

# Management of Fresh Wheat Residue for Irrigated Winter Canola Production

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# Cropping System

- 1. Under irrigated circles, potato are the dominant cash crop.**
- 2. Good rotations are needed to maintain productivity**
- 3. A common rotation is potato/winter wheat/winter canola**



# Problem

- 1. Difficult to establish winter canola in heavy winter wheat residue**
- 2. Growers currently burn residue and then moldboard plow.**
- 3. Losing valuable organic matter, C, N.**
- 4. Environmental problems with burning**





# Goal

- 1. Test other residue management methods**
  - straw removal**
  - straw chopping**
  - Disking vs plowing**
  - Direct seeding with and without row cleaners**
- 2. Understand why it is difficult to establish winter canola in winter wheat stubble- is it a biological (pathogen), physical or environmental cause?**

# Objectives

- 1. Determine how six different WW residue management practices affect WC health and yield.**
- 2. Determine cause(s) for decline in WC vigor and yield as affected by WW residue management.**
- 3. Test methods to retain WW residue without adversely affecting WC.**
- 4. Disseminate results of research through field days, grower meetings, an extension bulletin, and a scientific journal article.**

# Theories

## 1. Straw produces toxic compounds.

All of this work is done in greenhouse or artificial conditions

Compounds like water-soluble organic acids can be leached from straw that may inhibit seedlings, but they are very short-lived in the soil (microbes quickly use them).

No evidence for allelopathy in situ under field conditions

# Theories

**2. Decomposing straw immobilizes nitrogen.**

**This may occur over the season, but may not be important in the first 2-3 weeks of seedling establishment.**

**Can be overcome with adequate fertilizer**

# Theories

**3. Excess straw interferes with drill performance.**

**Problem of getting good seed-to-soil contact, straw tucking, clogging openers, etc.**

# Theories

- 4. Excess straw keeps soils too wet and cool.
- 5. Straw shades WC seedlings and interferes with photosynthesis.

4- may be important in spring, but not fall plantings

5- Australians have evidence for this- seedlings have to elongate out of residue, slows establishment

# Theories

6. Straw serves as a food base for soil-borne pathogens, increasing disease, especially for *Pythium* and *Rhizoctonia*.

10 years of evidence for this- *Rhizoctonia solani* AG 2-1





















# **Irrigated Winter Canola Experiment at Lind**

**Treatments (established on fresh irrigated winter wheat stubble)**

- 1. Burn + disk – present practice**
- 2. Mechanical straw removal + disk**
- 3. Chop stubble + moldboard plow**
- 4. Burn + direct seed**
- 5. Direct seed into standing residue**
- 6. Direct seed into standing residue with row cleaners**

