

Weed Control in Organic Strawberry

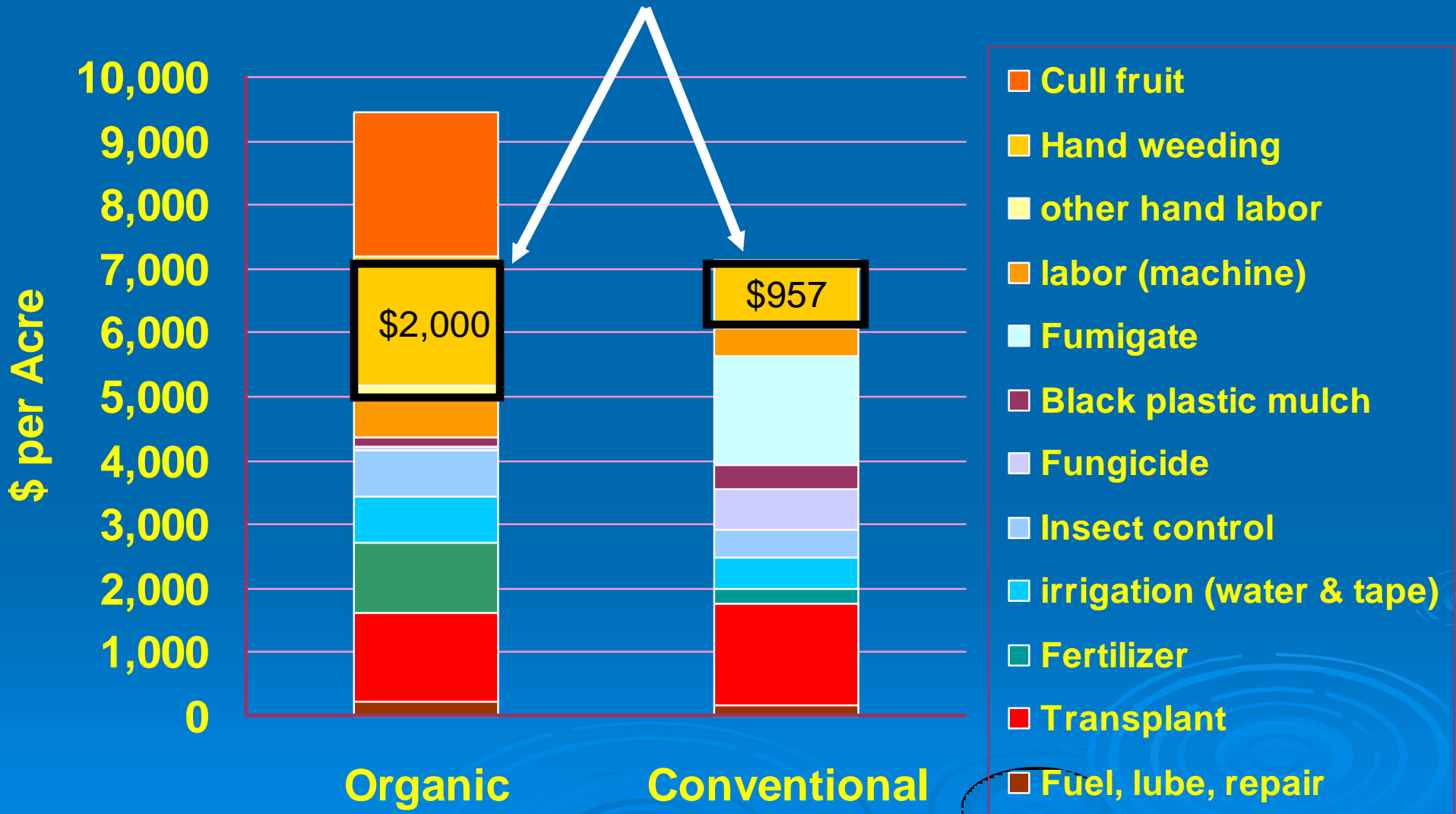
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Steve Fennimore & Mark Johnson

Univ. of California, Davis at Salinas, CA



Weeding costs

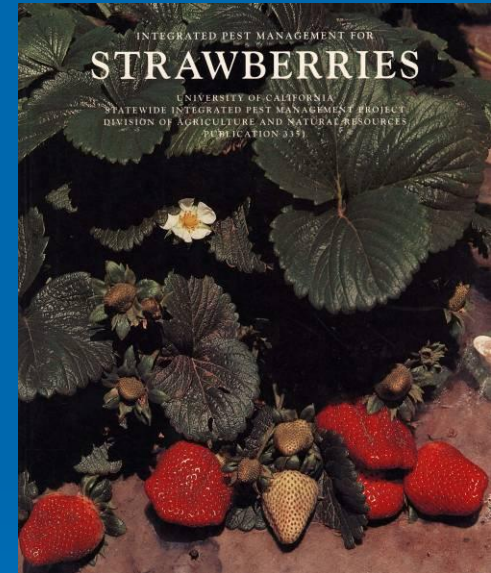


In organic – primarily hand labor



Weed control in organic strawberries

- Weeds and seed banks
- Field selection
- Handweeding and cultivation
- Crop rotation
- Mulches
- Weed suppression products



