



Managing Beetles in Stored Rice

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Grain Insect Pests

Most pest insects are ubiquitous

Grain pest categories:

primary pests and secondary pests

Ecological succession:

primary pests → secondary pests

Grain Loss

US loses 5-10% of stored grain value postharvest to insects.

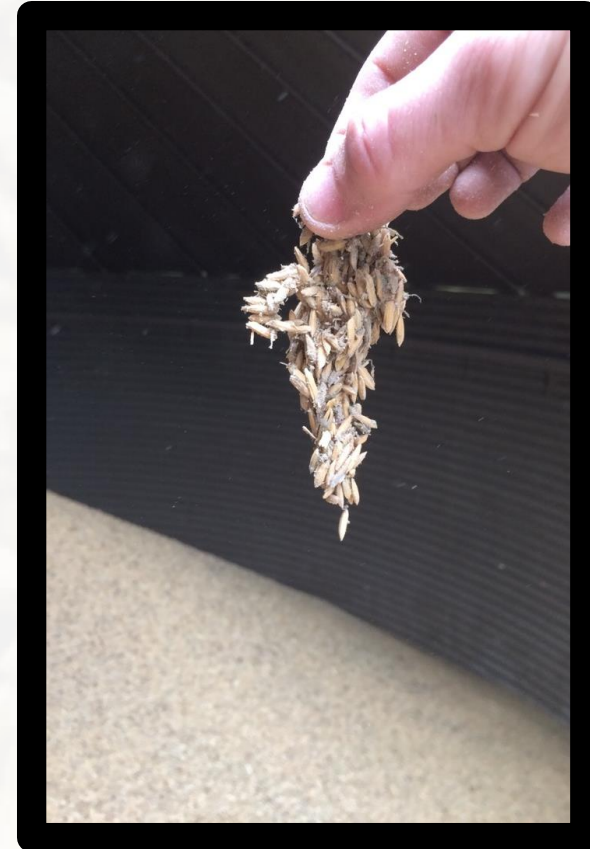
Infested grain is costly:

- Weight loss**
- Designated sample grade**
- Requires immediate fumigation**



Moths

- Angoumois grain moth
 - *Sitotroga cerealella*
- Indianmeal moth
 - *Plodia interpunctella*
- Moths found near surface of grain
- Mills do not check for moths



Beetles

Primary Pests

- Lesser grain borer (*Rhyzopertha dominica*)
- Rice weevil (*Sitophilus oryzae*)



Secondary Pests

- Red flour beetle (*Tribolium castaneum*)
- Confused flour beetle (*Tribolium confusum*)
- Sawtoothed grain beetle and others



Lesser Grain Borer



***Rhyzopertha dominica* F.**
(Coleoptera: Bostrichidae)

Eggs are oviposited outside grain

Larvae eat the kernel

Emerge as adults and continue feeding





Rice Weevil



***Sitophilus oryzae* L.**

(Coleoptera: Curculionidae)

Eggs are oviposited inside grain

Larvae eat the kernel

Emerge as adults and continue feeding



Flour Beetles

Tribolium castaneum (Herbst)

Tribolium confusum DuVal

(Coleoptera: Tenebrionidae)

Eggs are oviposited among broken grain and flour

Both larvae and adults feed on grain



Integrated Controls

- Fumigants
- Sanitation
- Moisture Control
- Protectants
- Resistance



Fumigants

- Phosphine is the primary gas used
- Unexpected cost and labor if done at the mill
- Concerns of resistance



Sanitation

- Left over grain can act as sources of pests
- Clean before and after binning
- Poor sanitation can also reduce the efficacy of other cultural control



Moisture Management

- High moisture content can lead to problems with
 - Insects
 - Diseases
 - Germination



