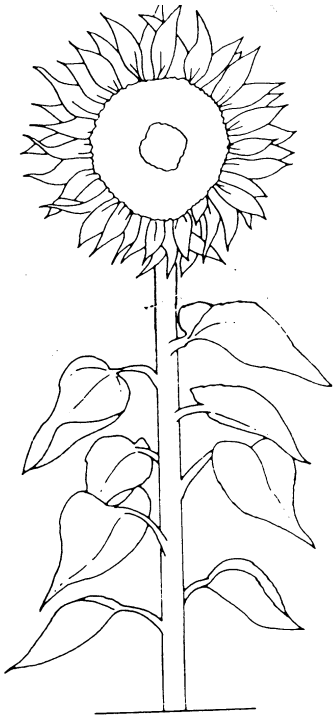
Fatty acid data and crop surveys indicate sources of red seed weevil populations and suggest strategies for management









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Red seed weevil biology

- *Smicronyx fulvus* LeConte
- #1 insect pest in SD, ND
- Single generation per year
- Larvae develop from single seed
- Overwinter in soil, adults emerge in July

Red seed weevil populations

- **Sources of adults important for management**

- **<u>Do adult fatty acids reflect larval diets?</u>**
  - **Traditional (wild)** **≈ 15-30% oleic acid**
  - **Mid-oleic (NuSun)** **≈ 55-75% oleic acid**
  - **High oleic** **≈ 80-90% oleic acid**

