Crop Production Show 2020

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Agri-ARM Research Update
January 16, 2020

Dry Bean Production:

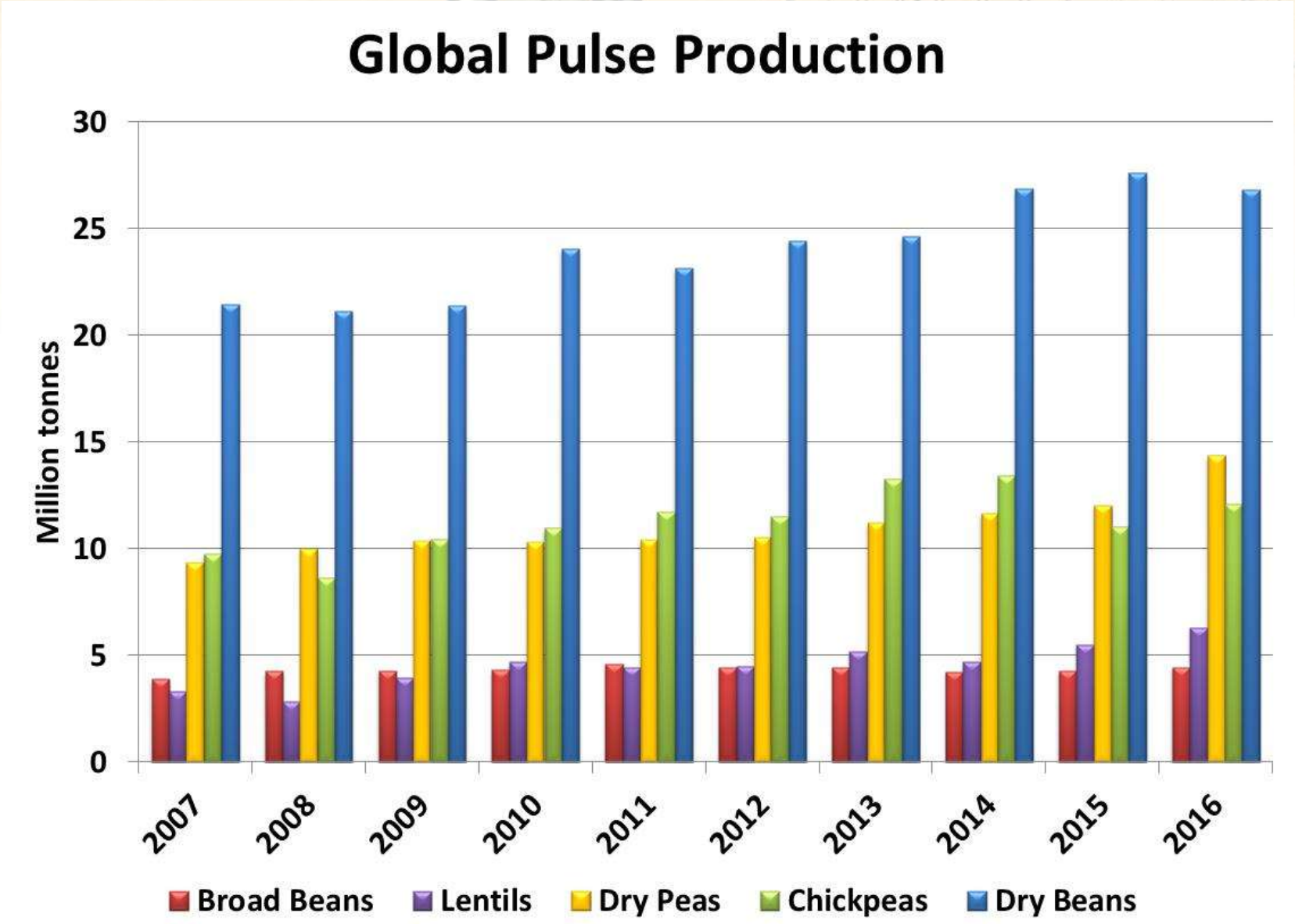
To Inoculate or Fertilize?

Garry Hnatowich, ICDC
Jessica Weber, WARC
Lana Shaw, SERF
Michael Hall, ECRF
Chris Holzapfel, IHARF

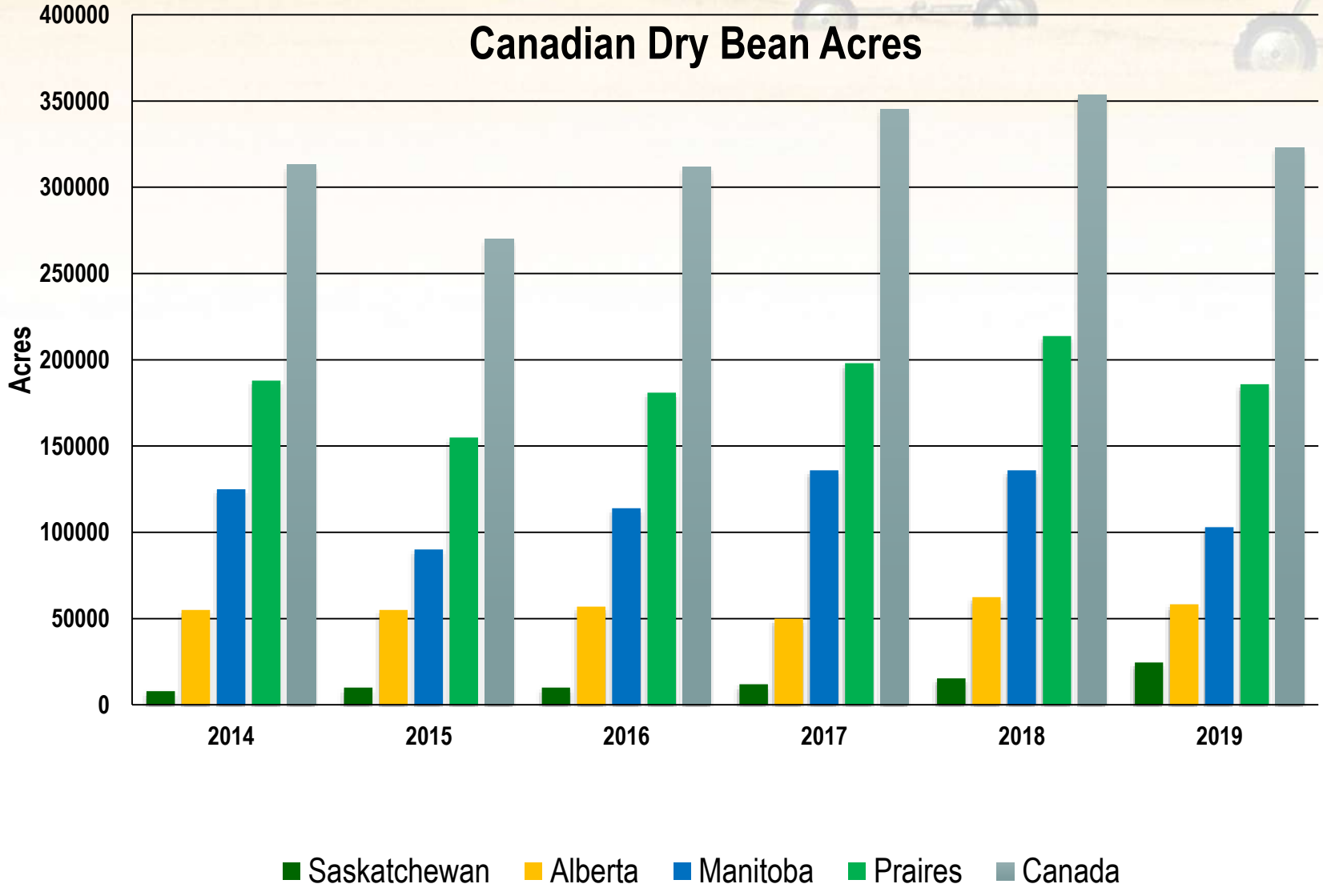
Dry Bean – In General

- Why Dry Bean?
  - High value.
  - Diversifies marketing options.
  - The most important and traded of the pulse crops.
  - Ideal for breaking disease cycles
  - Provides yield boost to following crop.
  - Three types of bean growth habit:
    1. Type I – determinant bush-type
    2. Type II – indeterminate upright, short vine
    3. Type III- indeterminate sprawling vine
  - As a legume a portion of it's nitrogen is supplied through biological N-fixation???