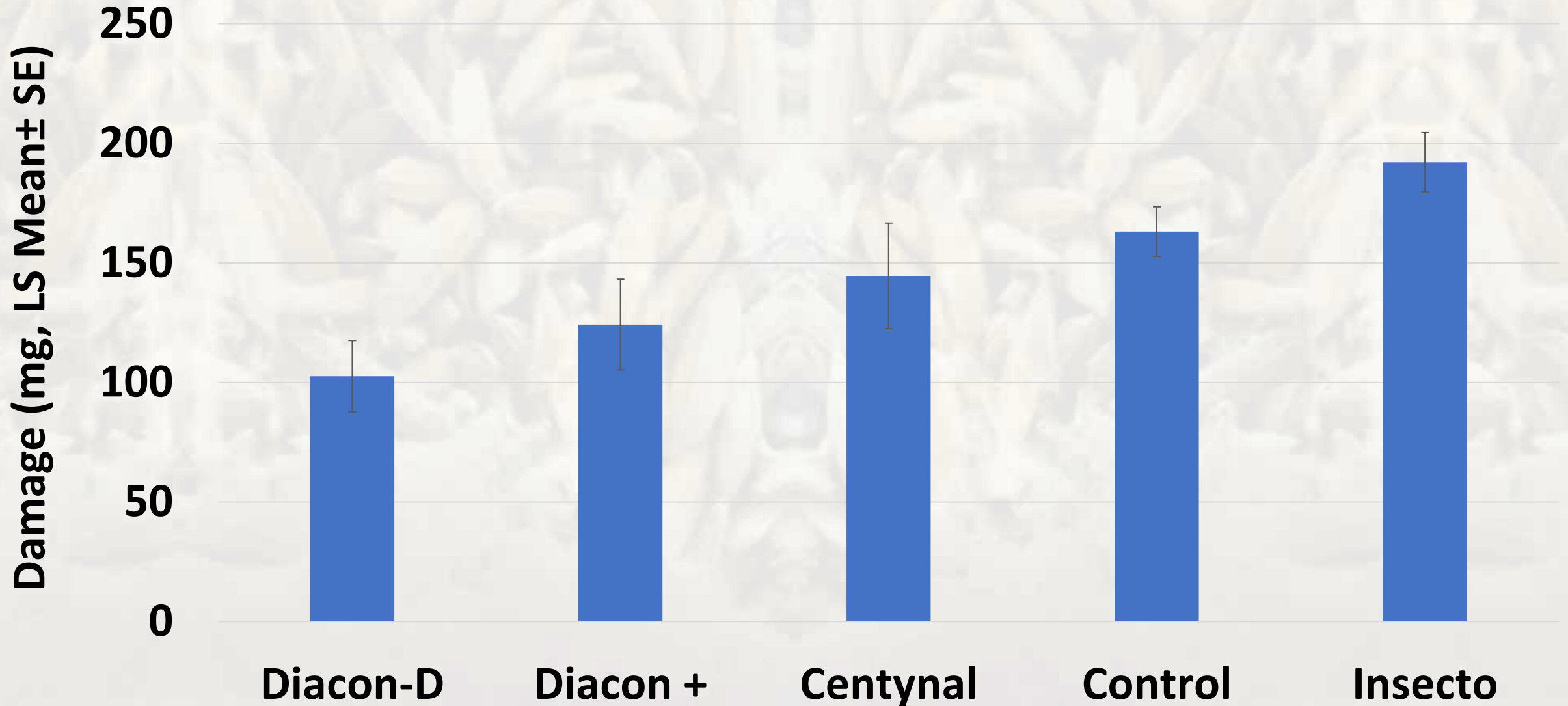
Protectants

Recent products need evaluation:

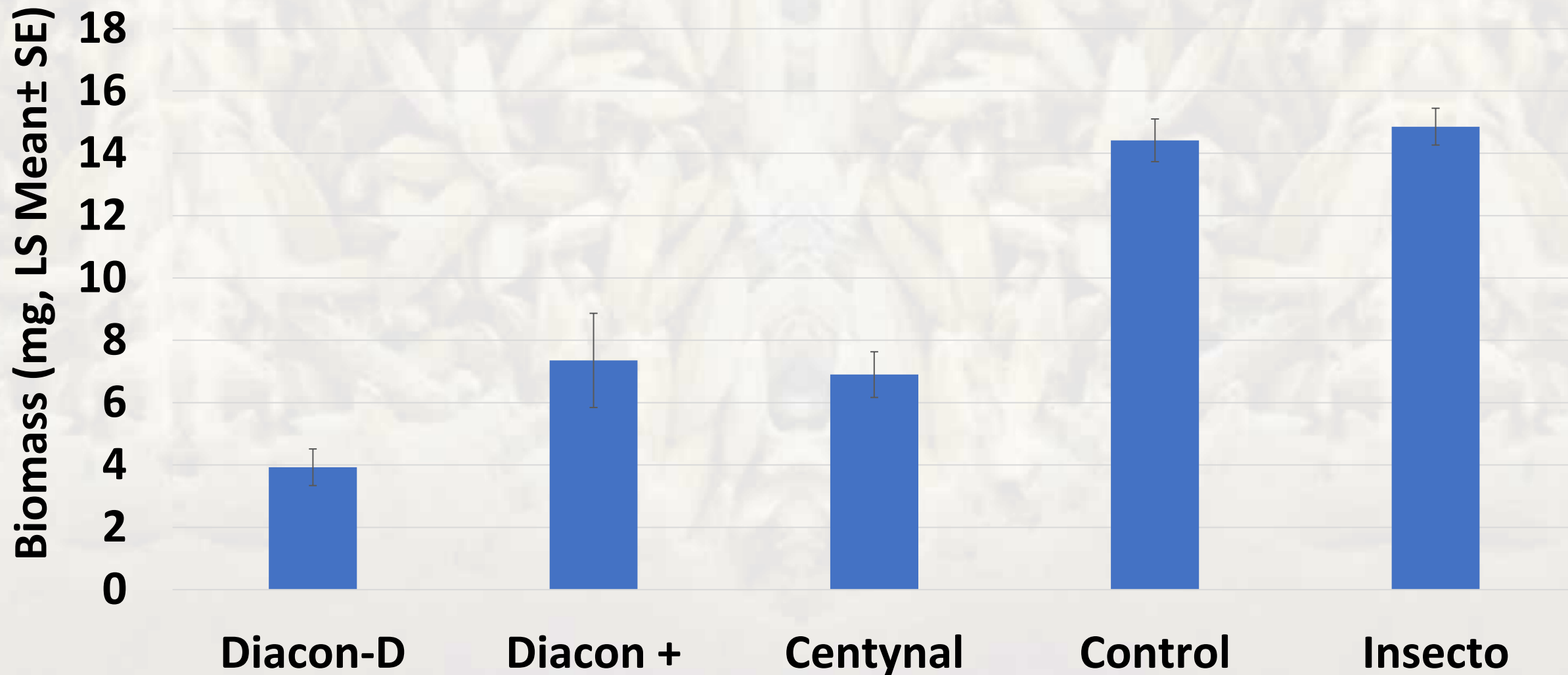
- Deltamethrin
- Methoprene
- beta-Cyfluthrin
- Diatomaceous Earth