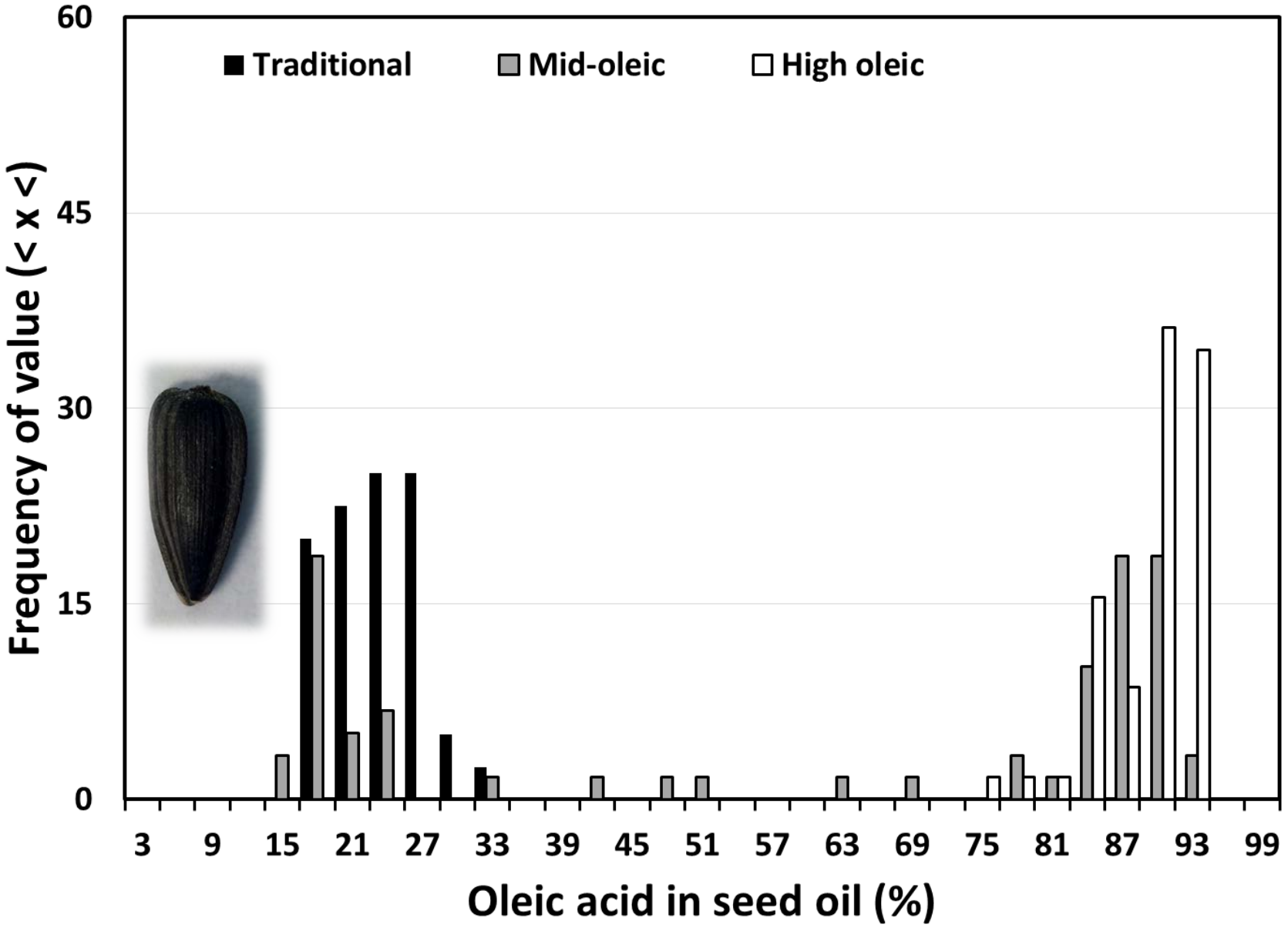
- **<u>Can crop survey data help?</u>**

Do adult fatty acids reflect larval diets?

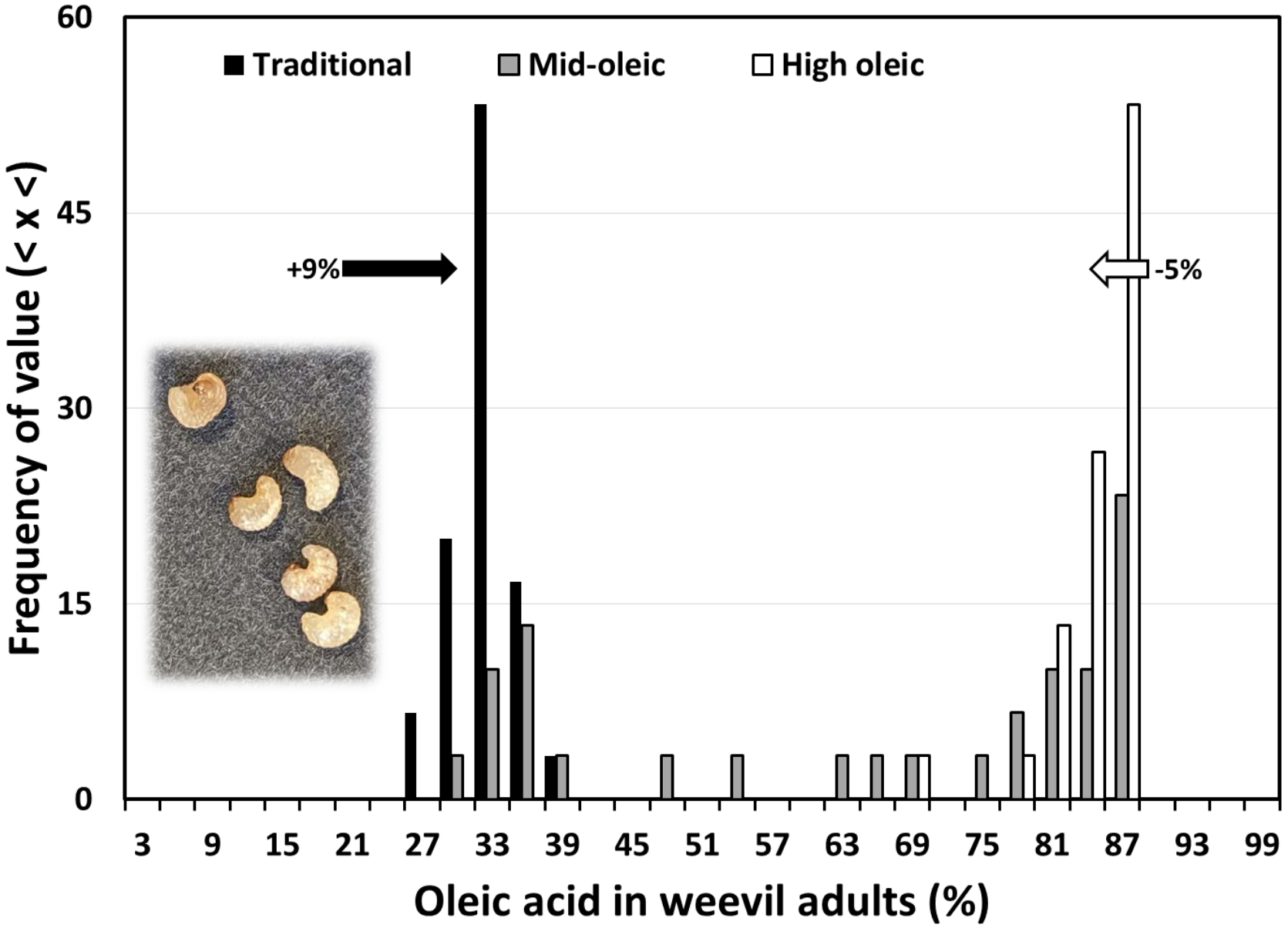
- **Planted, infested and bagged**
  - **Traditional (HA 89)**
  - **Mid-oleic (NuSun hybrid)**
  - **High oleic (HOLS-4)**