Dry Bean Production



Canadian Dry Bean Production - Acres



Growing Region

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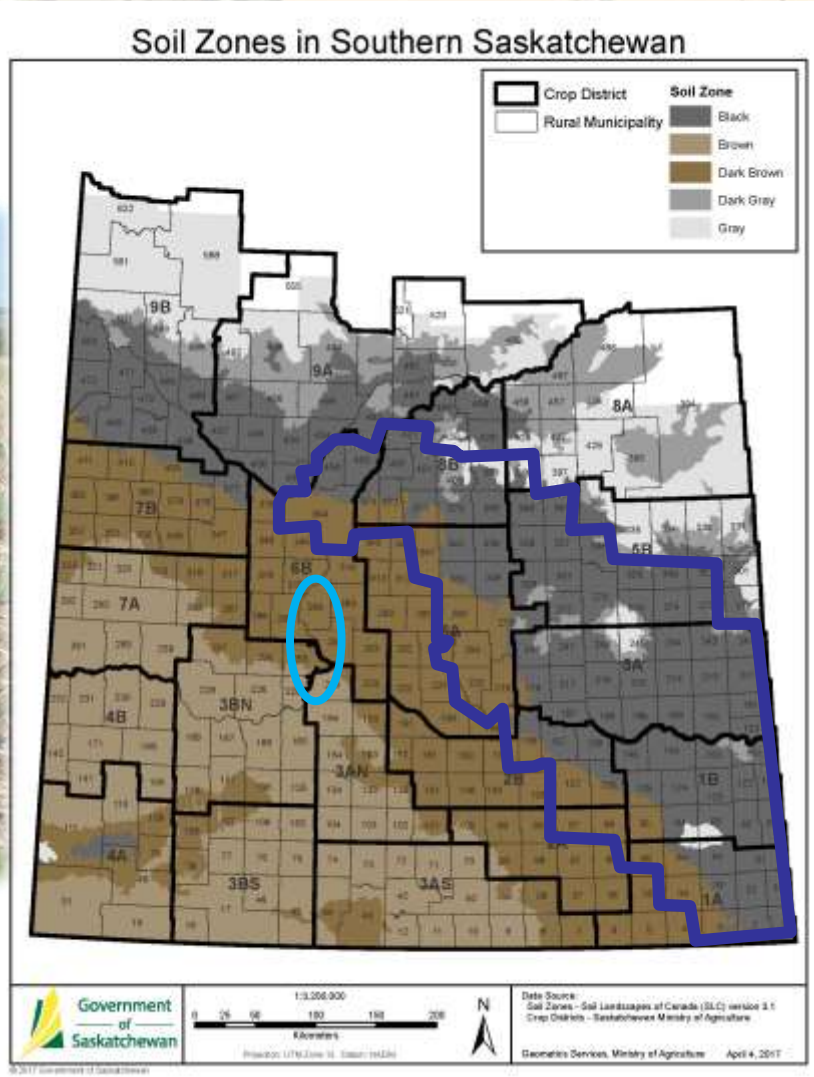
SCIC Dryland Coverage Area

Irrigated Production Area



Increasing SK Production

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Means moving from Wide Row to Narrow & Irrigated to Dry Land Production

Numerous Market Classes

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Most Likely Candidate for Narrow Row, Dry Land Production

Classes and Variety of Interest:

Black

- **CDC Blackstrap**
  - Type II Growth Habit
  - Early Maturity
  - High Yield Potential
  - Resistance to Common Bacterial Blight (CBB)
  - High Pod Set

2019 Dry Bean Trial

Initiated a trial entitled “Dry Bean Inoculant & Fertilizer Strategies for Solid Seeded Production.”

- 5 Agri-ARM Trial Location – Indian Head, Yorkton, Redvers, Scott, Outlook.

<u>Objectives:</u>

1. Demonstrate feasabilty of CDC Blackstrap under solid seeded, dry land production (Outlook irrigated as a comparison).
2. Evaluate efficacy of imported dry bean inoculant formulations alone or in conjunction with fertilizer N.
   - Domestic dry bean inoculants no longer manufactured!

Dry Bean Inoculant & Fertilizer Strategies for Solid Seeded Production

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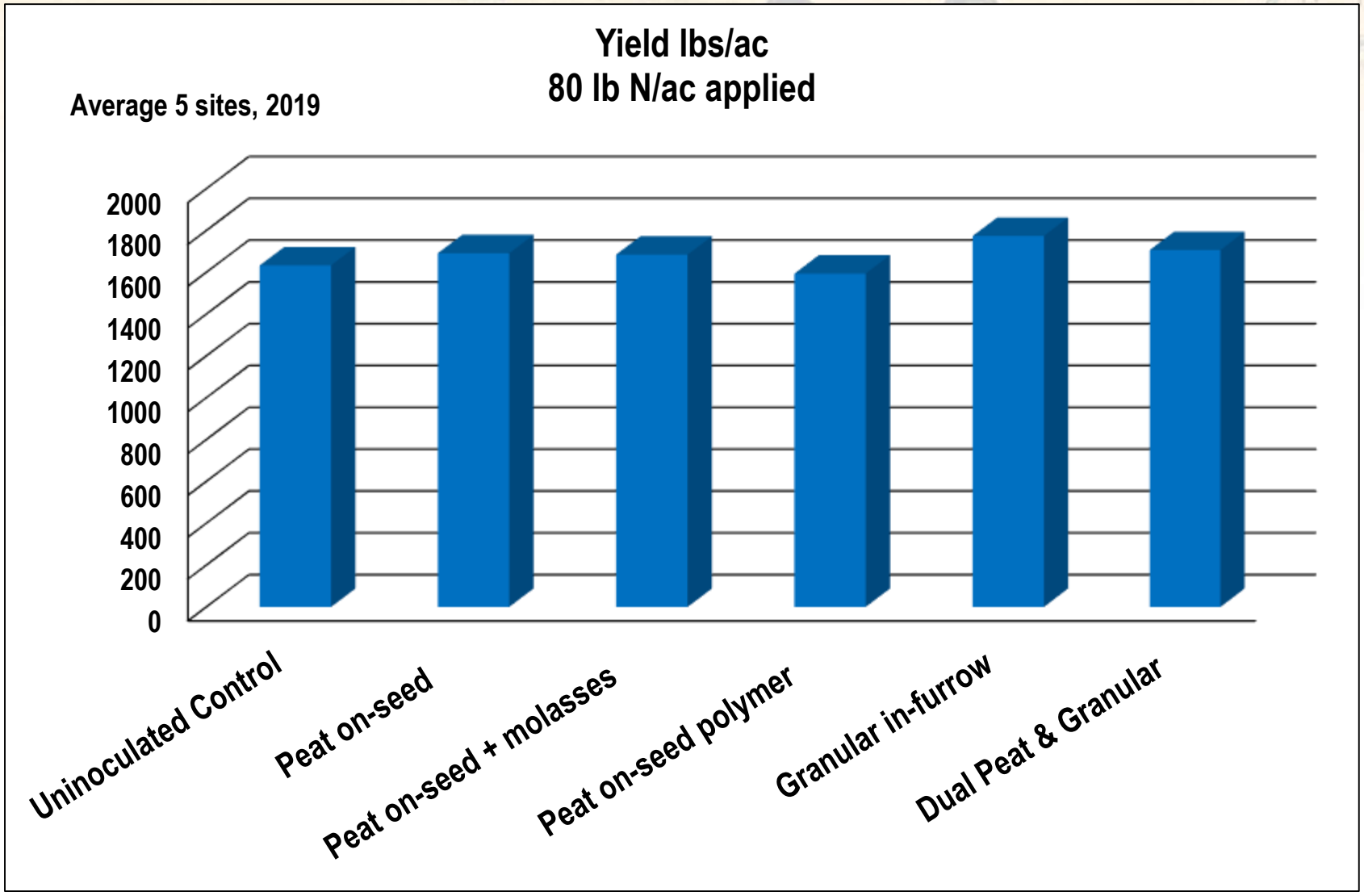
Inoculants courtesy of a USA manufacturer
(recommended rates of each formulation applied)

- Inoculant Treatments
  1. Control – uninoculated
  2. Peat Formulation – on-seed
  3. Peat Formulation – on-seed & molasses
  4. Peat Formulation – on-seed polymer coated
  5. Granular Formulation – in-furrow application
  6. Dual Peat Formulation & Granular Formulation
- Fertilizer Applications (side banded)
  - All inoculants treatments
  - 0 lbs N/ac
  - 80 lbs N/ac (total of soil test N [0-24”] + fertilizer N) as urea

