

2007 Studies in Lettuce Weed Control

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Lettuce Weed Control Studies

- **Transplanted Lettuce**
- **Drip Germinated Lettuce**
- **New Formulation of Kerb Evaluation**
- **Chemigation on the Central Coast**

Transplanted Lettuce

Current Situation

- **Lettuce and broccoli in the Salinas Valley are basically direct seeded**
 - Transplanting is used early in the lettuce season and in order to keep plantings on schedule
- **However, other crops on the central coast are now transplanted:**
 - Celery
 - Cauliflower
 - Leeks
 - Peppers
 - Fresh market tomatoes

Why is Lettuce not Transplanted?

- Moderately high plant population (26,150-31,300) makes the economics of transplanting vs direct seeding difficult
- Market demand is currently being met (no need for three crops?) with current rotation patterns
- Questions about the quality of transplanted head lettuce
- Other quality issues

Lettuce Transplant Costs

Not including seed

System	Plants Per 1,000	Transplant Per 1,000	Total Cost Per 1,000	Total Cost Per Acre
Conventional	10.50	8.00	18.50	485
Organic	13.50	8.00	21.50	563
Automated*	----	----	16.50	432

* Grower's Transplant, Inc.

Operation	Seeded	Transplants
Seeding	169	---
Transplanting	---	509
Fertilizer - Preplant	70	70
Fertilizer - Sidedress	102	102
Herbicide	48	48
Thin/weed	148	0
Hand Weed	57	57
Cultivation	27	10
Irrigation	167	167
Total Production Costs	788	963

Current Trends

- **Increase in cost of labor**
- **Decrease in the availability of labor**
- **Increased costs of inputs (water, fertilizer, pesticides, etc)**
- **Increased cost of land rent**
- **Need to intensify the use of land to cover increased costs**
- **New developments in technology**



Availability of labor



Automation



New Technology

Costly
High maintenance

What Will Agriculture in California Look Like in 10 Years

- **Will it be more or less as it is now?**
- **Will the trends we see in 2007 lead to a shift in the economics of production which force crops to be produced in a way that lends itself more to intensification and mechanization**

Based on this situation we feel it is important to explore new weed control options in the event that transplanting of broccoli and lettuce become more common place

Weed Control Options for Transplanted Lettuce

- **Currently there are no herbicides registered specifically for transplanted lettuce in California**

Lettuce: Seedling vs Transplant

- **Lettuce is particularly sensitive to damage by herbicides in the seedling stage**
- **As a result there is a very short list of herbicides that are safe for preemergence use: Kerb, Prefar, Balan**



Lettuce: Seedling vs Transplant

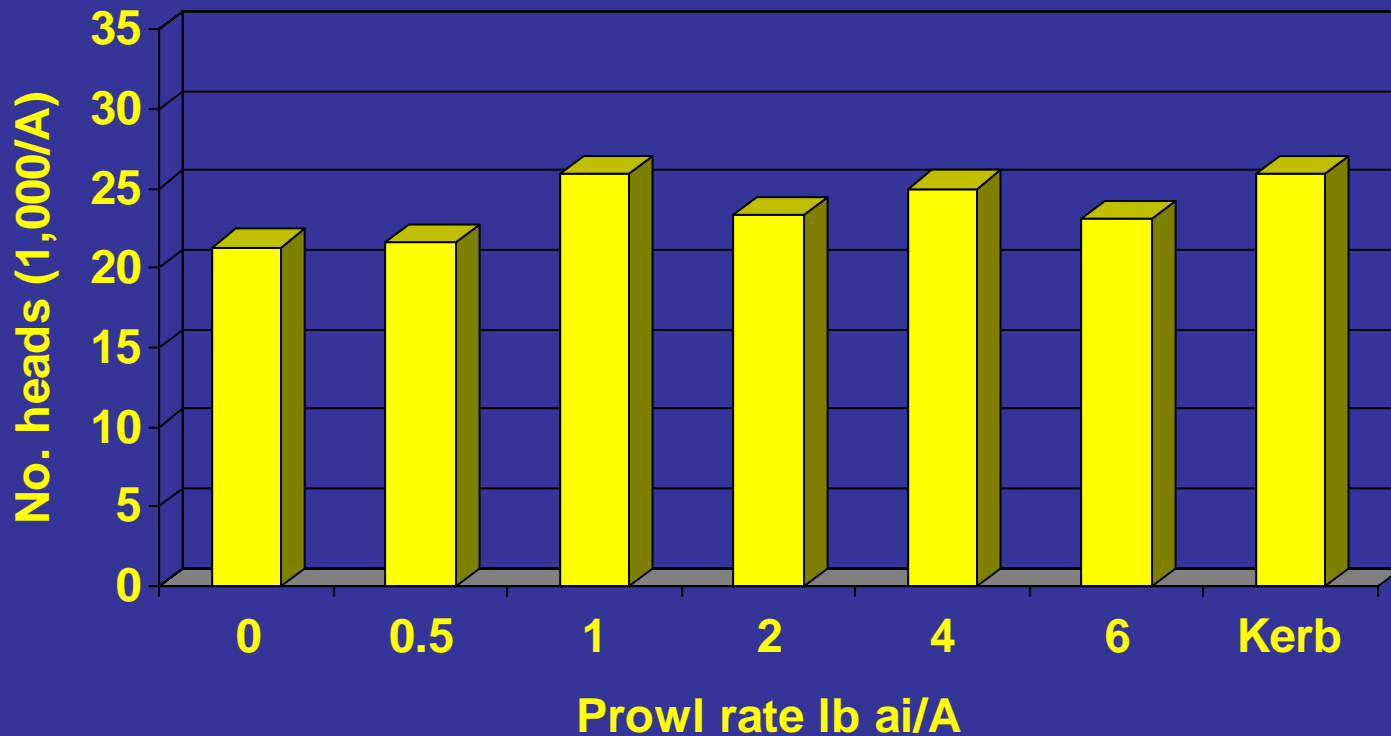
- Once lettuce is past the seedling stage:
- More tolerant of other herbicides
- More tolerant of physical manipulation



Weed Control Options for Transplanted Lettuce

- **Herbicide options for transplanted lettuce:**
 - **Prowl**
 - **Dual Magnum**
 - **Authority**

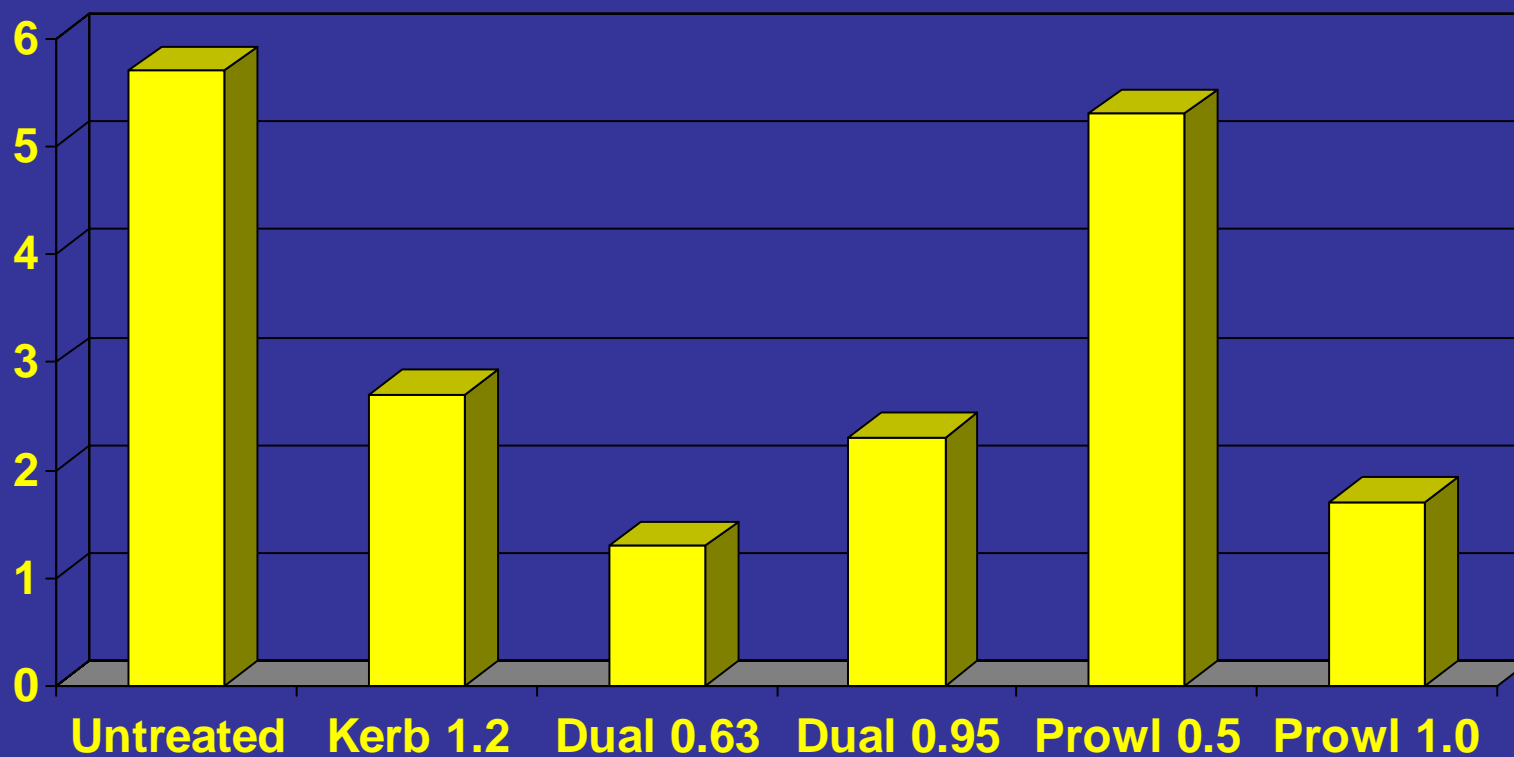
Prowl dose response on Romaine lettuce yield



