



# **Early Spring Applications of Group 15 Herbicides (Long Chain Fatty Acid Inhibitors) and Group 14 Herbicides (PPO Inhibitors) for Control of Herbicide Resistant Weeds**

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# Start Clean and Stay Clean

More challenging with herbicide resistant  
kochia and Palmer amaranth







# Kochia emergence

| Location    | Field type | GDD to 10% Emergence | Local date for 10% Emergence | GDD to 90% Emergence | Local date for 90% Emergence | GDD for Duration of Emergence |
|-------------|------------|----------------------|------------------------------|----------------------|------------------------------|-------------------------------|
| Stockton    | Non-crop   | 282                  | 4/3                          | 343                  | 4/9                          | 61                            |
| Hays        | Non-crop   | 137                  | 3/18                         | 173                  | 3/24                         | 36                            |
| Hays        | Cropland   | 238                  | 3/31                         | 365                  | 4/10                         | 127                           |
| Ness City   | Non-crop   | 114                  | 3/11                         | 475                  | 4/18                         | 361                           |
| Garden City | Cropland   | 283                  | 3/31                         | 1056                 | 5/26                         | 773                           |

Dille et al, 2017



# What Herbicides Are We Talking About?

## Group 15 herbicides (Long Chain Fatty Acid Inhibitors)

- Acetimide family
  - Dual II Magnum (s-metolachlor)
  - Harness (acetochlor)
  - Outlook (dimethenamid-P)
- Pyrazole family
  - Zidua (pyroxasulfone)

## Group 14 herbicides (PPO Inhibitors)

- Aryl-Triazinone family
  - Spartan (sulfentrazone)
  - Aim (carfentrazone)
- N-Phenylphthalimide family
  - Valor (flumioxazin)
- Diphenylether family
  - Cobra (lactofen)
  - Reflex (fomesafen)



# Components & Weeds

## Group 15

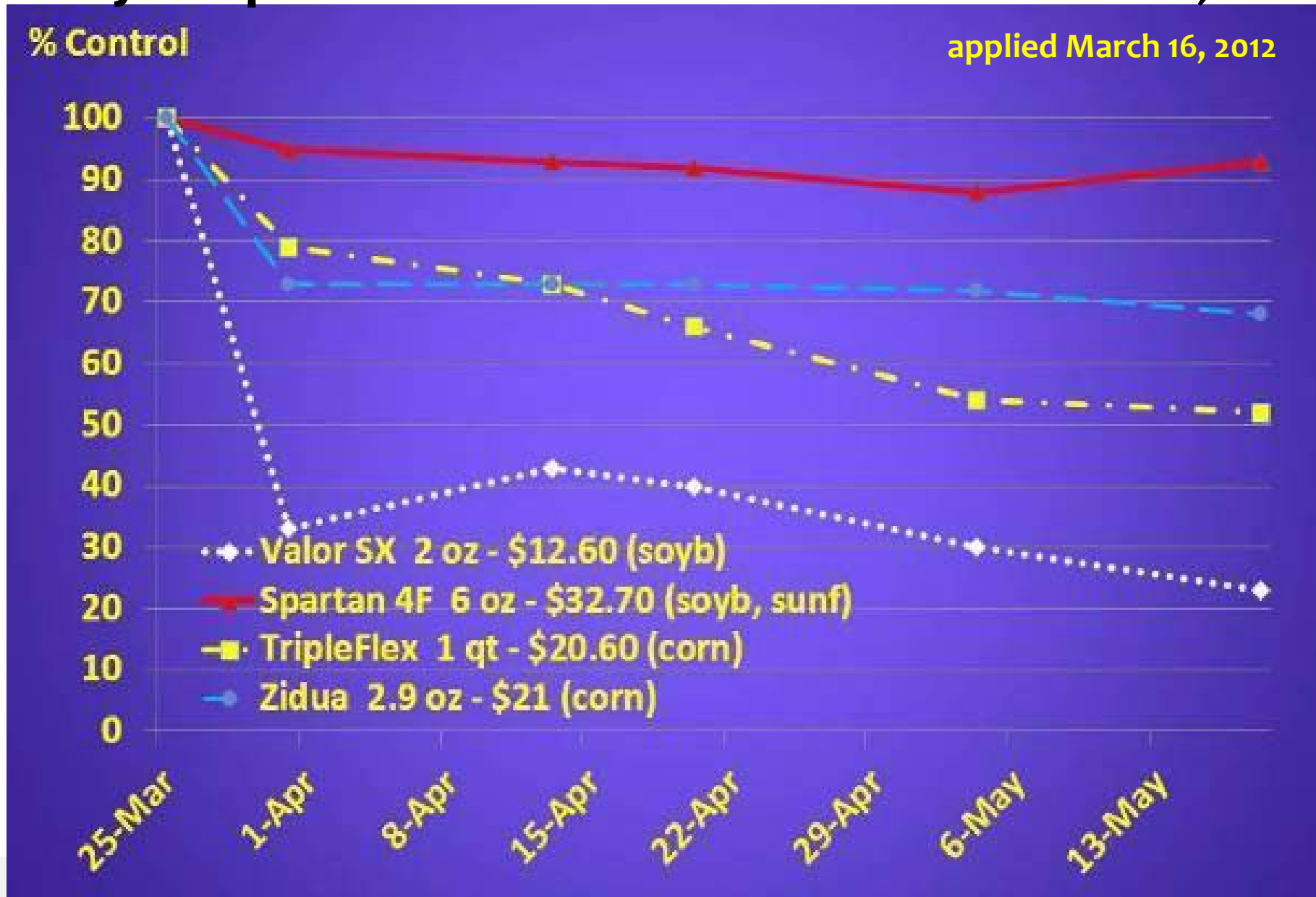
- s-metolachlor → Dual II Magnum
  - Controls: grasses and some small seeded broadleaves
- pyroxasulfone → Zidua
  - Controls: grasses and small seeded broadleaves

