Stress Tested:
What Makes or Breaks Soybean?

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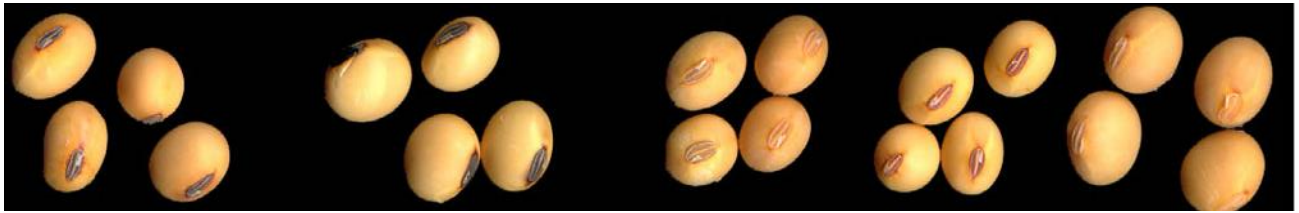
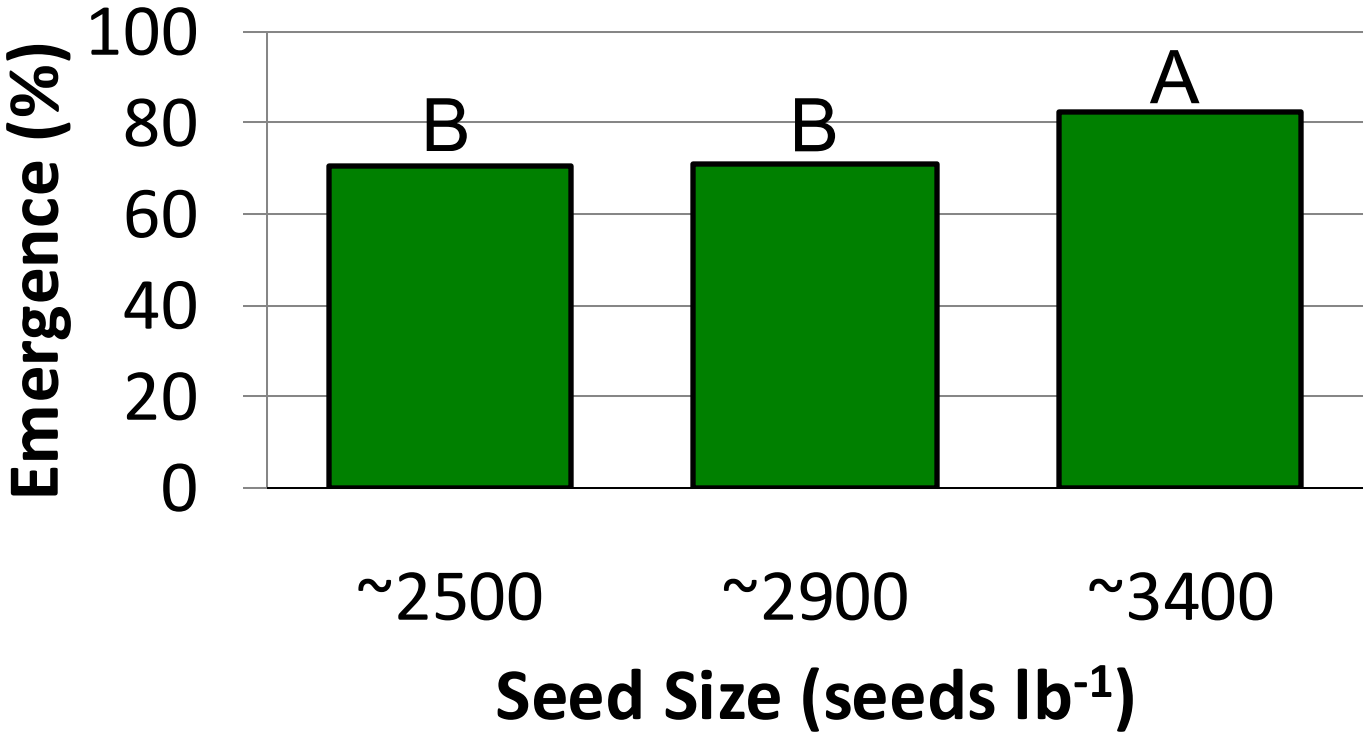
SOYBEAN STATION

DELIVERING FIRST CLASS SOYBEAN INFORMATION

Will Large Soybean Seeds Emerge Faster Than Small Soybean Seeds?