Damage By Insecticide



Beetles By Insecticide



Resistance

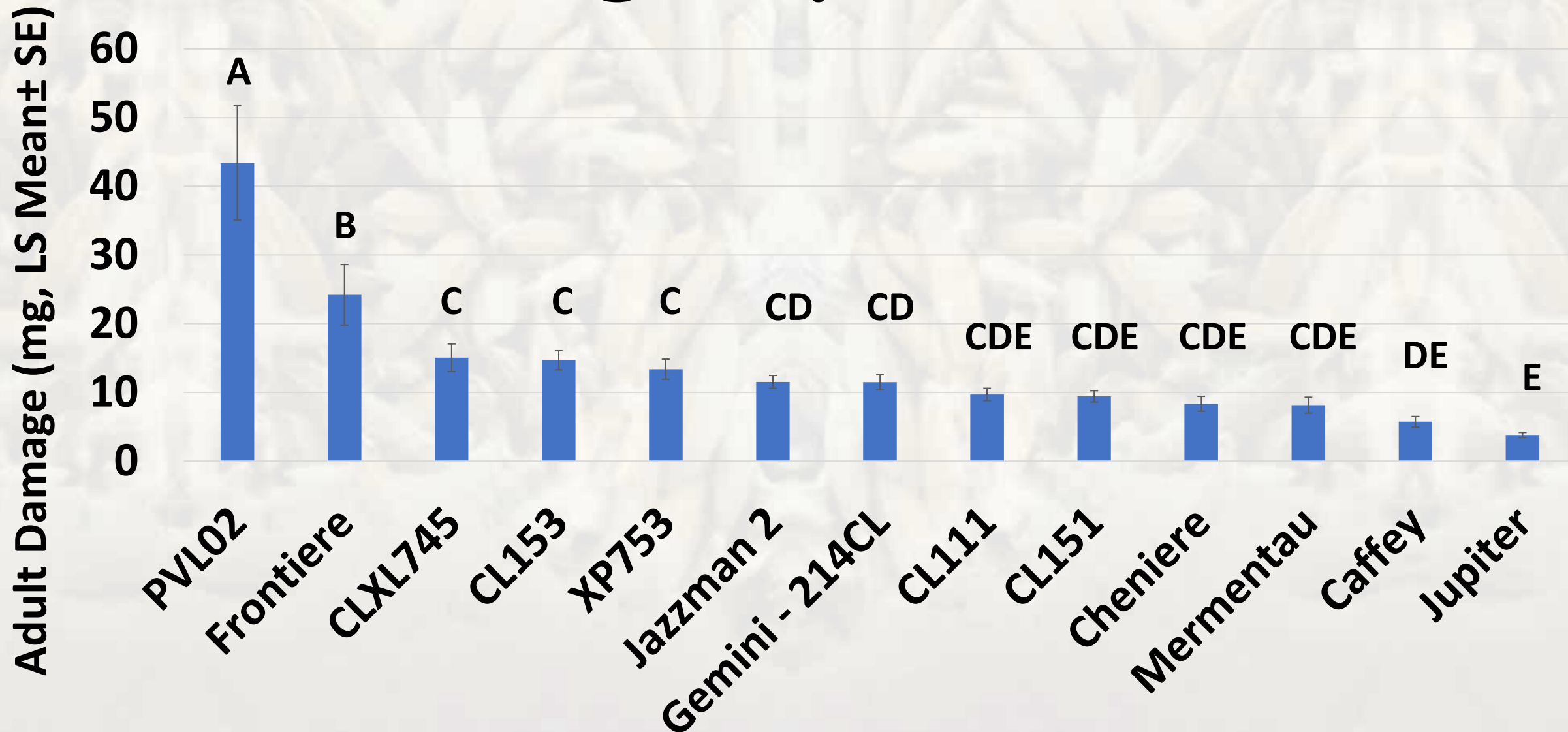
Rice varieties have differing susceptibilities in the field