## Group 14

- sulfentrazone → Spartan
  - Controls: pigweeds, kochia and other broadleaves
- flumioxazin → Valor
  - Controls: primarily broadleaves (kochia and Palmer) and some grasses



# Early Preplant Treatments for Kochia Control, Tribune KS



|                      |                       |                    |              |               |               |
|----------------------|-----------------------|--------------------|--------------|---------------|---------------|
| Late Fall/Winter     | Spartan Charge – or – | 5 oz               |              | sulfentrazone | carfentrazone |
|                      | Authority MTZ         | 10 oz              |              | sulfentrazone | metribuzin    |
|                      | Atrazine              | 1 lb               |              | atrazine      |               |
| At Planting          | Anthem Maxx           | 4.5 oz             |              | pyroxasulfone | fluthiacet    |
|                      | mesotrione            | 4 oz               |              | mesotrione    |               |
| Early Spring (March) | Zaltus SC             | 2.5 gal            |              | flumioxazin   |               |
|                      | Dicamba DMA           |                    |              | dicamba       |               |
|                      | Atrazine 4L           | gal RPK            |              | atrazine      |               |
|                      | Vanish Max 5.4        | glyphosate 275 gal |              | glyphosate    |               |
| Early March          | Rifle                 | 16 oz              |              | dicamba       |               |
|                      | Panther               | 3 oz               |              | flumioxazin   |               |
|                      | Atrazine              | 32 oz              |              | atrazine      |               |
| Fall<br>Early Spring | sulfentrazone         |                    |              | sulfentrazone |               |
|                      | flumioxazin           |                    |              | flumioxazin   |               |
|                      | Atrazine              |                    |              | atrazine      |               |
|                      | dicamba               |                    |              | dicamba       |               |
|                      | glyphosate            |                    |              | glyphosate    |               |
| Early Spring (March) | dicamba               | 1 pt               |              | dicamba       |               |
|                      | atrazine              | 1 lb               |              | atrazine      |               |
|                      | flumioxazin           | 3 oz               |              | flumioxazin   |               |
| At Planting          | glyphosate            |                    |              | glyphosate    |               |
|                      | FulTime NXT           | 3.2 qt             | encapsulated | acetochlor    | atrazine      |
|                      | Mesotrione            | 3 oz               | or 4 oz      | mesotrione    |               |
| Early Pre (Feb/Mar)  | atrazine              | 32 oz              |              | atrazine      |               |
|                      | dicamba               | 16 oz              |              | dicamba       |               |
|                      | Panther SC            | 2 oz               |              | flumioxazin   |               |



# Rotation Restrictions for Sunflower

- Valor EZ
  - 2 oz or less – 30 days (>1” rainfall/irrigation)
  - Up to 3 oz – 2 months (>1” rainfall/irrigation)
  - Up to 4 oz – 4 months
- Spartan FL 4L
  - Anytime
- Dual II Magnum
  - Anytime
- Zidua SC