Hard seeded weeds



Little mallow

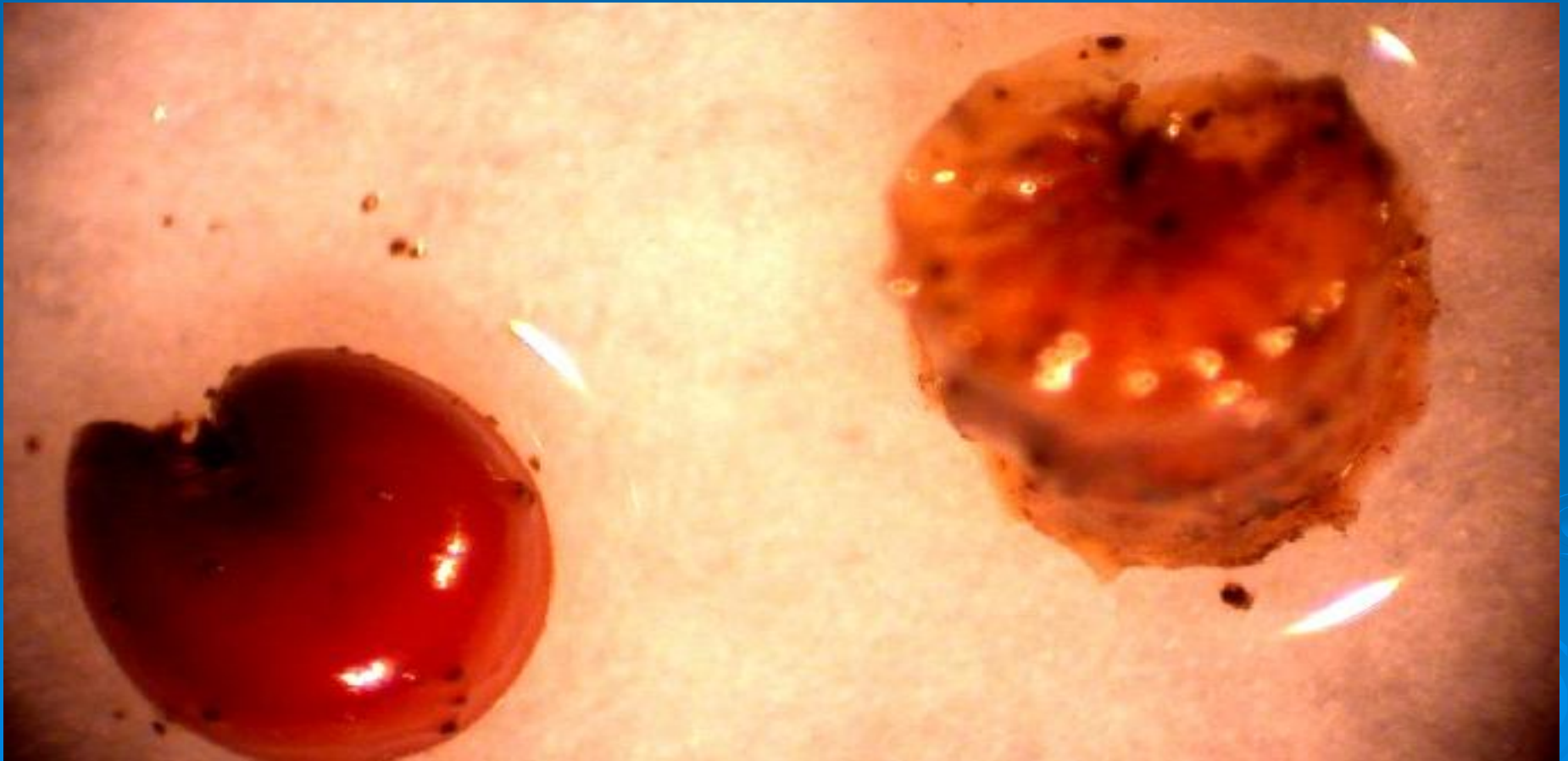


Sweetclover



Example:

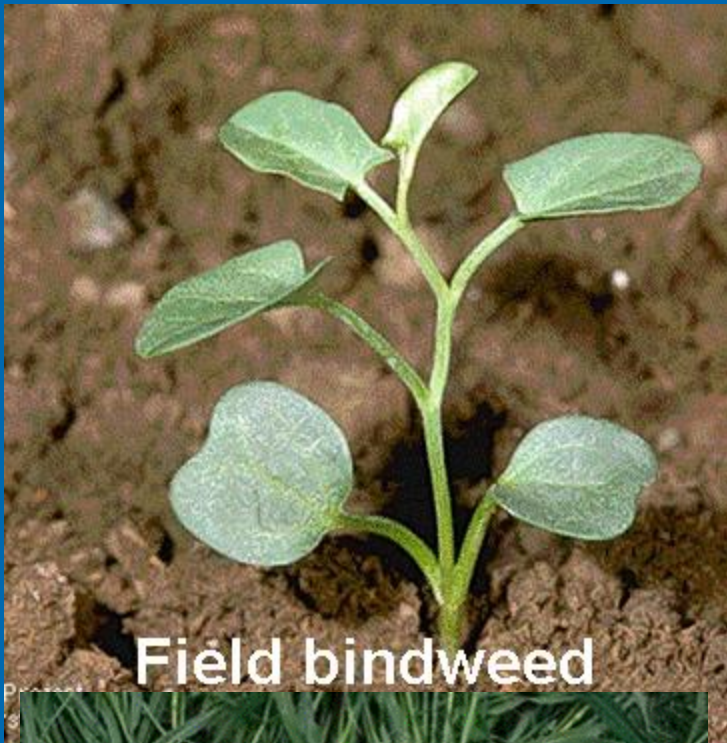
Little mallow/cheeseweed (*Malva parviflora*)



Annual weeds



Perennial weeds



Field bindweed



Johnsongrass



Yellow nutsedge

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Importance of weed seedbanks

- Weed seedbanks: the seeds in the soil
- Weed seedbank management forces us to take a long term approach to weed control
- Weed seedbanks represent the “true” weed population in the field

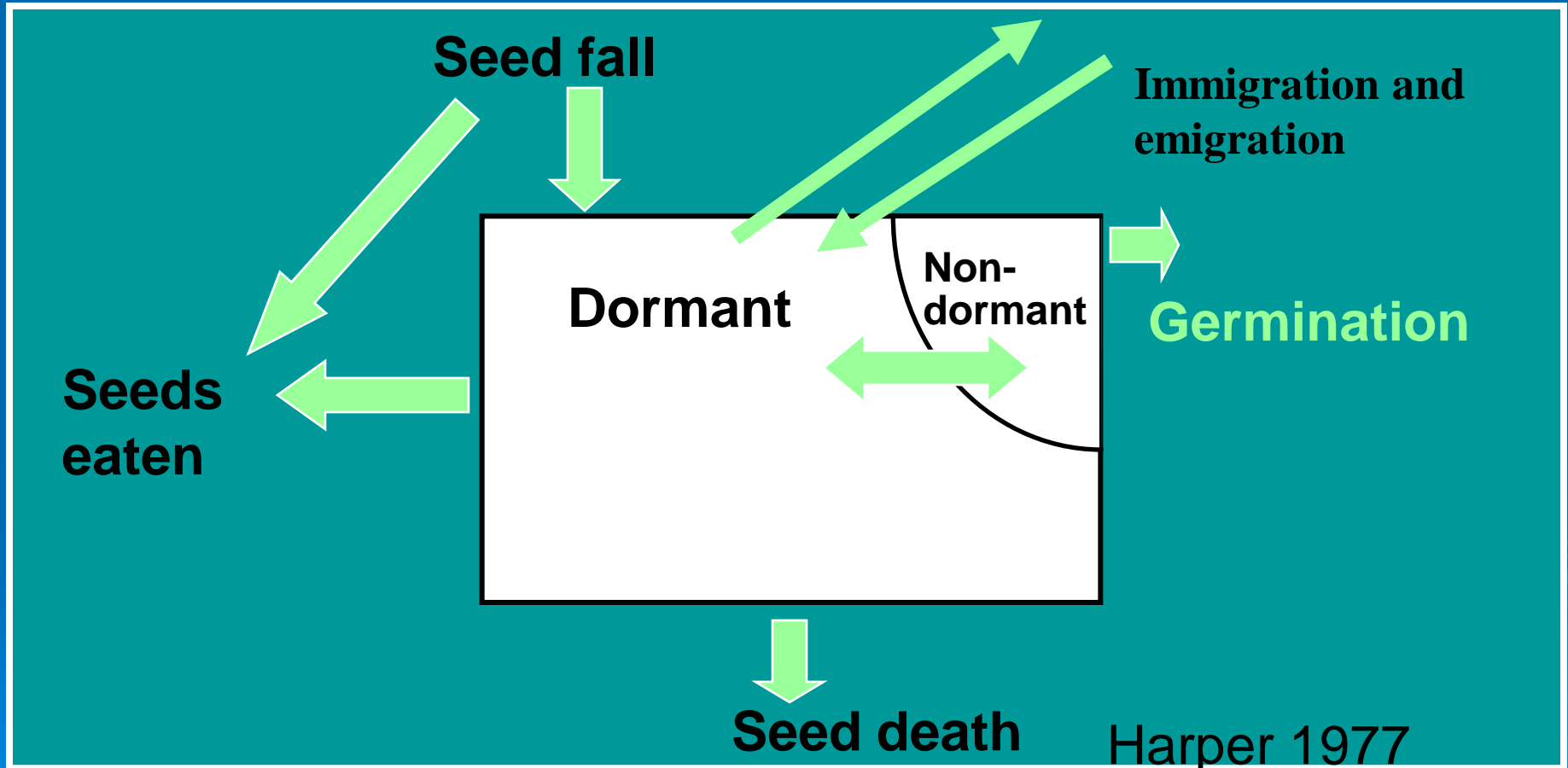
In the Salinas Valley, seedbank densities ranged from 6.3 to 140.2 million seeds /A. (Shem-Tov & Fennimore, 2003).