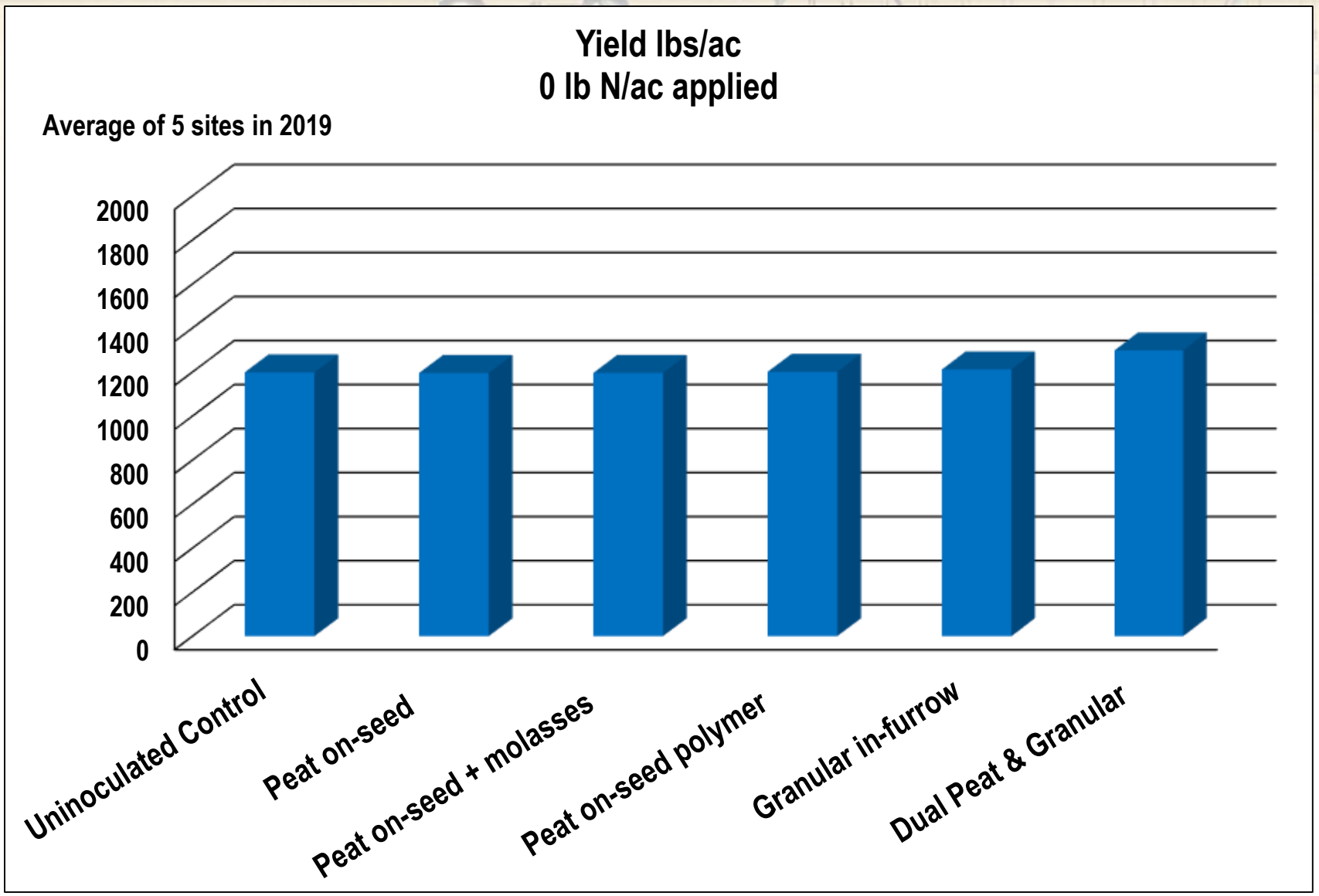
Funded by ADOPT

Dry Bean Inoculant & Fertilizer Strategies for Solid Seeded Production



No response to inoculant

Dry Bean Inoculant & Fertilizer Strategies for Solid Seeded Production



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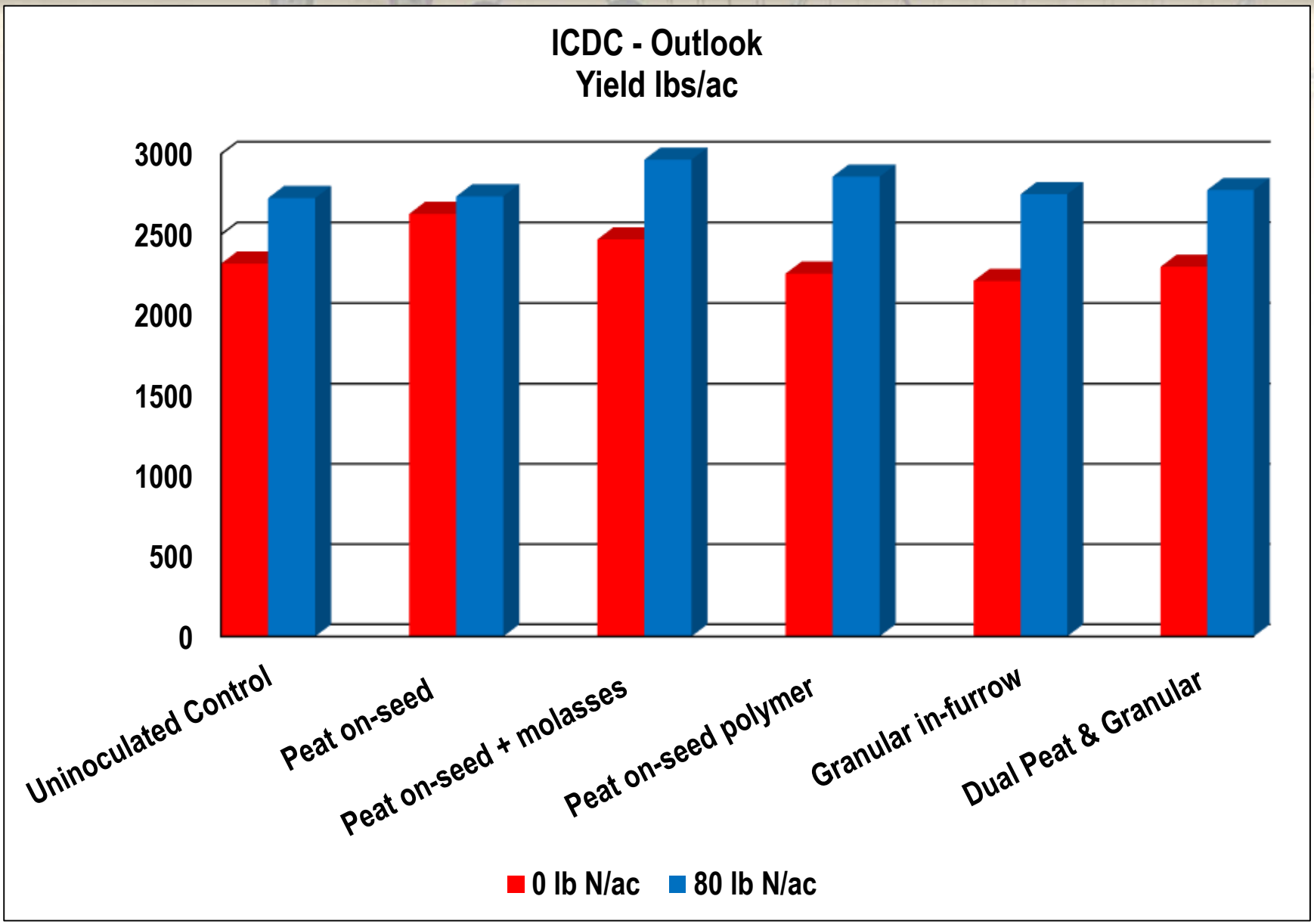
Dry Bean Inoculant & Fertilizer Strategies for Solid Seeded Production