## Treatments for Late Fall and Early Spring Applications of Group 15 and Group 14 herbicides.

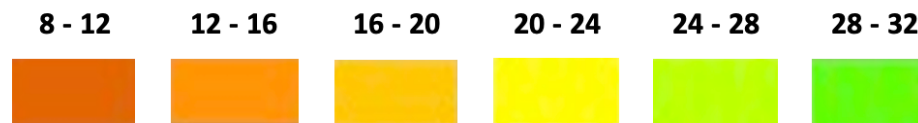
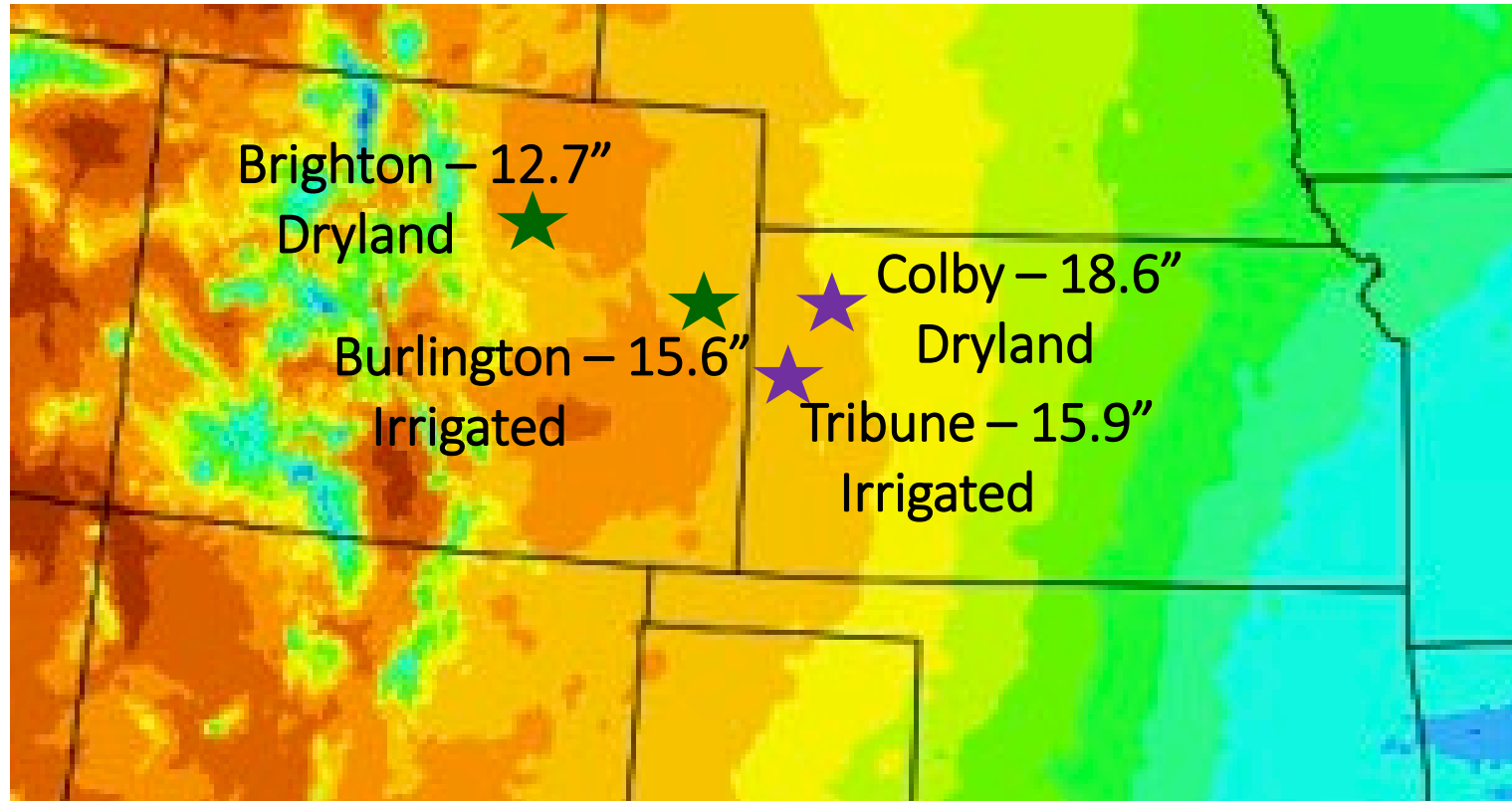
| Herbicide (Group Number)            | Available Premix for Herbicide Combination | Rate                    |
|-------------------------------------|--------------------------------------------|-------------------------|
| Dual II Magnum (15) + Spartan (14)  | Authority Elite                            | 25 fl oz/ac             |
| Zidua (15) + Spartan (14)           | Authority Supreme                          | 8.7 fl oz/ac            |
| Dual II Magnum (15) + Valor EZ (14) |                                            | 1.33 pt/ac + 3 fl oz/ac |
| Zidua (15) + Valor EZ (14)          |                                            | 3 fl oz/ac + 3 fl oz/ac |
| Dual II Magnum (15)                 |                                            | 1.33 pt/ac              |
| Zidua (15)                          |                                            | 3 fl oz/ac              |
| Spartan FL (14)                     |                                            | 4 fl oz/ac              |
| Valor EZ (14)                       |                                            | 3 fl oz/ac              |
| Control                             |                                            |                         |



