Management of Fresh Wheat Residue for Irrigated Winter Canola Production

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Objectives

1. Determine how four different WW residue management practices affect WC heath 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.
2. Decomposing straw immobilizes nitrogen.
3. Excess straw interferes with drill performance.
4. Excess straw keeps soils too wet and cool.
5. Straw shades WC seedlings and interferes with photosynthesis.
6. Straw serves as a food base for soil-borne pathogens, increasing disease, especially for Pythium and Rhizoctonia.

Irrigated Winter Canola Experiment

Treatments (established on fresh irrigated winter wheat stubble)

1. Burn stubble + disk
2. Chop stubble + moldboard plow
3. Burn stubble + direct seed
4. Direct seed into standing residue

Four replicates in RCB design. Plot length = 100 ft.


Stubble chopped +
moldboard plow
Standing stubble
09/06/2012


Stubble burned
then direct seed
Stubble burned + disk
09/06/2012


10/03/2012


10/03/2012


10/03/2012


10/03/2012


Burn & disk

Despite bird netting, horned larch birds 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 larches again ate almost every WC seedling.

Field experiment 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 in early spring
6. Weed pressure
7. Seed yield
8. Oil content

Disease Assessment

Why it is difficult to establish winter canola in winter wheat stubble- is it a biological (pathogen), physical or environmental cause?

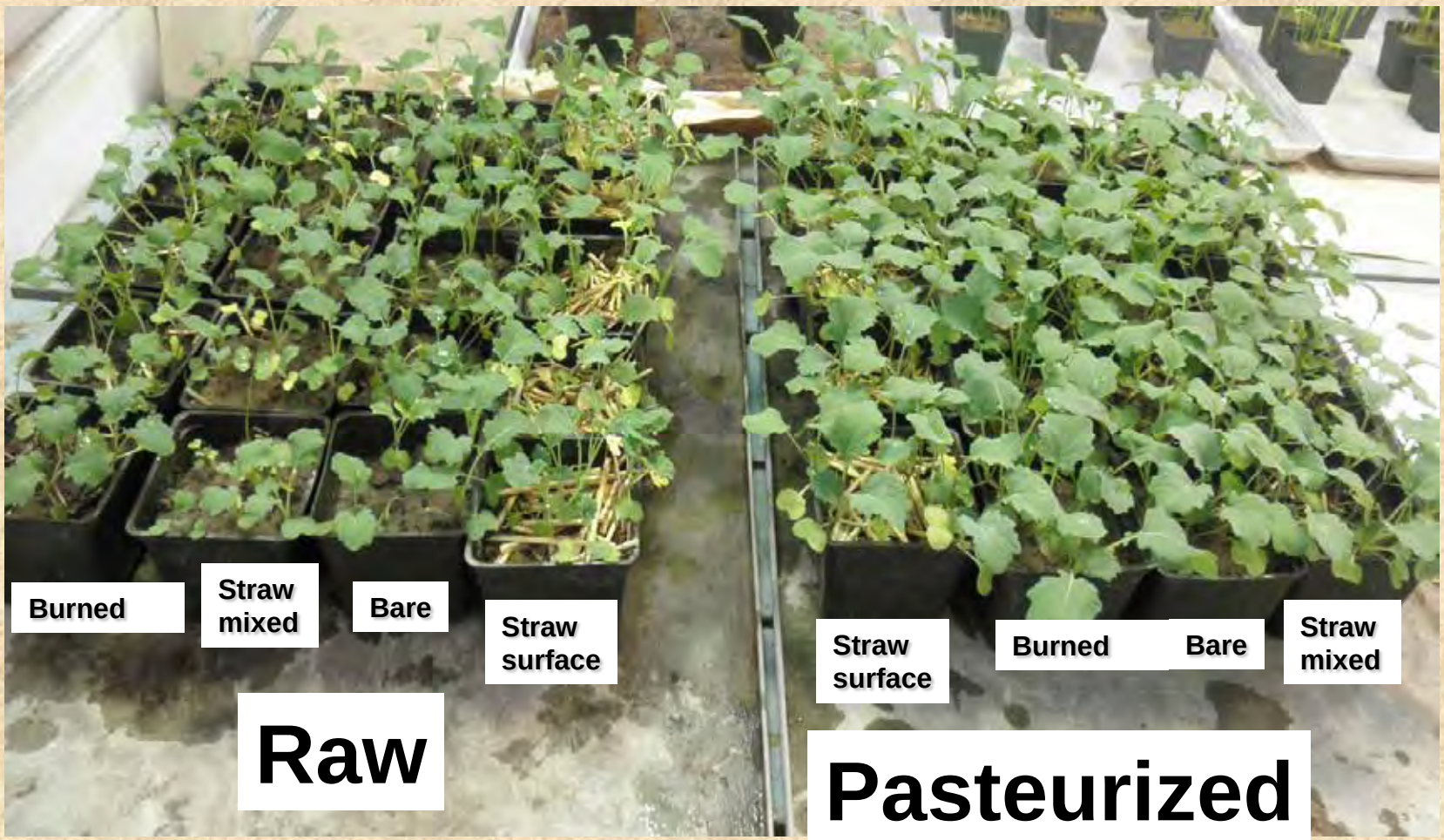
Is it due to *Rhizoctonia solani* AG 2-1?