Fennimore, 2007

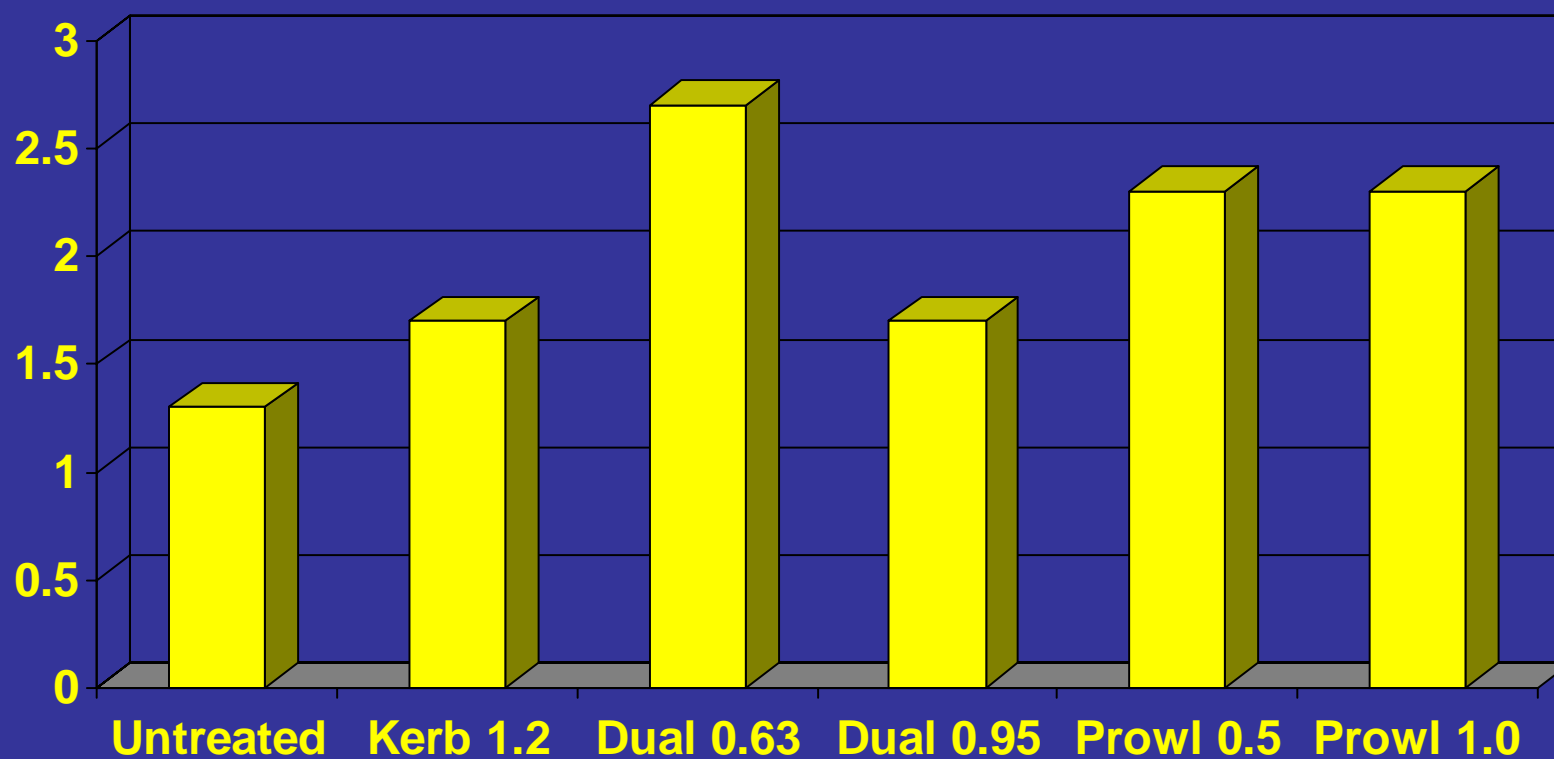
2007 Weed Evaluation

weeds/20 ft²



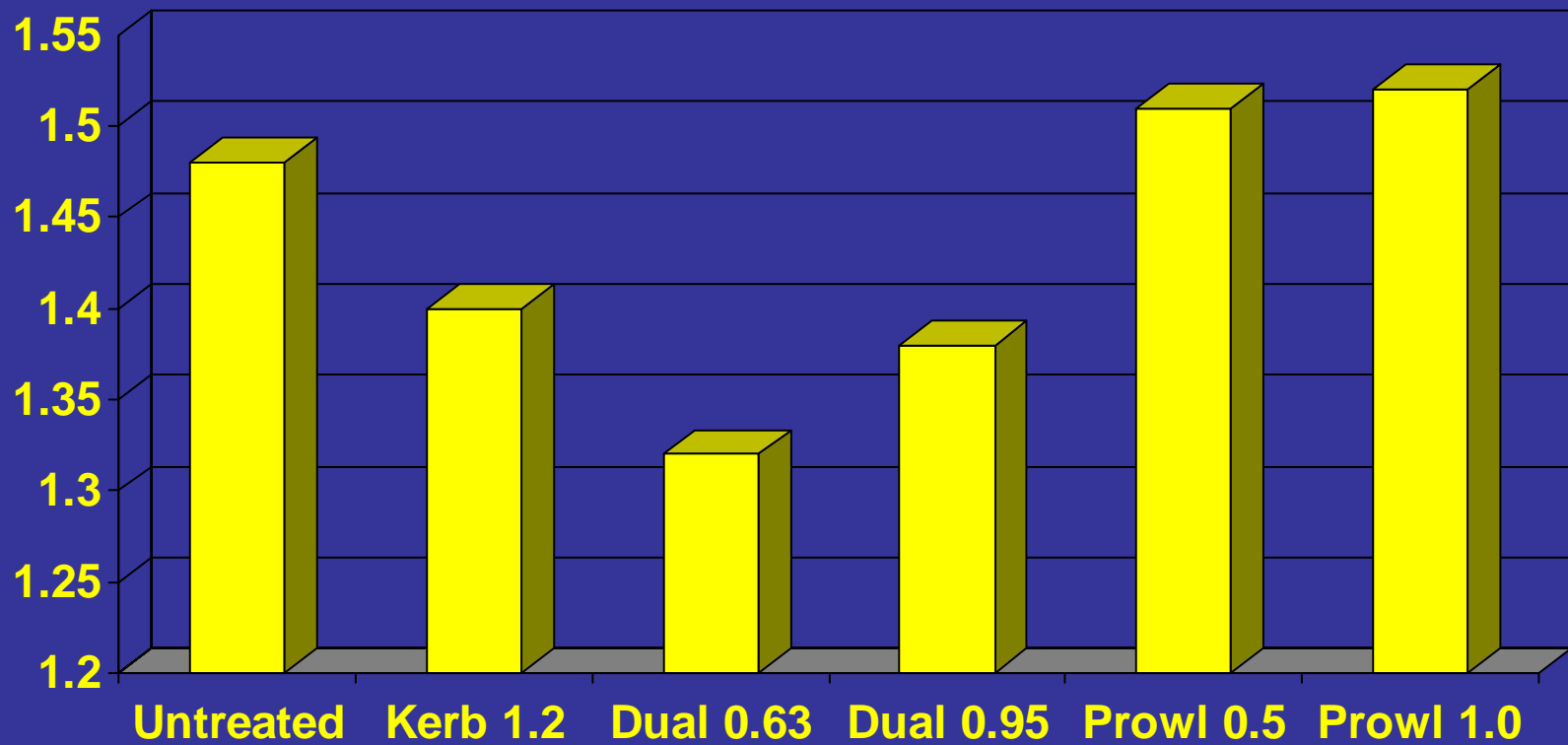
2007 Crop Safety Evaluation

Phytotoxicity Rating



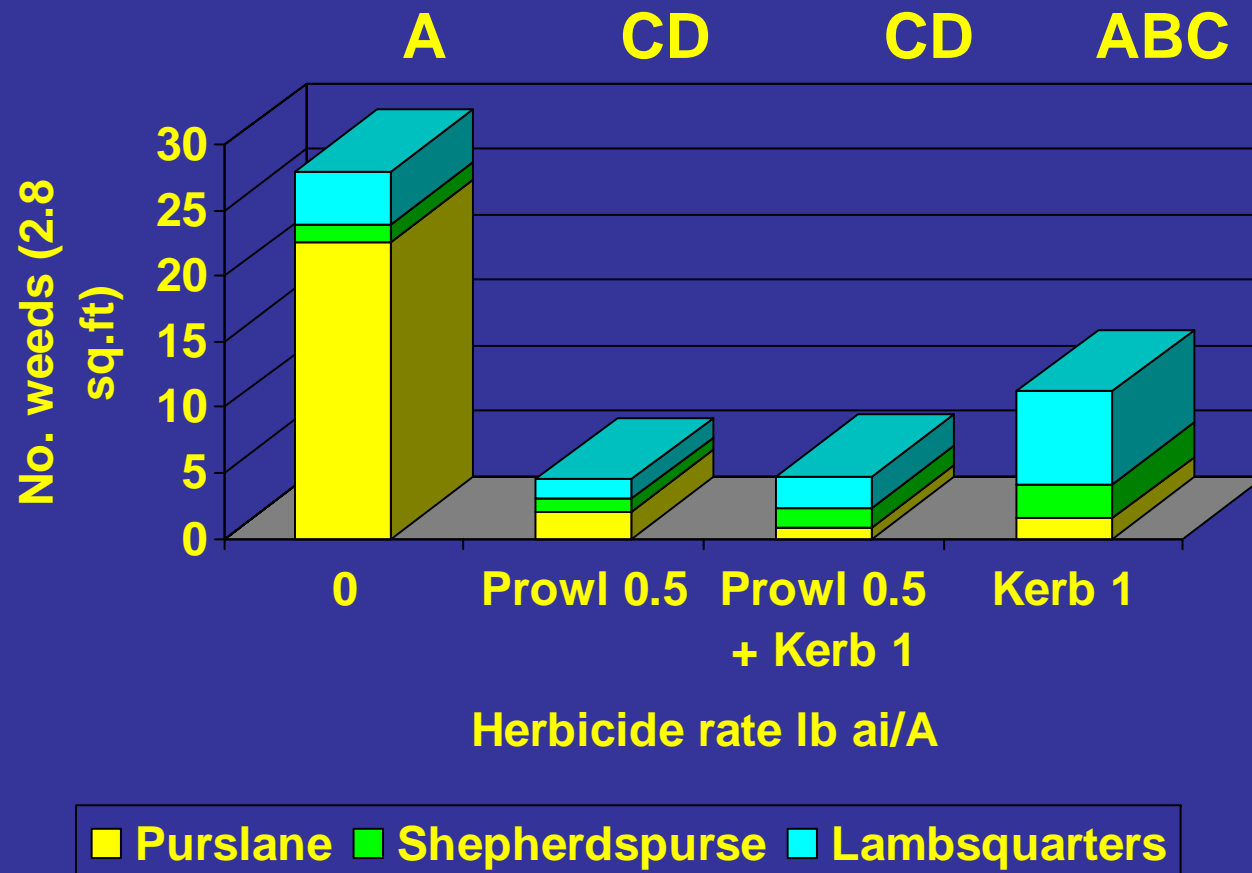
2007 Yield Evaluation

Mean Head Weight



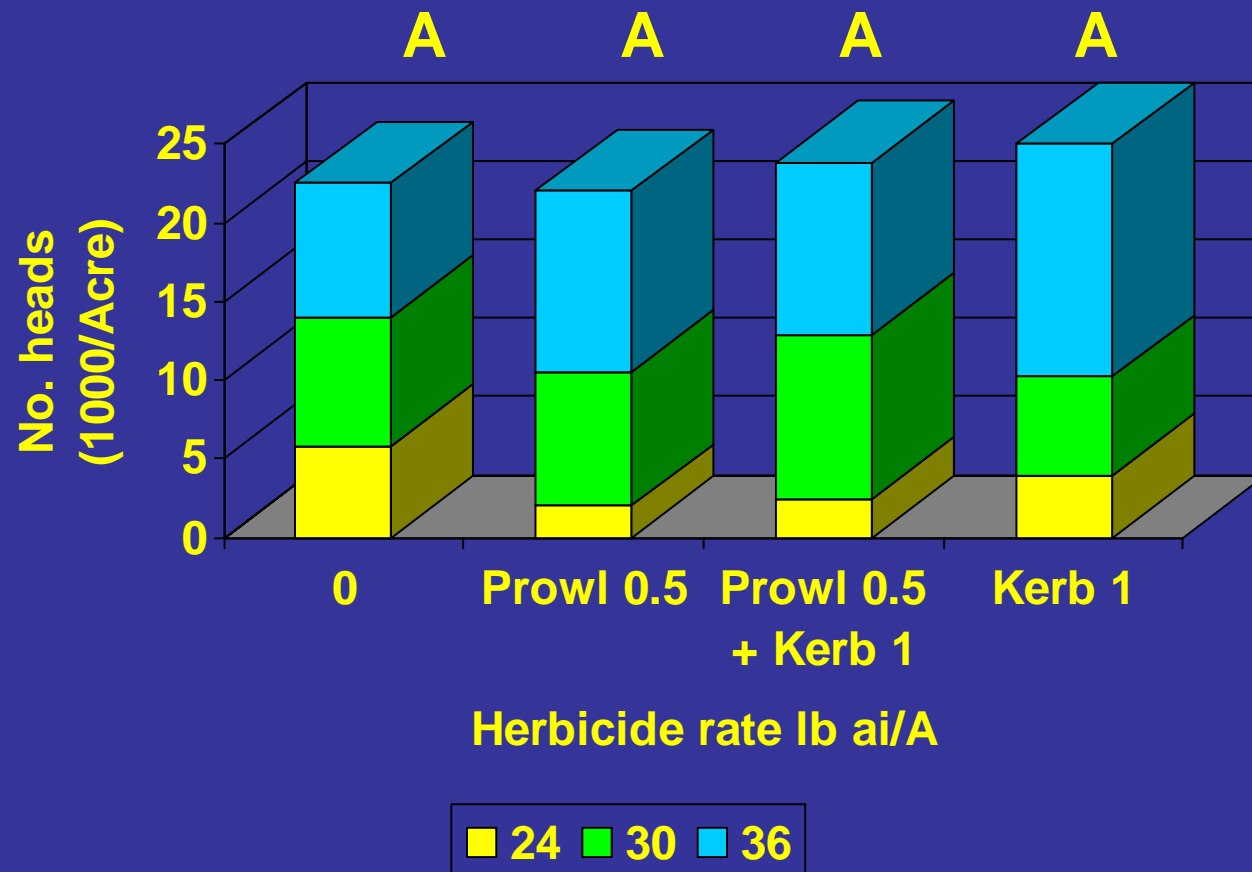
Kerb + Prowl tank mixes

Weed control – Prowl + Kerb



Fennimore, 2007

Iceberg lettuce yield – Prowl + Kerb



Fennimore, 2007

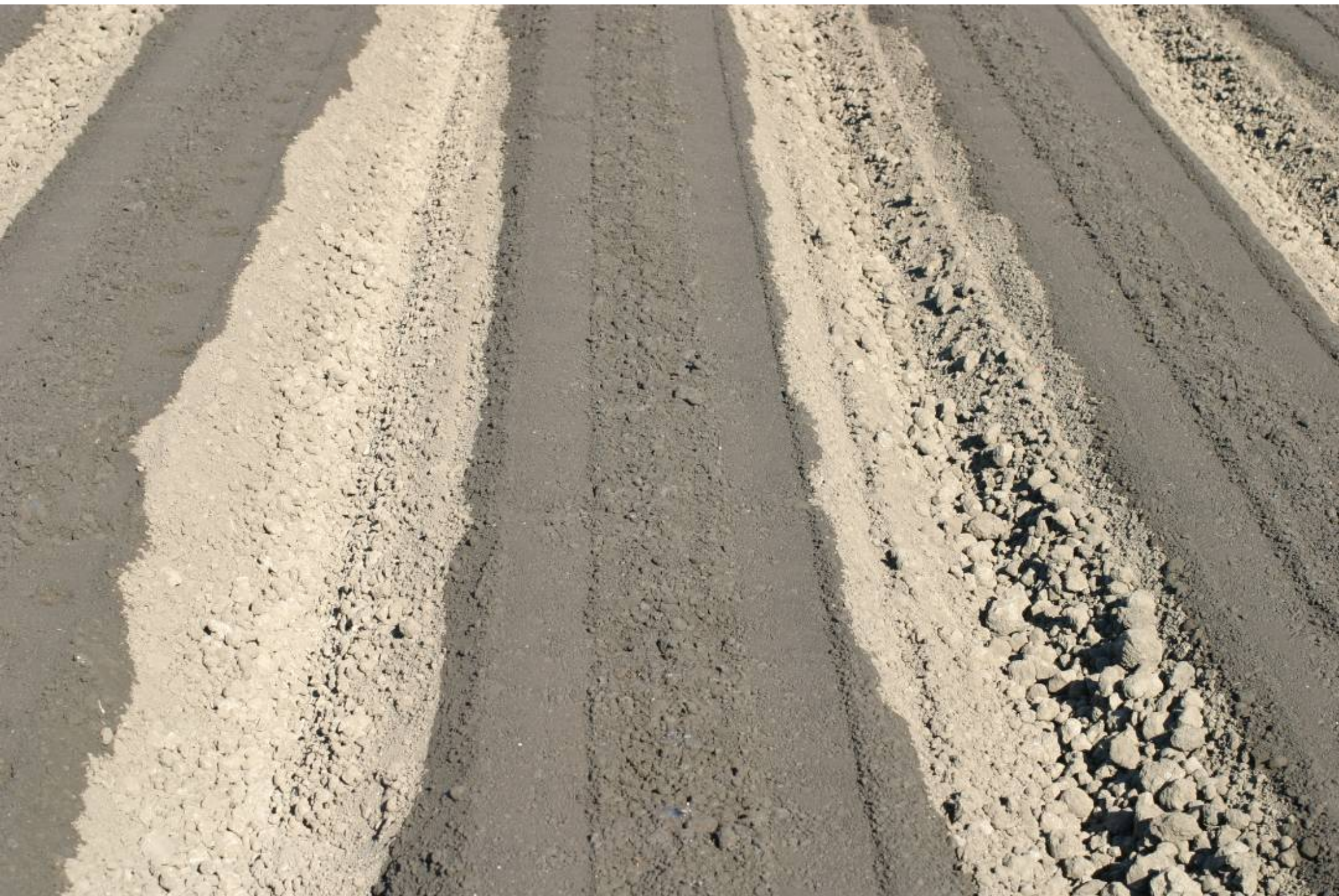
Summary: Prowl H2O

- **Prowl is as safe as Kerb on transplanted lettuce**