There are also differences in stored rice varieties

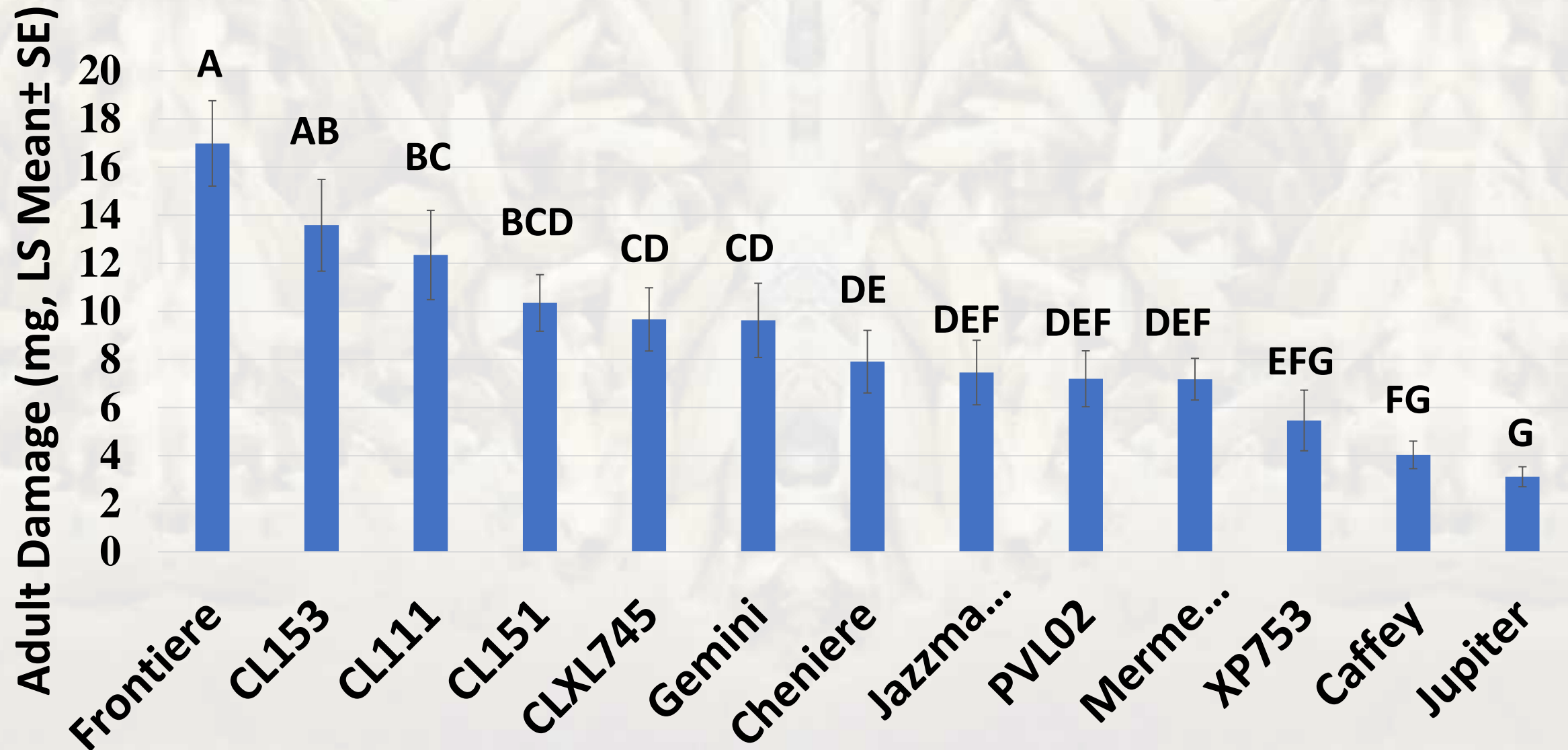
Previous research has shown large difference between varieties