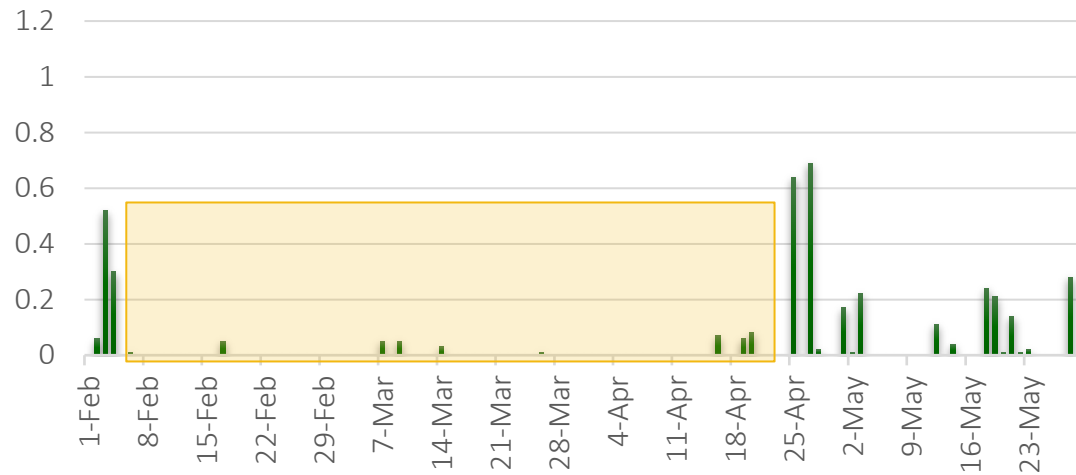
# Materials and Methods

- Randomized complete block, plots 10 x 30 ft
  - Herbicides applied with a backpack sprayer at 15 gal/ac
    - Colby (Dryland) – 3/28/24
    - Burlington (Irrigated) – 4/3/24
    - Tribune (Irrigated) – 4/4/24
    - Brighton (Dryland) – 5/13/24
  - Randomized complete block, plots 10 x 30 ft
  - Kochia seed spread in Colby on 4/1/24, ahead of a forecasted rain
- Sunflowers Planted  
Colby - 5/22/24  
Burlington - 5/22/24  
Tribune - 6/7/24  
Brighton - 5/23/24