- **Prowl is more effective than Balan**
- **Prowl fills some holes in the weed spectrum provided by Kerb (i.e. Pig weed)**
- **Prowl is compatible for tank mixes with Kerb**
- **Prowl was submitted to the IR4 program to develop a food use tolerance for transplanted lettuce**

Drip Germinated Lettuce

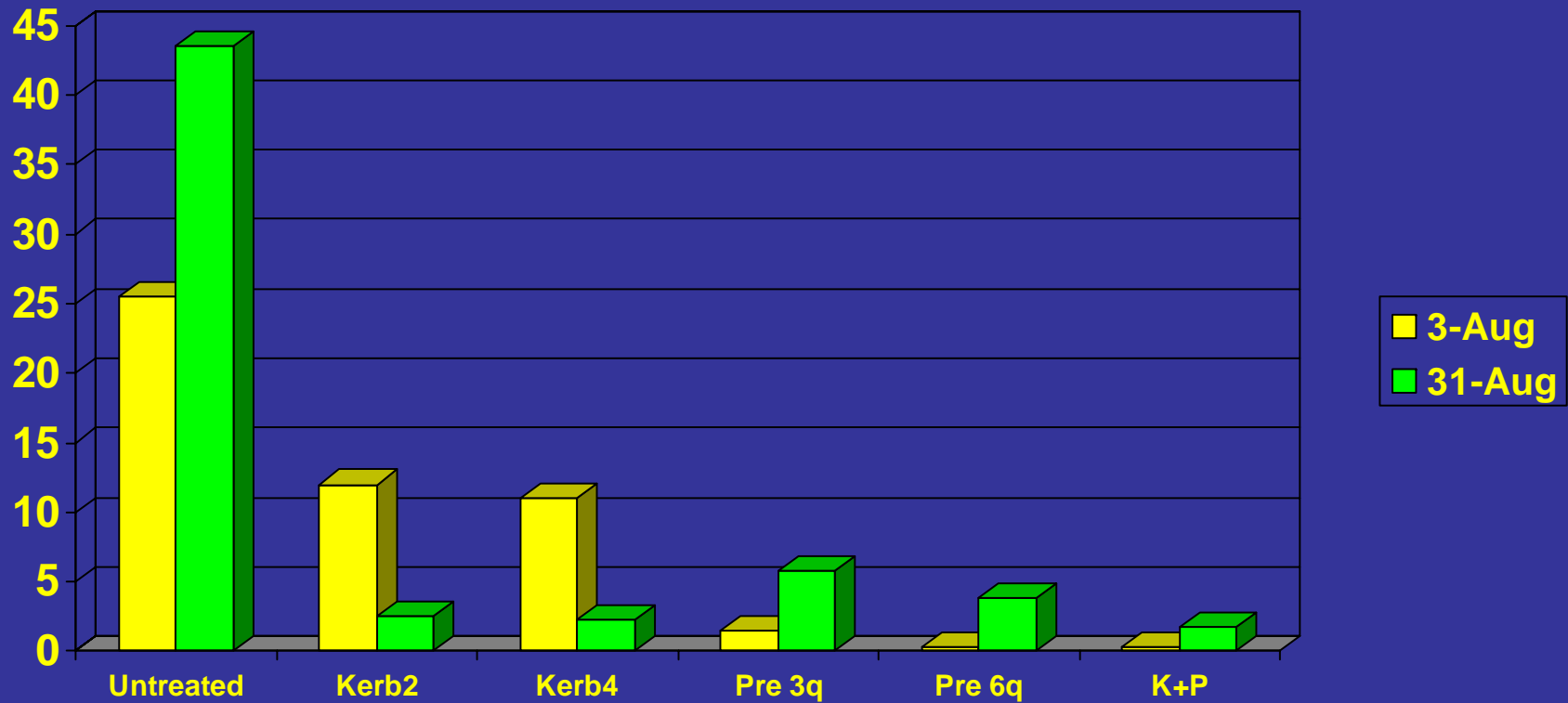
Background on Drip Germinated Lettuce

- **Drip irrigation was up to 30% of the Salinas Production in 2007**
- **Germination of lettuce with the drip system was still low, but it has some potential benefits of saving labor and water**



