Artificial Intelligence-based Insect Traps for Monitoring Sugarbeet Root Maggot Fly Activity

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Artificial Intelligence

- Teachable machines that react to information like humans

- Machine "learns" to recognize information patterns & performs a function controlled by an algorithm

- Machine continues "learning" based on ongoing feedback into algorithm

Our Experiment

- Two A.I.-based smart traps developed by Spensa Technologies® (bought out by DTN)

    - ✓ **Smart Trap™:** HD digital images of trapped insects on a sticky card inside trap housing

    - ✓ **Z-Trap™:** electrical impedance from insect's body on "bug zapper" style electrodes

- Traps ID target insect, send data to a website via a cellular network

Treatments

1. Smart Trap^{TM}

2. Z-Trap^{TM}

3. Sticky Stake*

4. Smart Trap, *baited*

5. Z-Trap, *baited*

6. Sticky Stake, *baited*

*Blickenstaff, C.C., and R.E. Peckenpaugh. 1976. J. Am. Soc. Sugar Beet Technol. 19: 112–117.

Materials & Methods

Location: St. Thomas, ND

Design: Randomized Complete Block (4 replications)

Trap spacing: 70 ft apart within a replicate (reps 150 ft apart)

Assessments: Capture rate, ID & reporting accuracy (every 3-4 d)