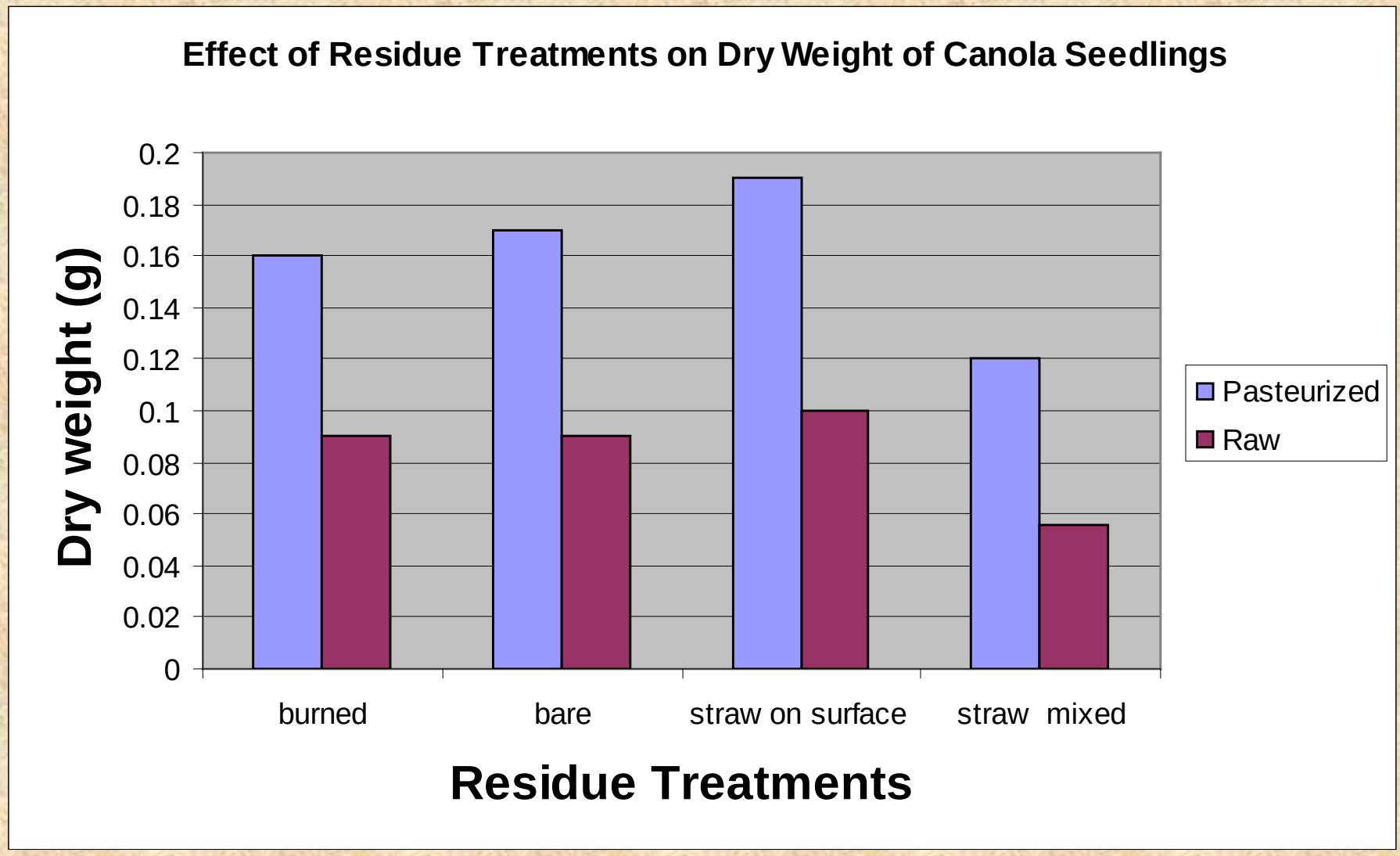
Laboratory Pot Experiment

- Take soil to the greenhouse.
- Pasteurize half the soil to remove pathogens, leave the other half untreated.
- Three residue treatments: (i) no WW residue, (ii) fresh WW residue mixed with soil, (iii) fresh WW residue on surface only.