Percent Emergence by Seed Size



Conley, 2009 unpublished

Soil Temperature & Seedling Growth

- 50°F soil is the accepted low soil temp
  - Some soybeans have germinated in 36 to 43°F
- Time to soybean germination & emergence can be related to heat unit accumulation.
  - Growing Degree Days (GDDs)

Planting Temperature (4 Days)

59 F for 4 days

48 F for first 24 hrs
then 59 F for 3 days

Planting Temperature (10 Days)

59 F for 10 days

48 F for first 24 hrs then 59 F for 9 days

Warm Soil (77 F) for 17 Days

Cold (45 F) Soil for 20 hours then Warm (77 F)

Horst Bohner, OMAFRA, greenhouse

Warm (77 F) for 8 hours, then 45 F for 4 Days, then Warm (77 F)

Delayed Emergence

- Soil crust (Rathore, 1983)
- Compaction (Knittle et al., 1979)
- Depth of planting (Hamman et al., 2002)
- Low soil moisture (Alm et al., 1993)
- Residue

~1 inch Crust

Soil Crusting

Management decisions that impact emergence?

Soil Crusting:

Loss of 1 cotyledon rarely reduces yield

Loss of both cotyledons can reduce yield 2 to 7%

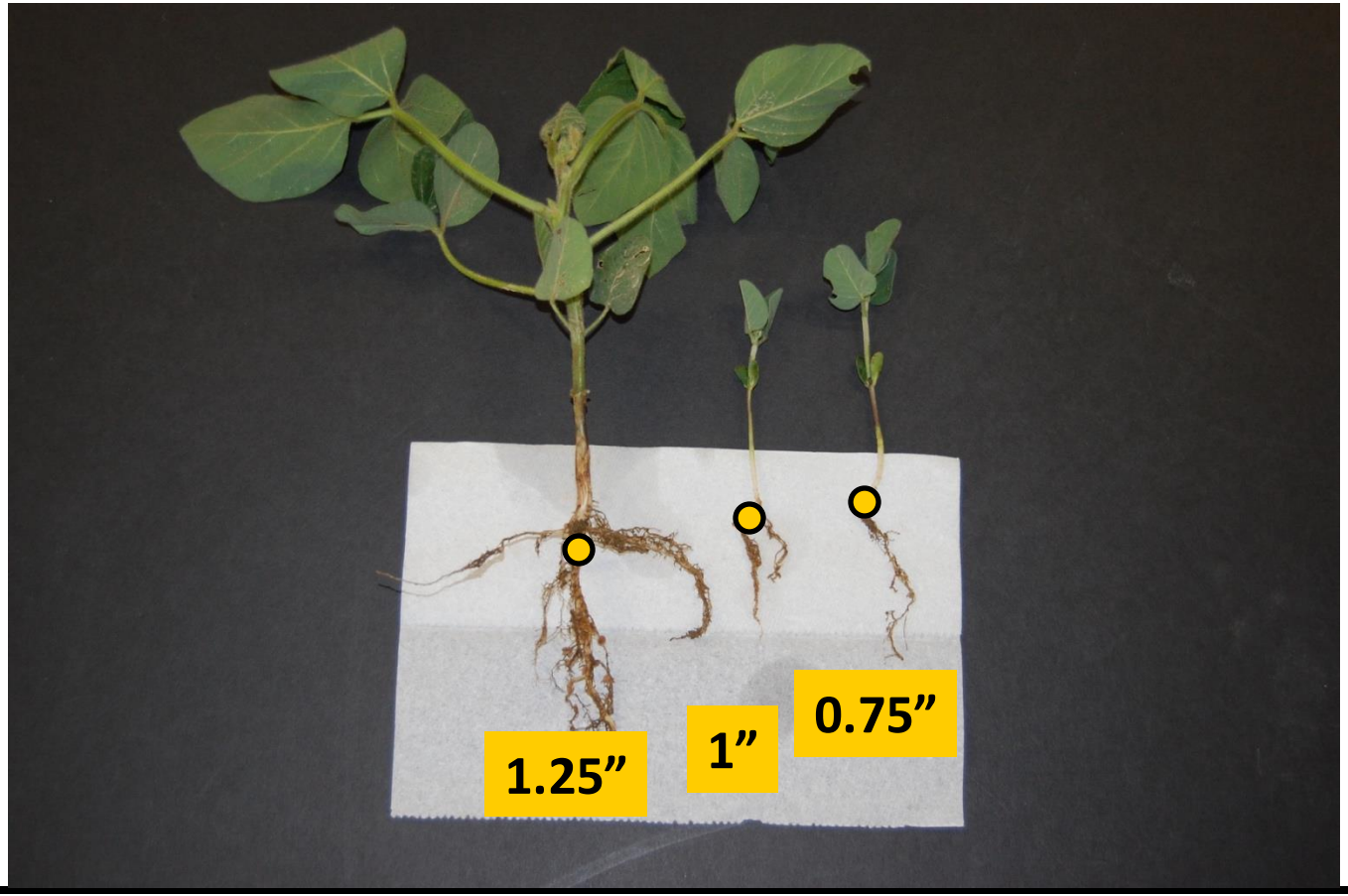
Rotary Hoe


Rotary Hoed
Crusted

7 Days After Rotary Hoe Event

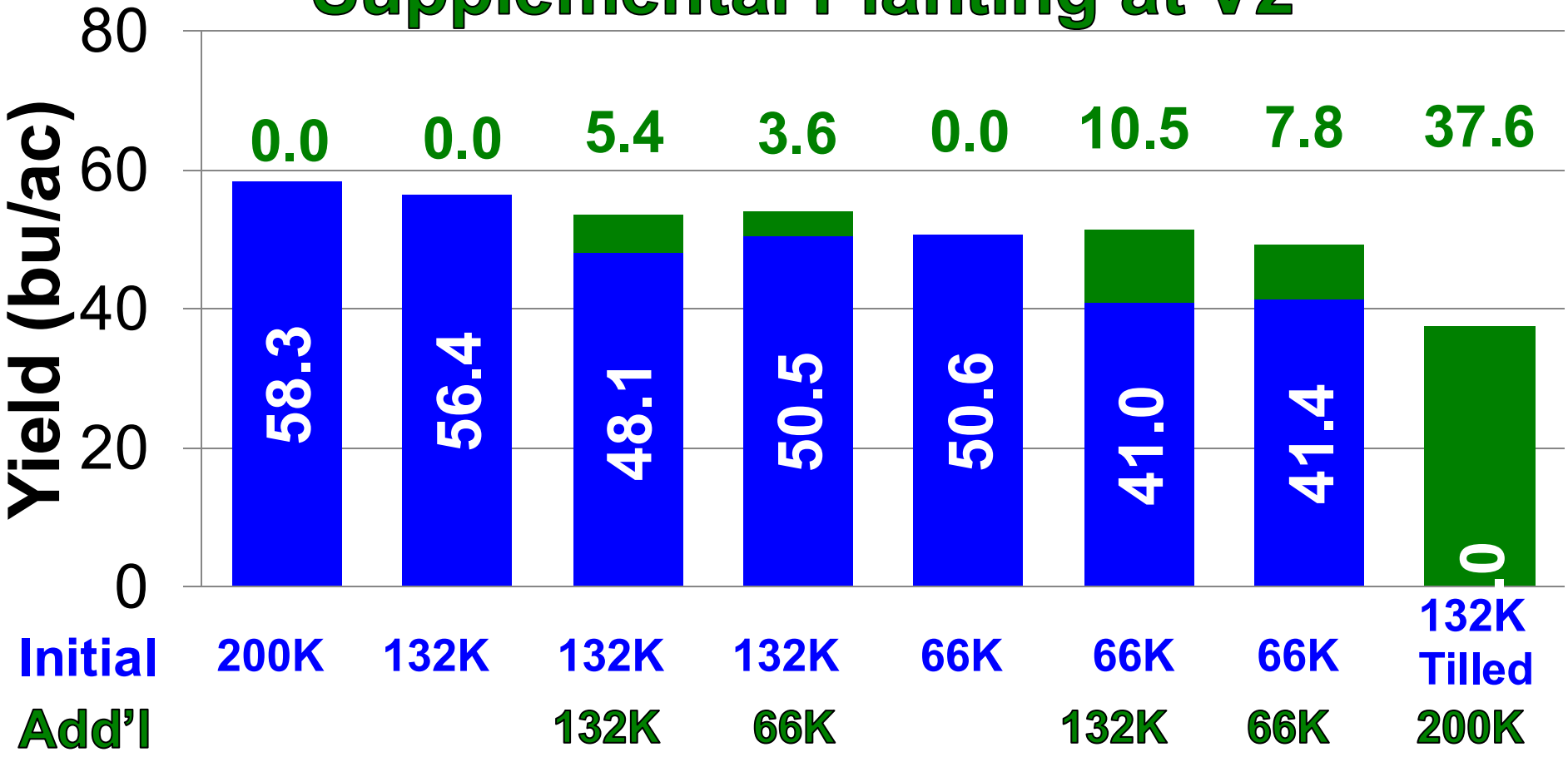
~11,000 plants acre^{-1} more

Seed Depth Issues Under Dry Conditions



Limited Soil Moisture

Supplemental Planting at V2



Timing of Delay

Low Population w/ 100% delay

50 K plants/ac on 15 inches

+

50 K plants/ac in b/t 15-in

Initial plants: V7

June 30, 2011

Initial Stand of 50,000 ppa in 15-in Rows