Duration: 9 trapping periods (early June to early July)
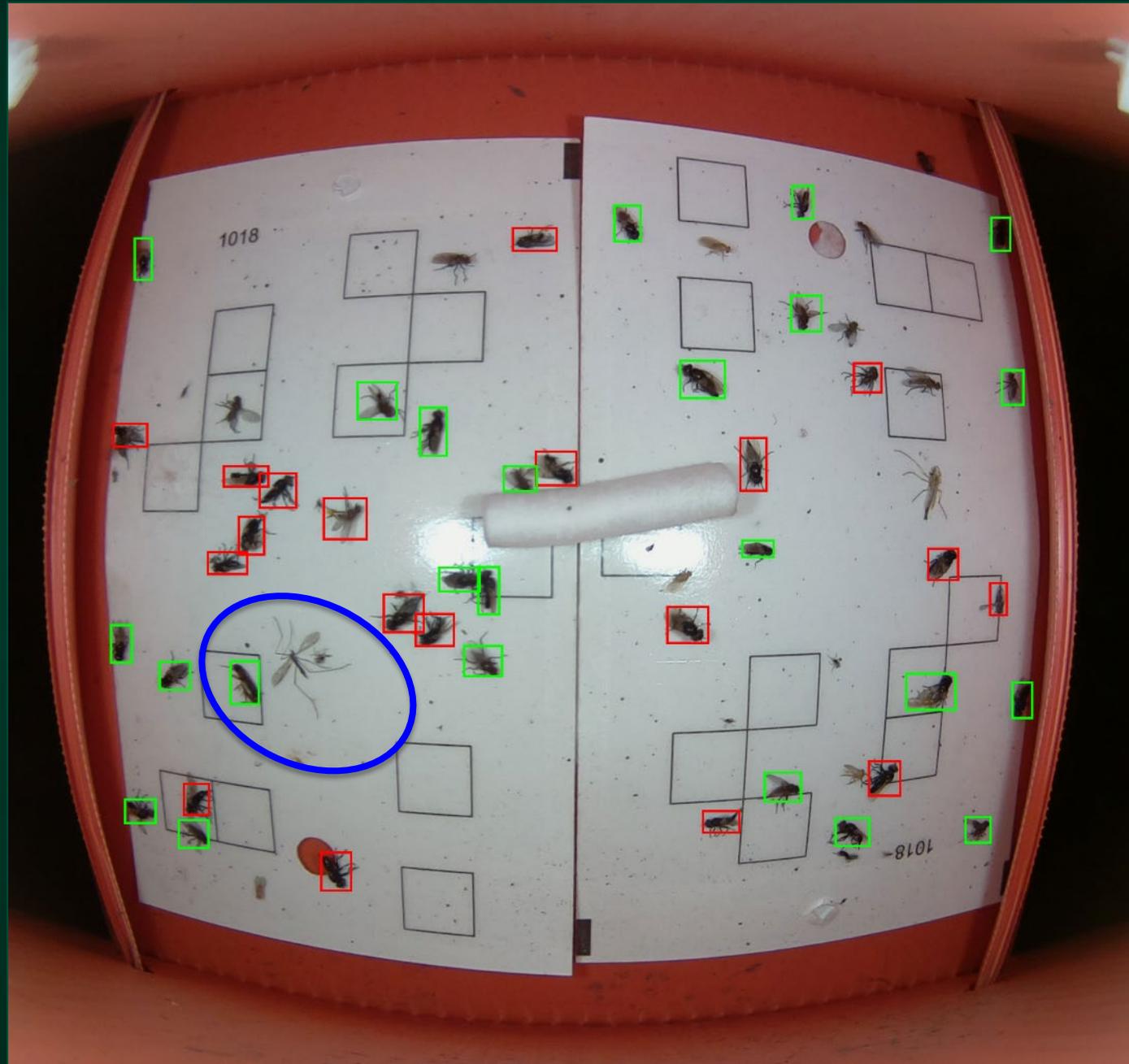