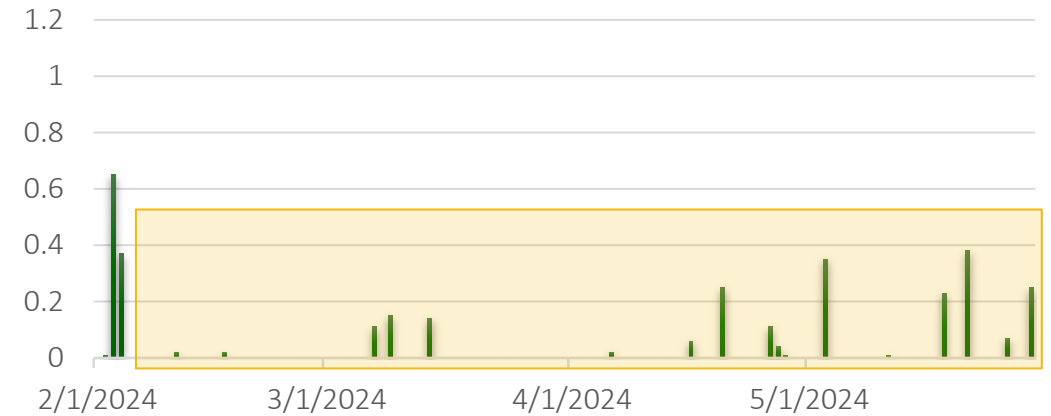




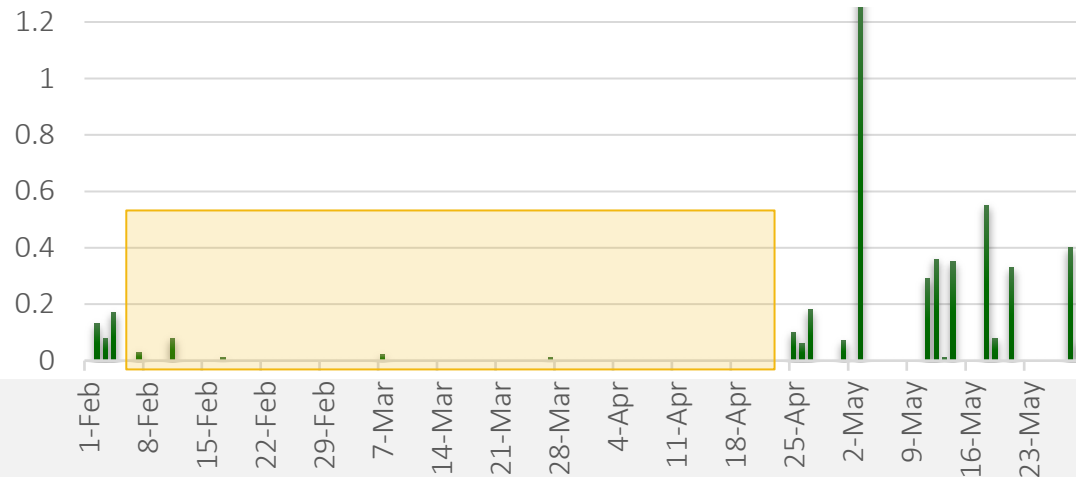
2024 Precipitation at Colby  
Total - 4.1"



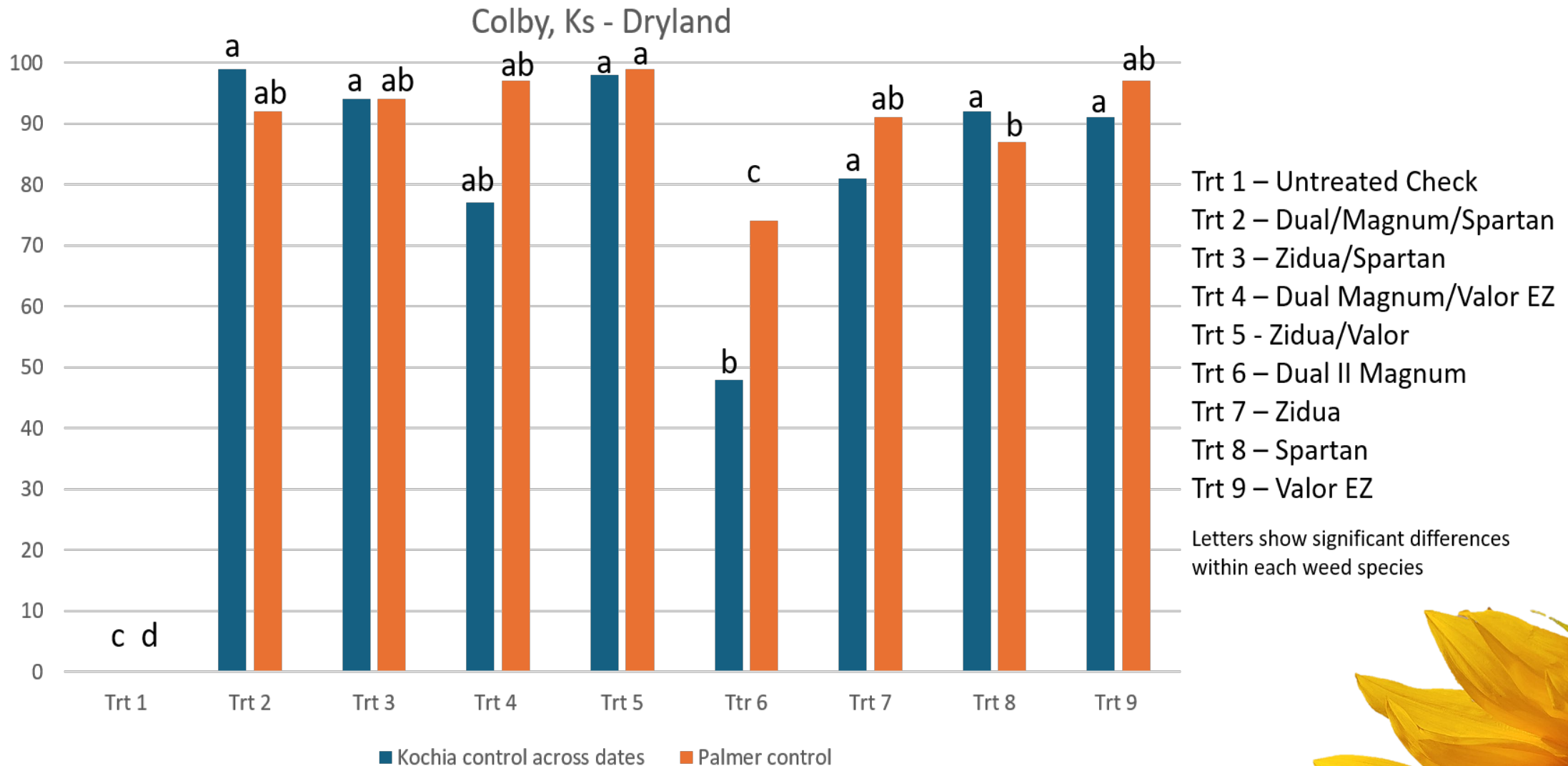
2024 Precipitation at Burlington  
Total - 3.25"