We only see the above part



Weed Seedbanks



Dormancy = dispersal in time

Wind-blown annual weed seeds



Common groundsel

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Annual sowthistle

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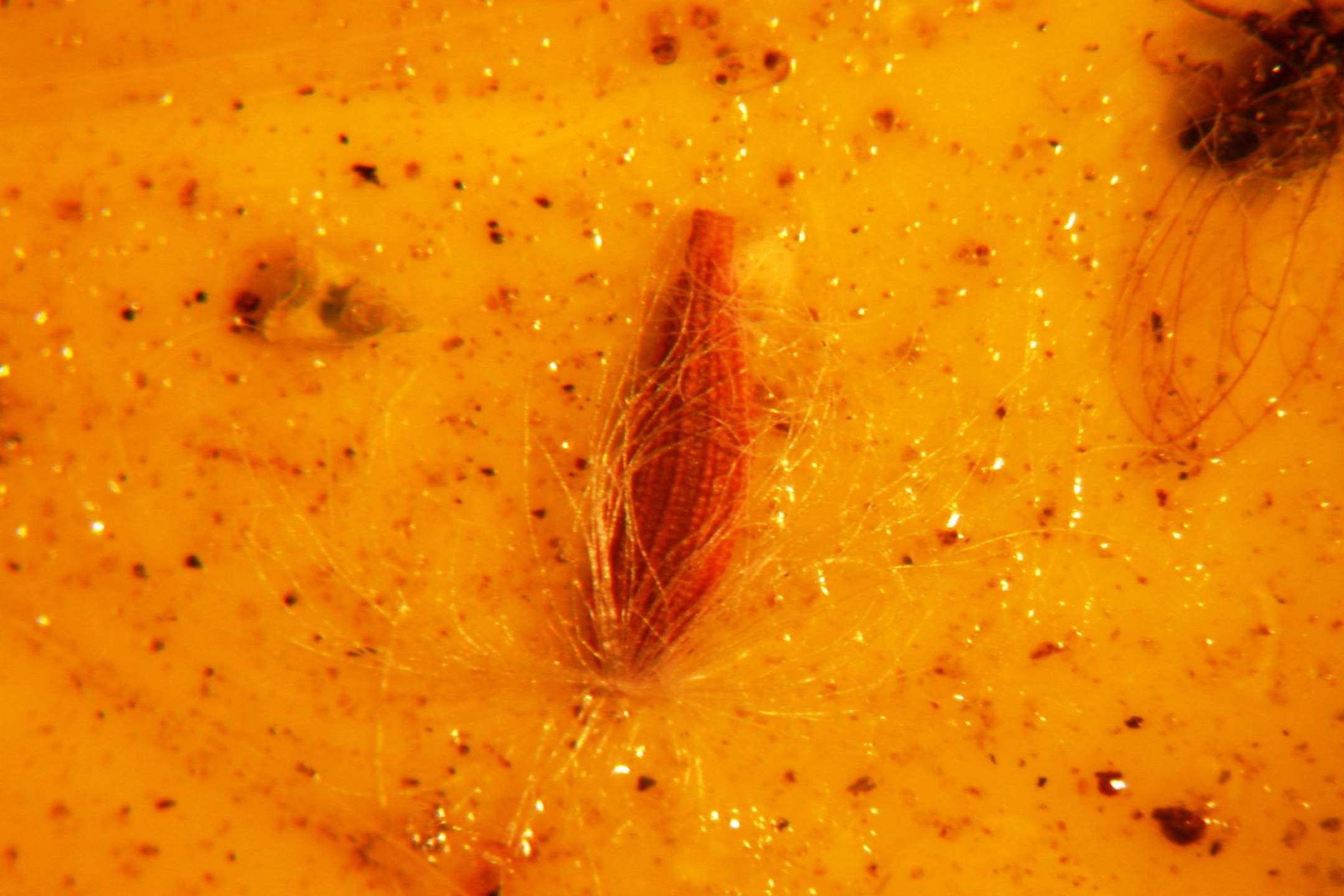


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Canadian horseweed (*Conyza* spp.)



**It is essential to destroy mother plants around your field
before they flower**



**Wind
direction**

Weed control with colored mulch

78-98% - red, yellow, brown, green, white/black, black

44-50% - blue and clear

Fruit yield:

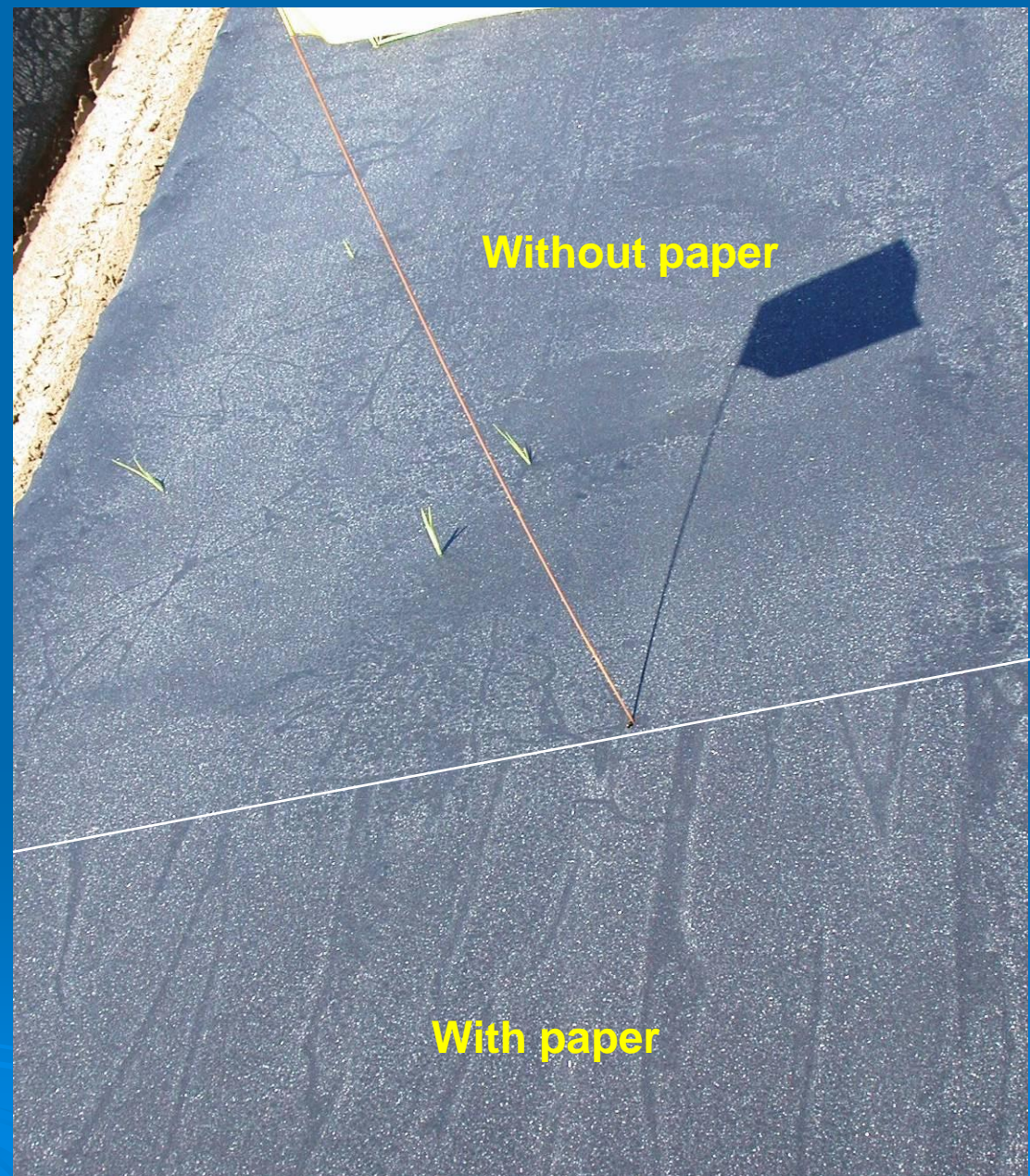
14% more on clear than colored



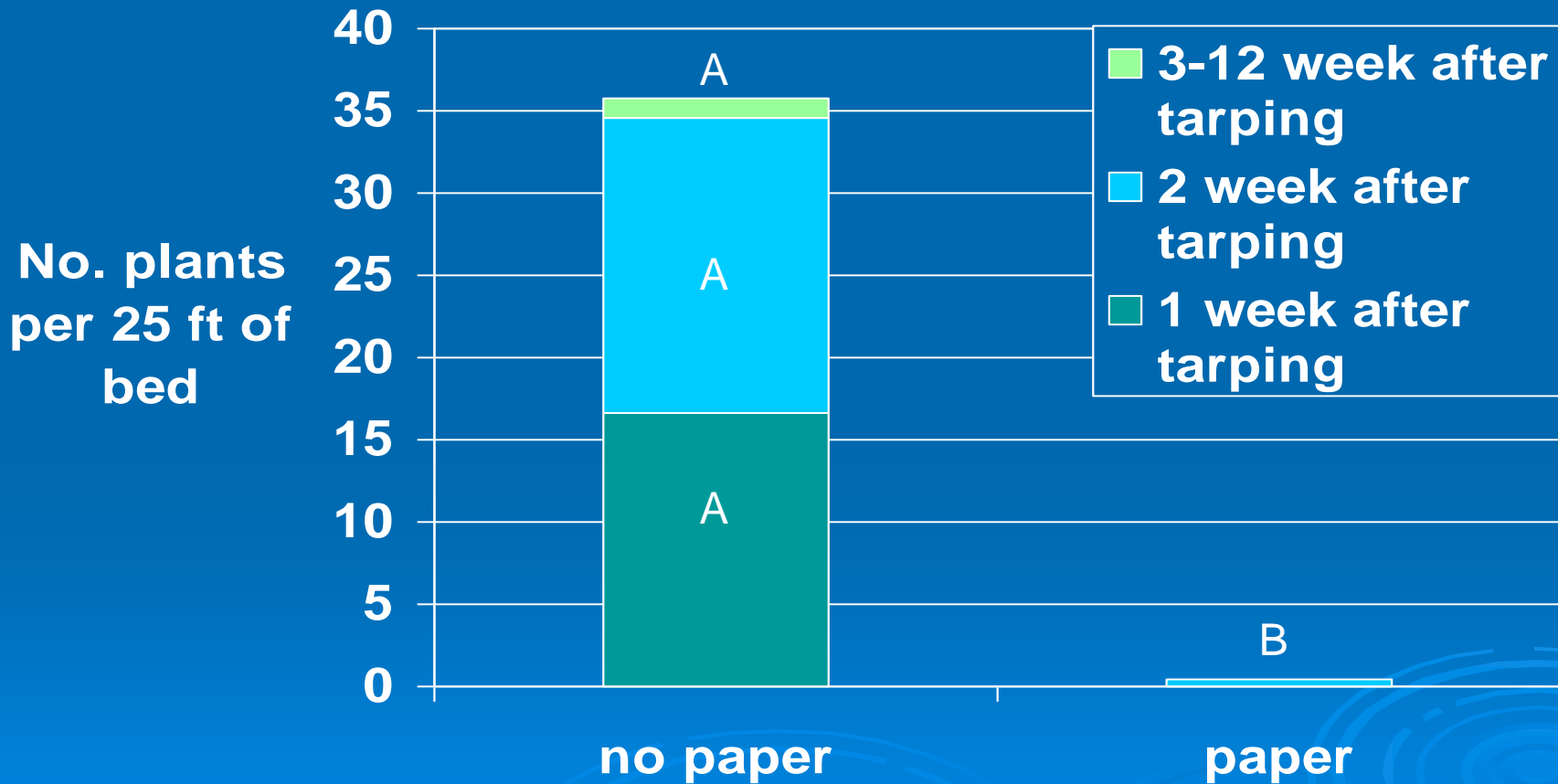


Paper from 'Novovita': recycled newspaper, gypsum





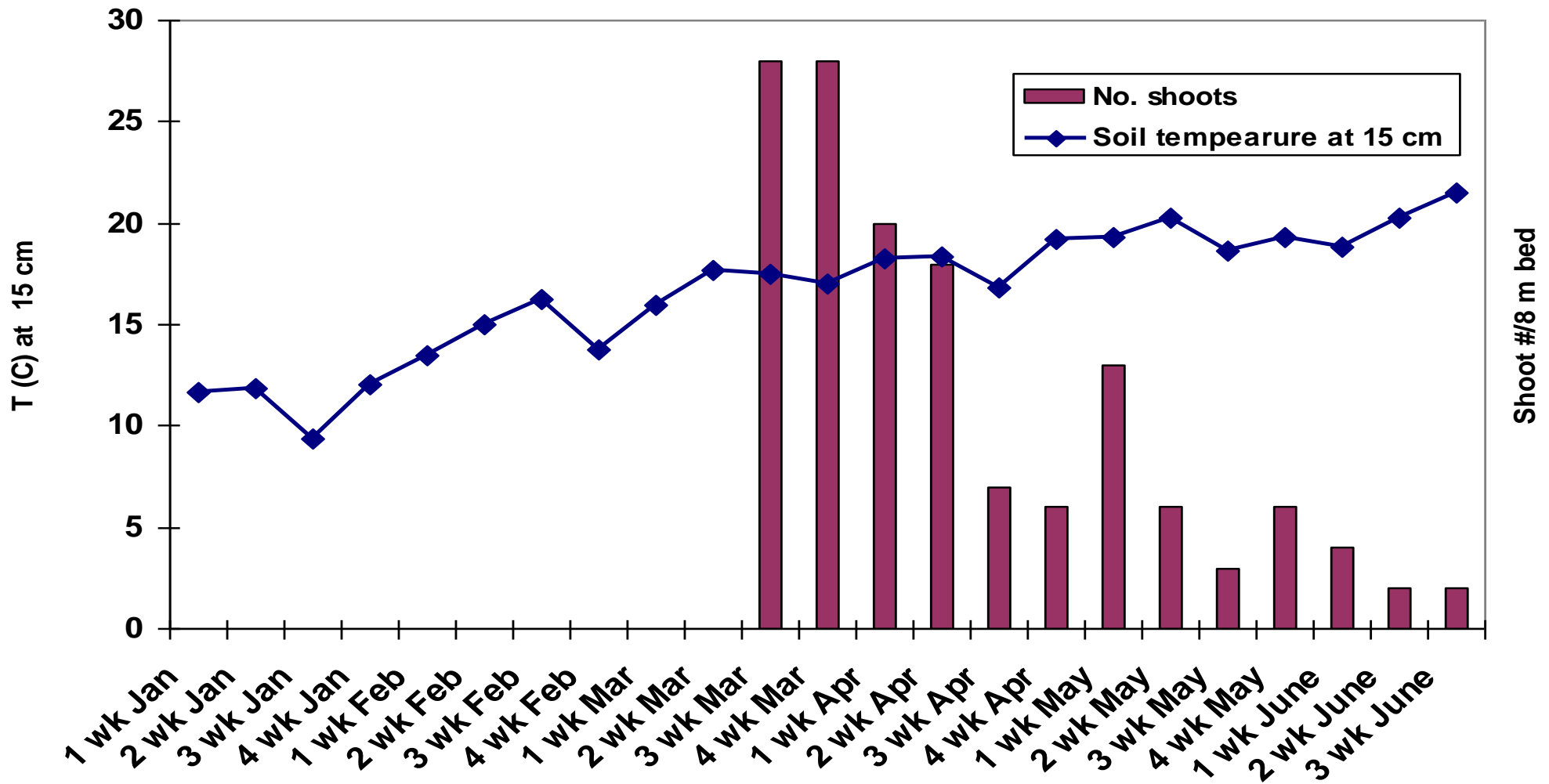
