Weed management systems for leafy greens

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Kerb update I

- The food use tolerance for leaf lettuce was lost in August of 2009.
- In July 2011 Dow, the Leafy Greens Board, and UC met with California DPR to discuss an application for a section 18 for select California Counties. We are currently preparing a section 18 request. Western Growers Assoc. will submit the section 18 request to California DPR.

Kerb update II

- We are having trouble getting the Kerb registration back because the risk cup for Kerb is 200% full.
- The reason the Kerb risk cup is full is that it can potentially contaminate surface drinking water sources.
- However, in lettuce production areas there is little or no surface water used for drinking water. Dow is trying to work through this issue, but it will be a long process.

Kerb update III

- The section 18 is the best hope that we have for a “quick” reestablishment of a Kerb label for use in leaf lettuce.
- If there is a “villain” in this story it is the Food Quality Protection Act as it established the “risk cup” concept.

Nobody makes herbicides “sized” for specialty crops – they get products “sized” for someone else

Collaborators

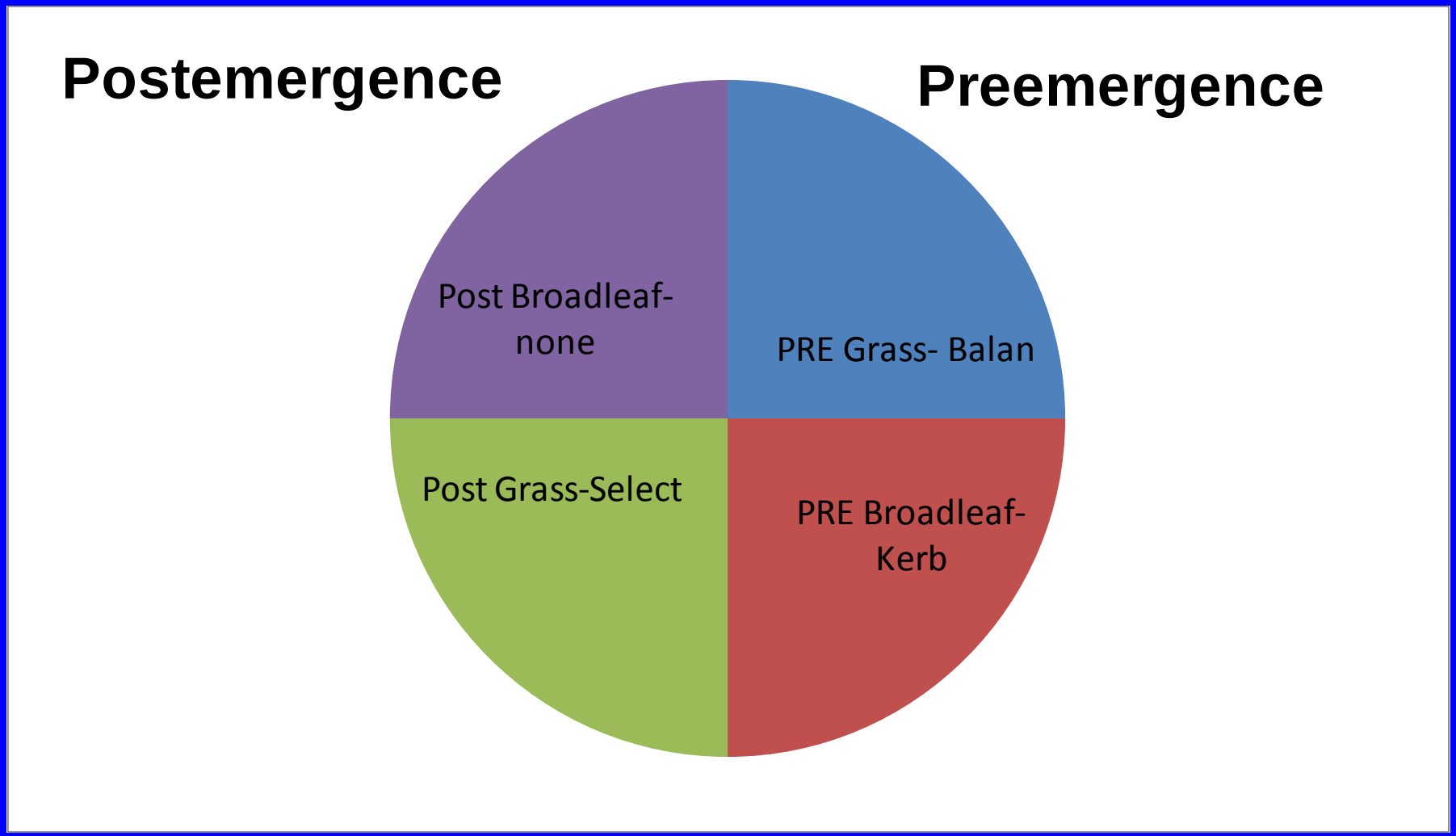
- Richard Smith, UCCE Monterey
- Beiquan Mou, USDA-ARS Salinas
- John Rachuy, UC Davis
- JoAnn Tanaka, USDA-ARS Salinas