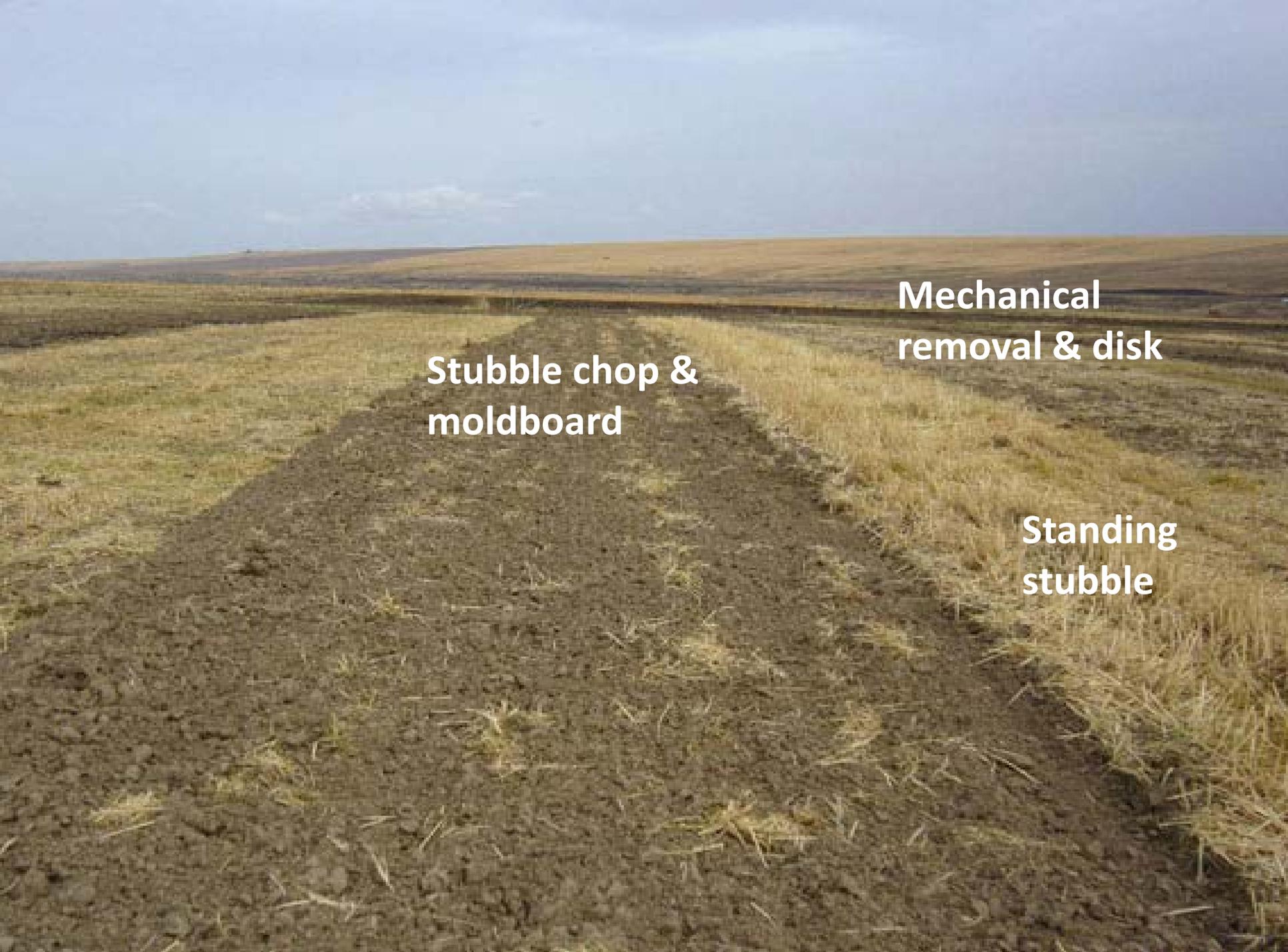






**Burn & direct seed**

**Burn & disk**



**Stubble chop &  
moldboard**

**Mechanical  
removal & disk**

**Standing  
stubble**

**Horned Lark-**  
***Eremophila alpestris***



**Despite bird netting, horned larks ate almost every WC seedling before emergence.**

**We then broadcast more seed, spread garlic powder, added 2" irrigation water, and then spread more garlic. Horned larks again ate almost every WC seedling.**