- **Fatty acid data**
  - **Individual seeds**
  - **Larvae**
  - **Adults (overwinter in lab)**
  - **(Field collected adults)**

Do adult fatty acids reflect larval diets?



Do adult fatty acids reflect larval diets?



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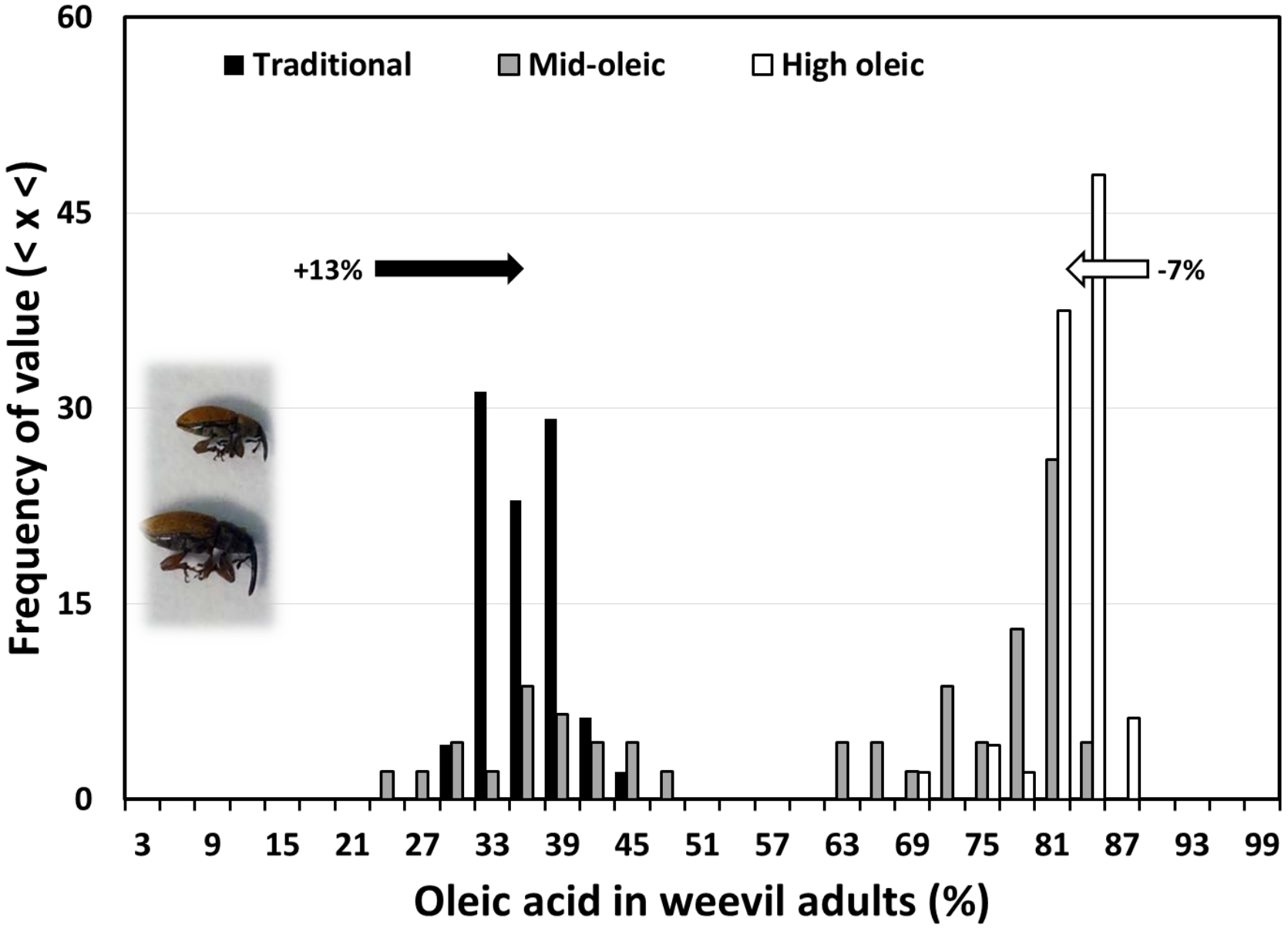