Yellow nutsedge germinated through plastic, 9/21 and 9/29 (pre-transplant)



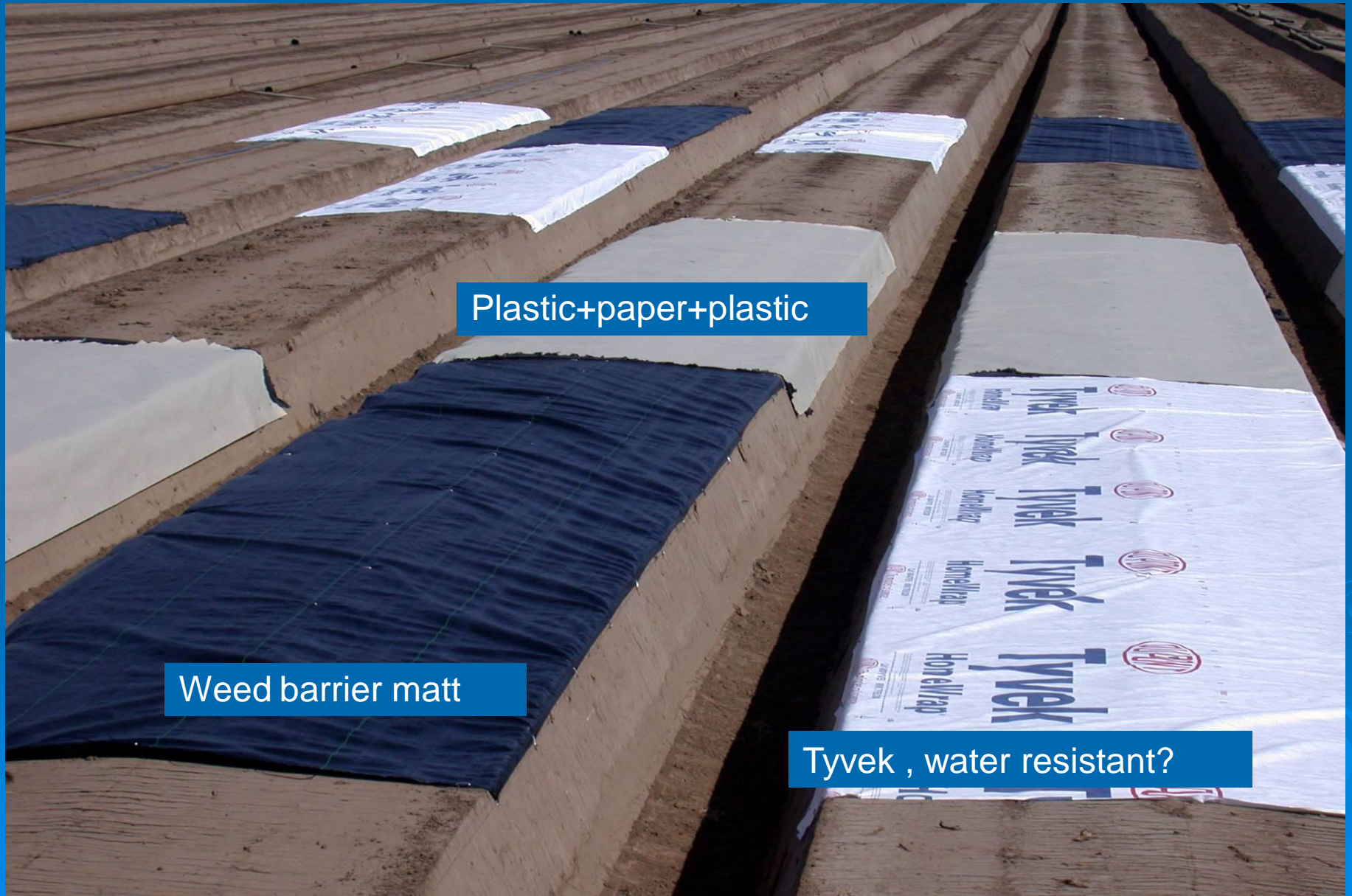
Yellow nutsedge germinated through plastic and paper+plastic, Spring 2006