Objectives

- Develop weed control programs for herbicide resistant lettuce breeding lines.
- Screen for higher Lorox (linuron) tolerance in spinach germplasm.

Herbicide-tolerant lettuce germplasm

The lettuce herbicide market by application method and weed class



Lettuce IDBR1 germplasm tolerance to tribenuron (Express)

- One trial was initiated in Aug. 15, 2011 on the Salinas Field station.
- Varieties used as parents: Buttercrunch, Lolla Rossa, Parris Island, and Salinas 88.
- The trial was replicated 4 times.

Lettuce IDBR1 germplasm source

- The source of the herbicide tolerance was prickly lettuce (*Lactuca serriola*).
- The resistance gene was then back crossed into butterhead lettuce.
- Once in lettuce, the gene was back crossed into crisp head, Romaine, red leaf and green leaf lettuce.
- All breeding was done using conventional back cross methods.

Express (tribenuron-methyl)

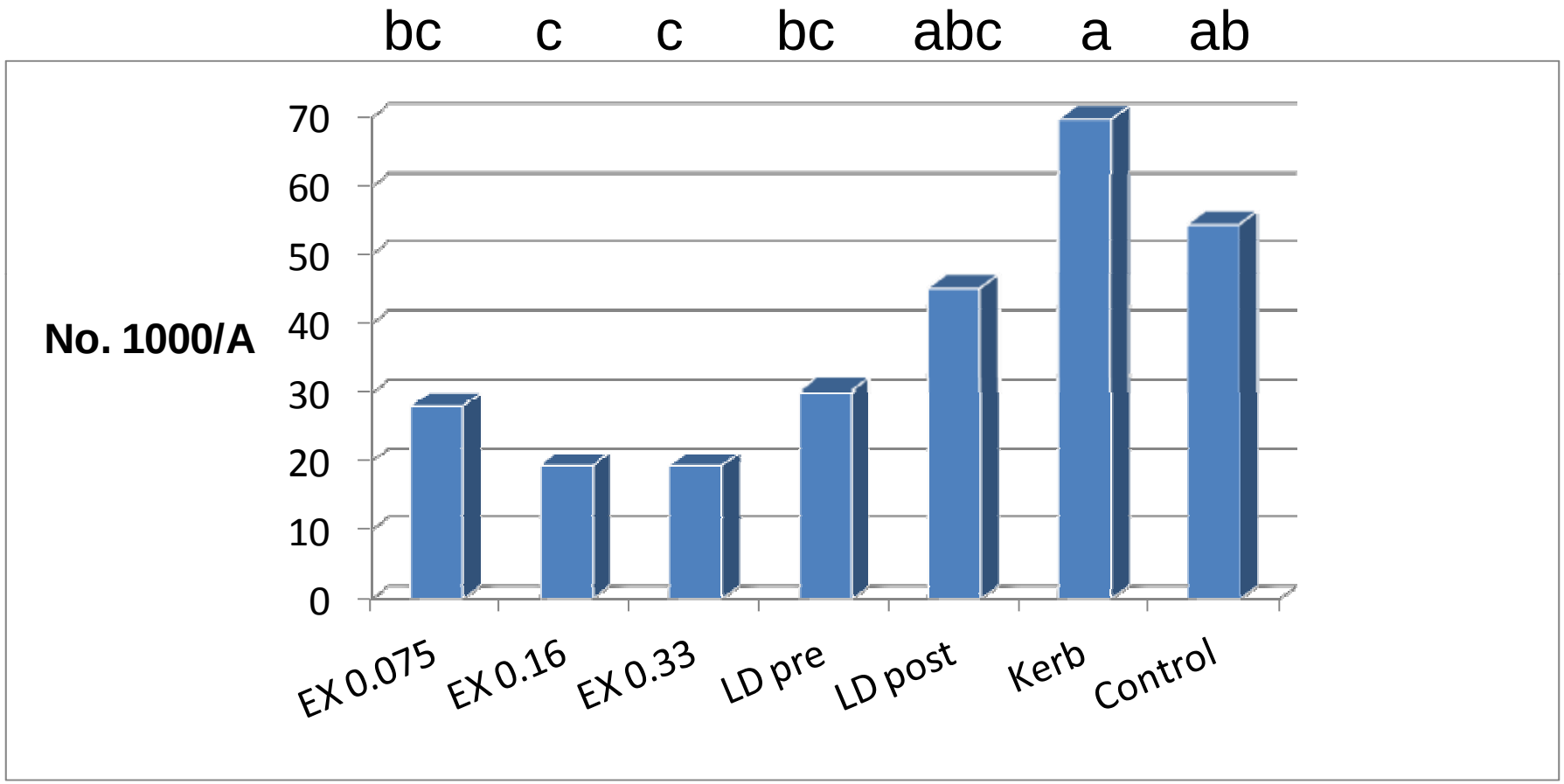
- Express is a sulfonyl urea herbicide from DuPont.
- Express registrations in California include small grains and sunflower hybrids that have the “Express Sun” trait.
- Express use rates 0.25 to 0.5 oz product/A.
- Rotational restrictions: any crop can be planted 60 days after application.