**Also tried cannons, dummy owls, etc.**

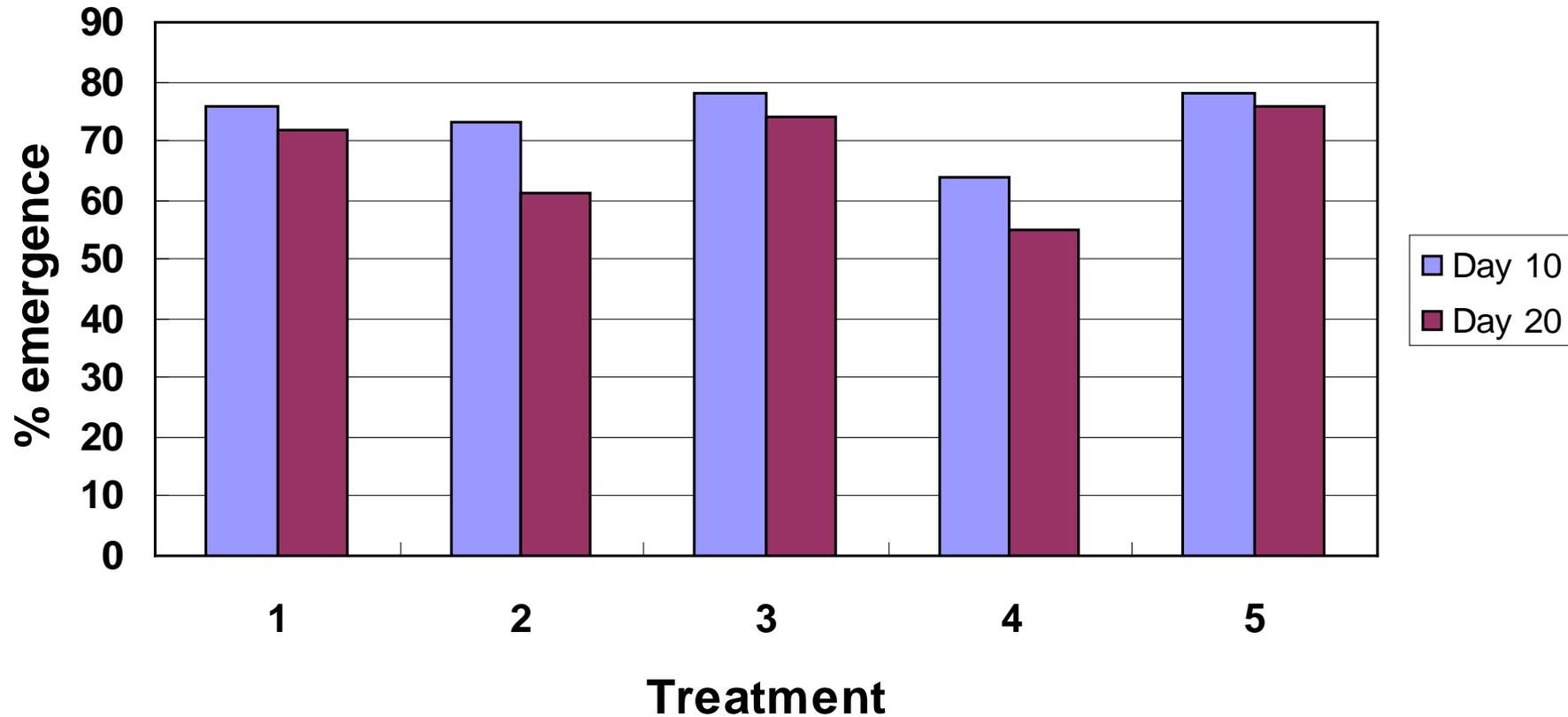
**Field experiment to be moved to the Jeff Schibel farm in 2012.**