2024 Precipitation at Tribune  
Total - 4.68"



# Kochia and Palmer amaranth Control





Dual II Magnum + Spartan

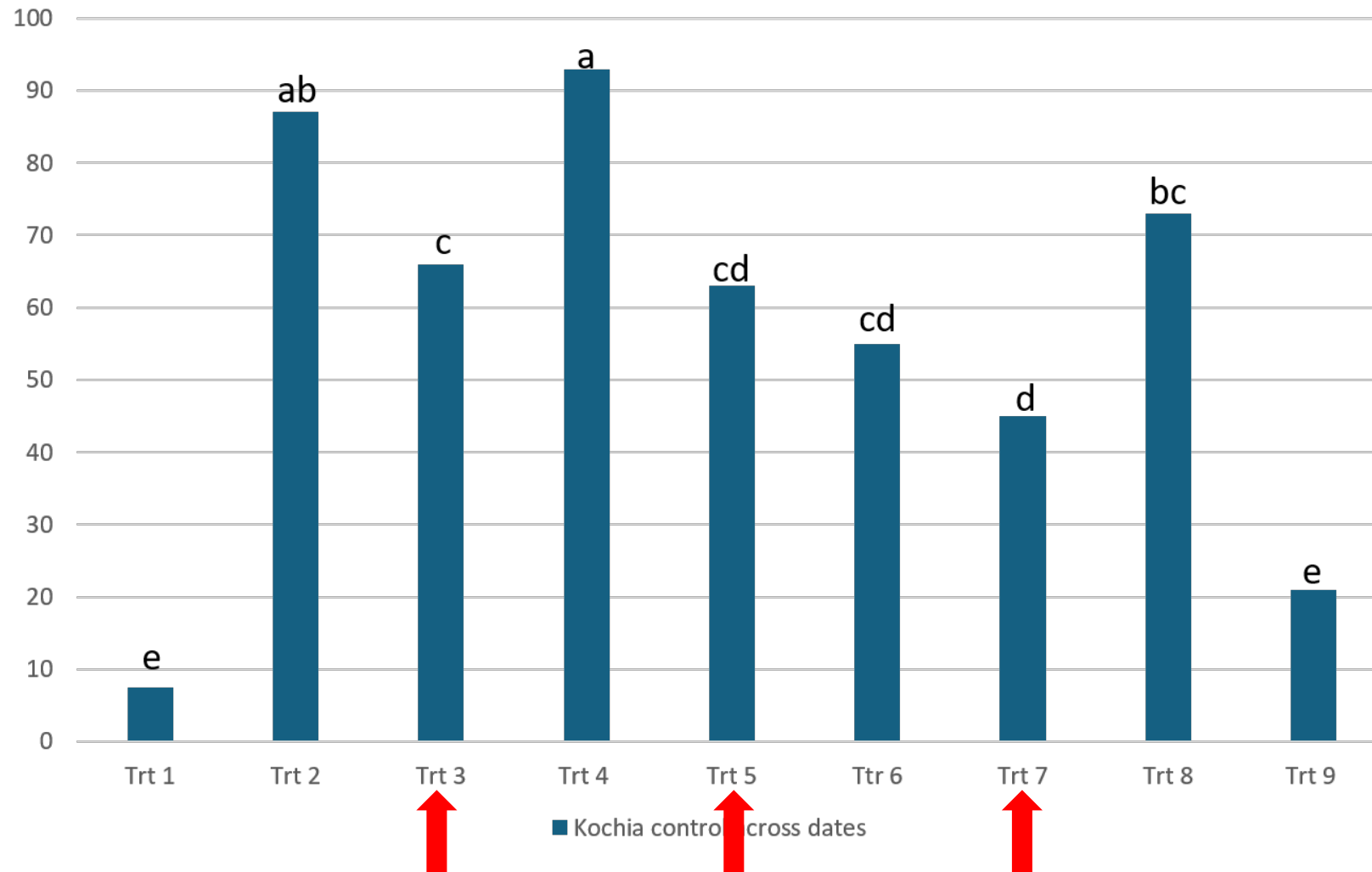


Dual II Magnum



# Kochia Control

Adams Co, Co - Dryland