Express – weeds controlled

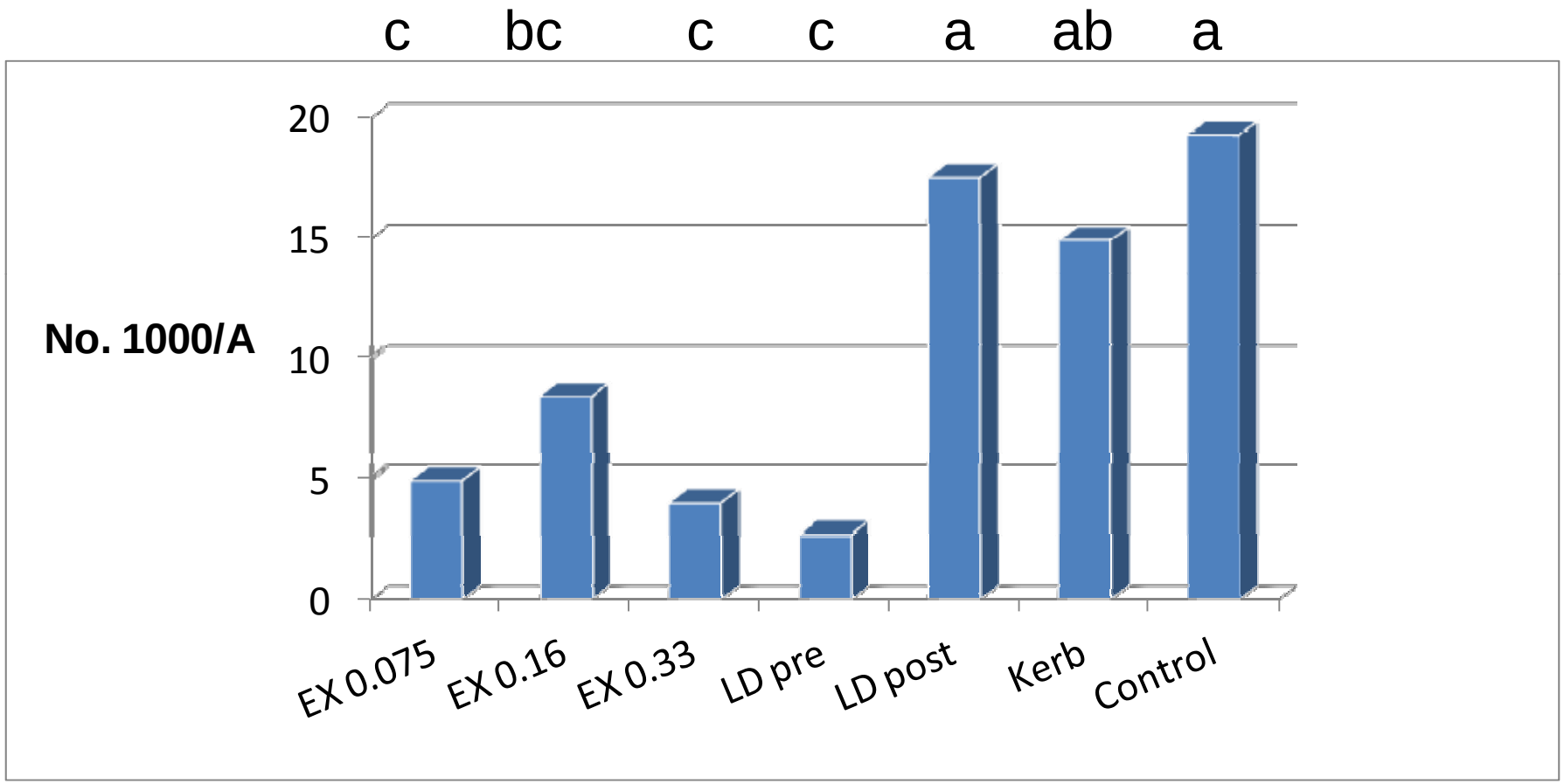
Chickweed	Groundsel	pineappleweed	sowthistle
Purslane	London rocket		
Shepherd's purse			

TRT	Herbicide	Form	Rate
1	Express	75 DF	0.075oz
2	Express	75 DF	0.16 oz
3	Express	75 DF	0.33 oz
4	Londax - PRE	75 DF	0.75 oz
5	Londax - POST	75 DF	0.75 oz
6	Kerb	3.3 SC	2.9 pt
7	Control		0.0