Dry Bean Inoculant & Fertilizer Strategies for Solid Seeded Production

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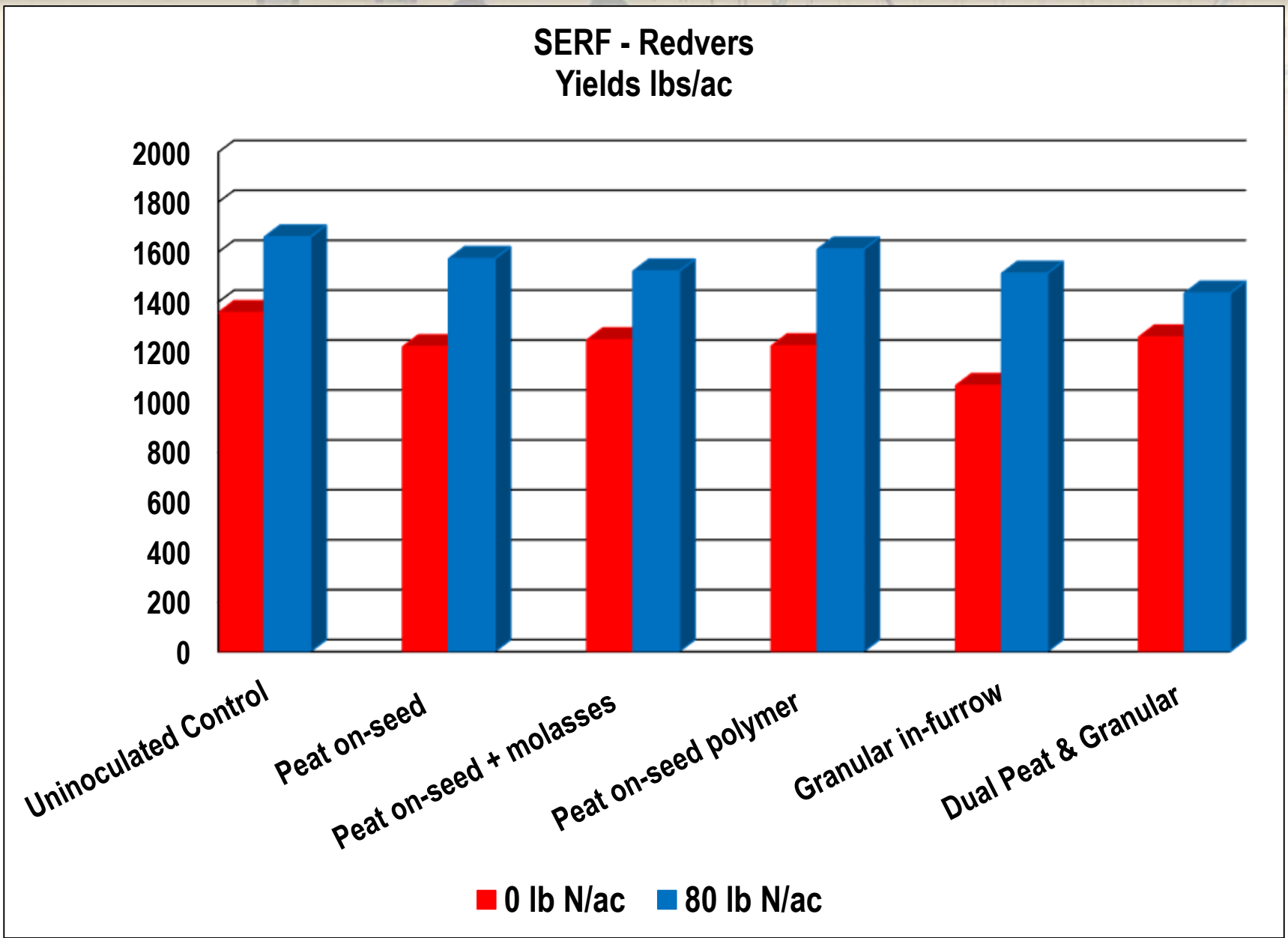
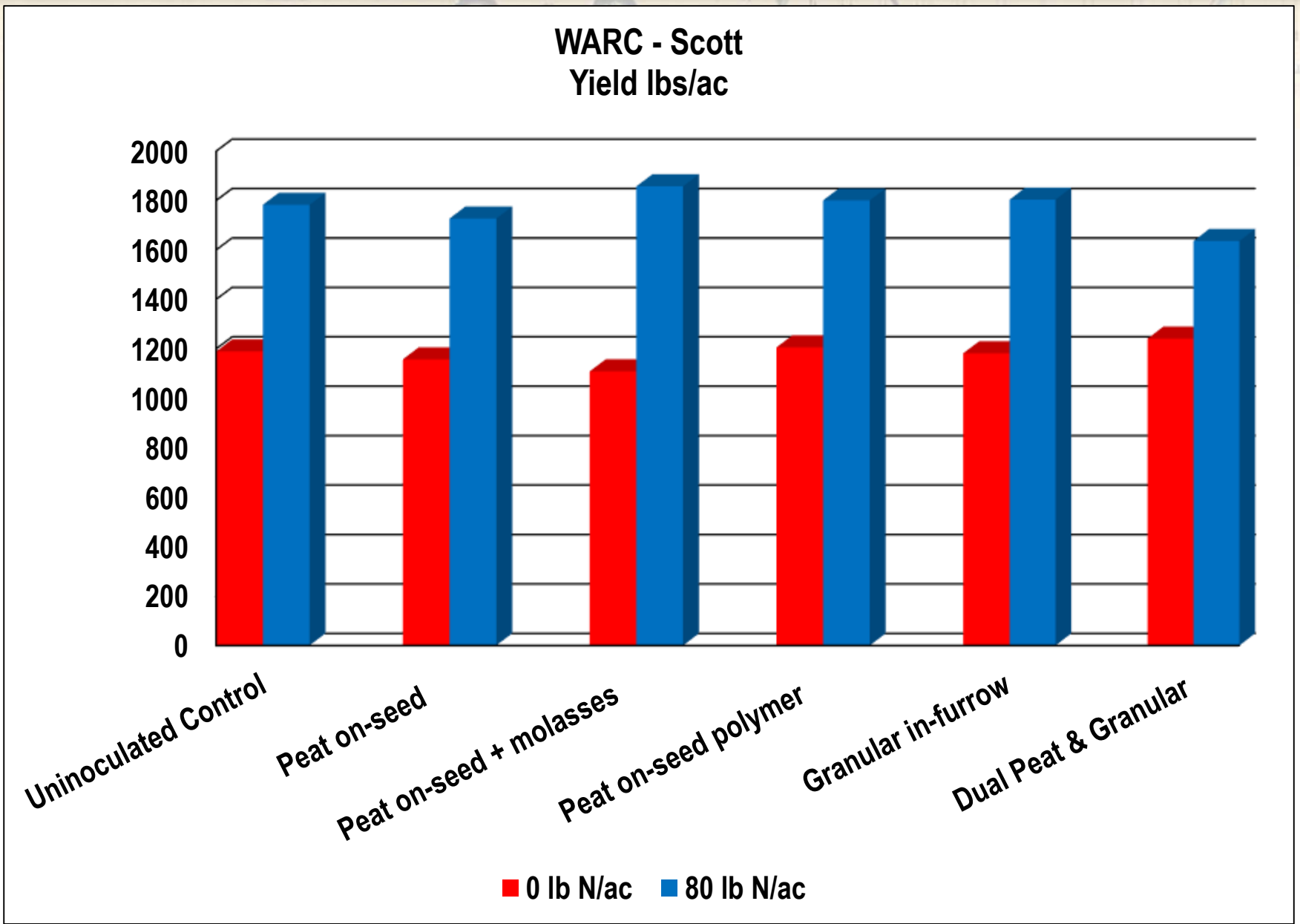
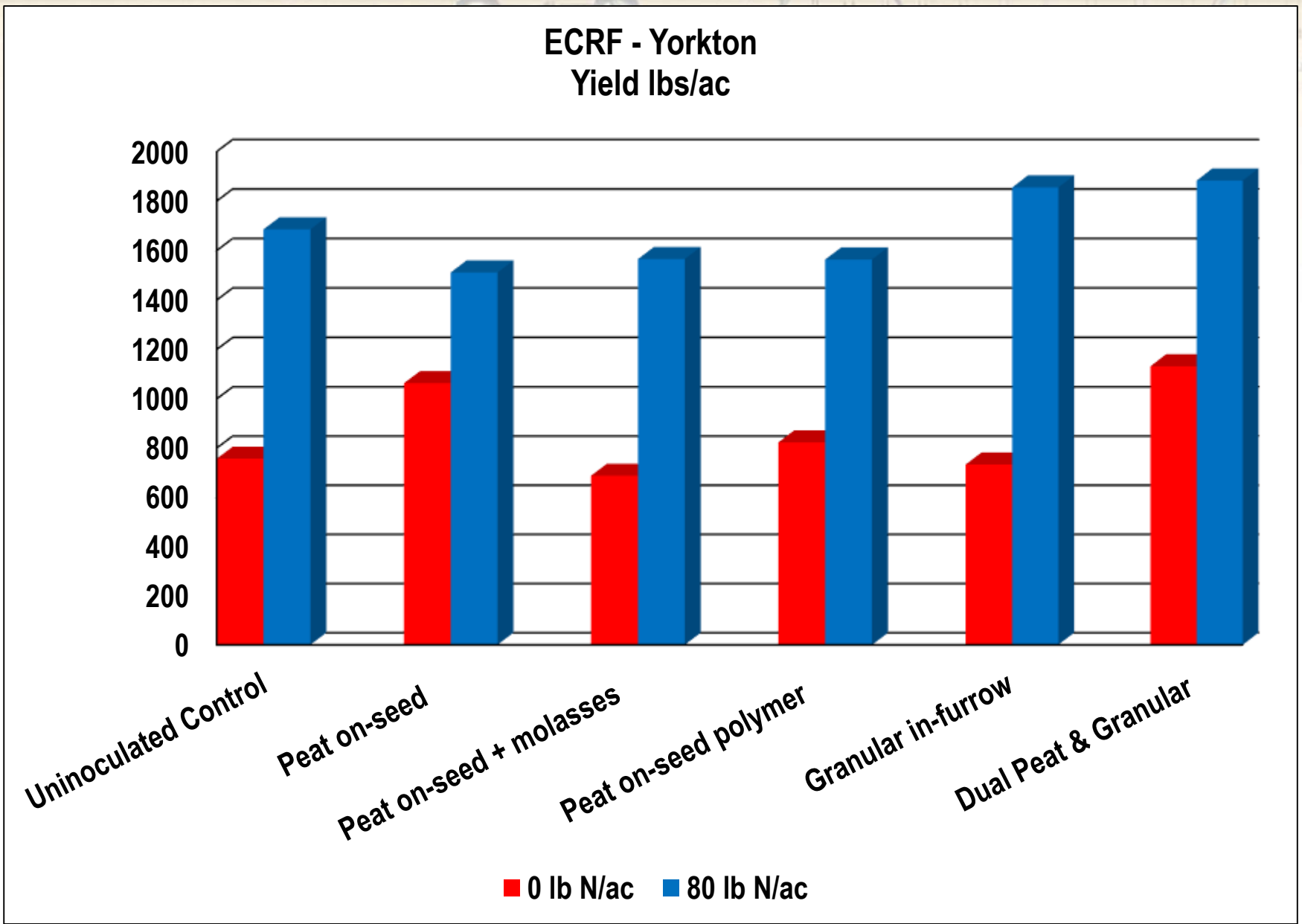