# Measurements in Winter Canola

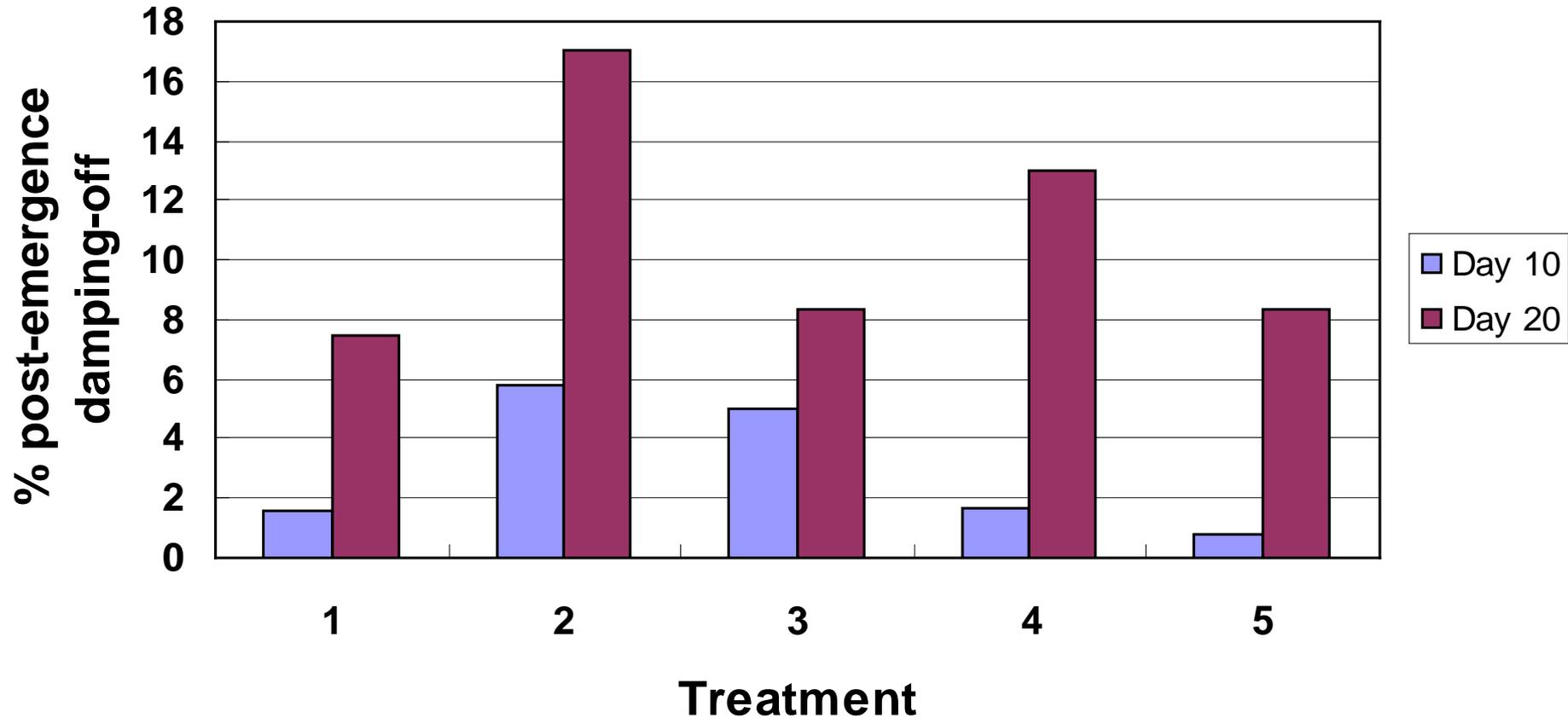
1. Soil water dynamics and water use efficiency
2. Plant stand establishment
3. Rhizoctonia levels in the soil
4. Rhizoctonia AG-8 and AG 2-1 on roots
5. Soil temperature
6. Weed pressure
7. Grain yield
8. Oil content