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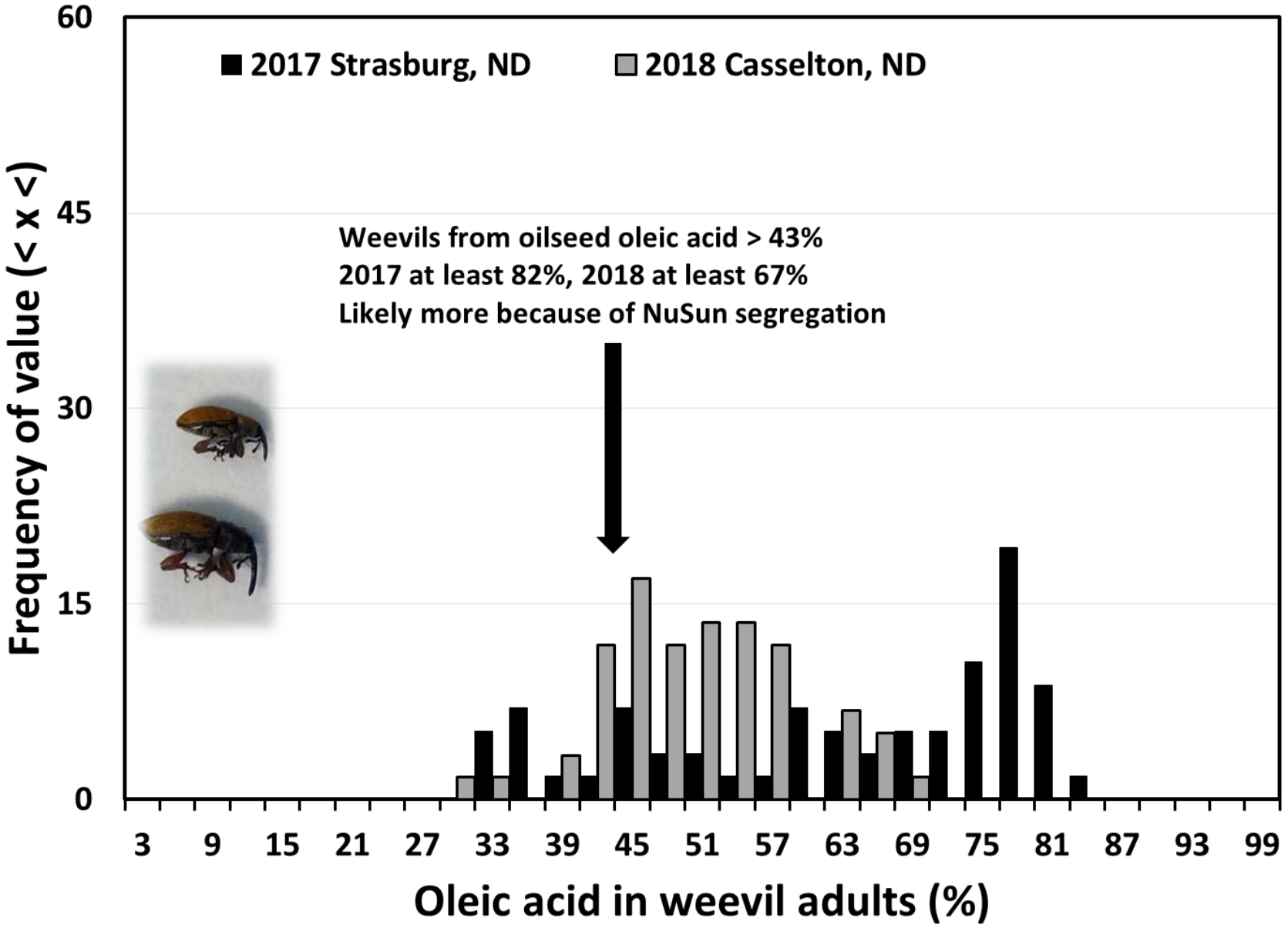