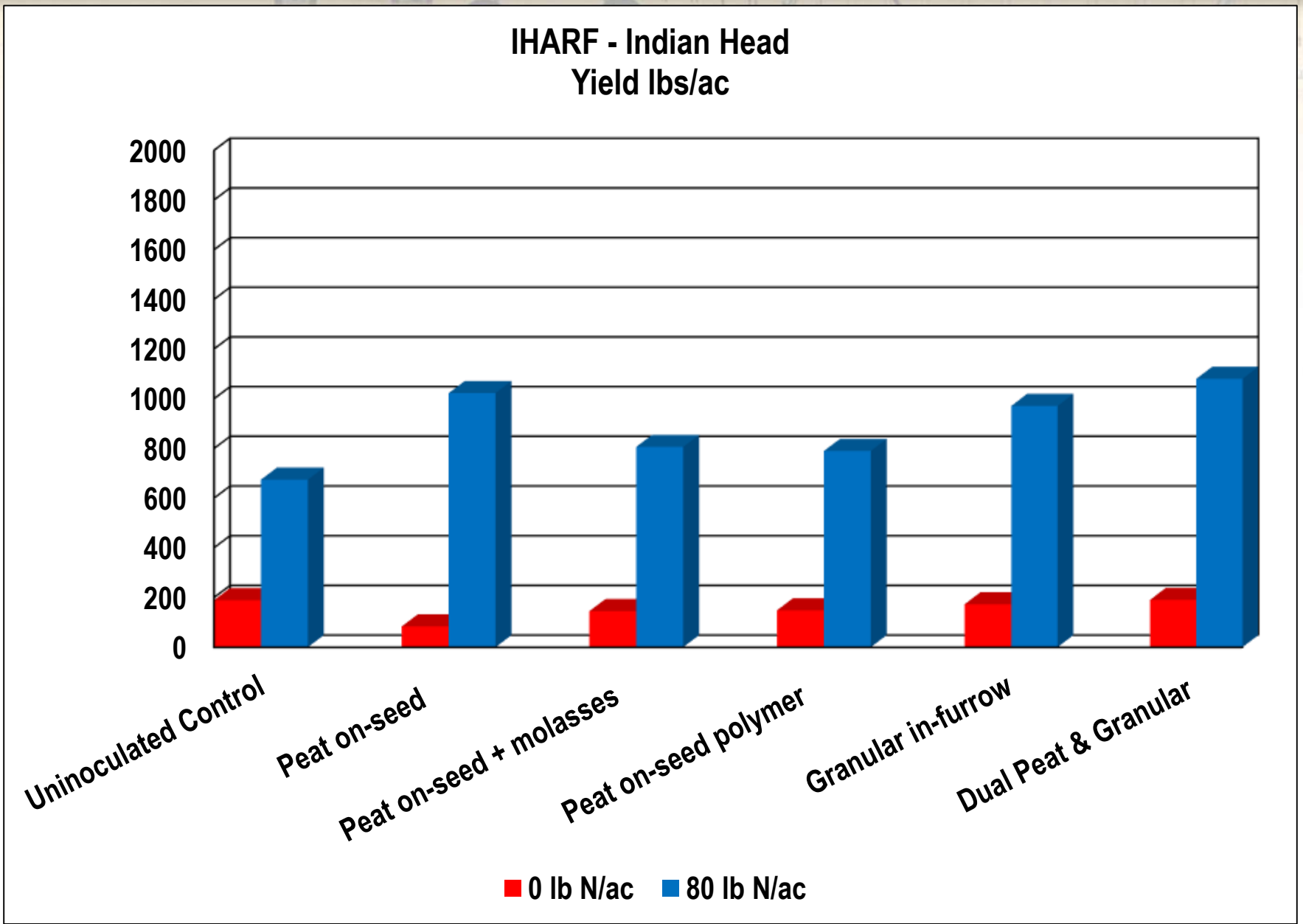
Dry Bean Inoculant & Fertilizer Strategies for Solid Seeded Production