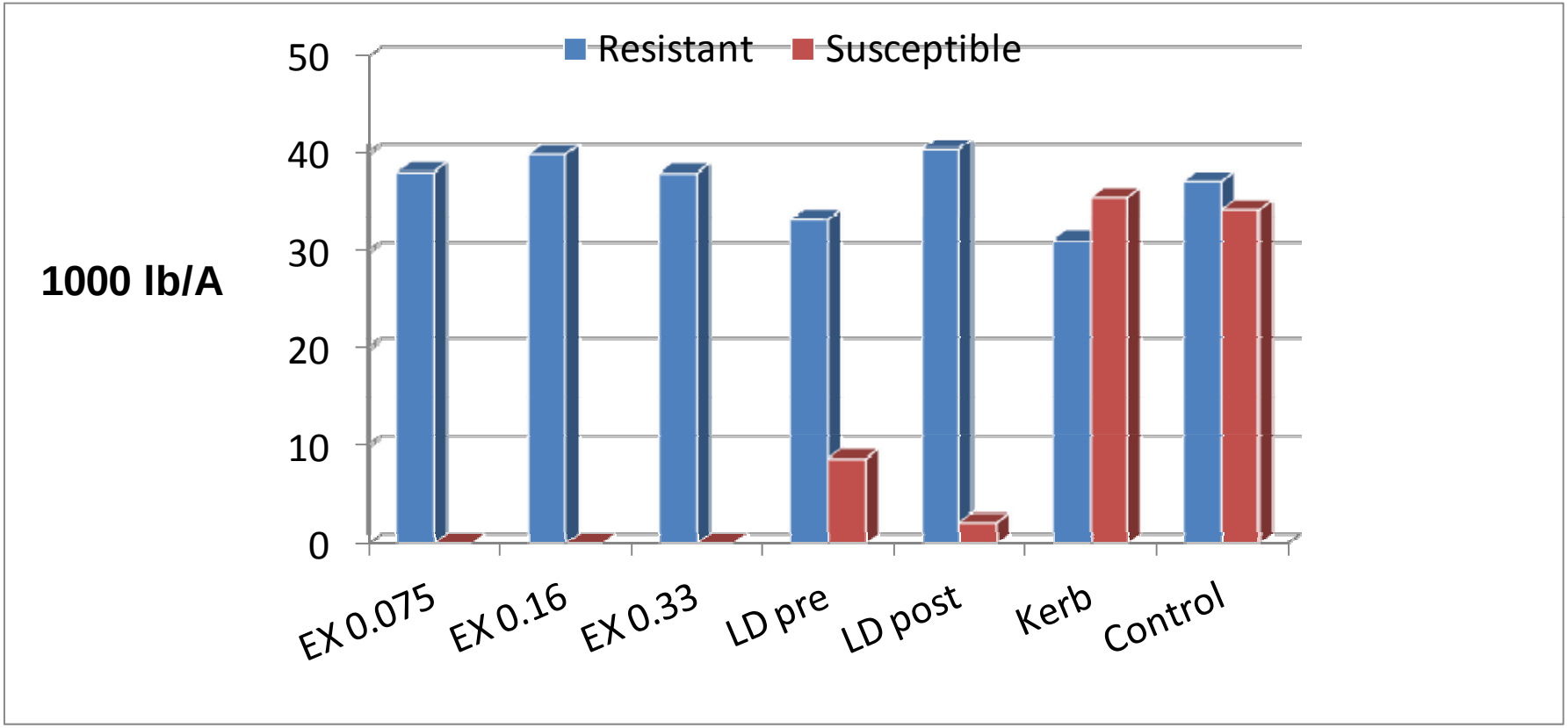
Sowthistle densities



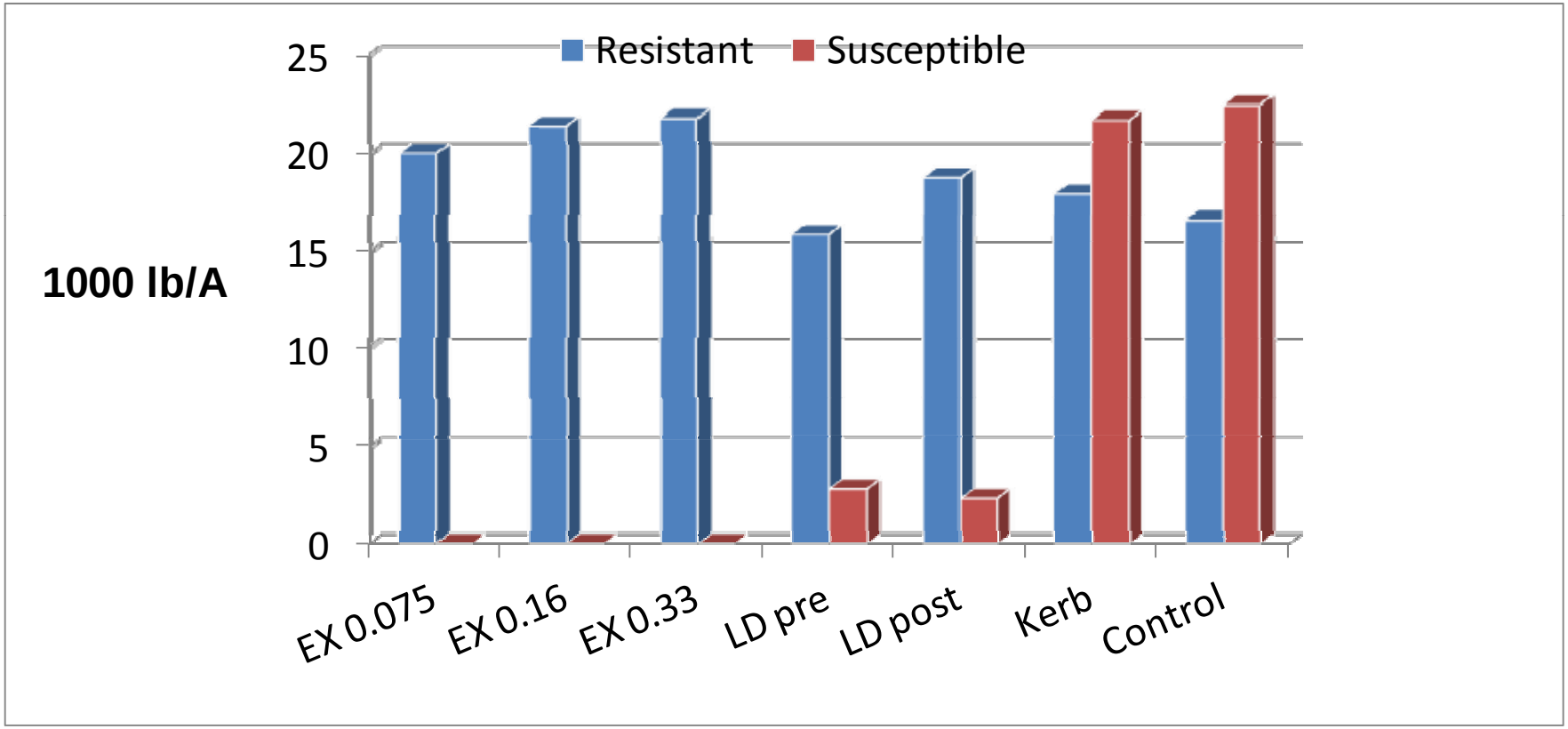
Groundsel densities



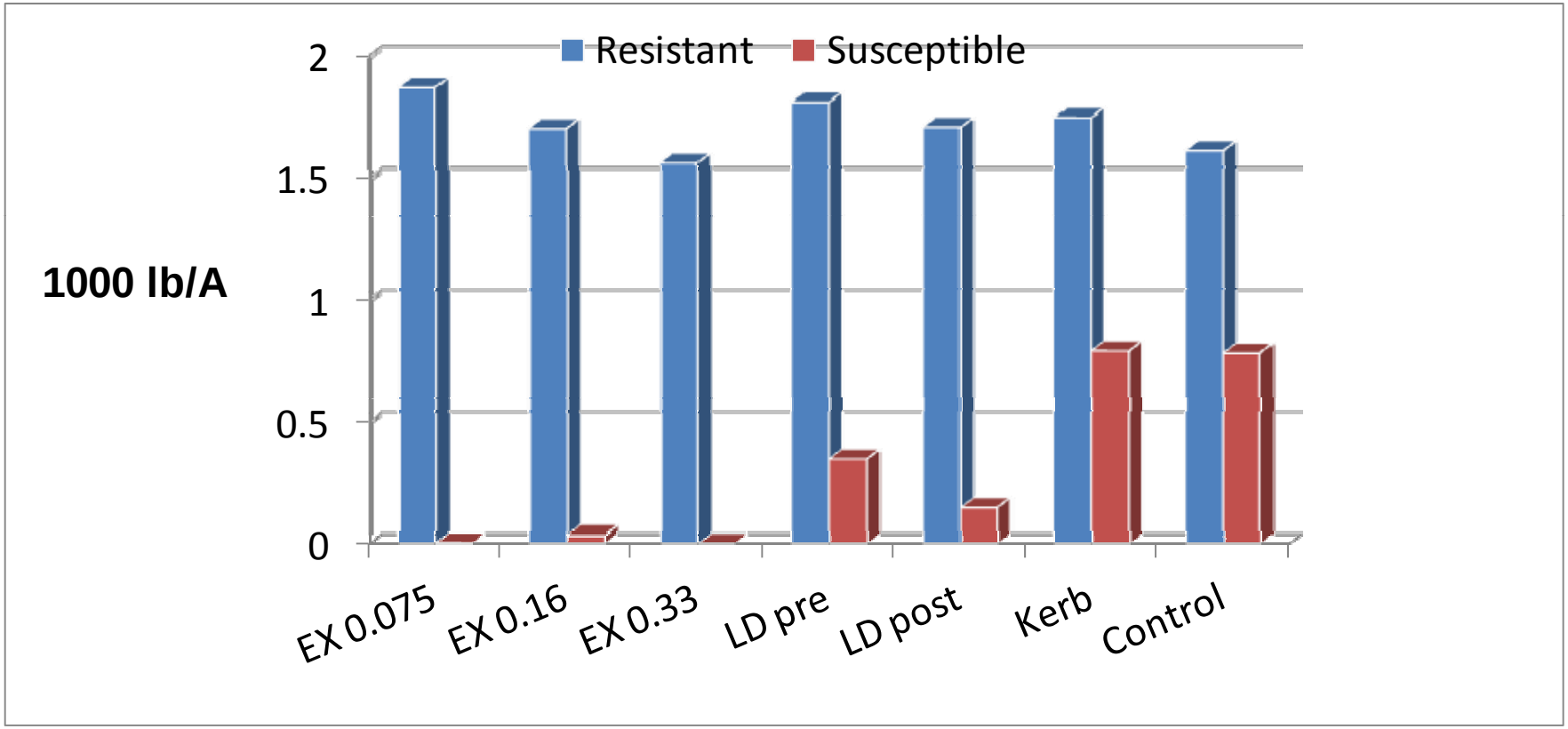
Romaine yield



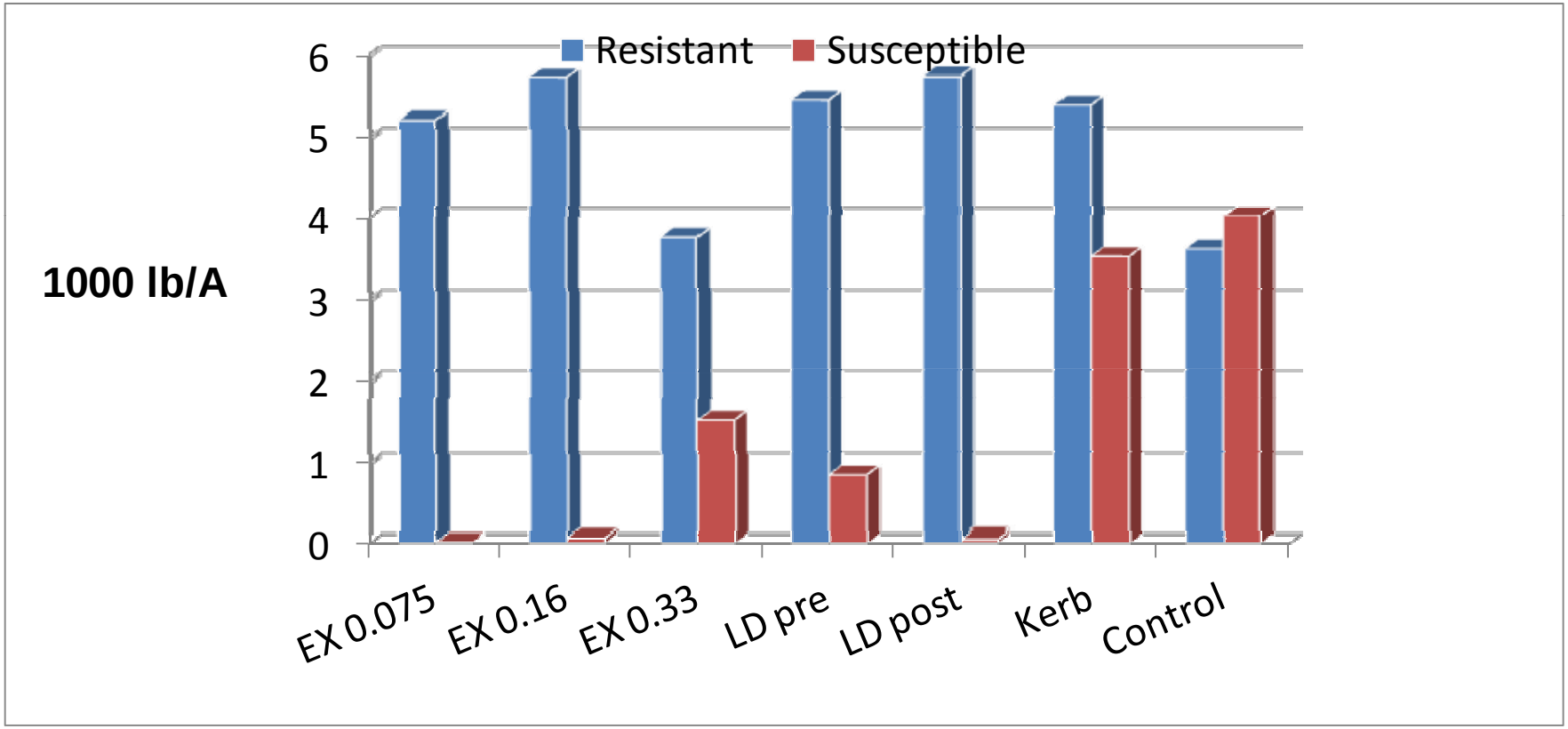
Crisphead yield



Red leaf yield



Butterhead yield




Crisp head
Romaine
2011.07 - Treatment #3
Express 75WG
0.0156 lb ai/Ac
R-11 NIS @ 0.25%
Post Emergence
Bed #6
(S) CrispHead - IDBRI
2011.07 - Treatment #1
Express 75WG
0.0035 lb ai/Ac
R-11 NIS @ 0.25%