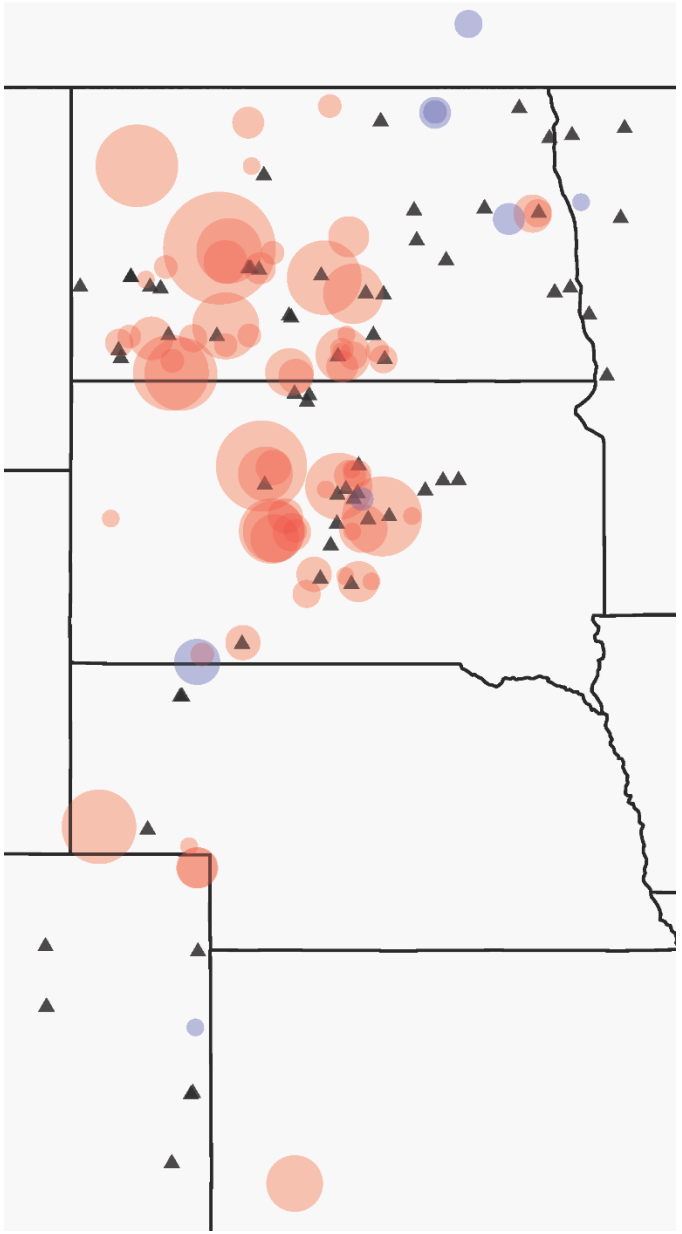
Can crop survey data help?