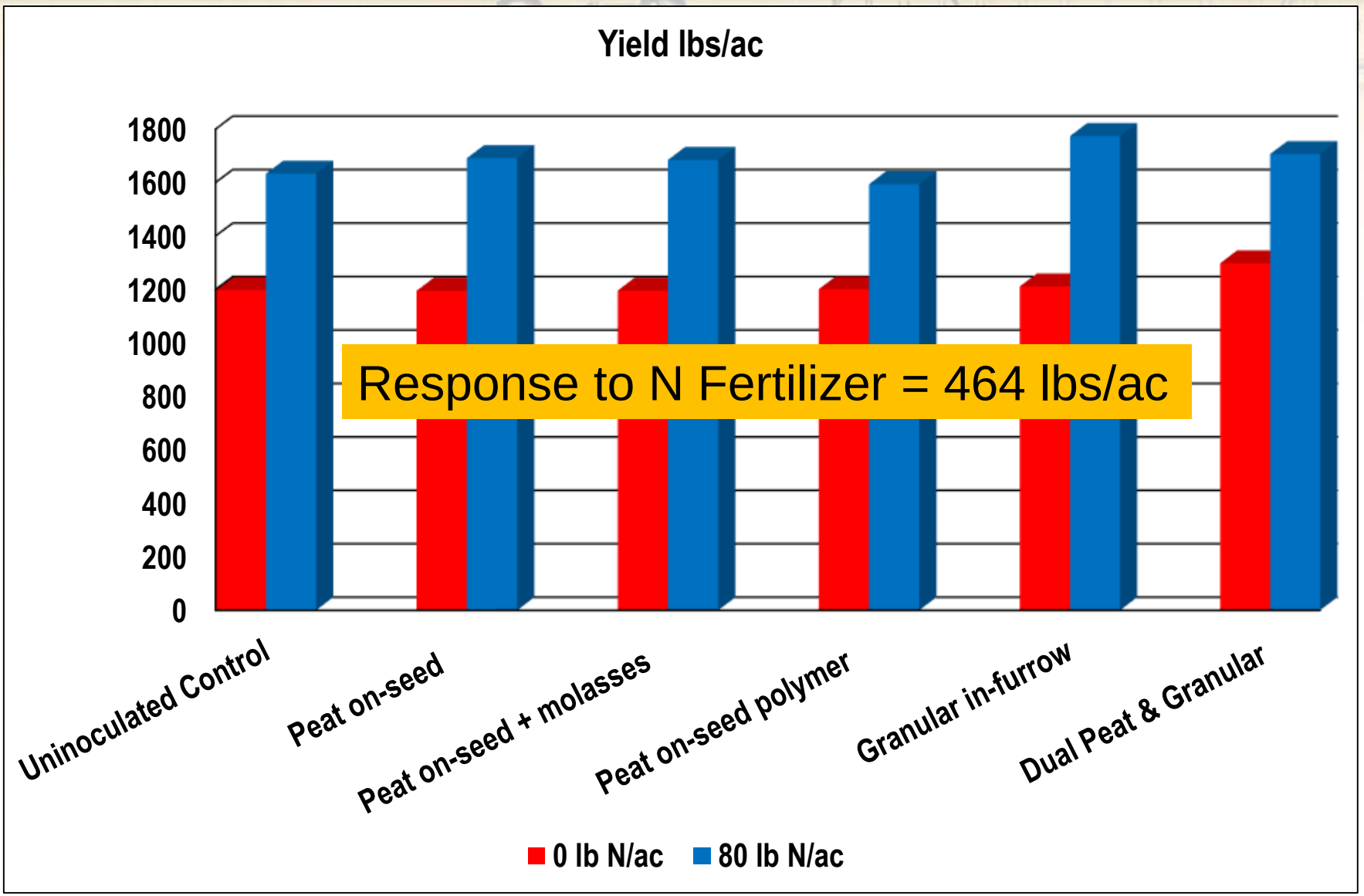
Dry Bean Inoculant & Fertilizer Strategies for Solid Seeded Production



Dry Bean Inoculant & Fertilizer Strategies for Solid Seeded Production

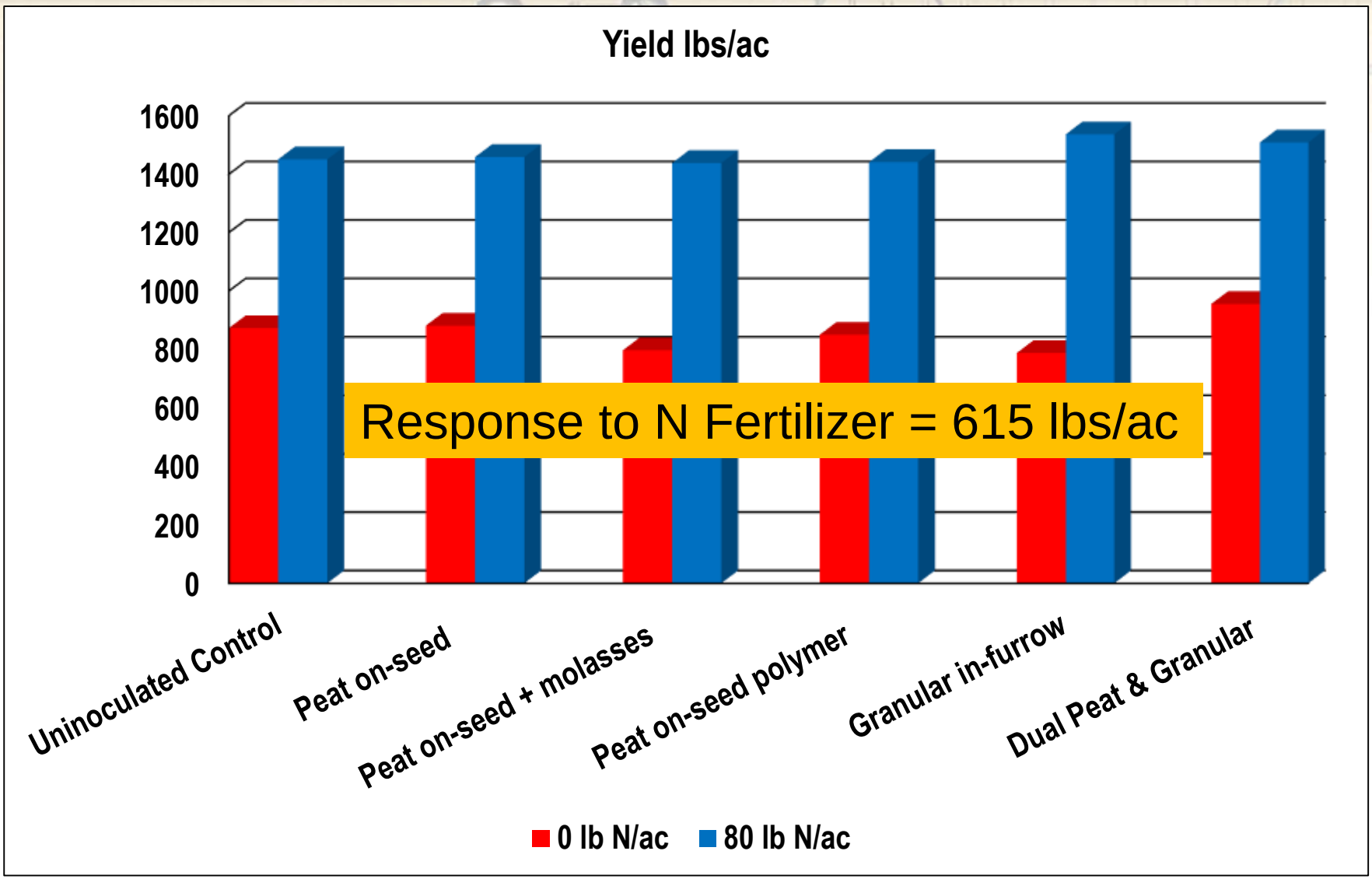


All Trial Locations



Average of 5 sites in 2019 (Indian Head, Redvers, Yorkton, Scott & Outlook)

Dry Land Trial Locations Only



Average of 4 sites in 2019 (Indian Head, Redvers, Yorkton & Scott)

Dry Bean Inoculant & Fertilizer Strategies for Solid Seeded Production

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General Observations

- Inoculation failed to provide a dry bean yield response.
- Application of 80 lbs N/ac (total soil + fertilizer N) resulted in a significant yield response at all sites compared to unfertilized treatments.
- At all sites CDC Blackstrap dry bean were direct combined – while harvest losses were not measured, observed losses at all locations were deemed slight.
- Solid seeded dry beans under dry land production appears to be feasible.