Delayed Emergence in between 15-in Rows (plant on right)

50% of yld

50% of yld

60% of yld

40% of yld

95% of yld

5% of yld

100% of yld

0% of yld

Perkins and Casteel

High Population w/ 100% delay

100 K plts/ac
on 15 inches
+
100 K plts/ac
in b/t 15-in

Initial plants were V7

June 30, 2011

Initial Stand of 100,000 ppa in 15-in Rows

Delayed Emergence in between 15-in Rows (plant on right)

50% of yld

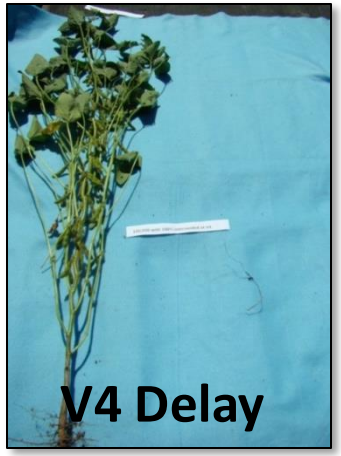
50% of yld

80% of yld

20% of yld

100% of yld

0% of yld



100% of yld

0% of yld

Perkins
and Casteel

Sandblasting with May 16th Storm

May 19th vs. June 4th

Fall rip
Spring finish
Mid-April Plant
May 15th ~V2
May 16th → Sandblasted
May 19th Replanted