- National Sunflower Association surveys
  - Every two years
  - About 150 fields
  - Seed samples collected
- Insect damage data
  - X-ray images
  - % seed damage

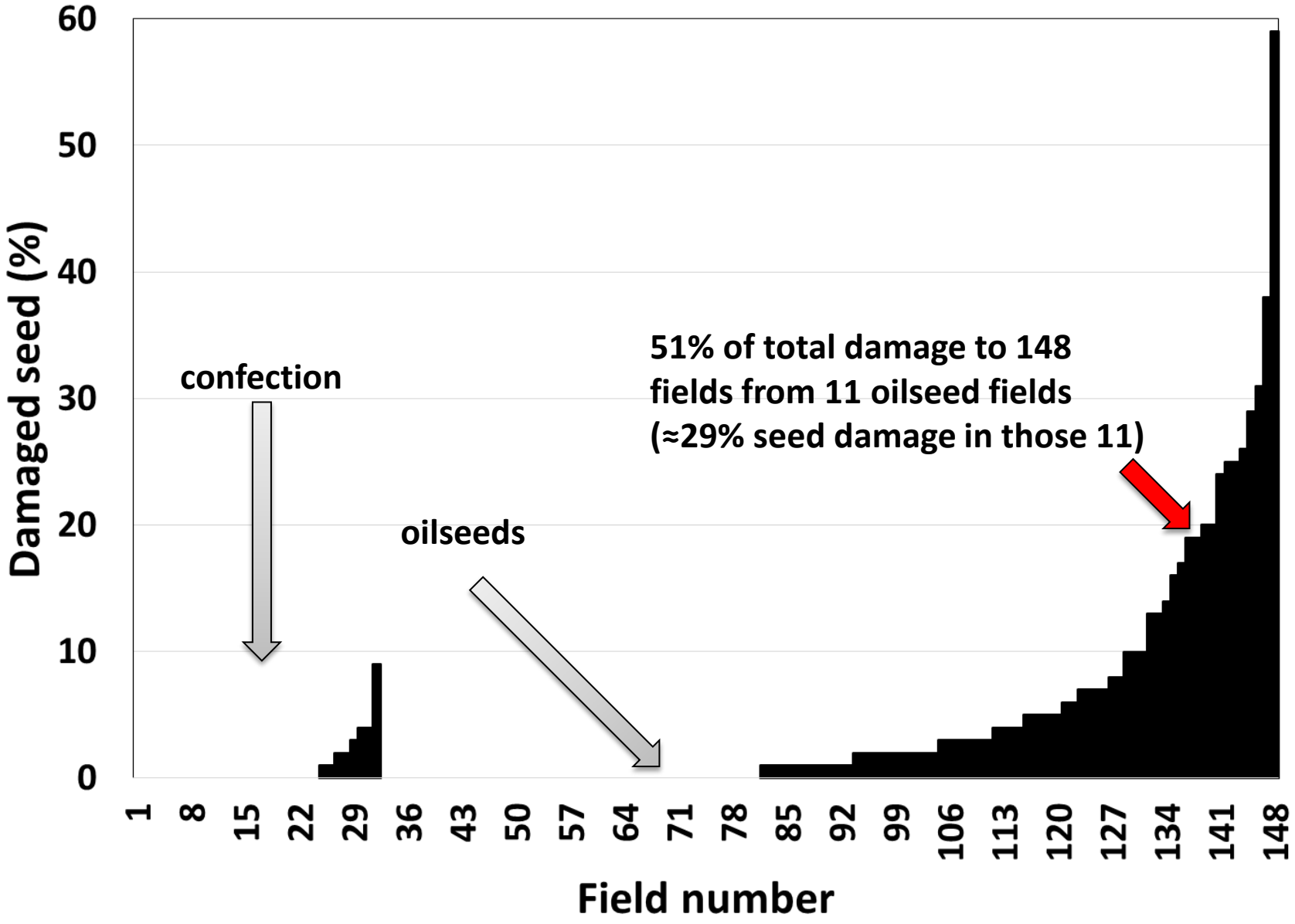
Can crop survey data help (2017)?