Dry Bean Inoculant & Fertilizer Strategies for Solid Seeded Production

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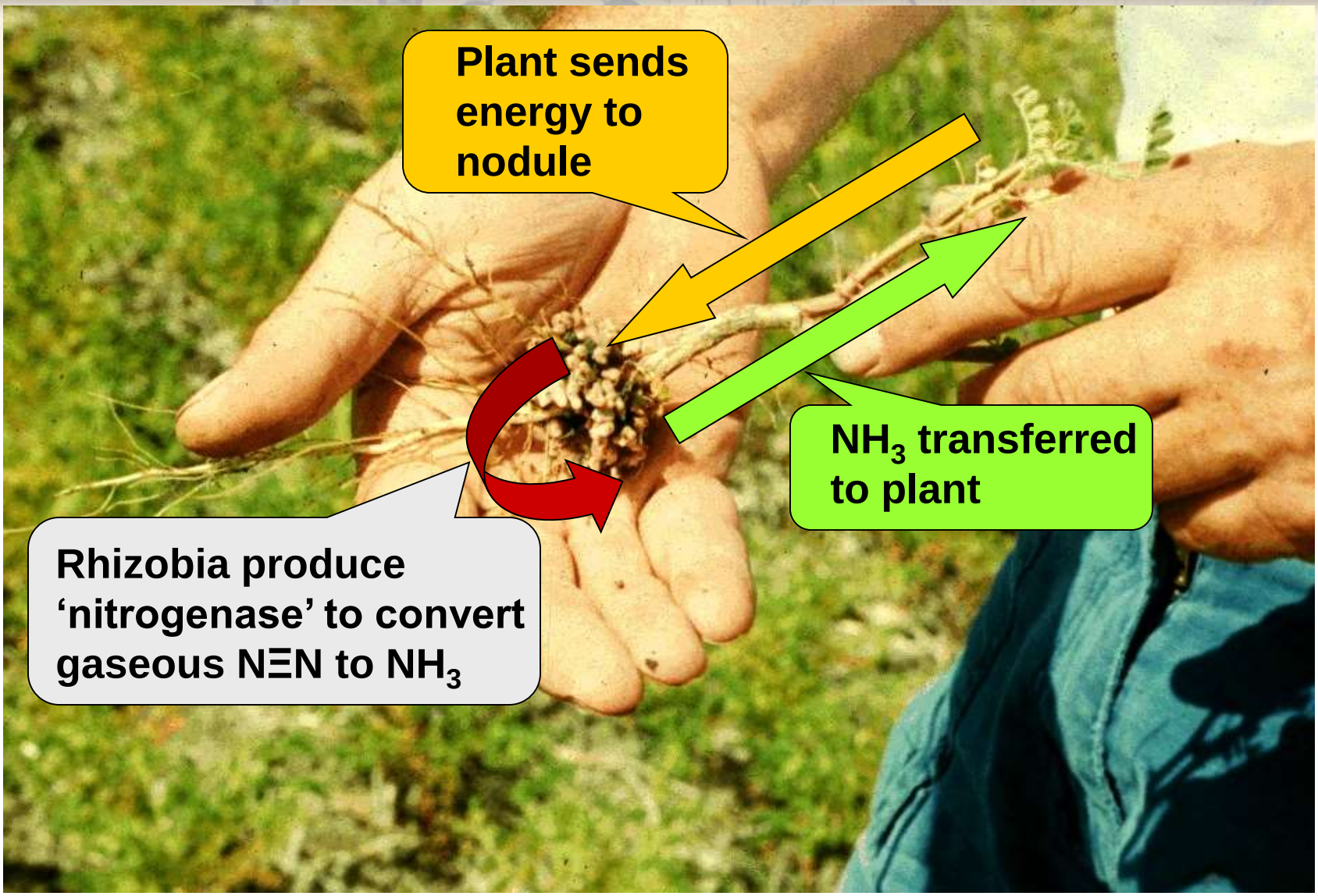
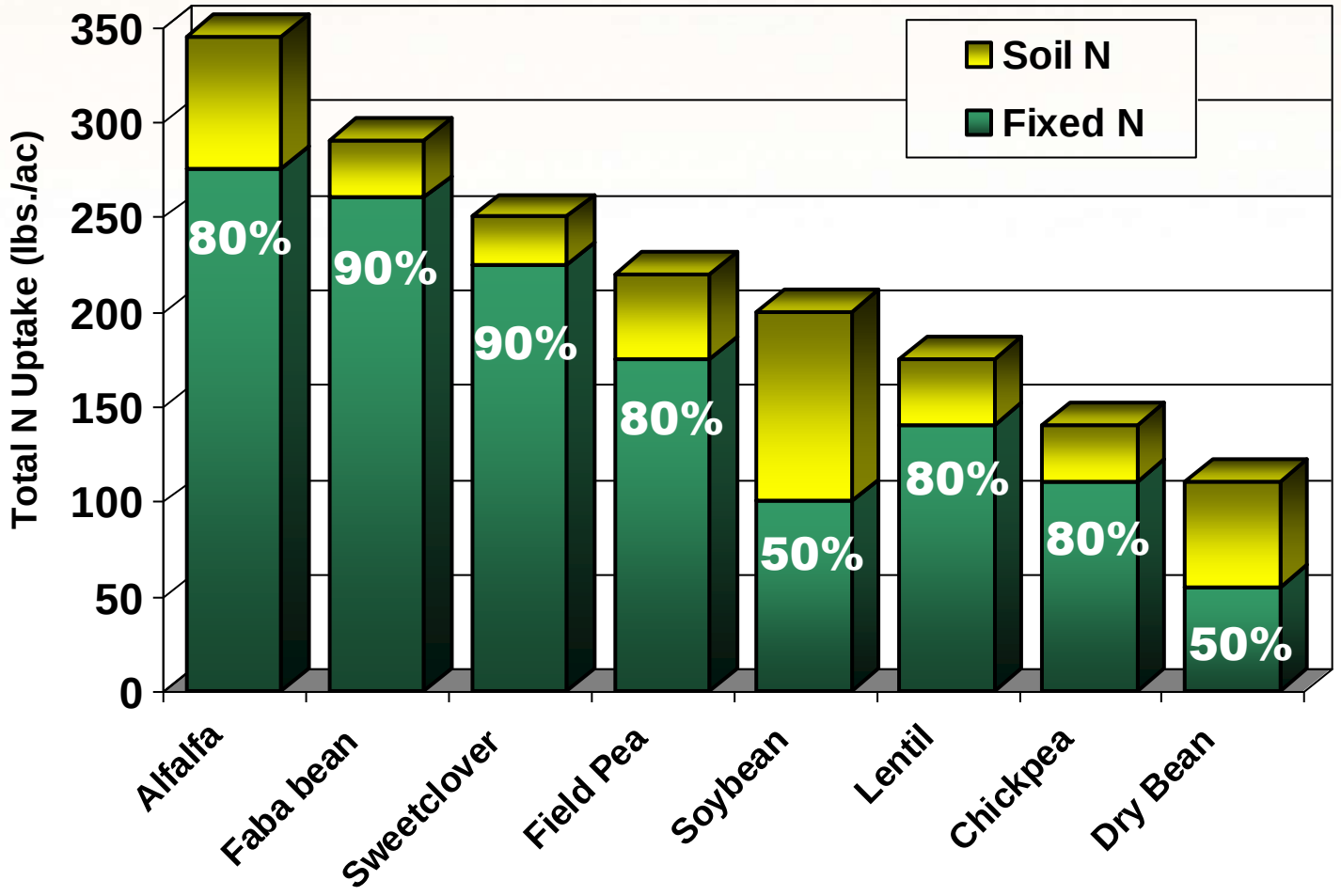
Overriding Question Arising from Results

- Why did inoculation fail to provide a yield response?