Fall VT, Mid-April Plant into stale seed bed

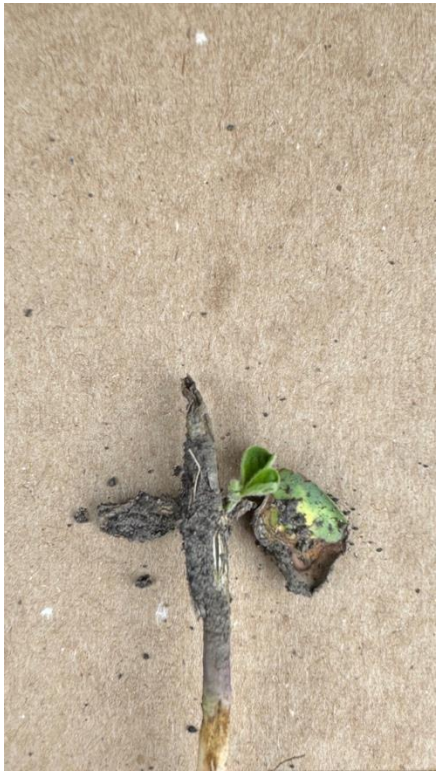
Fall rip, Spring finish Mid-April Plant

Fall VT, Mid-April Plant into stale seed bed

Fall VT, Mid-April Plant into stale seed bed

Soybean Recovery 18 d after Sandblasting






Soybean Recovery 18 d after Sandblasting




Replant

18 nd, 3 br.

72 R5 pods

Split @ Cotyledon

18 nd, 0 branches

62 R5 pods

Split @ Unifoliate

18 nd, 4 branches

70 R5 pods

Regular

22 nd, 5 br.

87 R5 pods

Corn Residue Effects on Soybean Development

Corn Residue Effects on Soybean Development

Corn Harvest: 12 rows @ 30-in

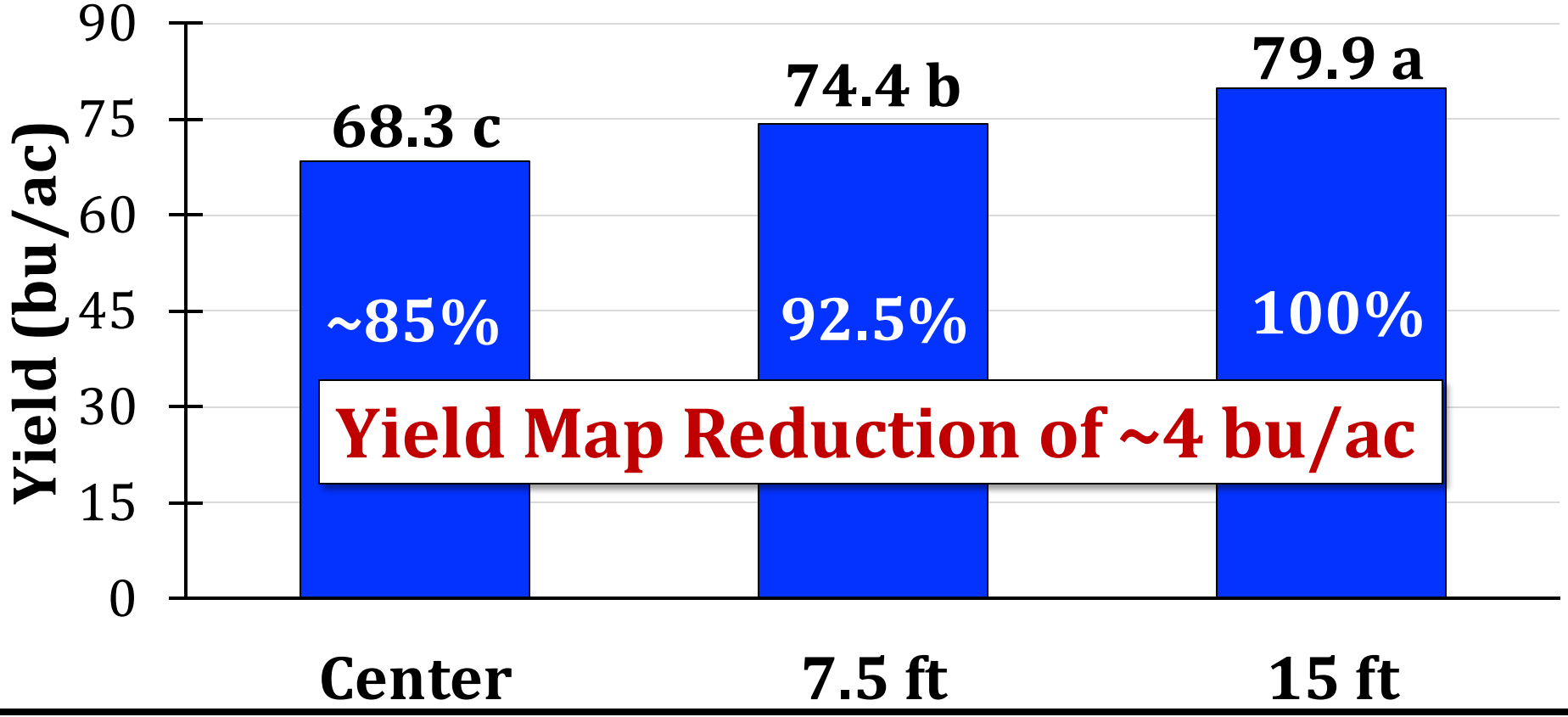
No-till soybean @ 15-in that split the corn rows