Nutsedge germination, winter-spring 2007



2007- 2008: so far 100% nutsedge control



Plastic+paper+plastic

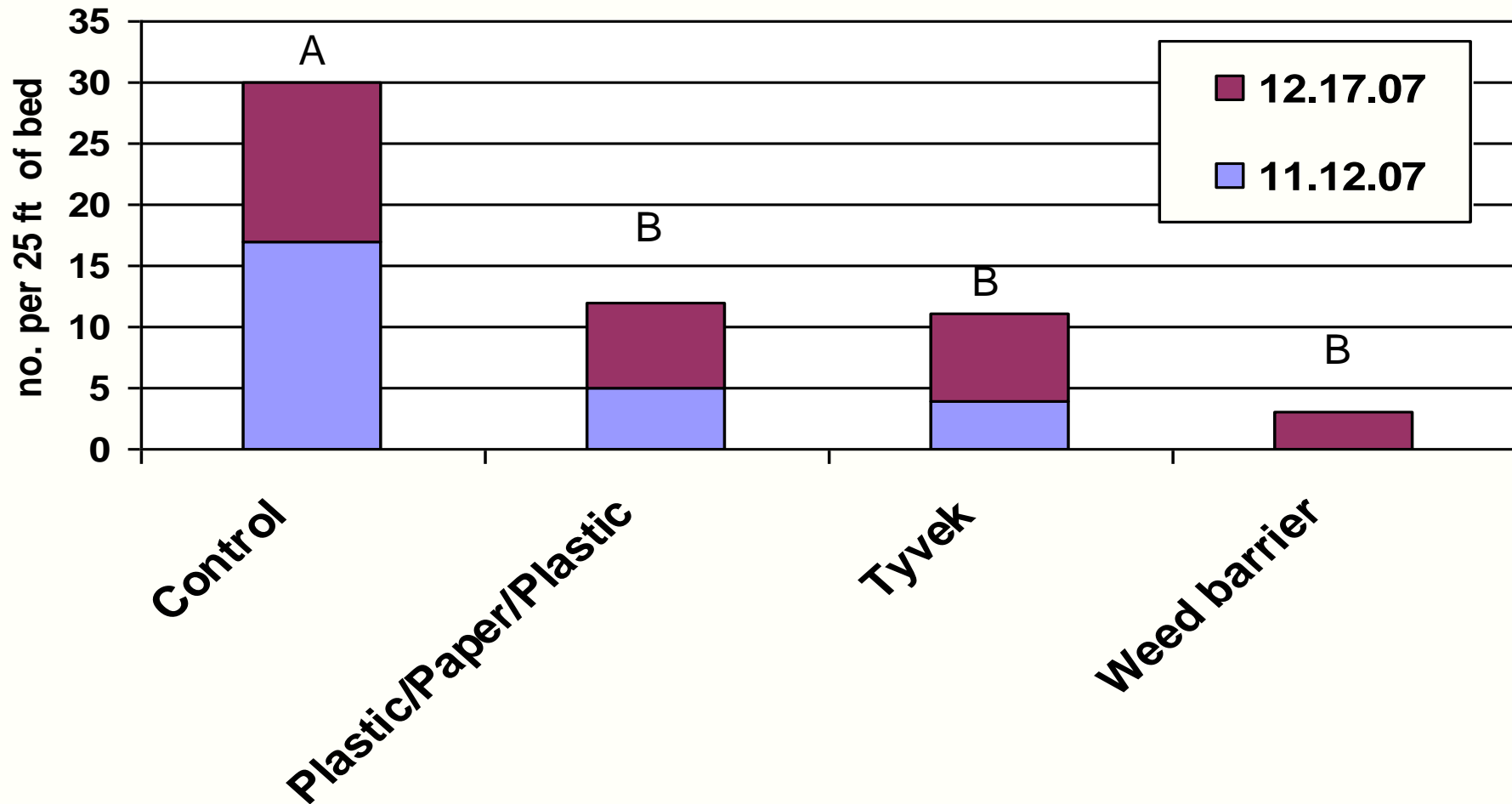
Weed barrier matt

Tyvek , water resistant?

Wind-dispersed weeds in planting holes



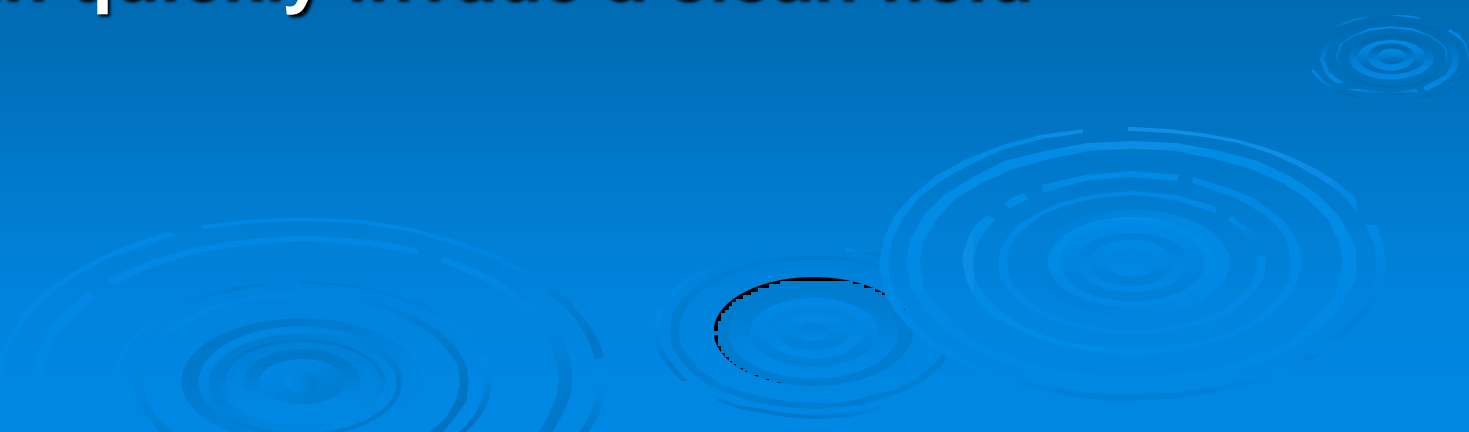
Wind-dispersed weeds in planting holes



Field selection

- **Avoid fields infested with perennial weeds.**
- **Annual weeds such as common purslane can be difficult to manage as well.**
- **Weeds such as common groundsel, common sowthistle, hairy nightshade and shepherd's-purse can be hosts of Verticillium.**

Sanitation

- **Clean equipment before moving from weed infested fields to clean fields – pressure wash**
 - **Remove uprooted bermudagrass and purslane from the field since these weeds can re-root**
 - **It is important to control weeds near the strawberry field because wind-blown seed from groundsel and sowthistle can quickly invade a clean field**
- 