## Bioassay of Field Soil from Fall, 2010 Planting of Winter Canola, sampled in Spring 2011



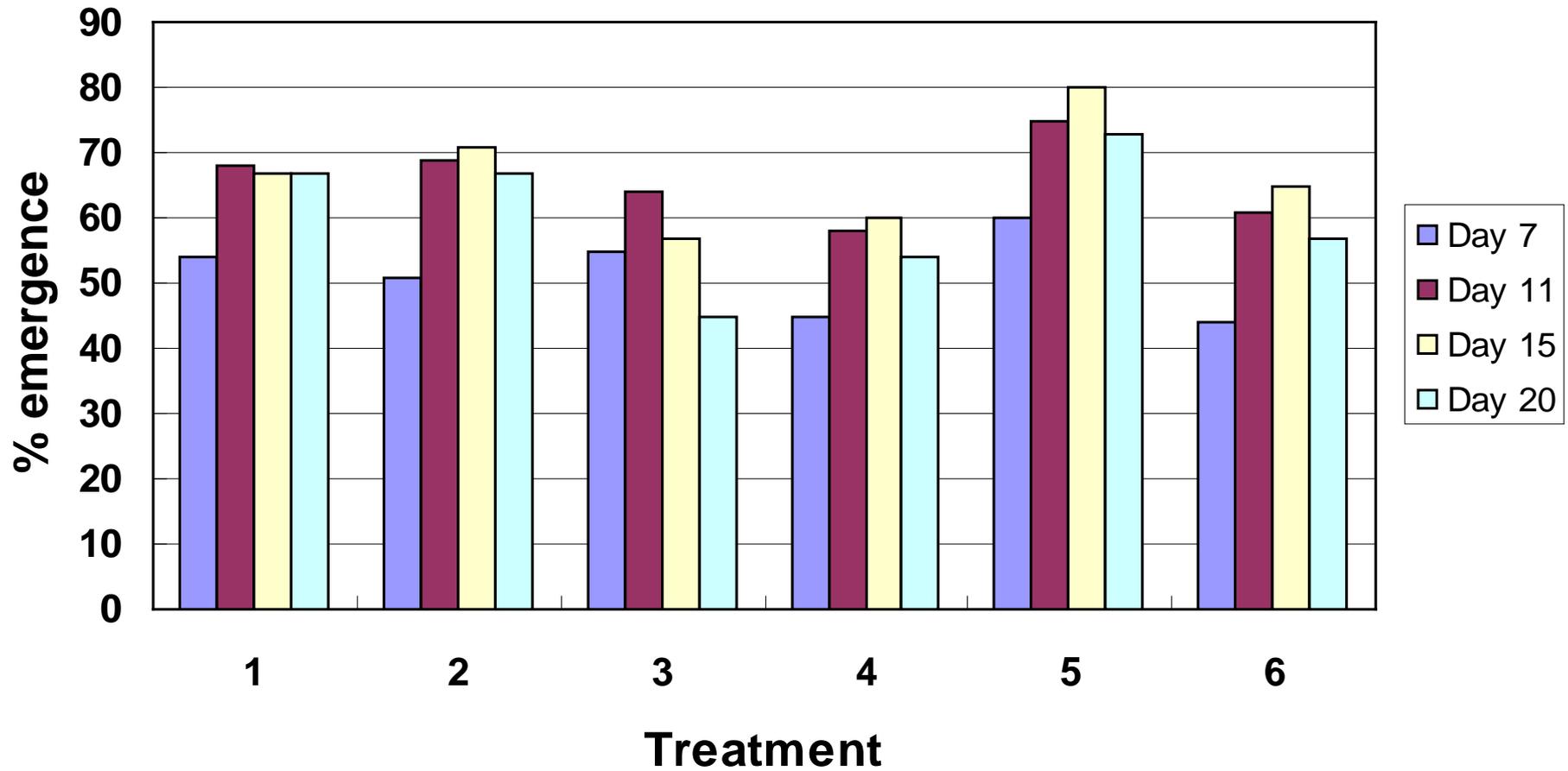
1) burn-disk; 2) straw removed, disk 2X, 3) straw chopped and plowed in;  
4) direct-seeded and 5) Burned-directed seeded