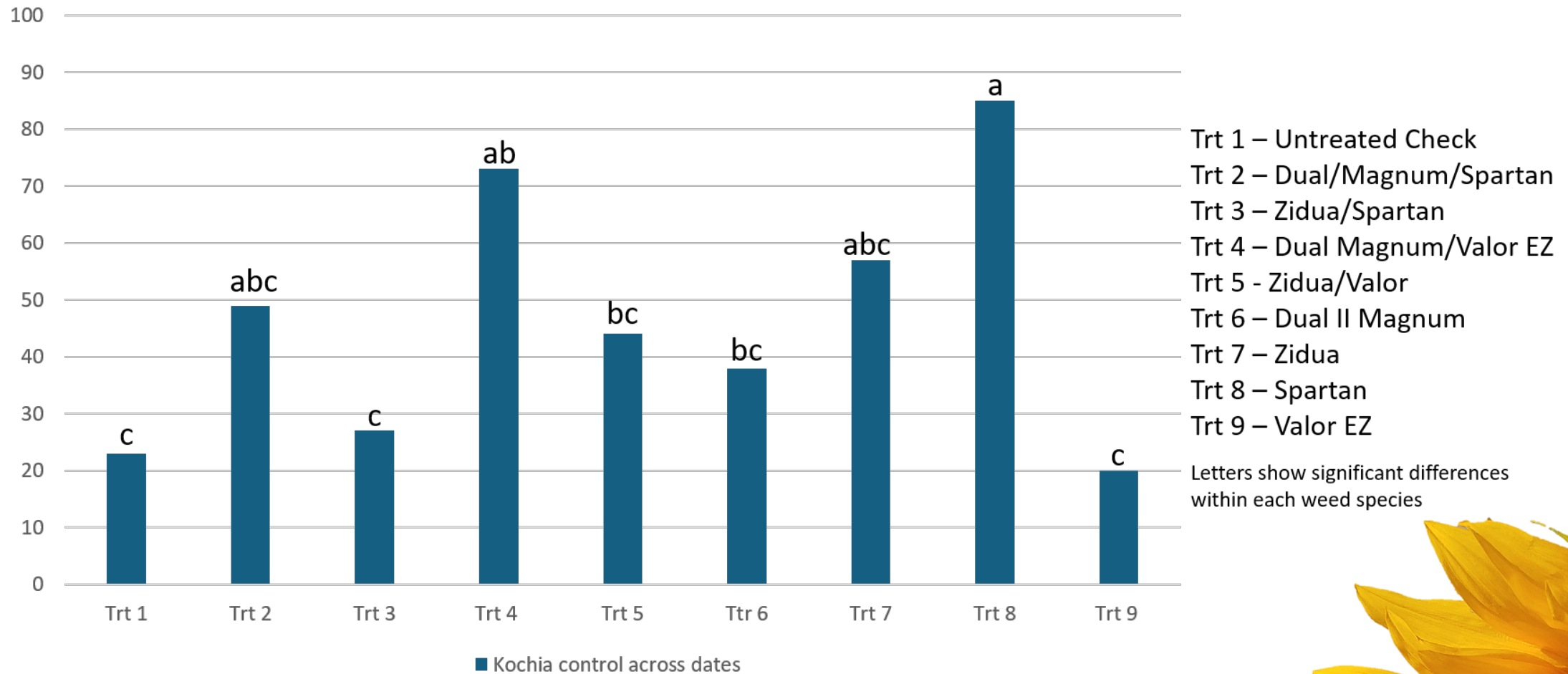


- Trt 1 – Untreated Check
- Trt 2 – Dual/Magnum/Spartan
- Trt 3 – Zidua/Spartan
- Trt 4 – Dual Magnum/Valor EZ
- Trt 5 – Zidua/Valor
- Trt 6 – Dual II Magnum
- Trt 7 – Zidua
- Trt 8 – Spartan
- Trt 9 – Valor EZ