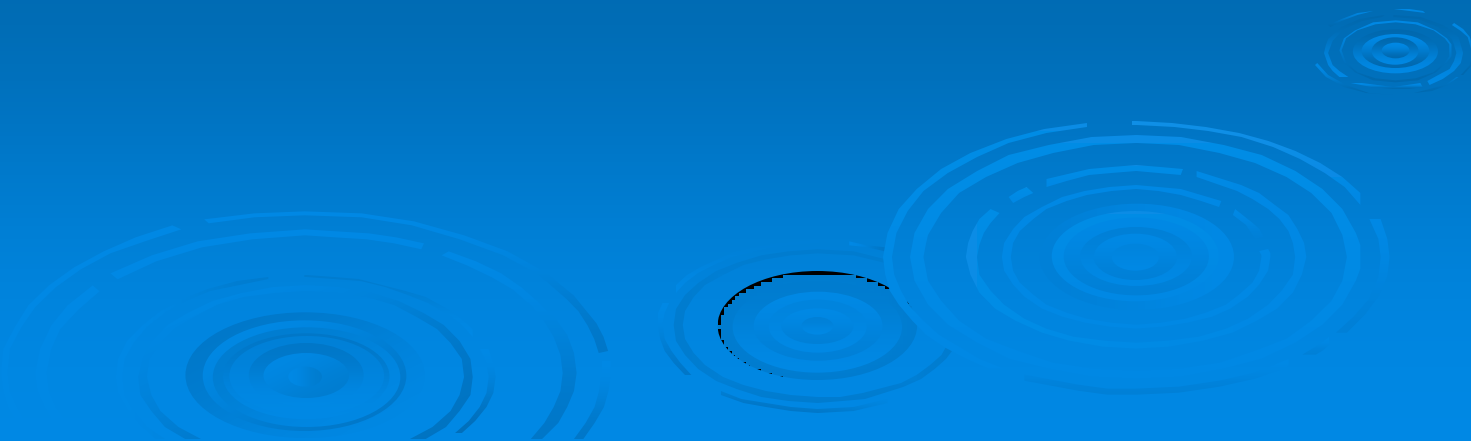
Tillage & cultivation

- The use of plastic mulches limits the use of tillage
- Tillage can be used before planting



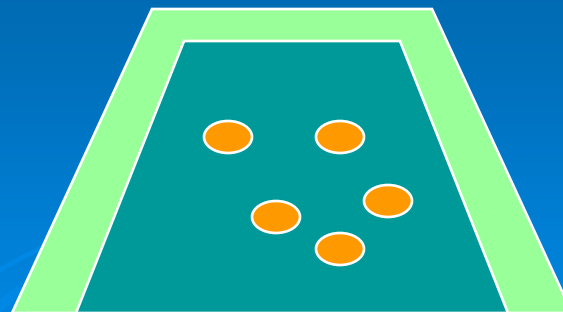
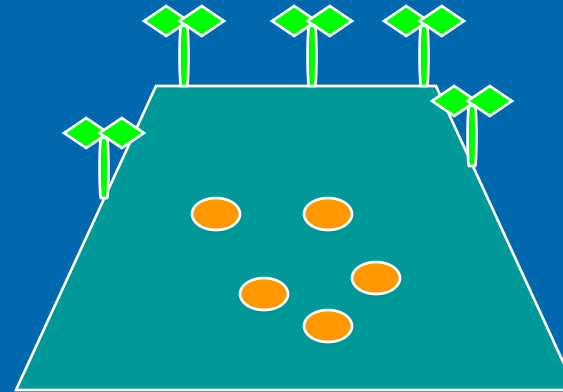
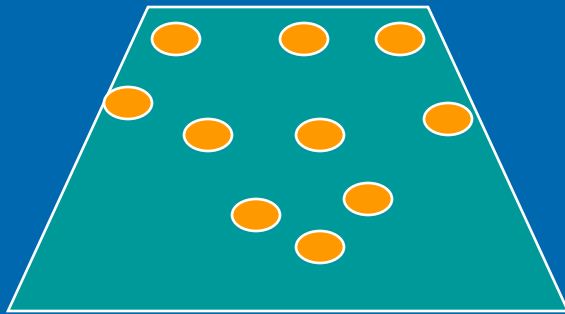
Preirrigation

- **Preirrigation and tillage before planting can be used help reduce weed populations**
- **The idea is to stimulate weed emergence before transplanting**



Preirrigation to control weeds

Irrigate



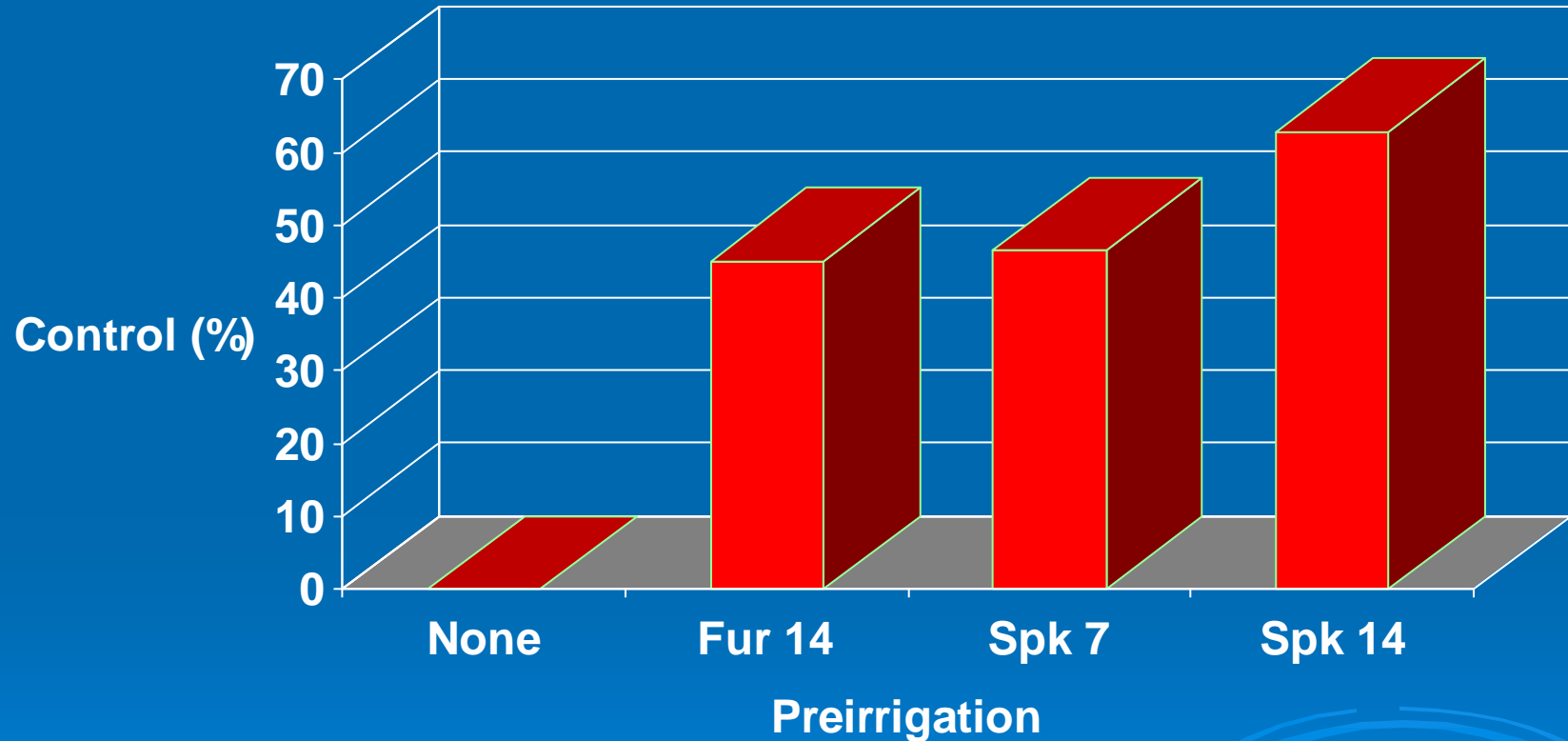
Shallow till
or burn

Preirrigation treatments

- **Furrow, sprinkler or no preirrigation**
- **Till and plant 7 or 14 days after preirrigation**
- **Lettuce was the crop**



Weed control with preirrigation



Spence 2002

Effects of preirrigation

No preirrigation



Preirrigation



Preirrigation conclusions

- Careful use of preirrigation and shallow tillage can control many weeds.
- Flaming can be used in place of shallow tillage.