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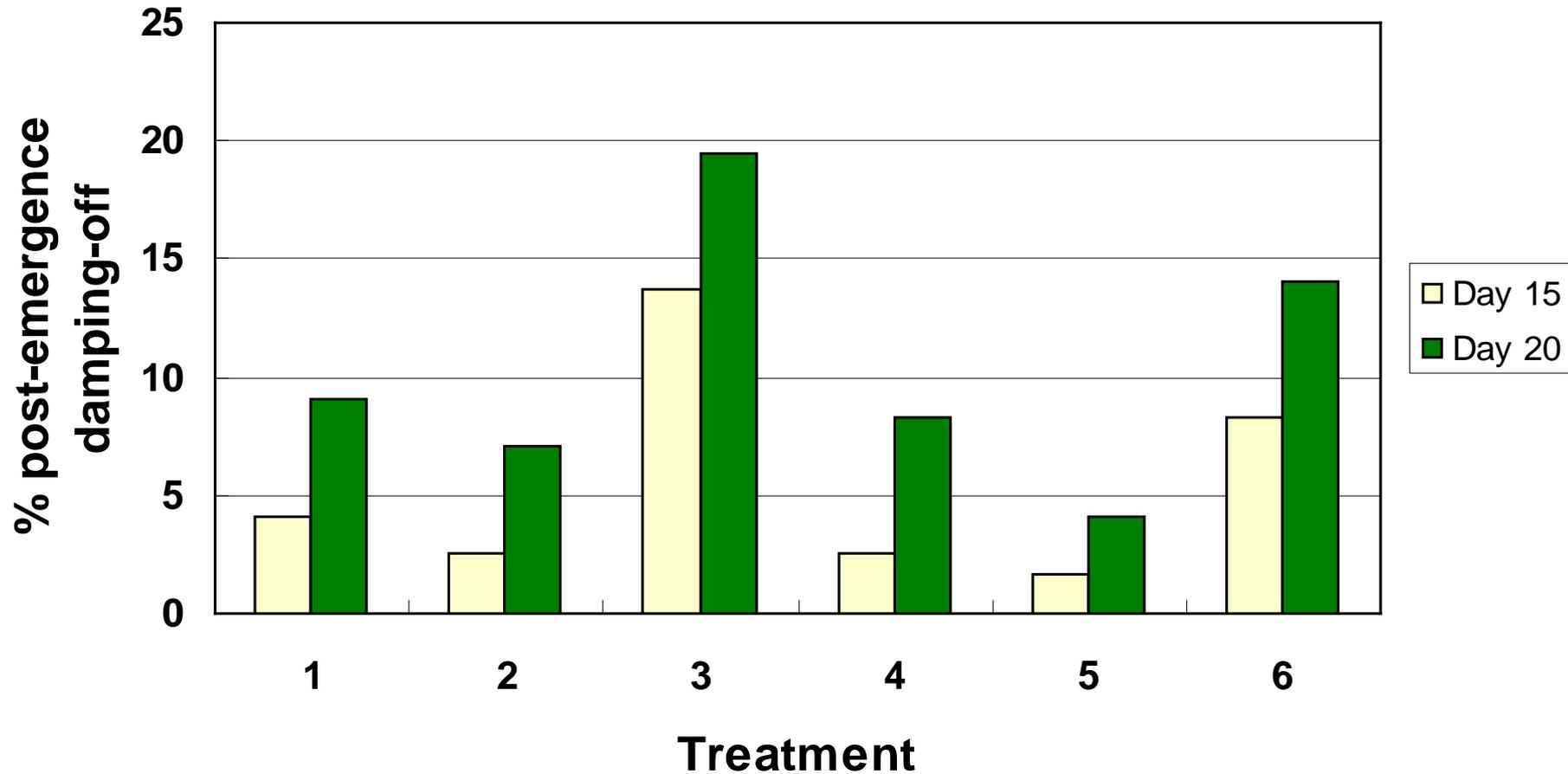
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## Bioassay of Field Soil from Fall, 2011 Planting of Winter Canola



- 1) burn-disk; 2) straw removed, disk 2X, 3) straw chopped and plowed in;  
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## Bioassay of Field Soil from Fall, 2011 Planting of Winter Canola



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# Conclusions

- **The treatment with chopped straw added to the soil (3) showed the most post-emergence damping-off from *R. solani* AG 2-1. This suggests that straw is providing a food base for this pathogen.**
- **Noticed better performance of the surviving seedlings in the two burned treatments. Is this due to stimulation by nutrients in the ash? Reduction of pathogen?**

# Laboratory Pot Experiment

- Take Lind soil to the greenhouse.
- Pasteurize half the soil to remove pathogens, leave the other half untreated.
- Four residue treatments: (i) no WW residue, (ii) fresh WW residue mixed with soil, (iii) fresh WW residue on surface only, (iv) straw burned on top of pot
- Then plant WC in ½ gallon pots.
- Pot experimental design is a 2 X 4 factorial with five replications.

# Hypothesis to be Tested

- **If we do not see a WC growth reduction in the pasteurized soil but see a growth reduction in the normal soil, this will prove that soil pathogens or other microbes are responsible for the phenomenon.**
- **If we see a WC growth reduction in the absence of straw, this will show that straw is not responsible for the problem.**
- **With normal soil, if there is WC growth reduction with WW residue, then planting methods to remove fresh residue from the seed row will be evaluated.**

A landscape photograph featuring a vast field of bright yellow flowers in the foreground. In the middle ground, a white, single-story building is visible, surrounded by a few trees. The background consists of rolling green hills under a clear blue sky. The word "Questions?" is overlaid in the center of the image in a bold, blue font with a white outline, set against a yellow rectangular background.

**Questions?**