Corn Residue Effects on Soybean Development

Heavy Corn Residue:
~10 ft of 30 ft

Corn Residue:
~20 ft of 30 ft

Corn Residue Effects on Soybean Yield



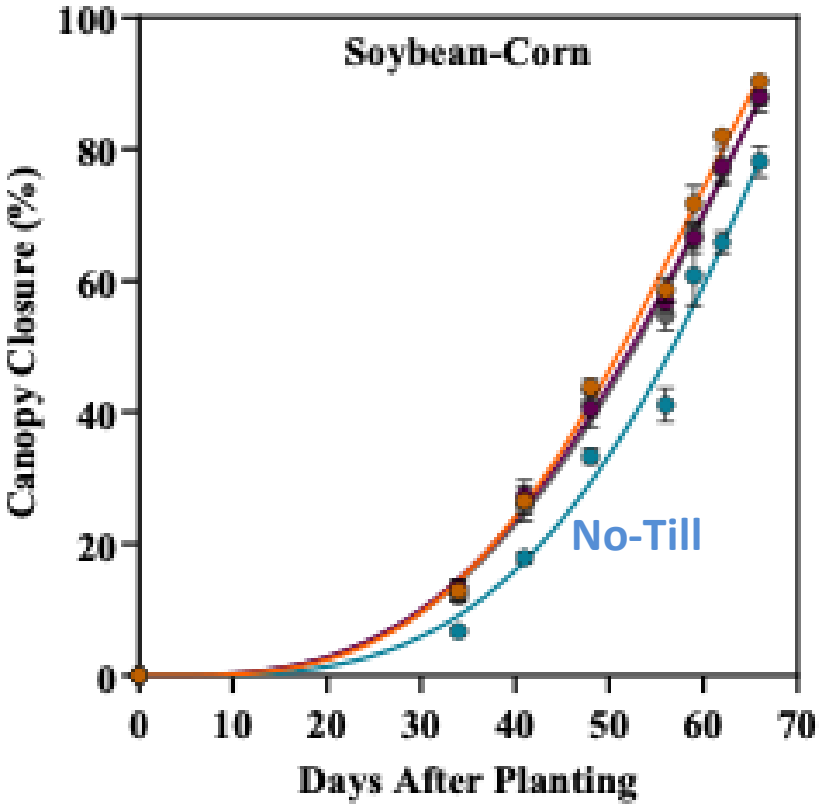
Soybean Delays: Development and Maturation

Corn Residue Effects on Soybeans

Position	Yield (bu/ac)	Moisture (%)	Harvest Stand	Seed Weight	Seeds per m^2
Center	68.3 c	10.2 a	78,031 b	14.7	460 c
7.5 ft	74.4 b	9.8 b	101,086 a	14.8	500 b
15 ft	79.9 a	9.9 b	97,894 a	14.8	537 a
CV (%)	4.2	2.3	10.2	1.6	4.2
Position	**	*	**	ns	**