Post Emergence
Bed #3
(R) Romaine 1 - (R) Romaine 2


Butterhead
2011.07 - Treatment #2
Express 75WG
0.0078 lb ai/Ac
R-11 NIS @ 0.25%
Post Emergence
Bed #1
(R) Butter Head - (S) Butter Head
Redleaf
2011.07 - Treatment #1
Express 75WG
0.0035 lb ai/Ac
R-11 NIS @ 0.25%
Post Emergence
Bed #2
(R) Red Leaf - (S) Red Leaf

Summary – IDBR1

- The resistance gene is protecting lettuce stand and yield.
- Weed control with Express is good and it controls weeds that Kerb does not control.
- Tribenuron/lettuce has been submitted to IR-4 (PCR 10873) and is a “B” priority. DuPont has been informed of our progress.

Screen for new herbicide-tolerant spinach germplasm

Spinach herbicides

- Ro-Neet – the major spinach herbicide. Many have commented on the difficulty in working with the 48 hour reentry interval.
- Dual Magnum – the 24C label requires at least a 50 day pre harvest interval.
- Bottom line – this is not a pretty picture.

Breeding for spinach herbicide resistance

- In 2009 we began selecting for increased tolerance to Lorox herbicide.
- Our objective is to eventually bring conventionally bred Lorox tolerant spinach to the market.

Screen for greater herbicide tolerance in spinach

- 21 populations – resistant accessions selected in 2009 were screened in 2011 for tolerance to Lorox (linuron) at 1 lb ai/A applied PRE. Survival in selected lines was 2 to 60% vs 0 to 36% for the control.

Herbicide tolerance in spinach

- Surviving spinach lines are being grown for seed in isolators.
- Progeny will be planted and screened with Lorox.

Herbicide tolerance breeding

- Breeding for increased herbicide tolerance in leafy greens isn't a fast or easy procedure, but there are no easy alternatives.
- There is precedent for conventional breeding for increased herbicide tolerance in field corn, rice, soybean, sunflower and wheat.

Acknowledgments

- CA Leafy Greens Board
- Sharon Benzen, USDA-ARS