Z-Trap electrodes
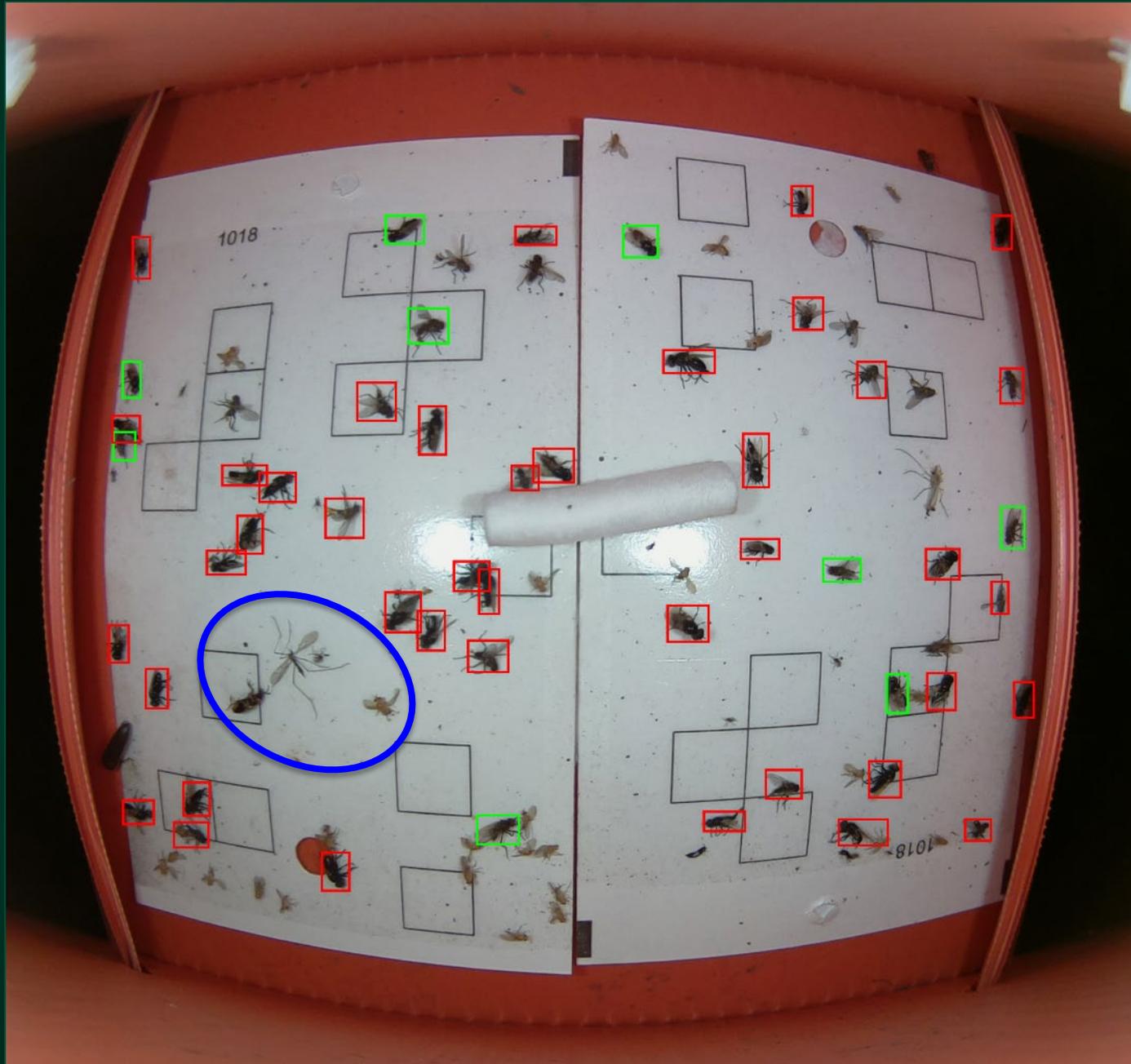
Smart Trap™