Hypothesis to be Tested

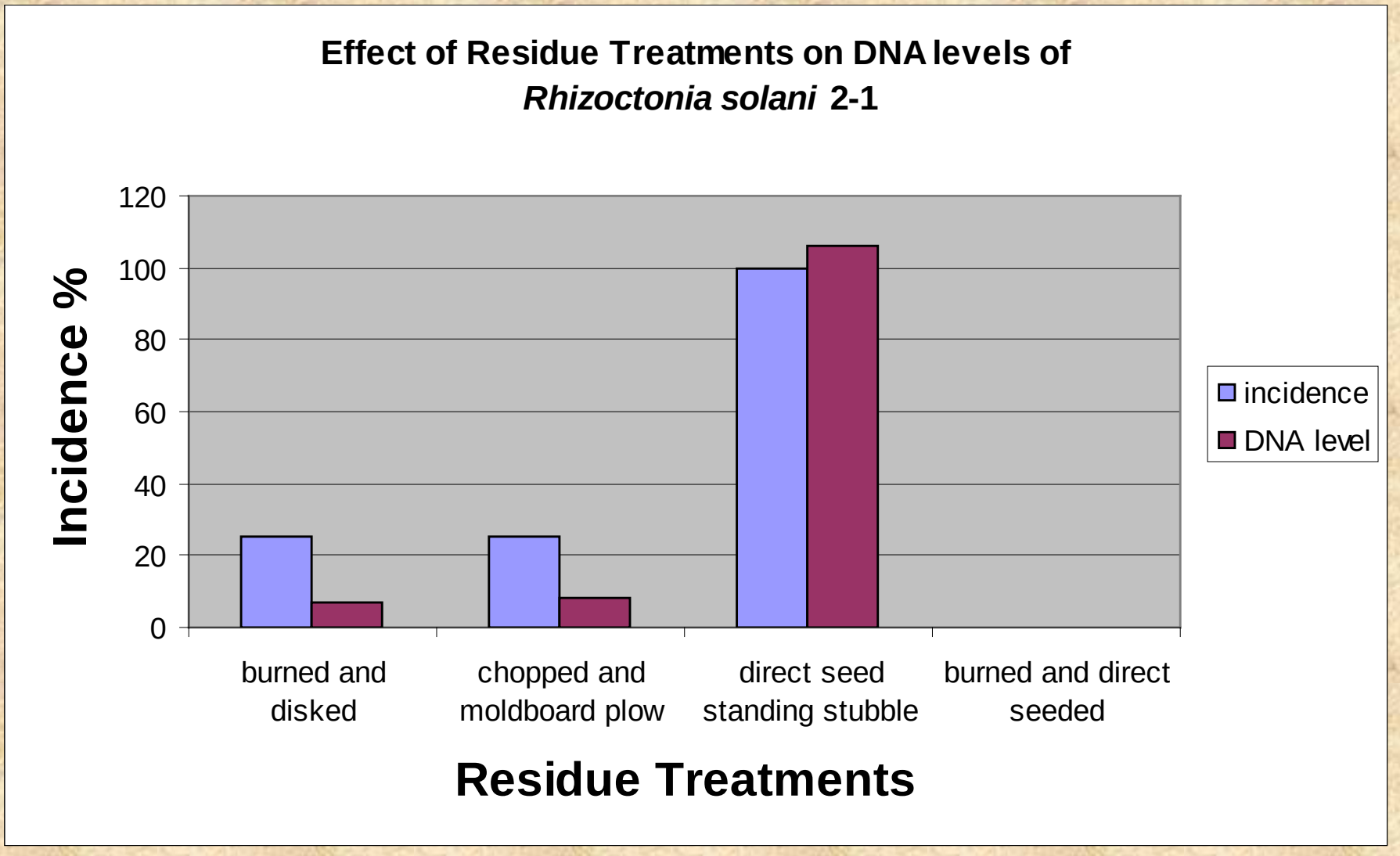
- If we seen increased winter canola growth in the pasteurized soil (where we removed the pathogens) this will prove that soil pathogens or other microbes are responsible for the phenomenon.


Burned
Straw mixed
Bare
Straw surface
Raw
Straw surface
Burned
Bare
Straw mixed
Pasteurized


Effect of Residue Treatments on Dry Weight of Canola Seedlings
Dry weight (g)
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
burned
bare
straw on surface
straw mixed
Residue Treatments
Pasteurized
Raw

Sampled Experimental Field on Schibel Farm in Oct. 2012

- Measured DNA of *Rhizoctonia solani* AG 2-1 from soil samples.


Effect of Residue Treatments on DNA levels of
Rhizoctonia solani 2-1
Incidence %
120
100
80
60
40
20
0
burned and disked
chopped and moldboard plow
direct seed standing stubble
burned and direct seeded
Residue Treatments
incidence
DNA level

Conclusions

- Both field and greenhouse data implicate *Rhizoctonia solani* 2-1 being involved in reduced stand establishment in direct-seeding.
- Unknown- involvement of wheat and straw in this disease- is it serving as a food source for fungus?
- Does the straw create a good microenvironment for the disease in the canola seedlings?
- Does not appear that tillage (disking/plowing) is involved, because DNA levels in Treatment 4 (no disturbance) are very low.