Purslane Evaluation

15 and 43 DAT Plants per 45 ft²





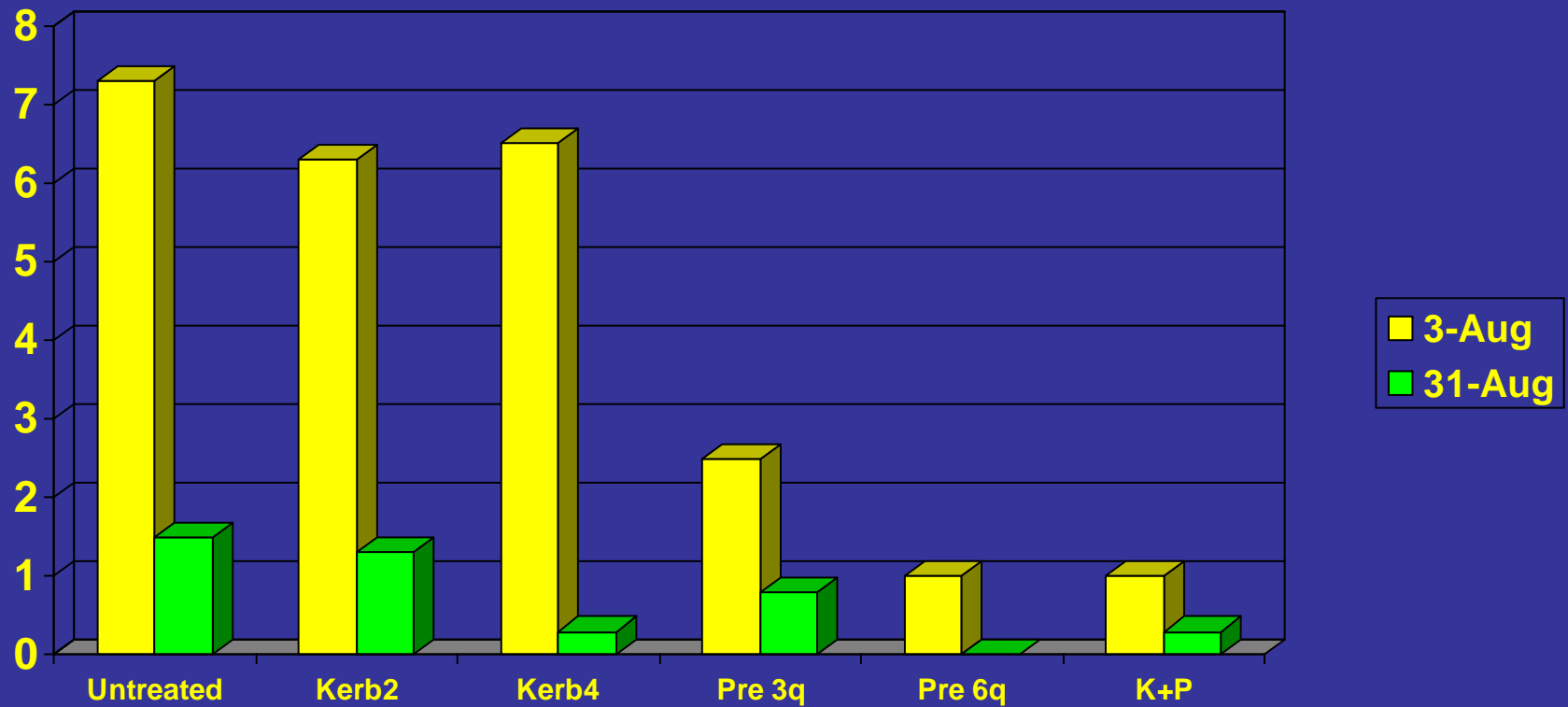
Untreated



Kerb + Prefar

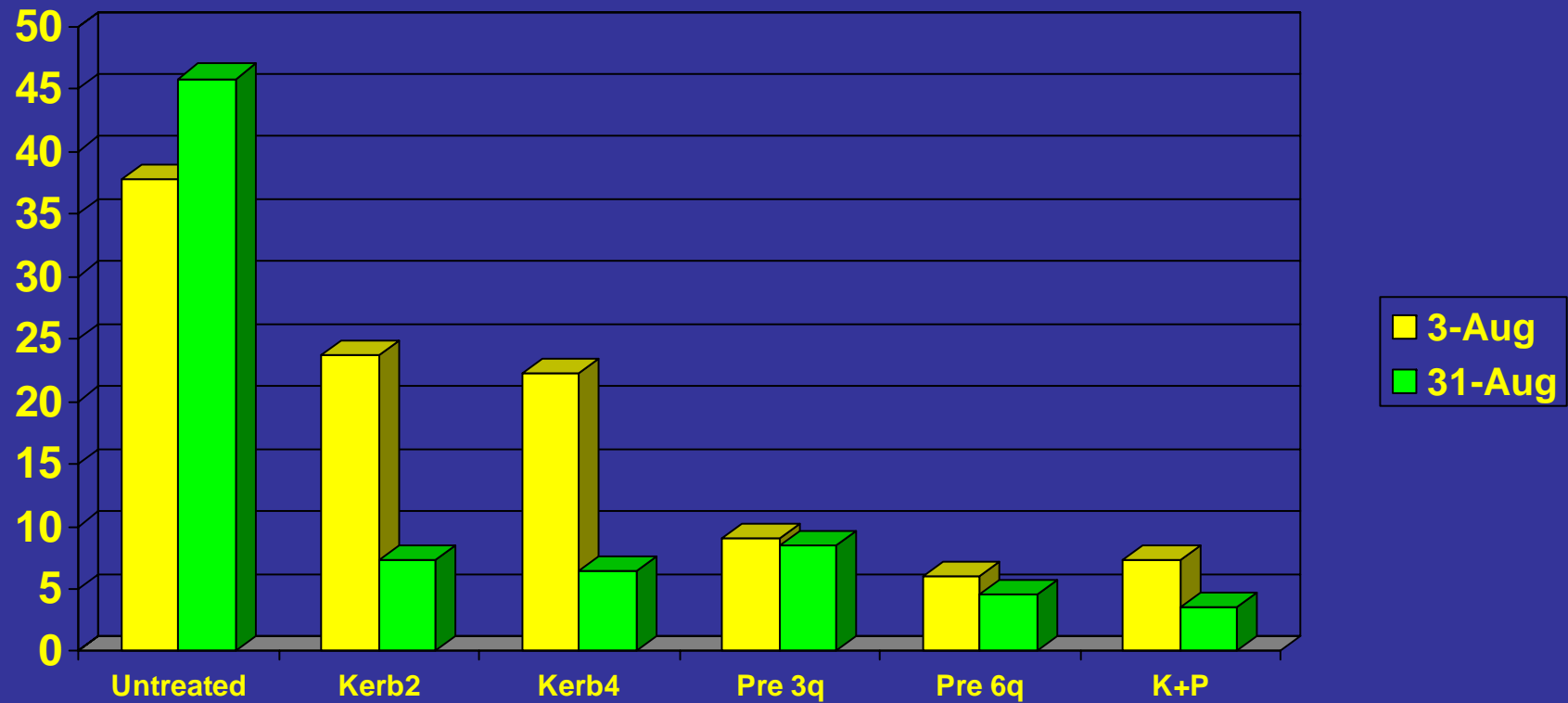
Nettle Evaluation

15 and 43 DAT Plants per 45 ft²



Total Weeds Evaluation

15 and 43 DAT Plants per 45 ft²



Concentration of Kerb in Soil

Soil Depth	Kerb ppm	Percent of Kerb
0 – ½ inch	7.5	63
½ - 1 inch	0.7	6
1 – 1½ inches	0.5	4
1½ - 2 inches	0.3	3

Summary of Weed Control with Drip Germination

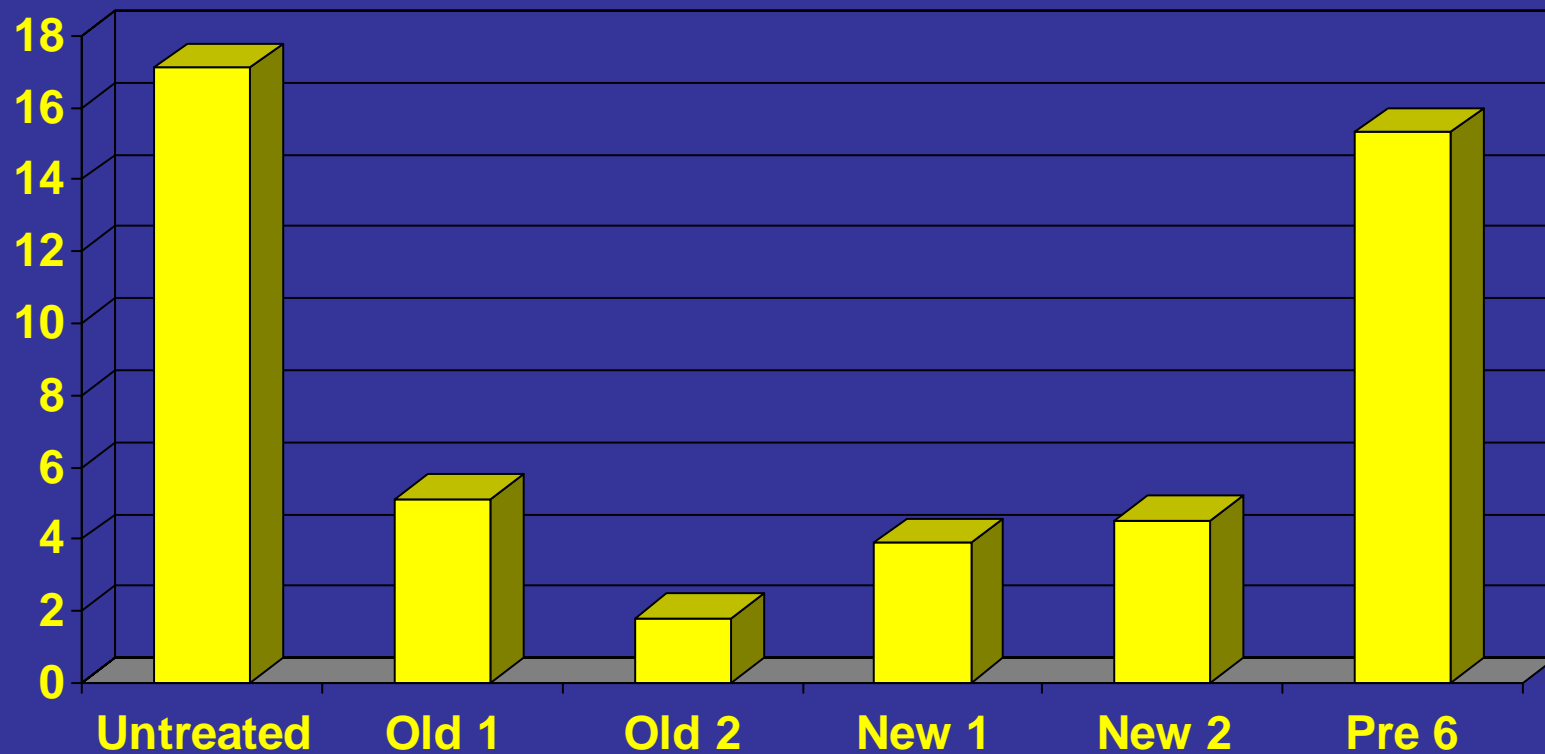
- **Both Kerb and Prefar were effectively activated by the drip germination water**
- **It may be that drip germination may have some advantages over sprinkler irrigation by not moving the water down in the soil profile**

New Formulation of Kerb Evaluation

- **In 2007 we evaluated a liquid formulation of Kerb**
- **It is a 3.3SC**
- **We compared it at equal lbs a.i./A with the 50W formulation**