Weed managements products



'Waipuna' hot foam system

- Heated organic foam (coconut/corn syrup + water) disrupts plant cells
- 250 gal water/hour, diesel or propane boiler



Testing weed control

Vegetating

- annuals
(cheeseweed, lambsquarters)
- Perennial
(Bermuda grass)



Testing weed control

Seed

- little mallow
- ryegrass
- burclover
- At 4 depths
0, 3, 6, 9 cm



**10 ft² /minute at
high plant canopy
density**



Above-ground annuals: 1 day



Bermuda grass: 1day



Bermuda grass

14 day



30 day



Bermuda grass

‘Waipuna’

Untreated



Seed survival


- Burclover: no effect of Waipuna treatment on germination at all depths
- Ryegrass: germination reduced 82% at the surface, no effect at other depths
- Little mallow: viability reduced 57% at the surface, no effect at other depths




A photograph taken from a high angle looking down at a garden plot. The plot is filled with small, green, leafy plants, likely a cover crop or a young vegetable crop. A wooden stake is stuck into the soil, with a white rectangular label attached to it. The label has the text "Standard Flame Burner" printed on it. To the left of the stake, there is a larger, more developed plant with broad, rounded leaves. The soil is dark brown and appears to be well-tended. In the bottom center of the frame, the tips of a person's feet wearing dark brown boots and blue jeans are visible, suggesting the photo was taken from a first-person perspective. The lighting is bright, casting shadows on the soil and plants.

Standard Flame
Burner

Matran
45.6% Clove Oil
@ 5 GPA Product
(50 GPA Volume)



Bradford
Horticultural
Vinegar
20% Acetic Acid
@ 15.4 GPA



Xpress
20.5% Clove &
Thyme Oils
@7.5 GPA

Crop rotations

- Careful management of weeds in crops grown in the season(s) prior to strawberry production can help reduce weed populations in the field.
- Management of weeds in crops such as celery, cole crops and lettuce can help reduce weed populations in the field.



Soil solarization

- Works well in the warmer parts of California such as the deserts and central valley.
- Difficult to use on the coast due to fog, and cool temperatures. Regarded as undependable on the coast.
- In one study gave ~ 60-70% weed control

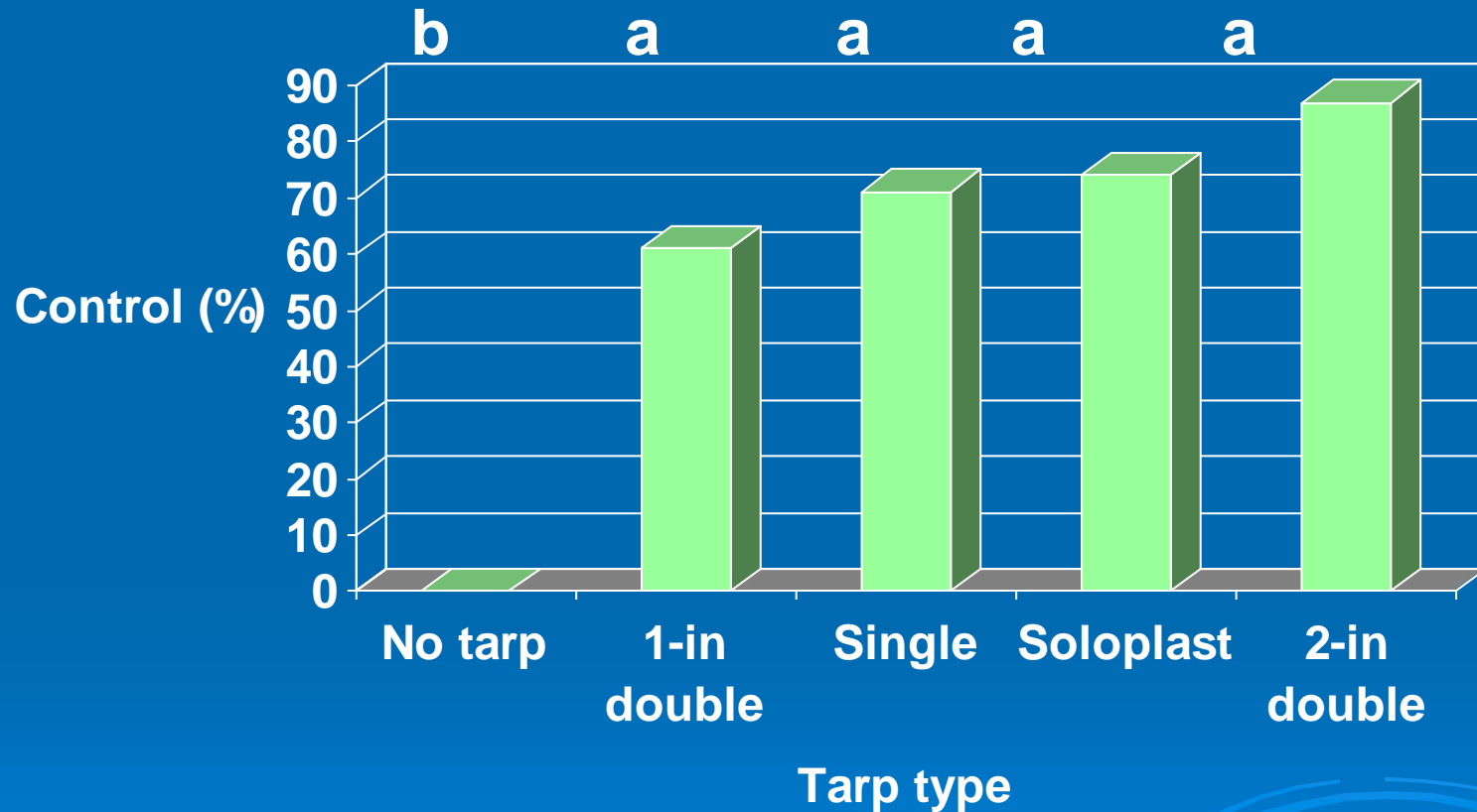
Solarization near coast: Double layer with 2-inch spacing



Soloplast

Standard

Soil solarization: weed control



Steam and hot gas: complete control, but how to make field application is efficient/economical?

- Use of steam blankets
- Inject via heat resistant drip tape to beds
- Use spiked metal tubes on bed tops
- Use in combination with solarization to disinfect top layer and deeper parts of beds = reduce fuel costs associated with heating water

Summary - weeds

- Weeds must be carefully managed in and around the production field before and during strawberry production.
- A long-term approach to managing weed seed banks in the production field will lead to lower weeding costs.
- Field selection, sanitation, preirrigation and tillage, solarization handweeding and plastic mulches are the tools by which weeds are managed in organic strawberries.

Acknowledgments

- UC SAREP
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