- **Weevil seed damage**
  - n=162 fields
  - Weevil primary in 85%
  - Per-sample damage > 2x

  - No spatial pattern
  - 6 of most damaged (26%)
  - At 5.5 miles away (2%)



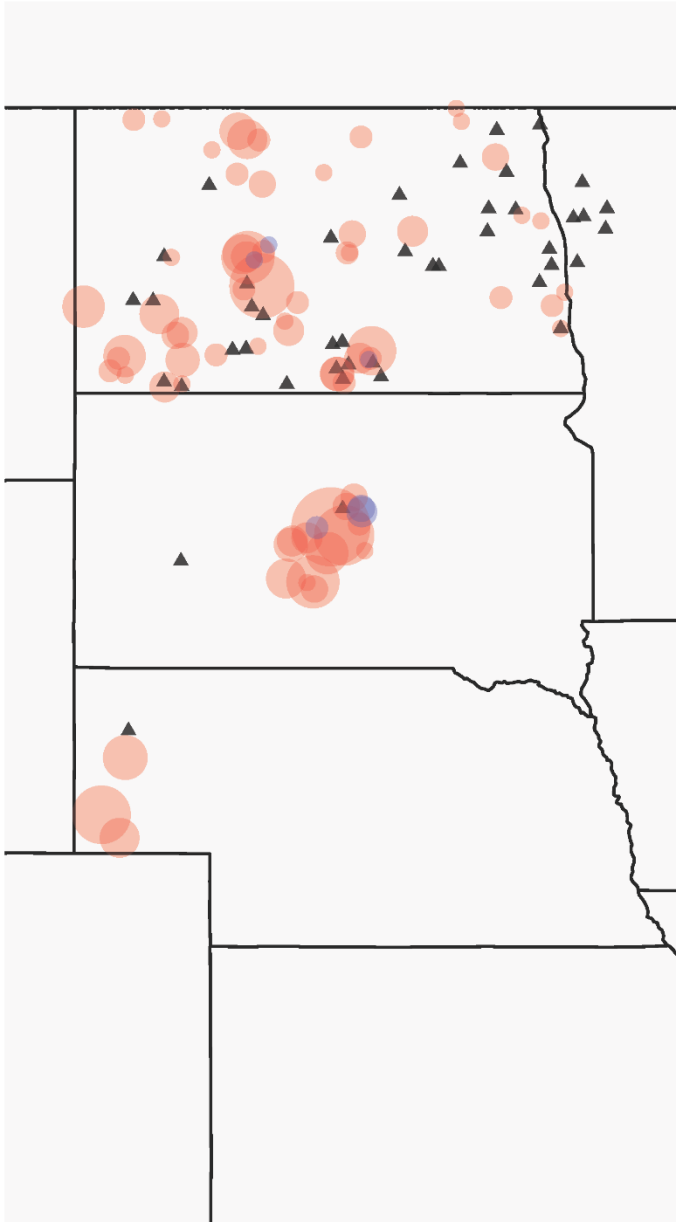
Can crop survey data help (2017)?