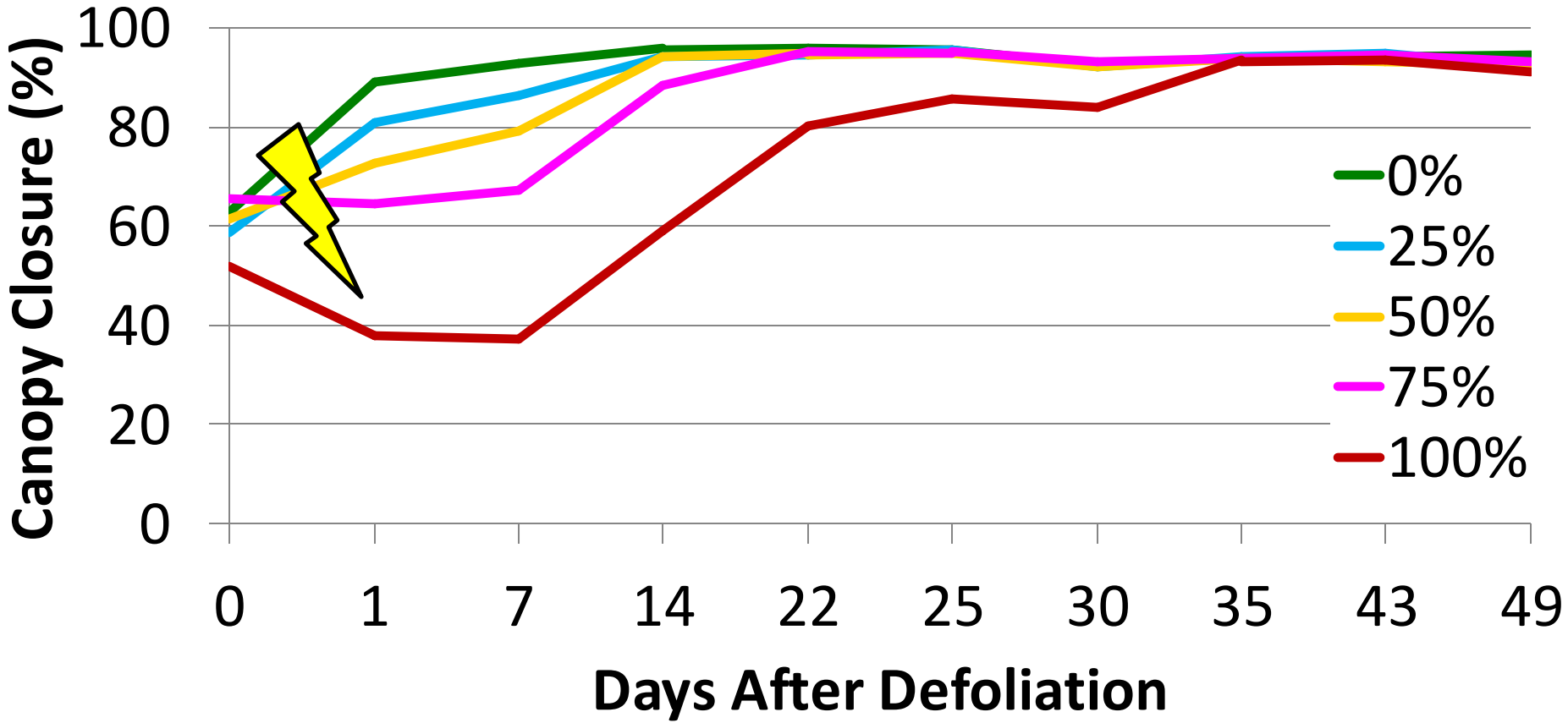
Emerging Challenges in Soybean

- High-yielding corn (and residue) and earlier plantings of soybean:
  - ***Impede Soybean Establishment and Development***, especially in no-till and minimum till fields
  - ***Cascading effects*** on yield potential, nutrient availability, and field conditions that are conducive for plant pathogens (e.g., SDS, phytophthora)