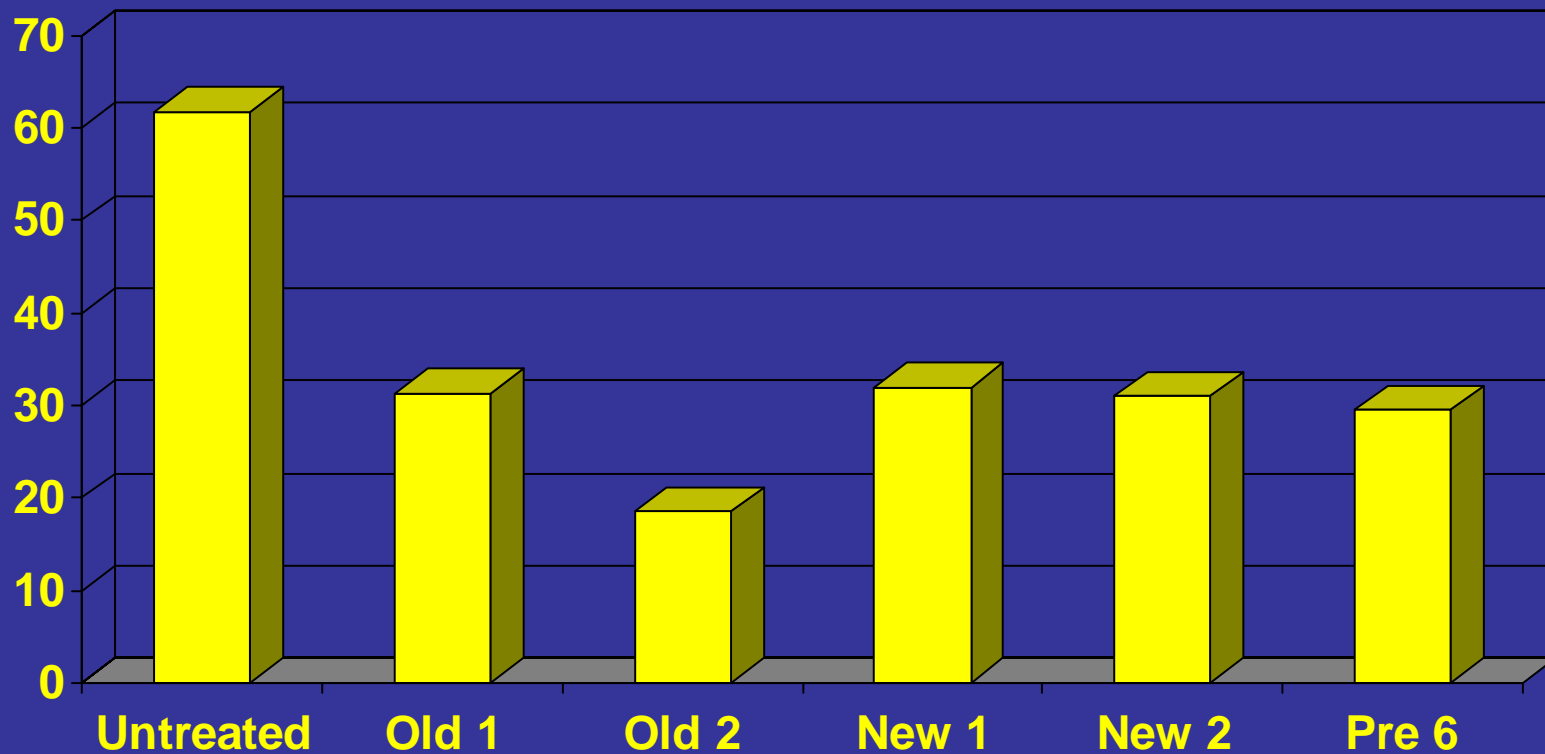
Shepherd's Purse Evaluation

21 DAT Weeds/6 ft²



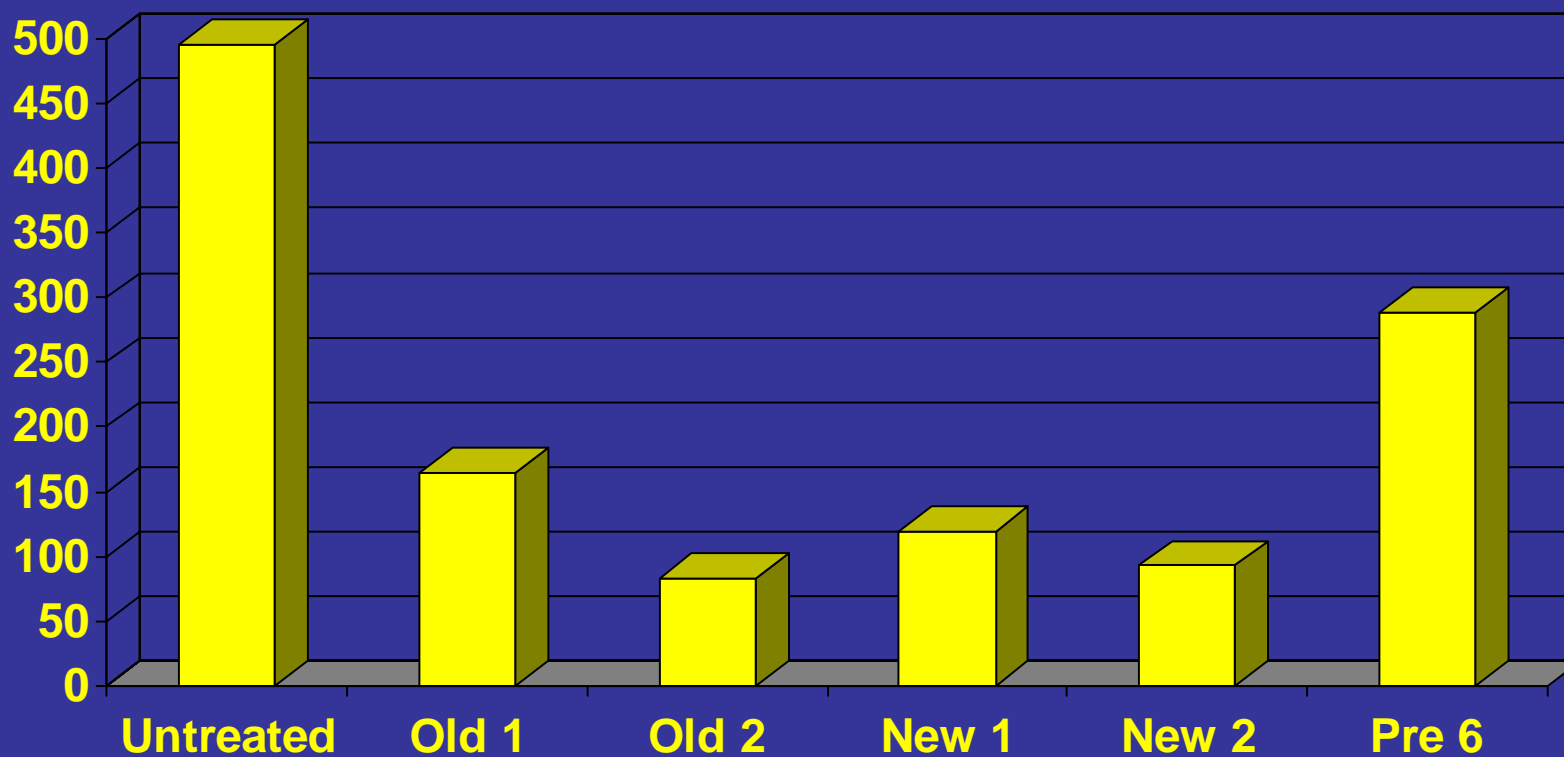
Total Weeds Evaluation

21 DAT Weeds/6 ft²



Percent Ground Cover by Weeds

28 DAT Weeds cm²/m²





50W 2.0 lbs/A



3.3SC 2.4 pint/A

Summary of New Kerb Formulation

- It looked comparable to the 50W formulation at the same level of active ingredient
- It is slated to be available by the summer of 2008

Kerb Chemigation on Lettuce

Background on Kerb Chemigation

- **This application technique was originally worked on by Barry Tickes in Yuma, Arizona**
- **Barry had demonstrated that delayed applications of Kerb following the germination water improved weed control**
- **Following 911 when crop dusters were temporarily grounded he began experimenting with injecting Kerb in the germination water**





- **A 24 (c) registration was granted in 2003 for sprinkler application of Kerb (1-2 lbs/A) in Arizona and Imperial and Riverside Counties in CA on lettuce, radicchio, endive and escarole.**
- **Fresno County was added in August 2006**

Timing	Date	Days after 1 st irrigation	Days to weed seed germ.
Early	Sept 1 – Oct 15	1 - 3 days	Pigweed (2-4)
Mid	Oct 15 – Dec 15	3 - 6 days	Purslane (1-7)
Late	Dec 15 to Jan	5 - 6 days	Shepherd's-purse (4-7)