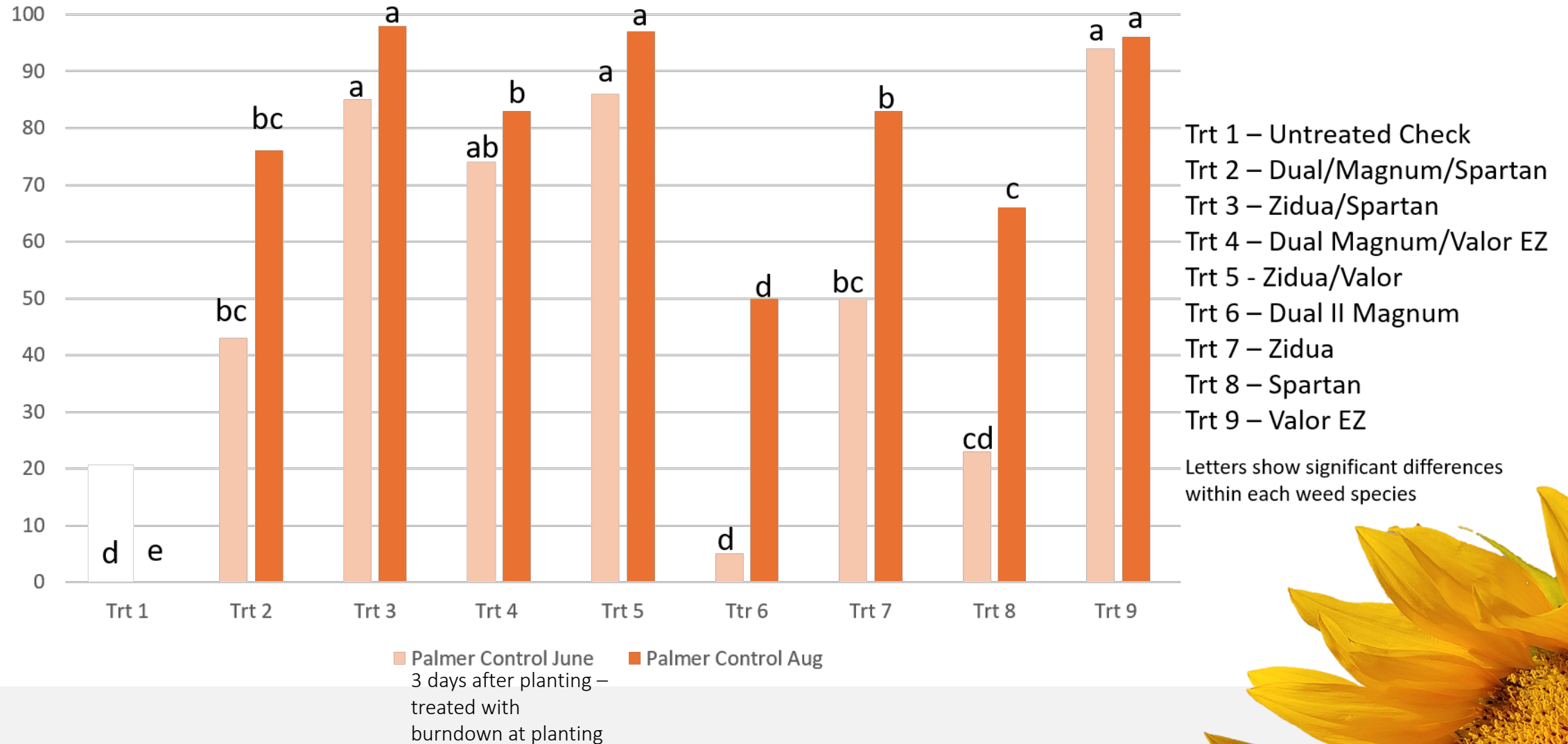
# Kochia Control

Burlington, Co - Irrigated



# Palmer amaranth Control

Tribune, Ks - Irrigated



# Other Weeds...

- Zidua activity on tumble windmillgrass?
- Growing problem in no-till fields
- Shallow rooted, perennial grass
- Tolerant of glyphosate



# Summary

- Start Clean, Stay Clean
- Drought caused challenges with herbicide activation and kochia emergence
- At Colby:
  - there was better kochia control with tank mixes or Group 14 (Spartan or Valor)
  - Better Palmer amaranth control with tank mixes than single products
- Bit more of a mixed bag at other locations
- 2<sup>nd</sup> year of data
- Plots laid out for winter applications at Colby





A photograph of a sunflower field. In the foreground, several large sunflowers with bright yellow petals and dark brown centers are in focus. The background shows more sunflowers stretching into the distance under a blue sky with light, wispy clouds. The sunflowers are surrounded by large green leaves.

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