Hail Damage and Recovery

MG 2.7 Leaf Removal at R1



MG 2.7: 50% Leaf Removal at R1

2 DAT (06/27)

7 DAT (07/02)

16 DAT (07/11)

23 DAT (07/18)

MG 2.7: 100% Leaf Removal at R1

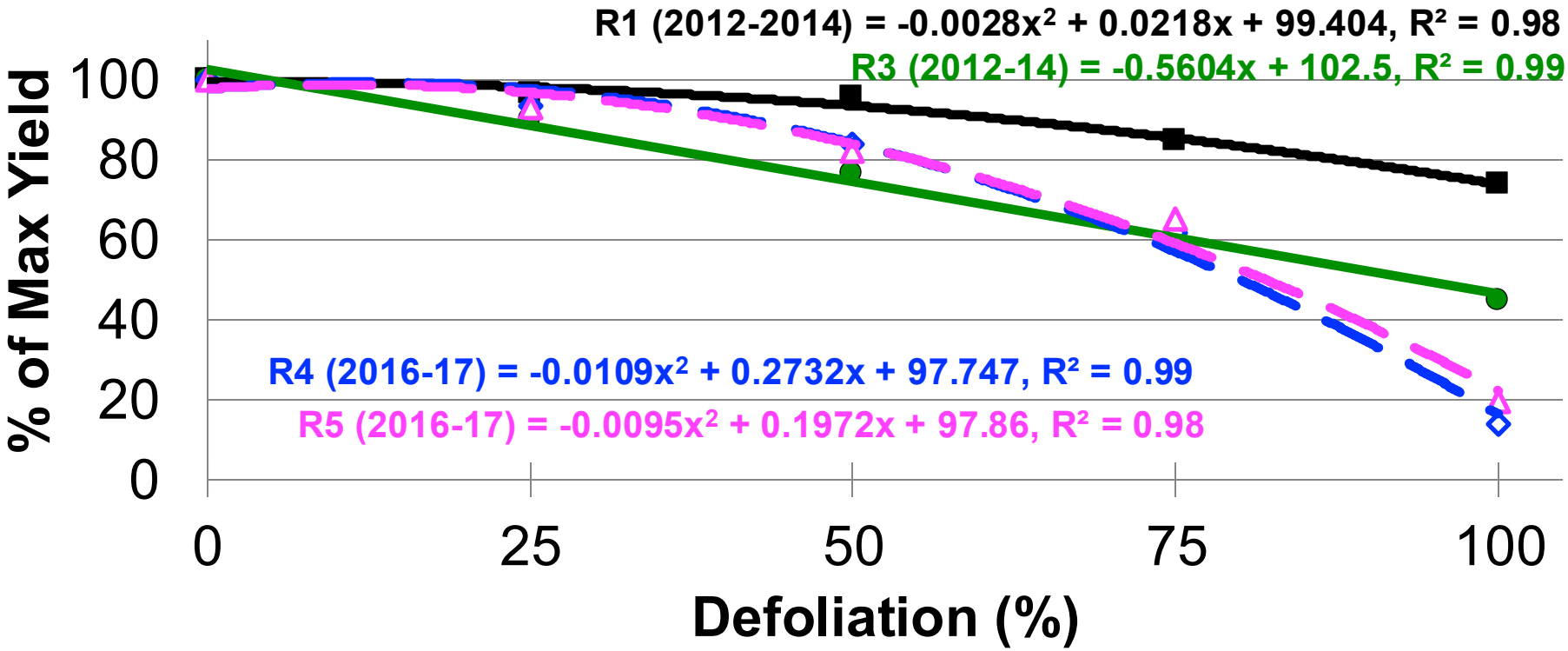
2 DAT (06/27)

7 DAT (07/02)

16 DAT (07/11)

23 DAT (07/18)

Soybean Defoliation @ R1, R3 (2012-14), R4, R5 (2016-17)



Soybean Stress Tests

- **Timely Planting: 4 to 8 bu in May (10+ bu occasionally)**
  - **Soil water temperature in first 12-24 hr**
  - Need fungicide seed treatment for earlier plantings
- **Plant Stands: Balance Seed Cost & Plant Development**
  - Early: 100,000 to 120,000 plts/ac optimal (some differences due to latitude)
  - **Harvest: 85,000 plts/ac**
  - **Replant starts around 70,000 plts/ac**
- **Solid Foundations and Access to Plant Nutrition**
  - Heavy corn residue in no-till → up to **15% yield hit** delayed development
  - Delayed development even with row cleaners → **~7 day canopy closure lag**
- **Hail Damage and Recovery**
  - R1 can recover well: 50% leaf loss → **5% yield hit**
  - R3, R4, and R5: 50% leaf loss → **~20% yield hit**

QUESTIONS?

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