Too early



Treat



Too late

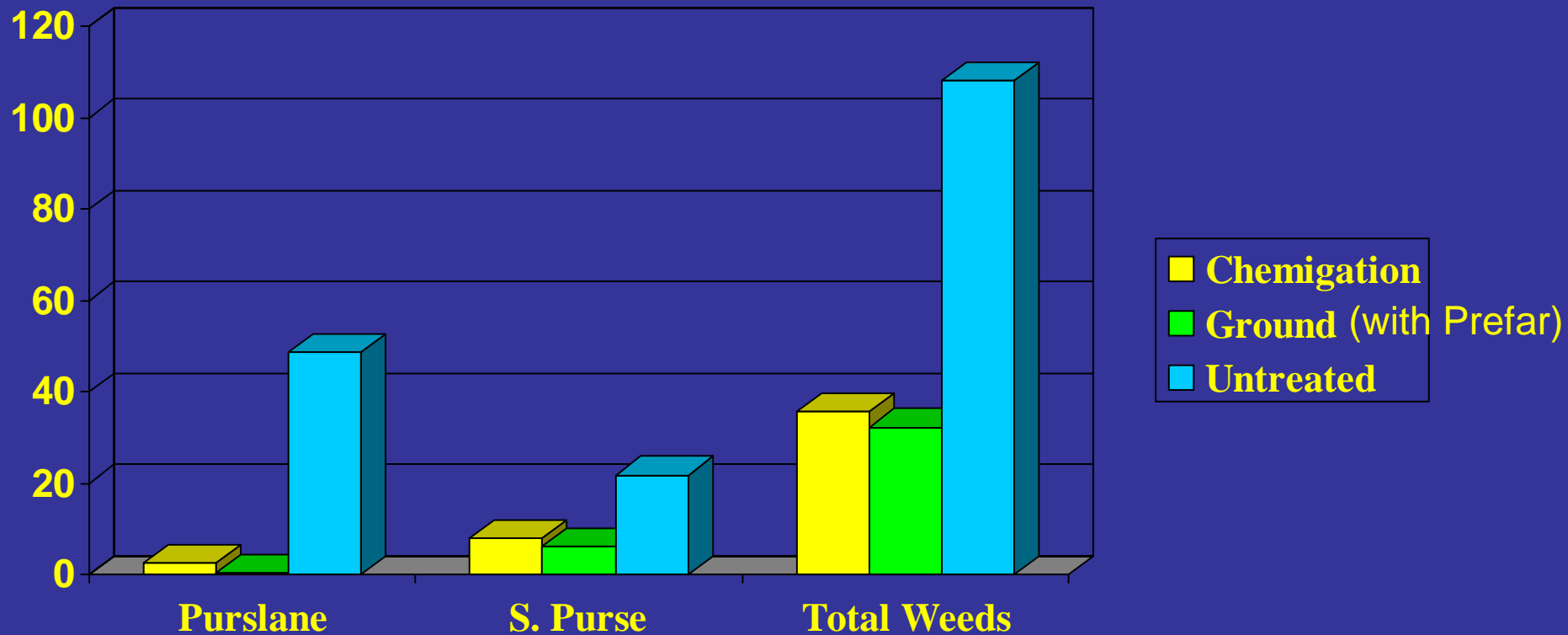


What are the Advantages in Monterey County?

- We do not have the same conditions as the desert or Huron areas (heat at application time and weed pressure)
- We do see less than optimal efficacy with Kerb in some situations with particular weeds: Shepherds purse, purslane and nightshade, and others???
- In 2005 we began to compare Kerb chemigation with traditional ground application