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June 13

June 14

Mark Boetel: NDSU, St. Thomas
SUGAR BEET

‹ Fields   ✎   Weather   Crop Planning   Tr

📅 YOU ARE VIEWING A PAST SEASON (2018).

Mark Boetel ⬍ 〉 NDSU ⬍ 〉 St. Thomas ⬍

	06/22	06/23	06/24	12/31 ▼
010C SBRM24	55	38	8	
0174 SBRM24	29	34	20	
0177 SBRM24	35	31	6	
0178 SBRM24	32	31	15	
0185 SBRM24	28	35	1	
0188 SBRM24	21	29	6	
020D SBRM24	30	41	13	
0255 SBRM24	28	28	13	
0328 SBRM24	92	42	19	
0335 SBRM24	92	50	24	

‹ 1/3 ›   Save

Add: + Trap   + DTN Trap   + Puffer®

Puffer® is a registered trademark of Suterra, LLC.

Export ⌃
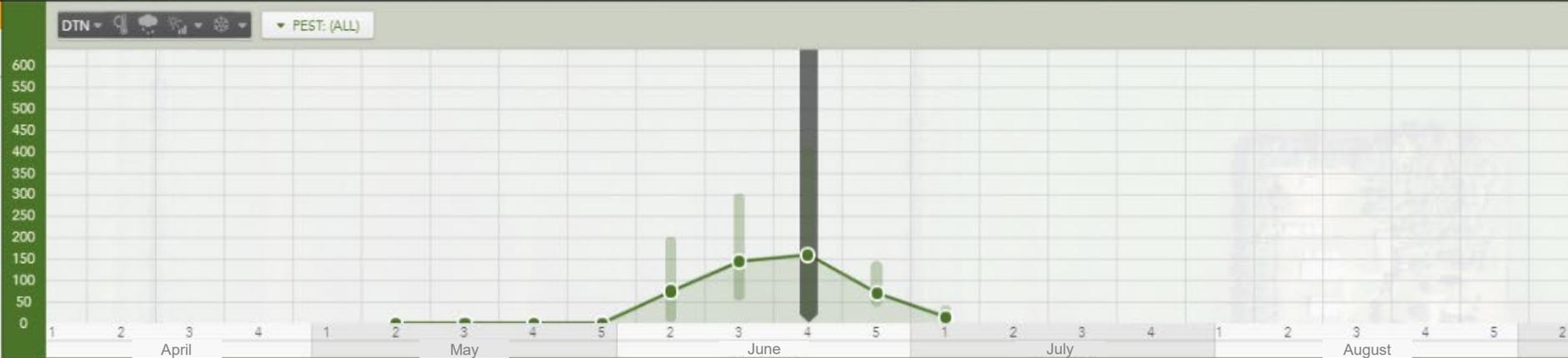
Group By
● Day
○ Week
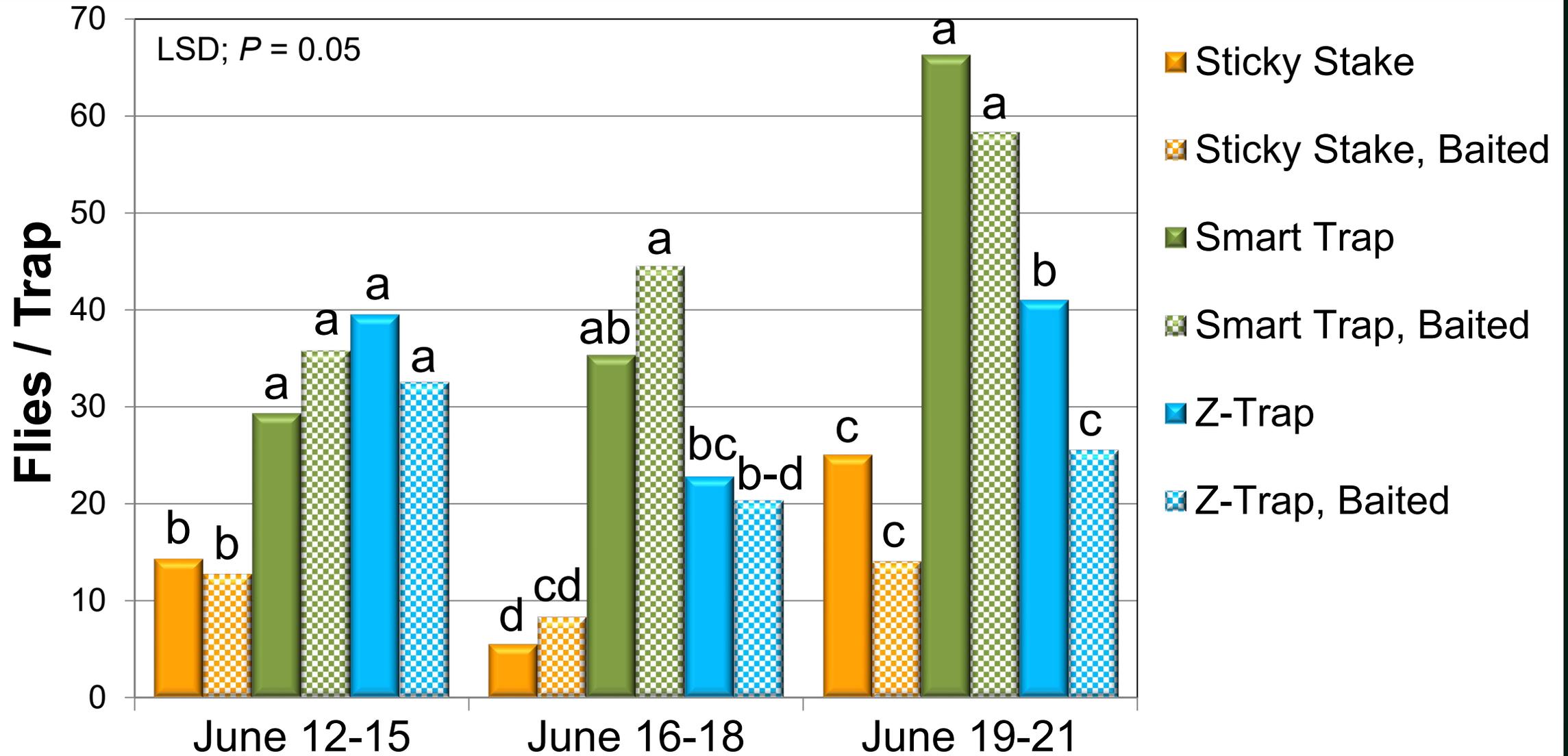○ No Grouping

Date range
○ All Dates
● Date Range
1/1/2023 ▼ - 12/31/2023 ▼

Export

DTN ▼   ▼ PEST: (ALL)

April   May   June   July   August

80TH ST NE   80TH ST NE   80TH ST NE   80TH ST NE

| TRAP 073D **131** | SENTINEL 0185 **126** | Stk - R **26** | StkB - **14** | TRAP 078D **206** | SENTINEL 0188 **116** |