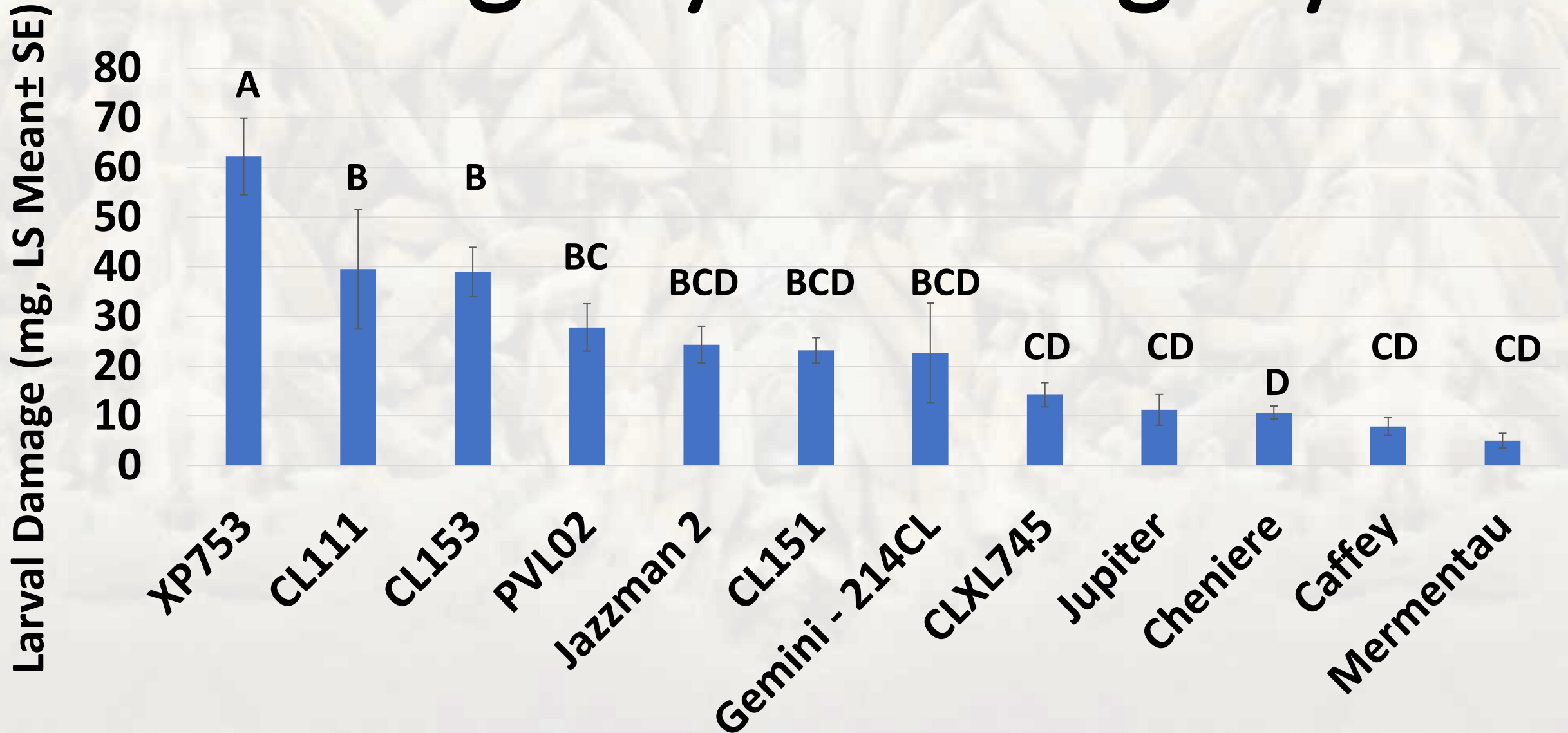
Damage By Adult RW



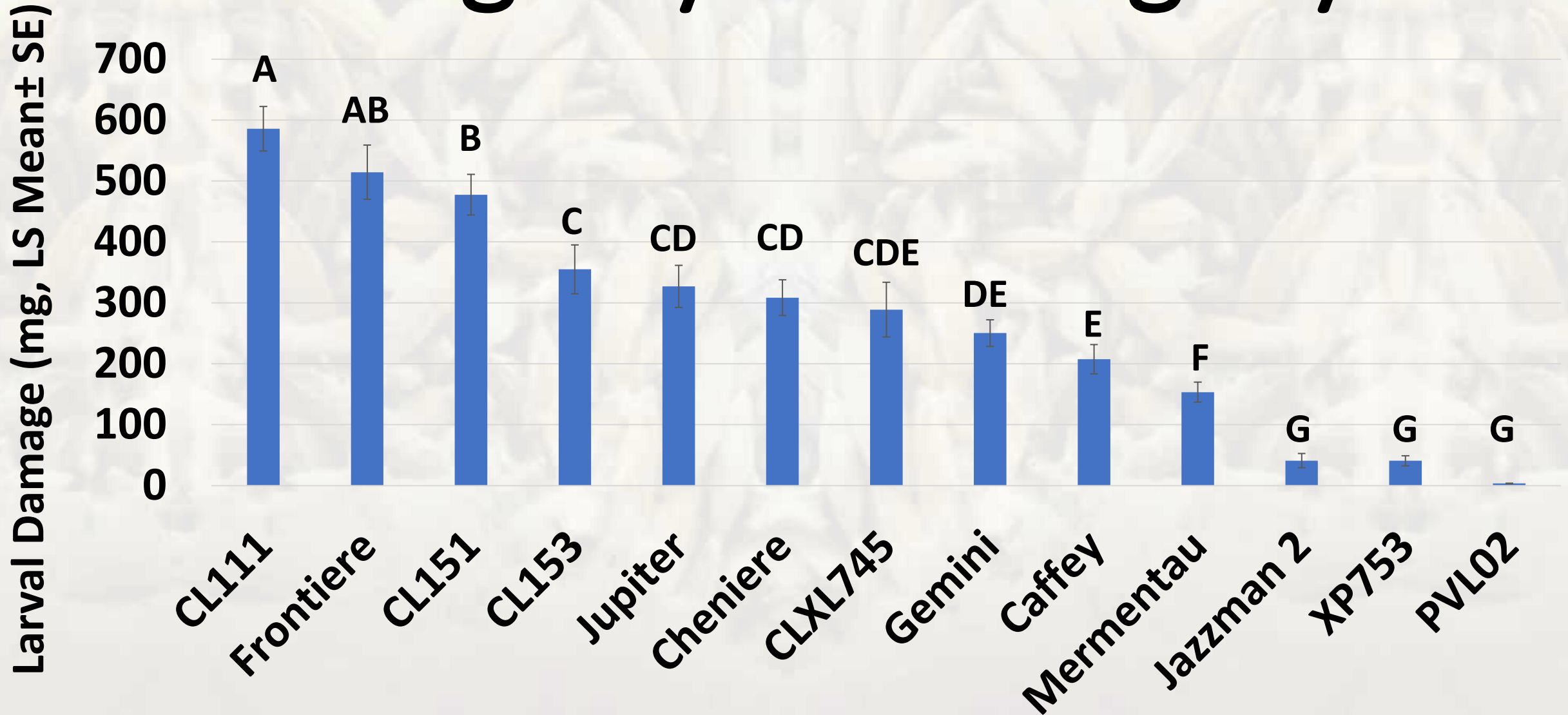
Damage by Adult LGB



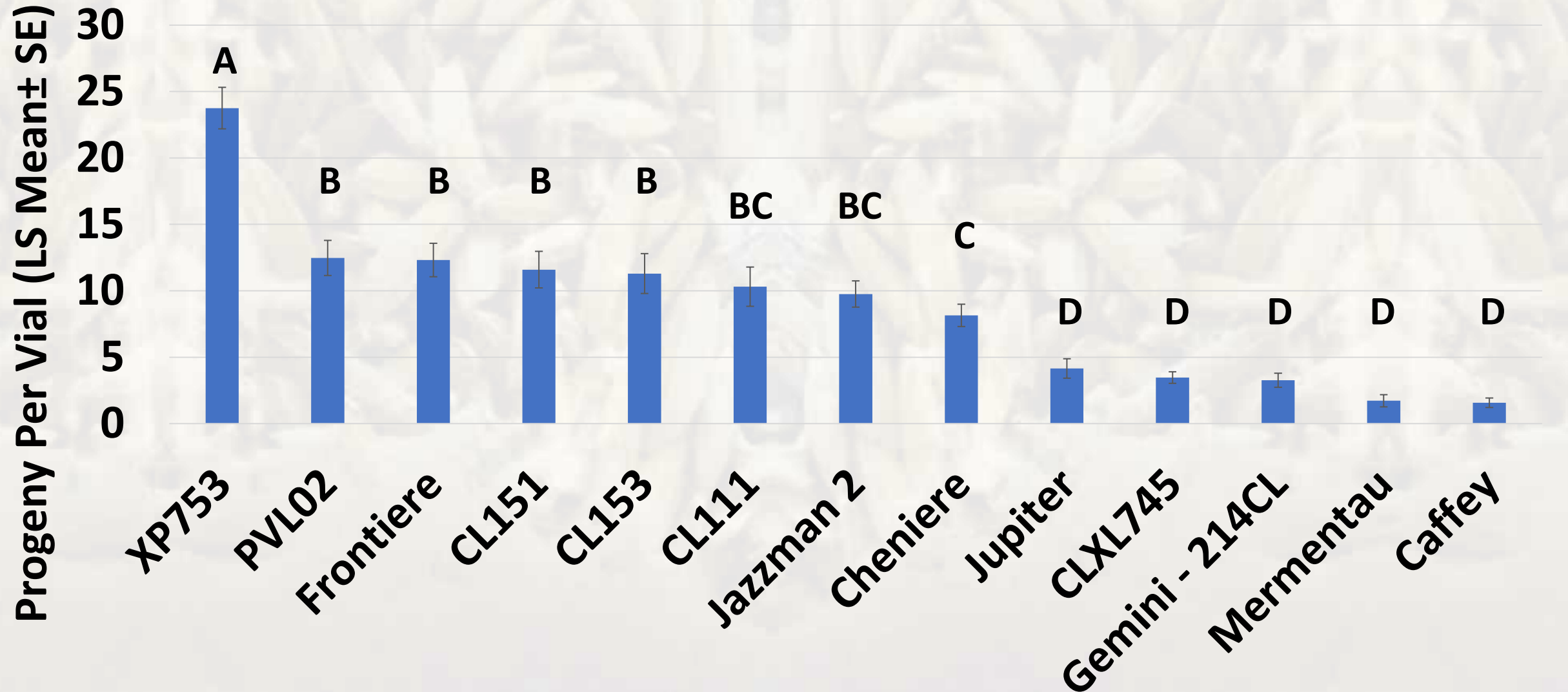
Damage By RW Progeny



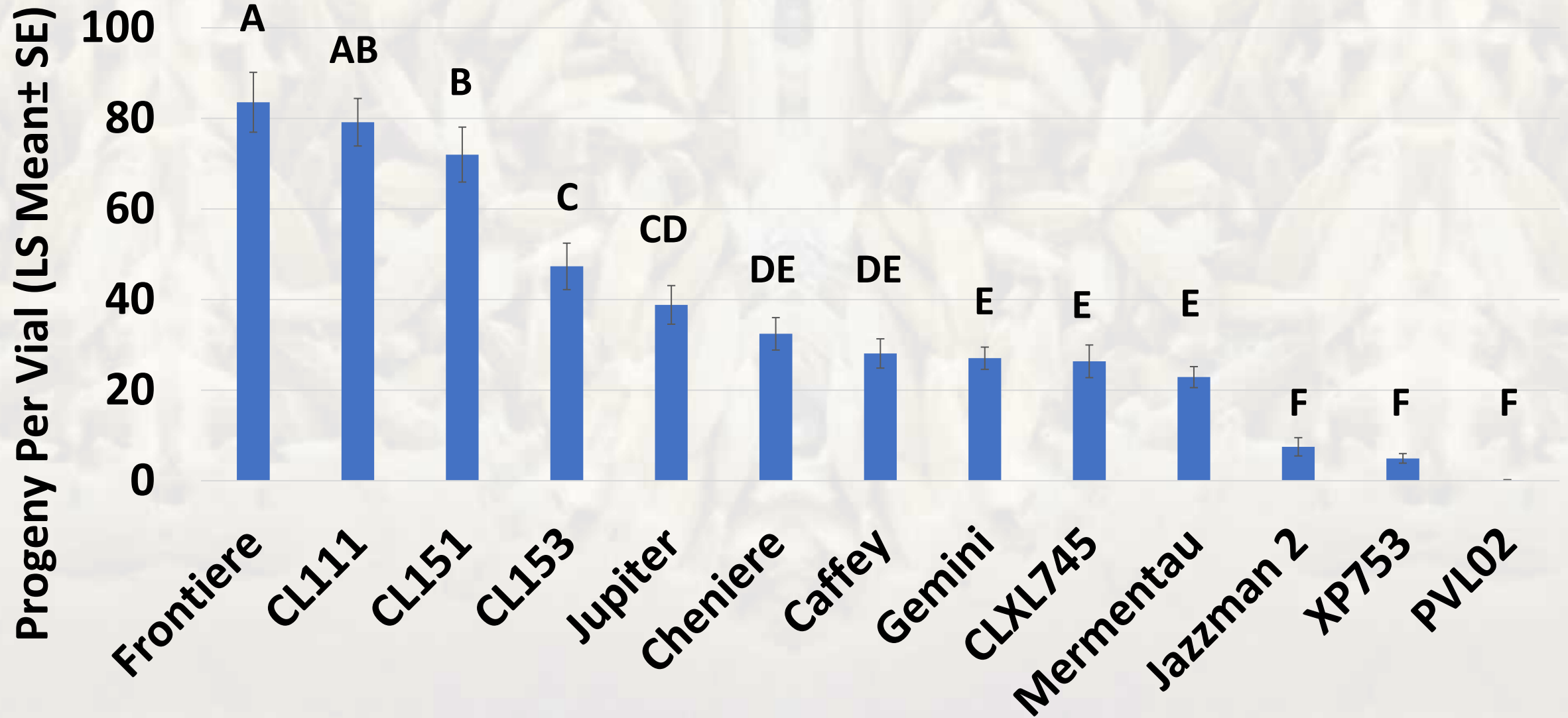
Damage by LGB Progeny



RW Progeny Count



LGB Progeny Count



Broader Impacts

- 1. Sanitation can reduce insect introductions**
- 2. Moisture control can reduce the viability of insects**
- 3. Protectants can further reduce pest pressure**
- 4. Varietal resistance can inform growers about the amount of chemical inputs needed**

All of this works towards reducing fumigation usage and costs

Thank You!!

Louisiana Rice Research Board

The Wilson Lab

The Sun Lab

Undergraduate Assistants and Interns

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