Kerb* Chemigation Trial

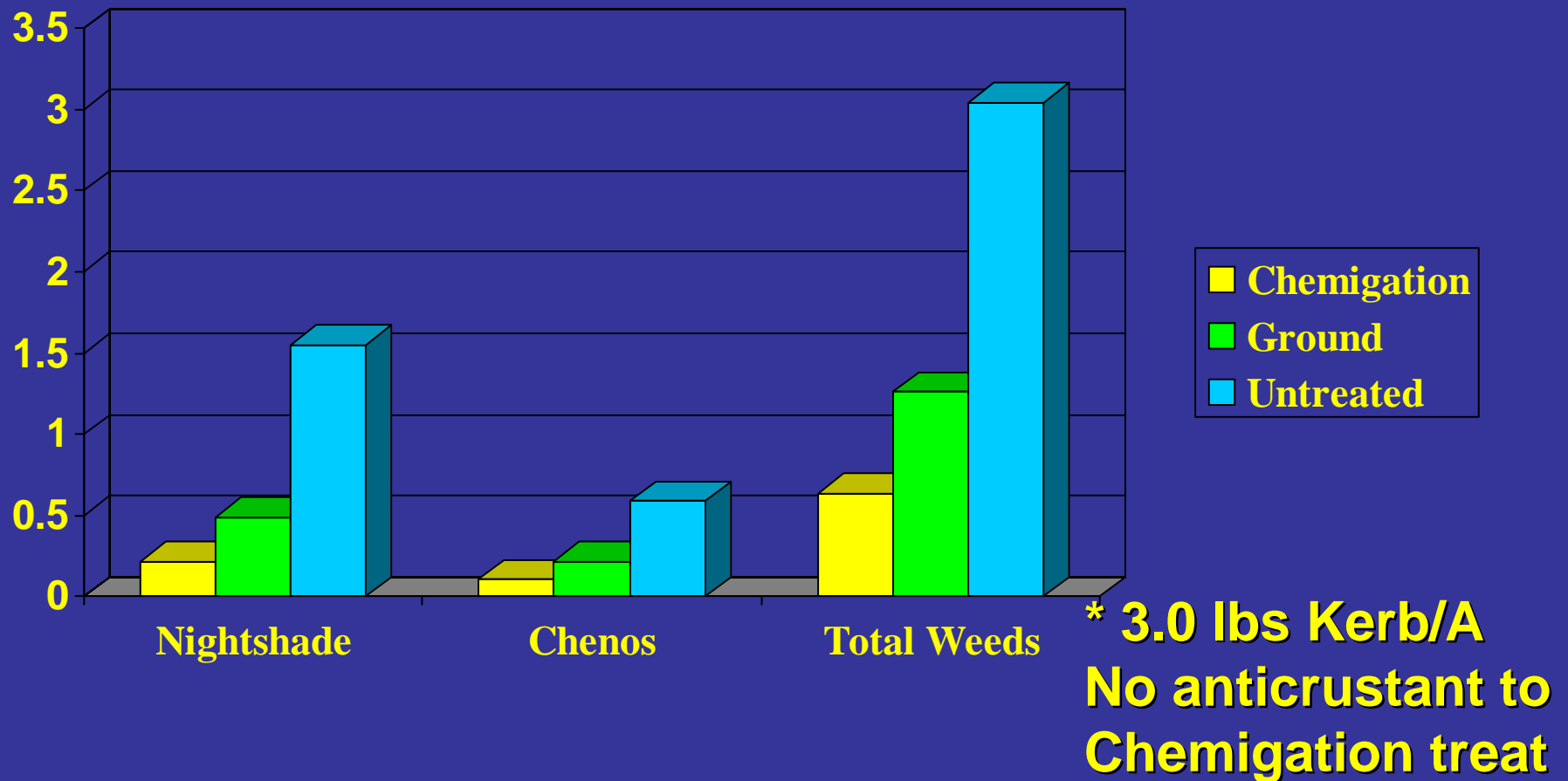
River Road, 2005



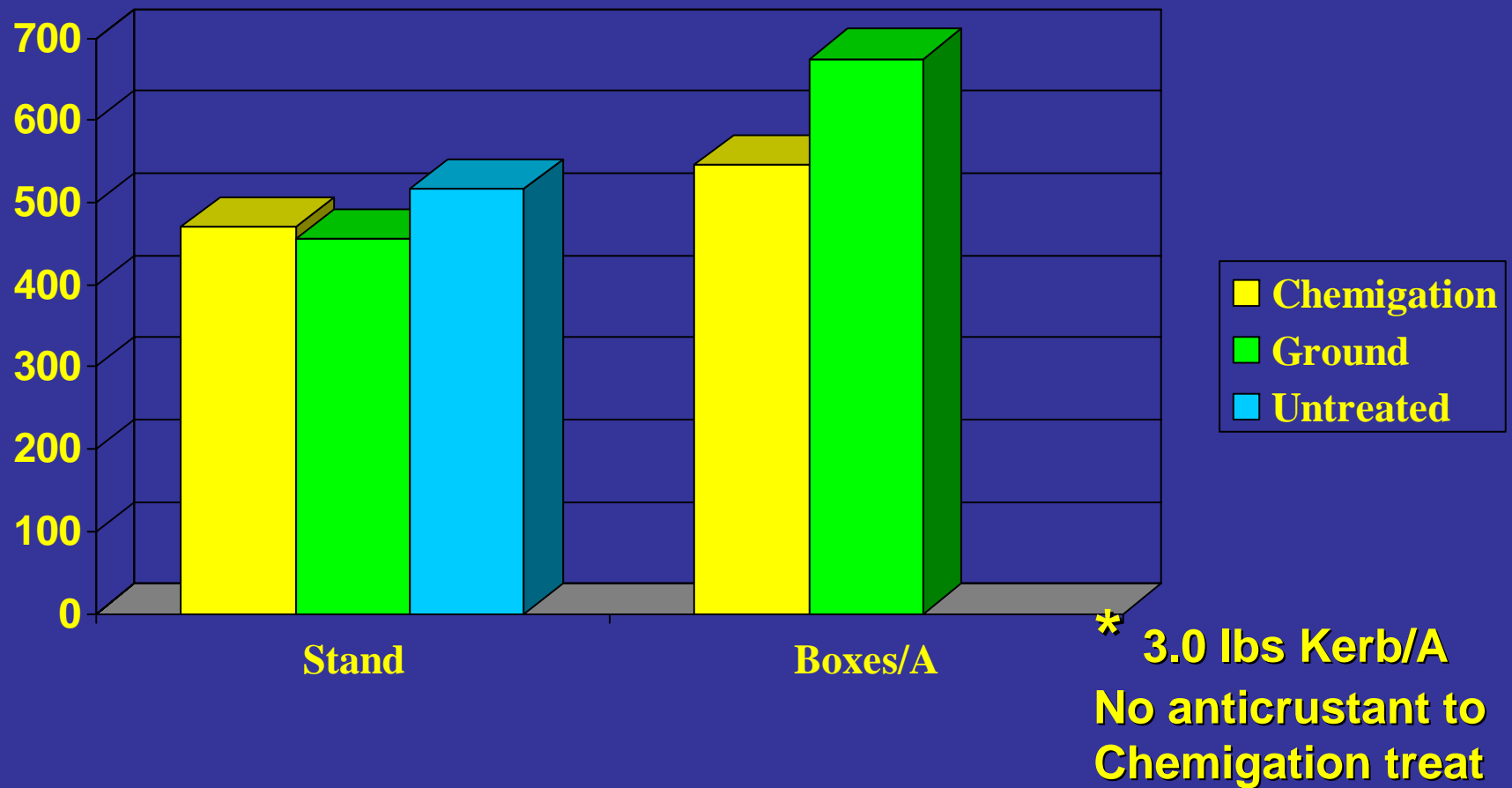
* 2.5 lbs Kerb/A

Kerb* Chemigation Trial

Gonzales, 2006

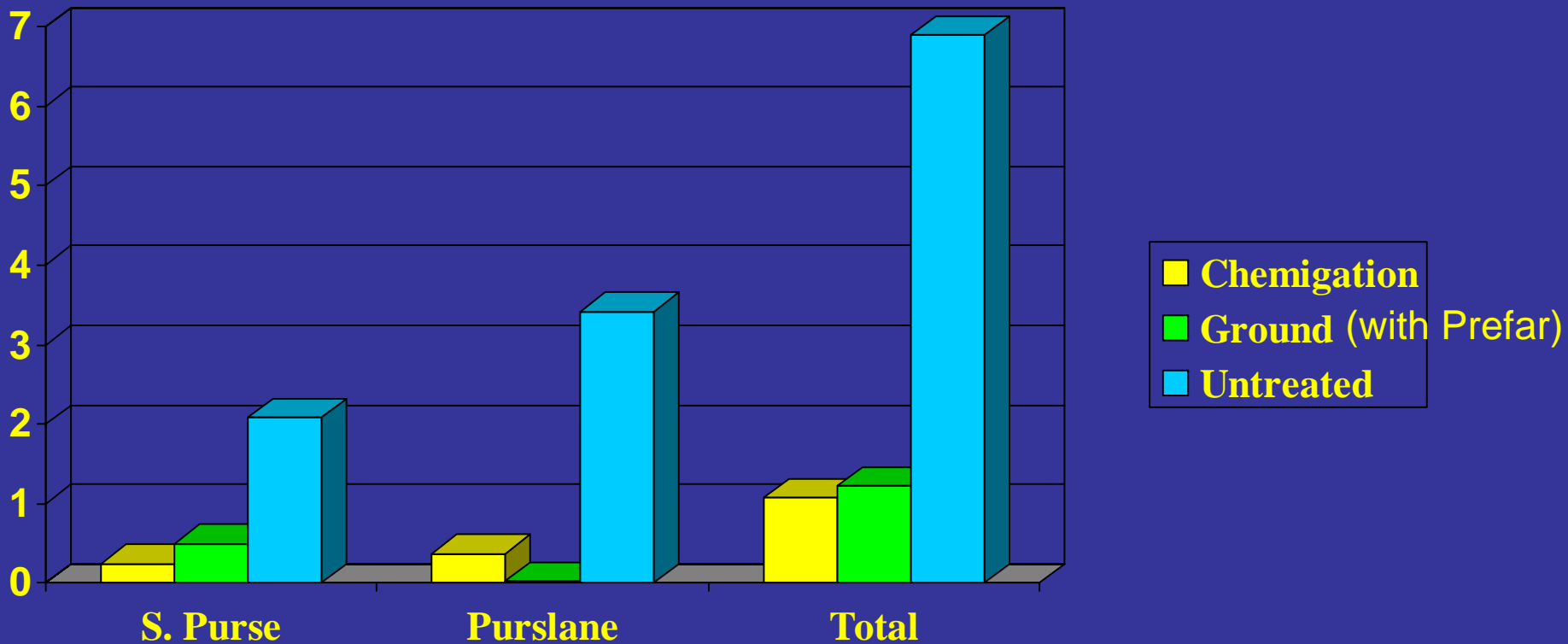


Kerb* Chemigation Trial Gonzales, 2006



Kerb* Chemigation Trial

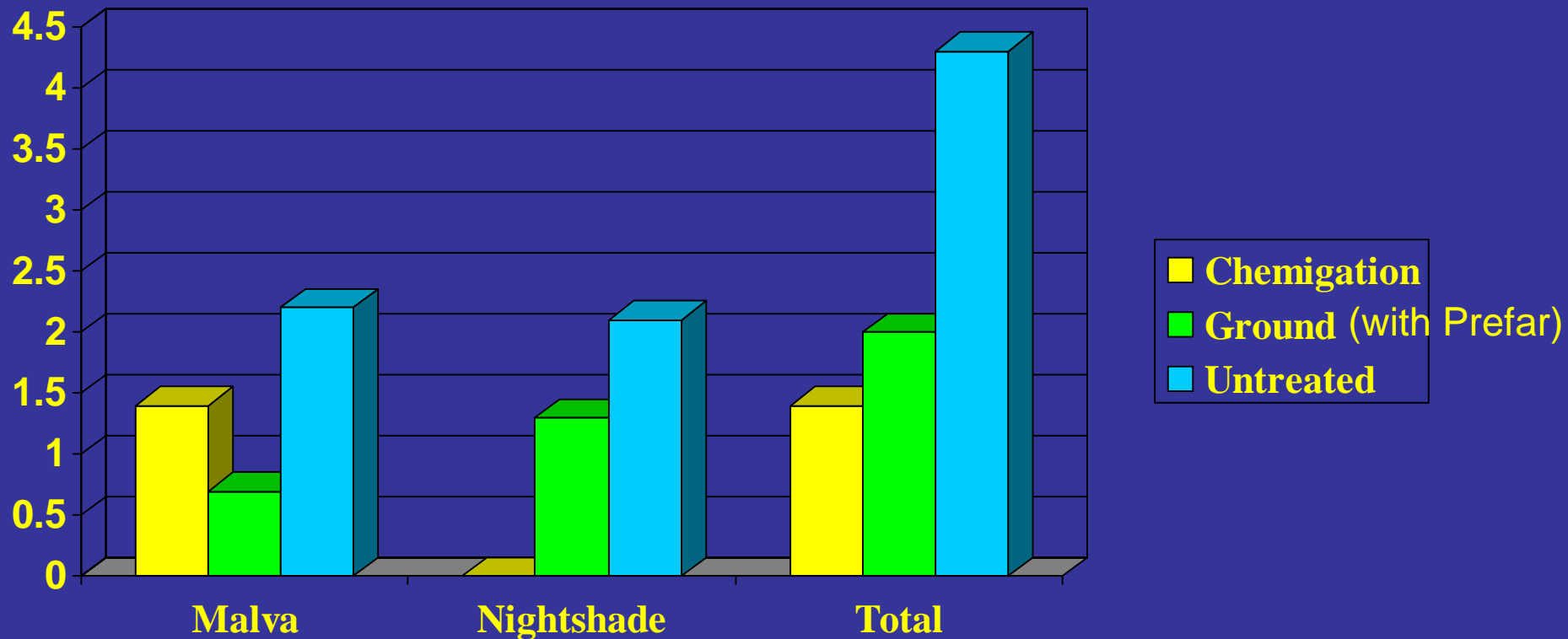
River Road, 2006



* 2.5 lbs Kerb/A

Kerb* Chemigation Trial

San Juan Bautista, 2006



* 3.0 lbs Kerb/A

Summary

- Kerb chemigation in Monterey County does not have the same dramatic impacts that have been seen in Yuma and Huron areas
- At 2-3 lbs/A, it provides equivalent weed control to ground applications
- We observed some yield reduction at 3 lbs/A on Chualar loam soil, but it was unclear if that was due to the lack of anticrustant on the chemigated treated side of the field
- The impacts are subtle, but it appears to improve control of shepherds purse, purslane and hairy nightshade.

Summary Continued

- This technique has been granted a statewide label for California that is slated to be effective in the spring of 2008