Stk - R **32** | TRAP 0335 **317** | SENTINEL 010C **180** | StkB - **22** | SENTINEL 0177 **131** | TRAP 073B **239**

SENTINEL 0174 **145** | TRAP 0328 **361** | StkB - **35** | SENTINEL 0255 **153** | TRAP 074E **310** | Stk - R **33**

TRAP 069F **413** | TRAP 073A **406** | SENTINEL 020D **182** | SENTINEL 0178 **194** | Stk - R **31** | StkB - **18**

St. Thomas
75.9 acres
Sugar Beet
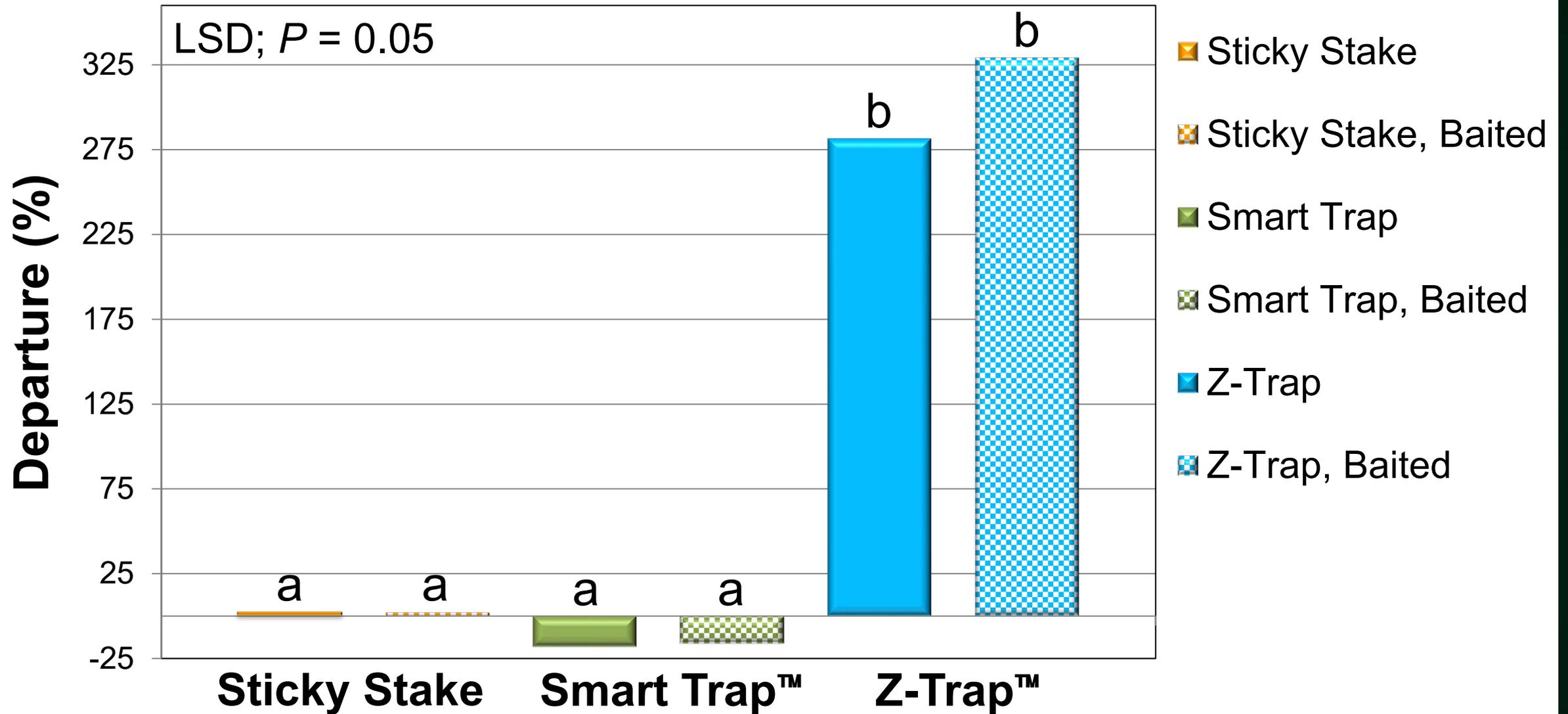
Conclusions

- Both A.I.-based traps successfully captured SBRM flies

- Flies recovered after being zapped in Z-traps
  (a kill agent was used in collection containers after 1st year)

- Smart Trap™ accuracy was 82-84% (without new feedback to algorithm)

- Feedback is being compiled to further train algorithm

- Findings are preliminary (more data to process)

- Smart Trap™ has great potential for monitoring SBRM

Acknowledgments

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- Spensa and DTN

Thank you!

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