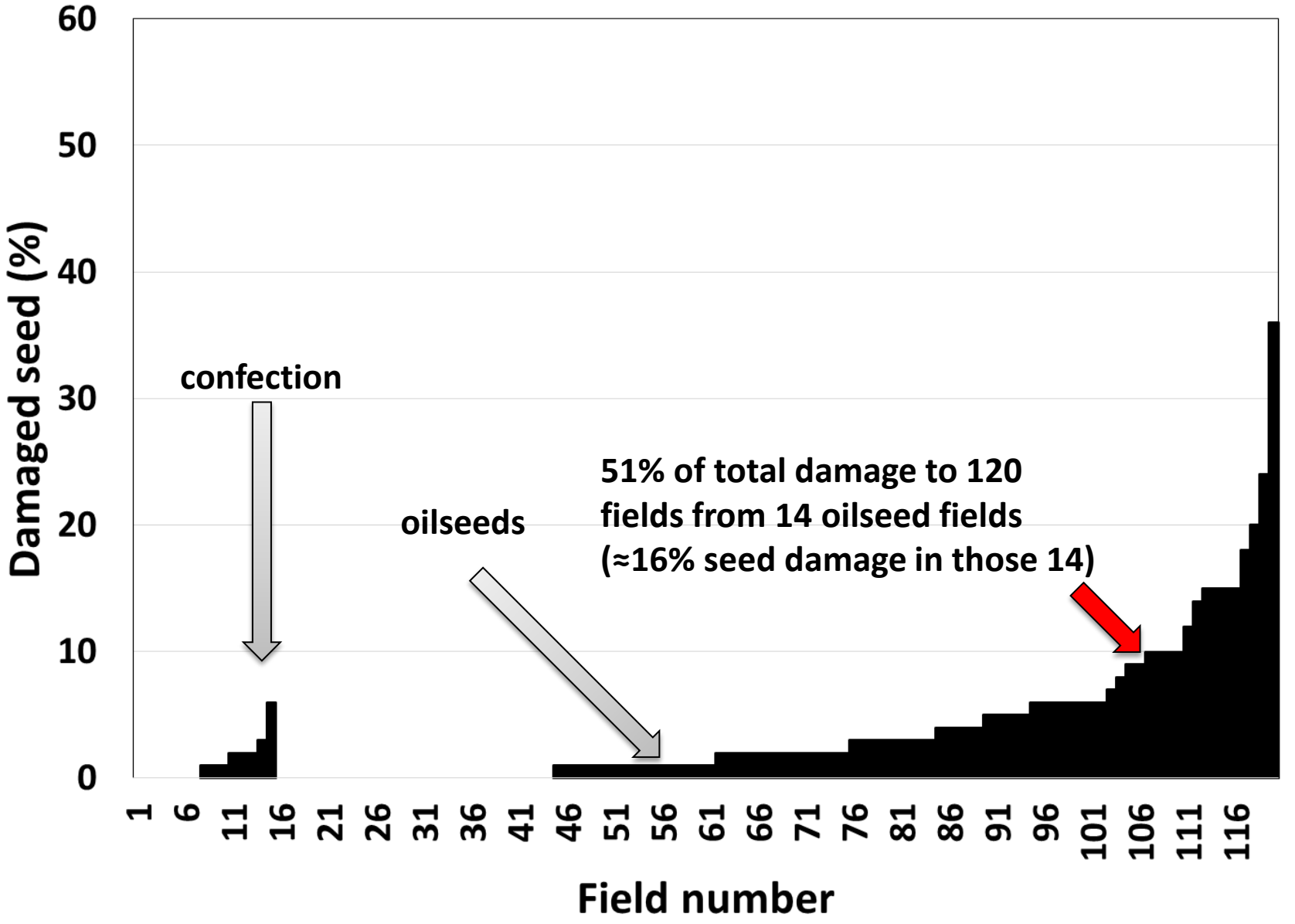
Can crop survey data help (2019)?

- **Weevil seed damage**
  - **n=120 fields**
  - **Weevil primary in 74%**
  - **Per-sample damage > 2x**

  - **Closeness of heavy & light (or undamaged) fields points to management**



Can crop survey data help (2019)?



Summary

- **Weevils mostly "are what they ate"**
  - **Oleic acid values slightly less extreme in weevils**
  - **Main source = (unmanaged?) oilseed sunflowers**
- **No apparent spatial pattern of seed damage**
  - **Confections getting insecticide applications**
- **Management should consider insecticides +**
  - **HA 488, resistance with ≈ 70% less damage**
  - **Planting time modifications (≈ 30% less damage)**

Summary – Future Directions

- **How far do adult weevils disperse?**
  - **Is there a safe distance from last year's crop?**
- **Can we predict weevil emergence reliably?**
  - **Are altered planting dates otherwise suitable?**
- **What is the role of resistant germplasm?**
  - **How easily can this be used commercially?**
  - **What about weevils that survive on HA 489?**

Acknowledgements

- National Sunflower Association
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