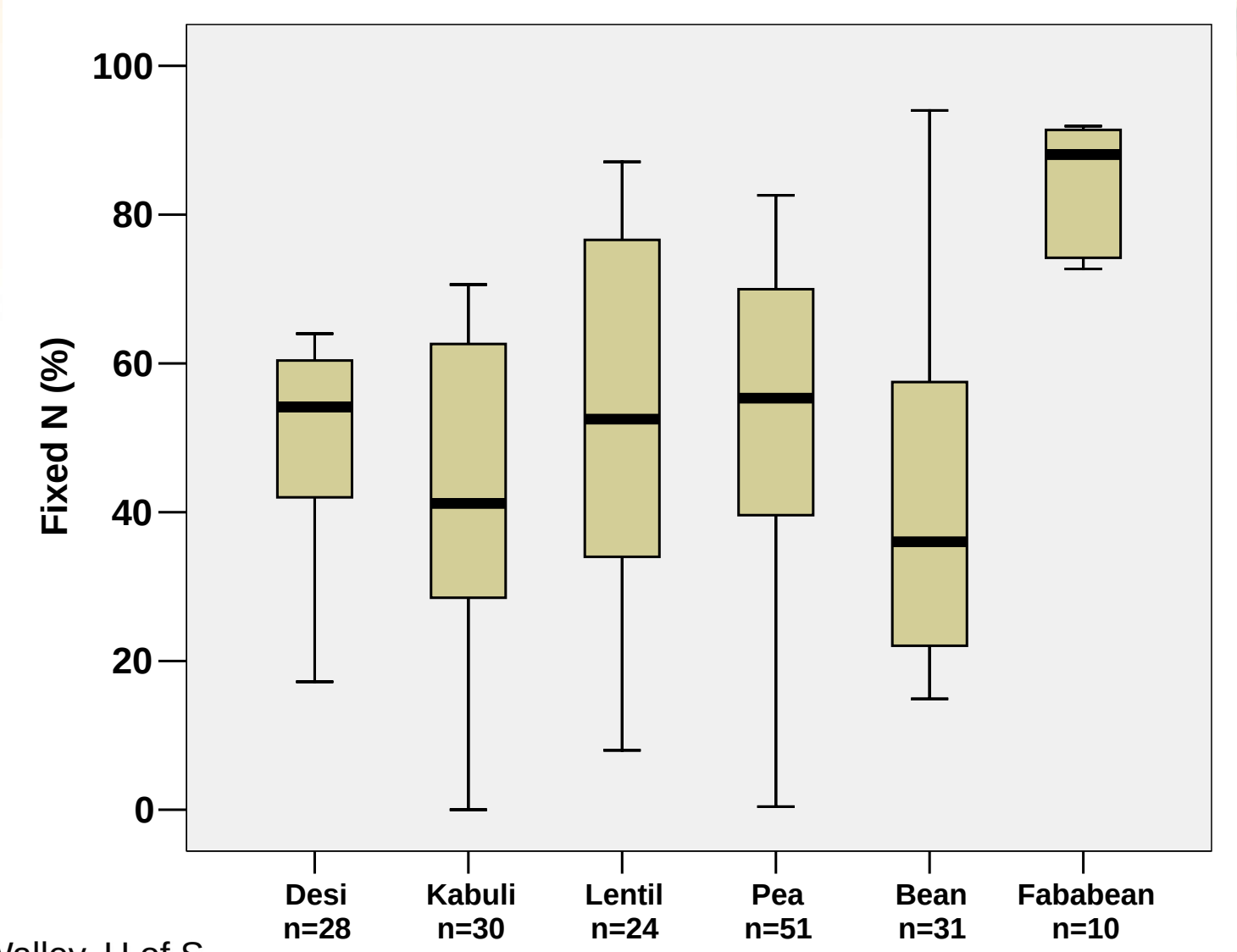
Nitrogen Fixation



Nitrogen Fixing Abilities of Legumes



Reported N Fixation Levels in Western Canadian Research Trials



Dr. Fran Walley, U of S

Validly Described Genera & Species of Root-Nodule Bacteria of Legumes

Azorhizobium
- *A. caulinodans (Sesbania)*

Bradyrhizobium
- *B. elkanii (Glysine,* soybean*)*
- *B. japonicum (Glysine,* soybean*)*
- *B. liaoningense (Glysine,* soybean*)*
- *B. yuanmingense (Lespedeza)*

Mesorhizobium
- *M. amorphae (Amorpha)*
- *M. chacoense (mesquite)*
- *M. ciceri (Cicer,* chickpea*)*
- *M. huakuii (milkvetch)*
- *M. loti (Lotus)*
- *M. mediterraneum (Cicer)*
- *M.plurifarium (Acacia)*
- *M. tianshanense (Glycyrrhiza)*

Rhizobium
- *R. etli (Phaseolus vulgaris,* bean*)*
- *R. galegae (Galega; Leucaena)*
- *R. gallicum (Phaseolus; Dalea)*
- *R. giardinii (Phaseolus)*
- *R. hainanense (Stylosanthhes)*
- *R. huautlense (Sesbania)*
- *R. indigoferae (Indigofera)*
- *R. leguminosarum*
  - *bv trifolii (Trifolium,* clover*)*
  - *bv viciae Pisium,* peas*, Lens, l* entil*)*
  - *bv phaseoli (Phaseolus,* beans*)*
- *R. loessense (Astragalus)*
- *R. mongolense (Phaseolus, Medicago)*
- *R. sullae (Hedysarum)*
- *R. tropici (Phaseolus; Leucaena; Dalea)*

Sinorhizobium
- *S. abri (Abrus)*
- *S. americanus (Acacia)*
- *S. arboris*
- *S. fredii (Glycine,* soybean*)*
- *S. indiaense (Sesbania)*
- *S. kostiense*
- *S. kummerowiae (Kummerowia)*
- *S. medicae (Medicago)*
- *S. meliloti (Melilotus,* sweetclover; *Medicago,* alfalfa; *Trigonella,* fenugreek*)*
- *S. morelense (Laucaena)*
- *S. saheli, S. sahalense (Sesbania)*
- *S. terangae (Sesbania; Acacia)*
- *S. xinjiangense (Glycine,* soybean*)*

Allorhizobium
- *A. undicola, R. undicola (Neptunia)*
- *R. radiobacter (non-nodulating sapro-phyte), R rhizogenes (causes hairy root disease), R. rubi, R. vitis*

P. H. Graham

Dry Bean Inoculation - Desired

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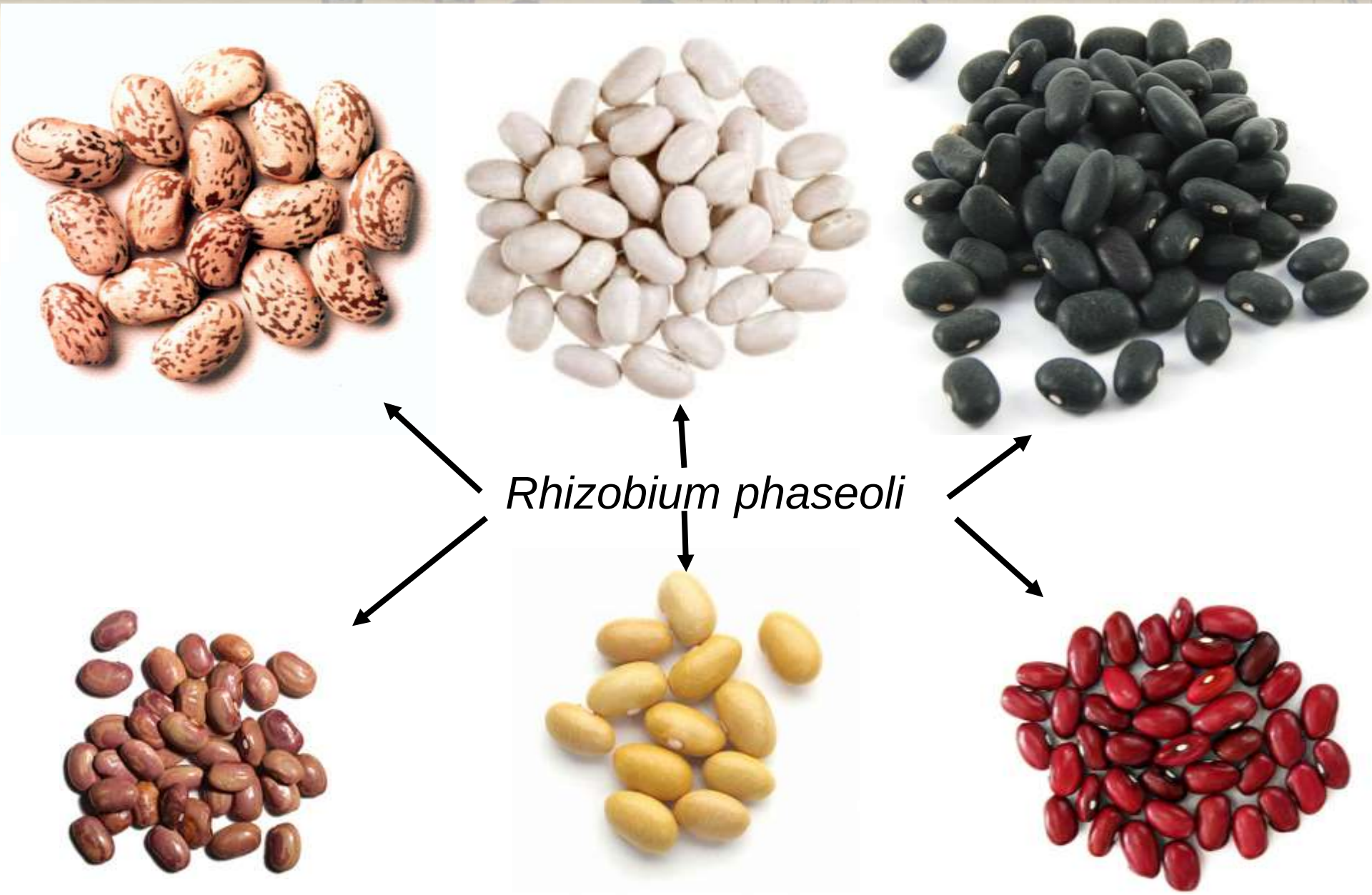

Dry Bean Inoculation – Rhizobia Specificity

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Rhizobium phaseoli

Dry Bean Inoculation – Rhizobia Specificity

Variety 1 Variety 2 Variety 3

Rhizobium phaseoli – strain A

Rhizobium phaseoli – strain B

Dry Bean Inoculation – Rhizobia Adaptability

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Funding Provided by ADOPT

Thank You

AgriARM Applied Research Management

WARC

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NARF Northeast Agriculture Research Foundation

IHARF INDIAN HEAD AGRICULTURAL RESEARCH FOUNDATION

South East Research Farm

East Central Research Foundation Ltd.

garry.icdc@sasktel.net
P: (306) 867-5405
C: (306) 361-6231