Evaluation of various soil amendments to manage Clubroot on Canola in field condition

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Clubroot

- Caused by a pathogen *Plasmodiophora brassicae* belong to lower group of living organisms called Protista
- Not a fungus/amoeba/slime mold but has some characters similar from each
- A serious yield robing disease of brassica crops
  - E.g. Canola, cauliflower, cabbage, rutabaga, radish, turnip, brussel sprouts, kale etc.
  - Susceptible brassica weeds: wild mustard, shepard's purse, volunteer canola, stink weed
- Prefers acidic soils but found in the soils of pH up to 7.2
- Once in the soil can live as resting spores up to 20 years
- Pathogen infects roots; causes galls there by restricting the flow of water and nutrients to the plant
- If 100% of plants infected results in 50-80% reduction in yields (Europe and Sweden Research)

Clubroot - The challenge

- Clubroot has been a regular finding ever since identified in Cavalier County, ND in 2013
- Clubroot has appeared in 2016, in the field where it has been identified in 2014
- In 2017 started spreading to neighboring fields (found in new fields too)
- 2018 found in 33 fields (Epidemic?)

Challenges:

  - Lack of understanding of pathogen biology
  - Lack of knowledge of Genetic resistance
  - No effective chemical control and
  - Lack of knowledge on rotations to be followed
  - No significant yield loses seen in clubroot infected fields yet in Cavalier County (2018 showed some clubroot impact on canola yields)
- A Clubroot survey group has been formed with one pathologist, two extension specialists and seven county agents to create awareness of clubroot and its management in 2016.

Clubroot in ND and in Manitoba, Canada

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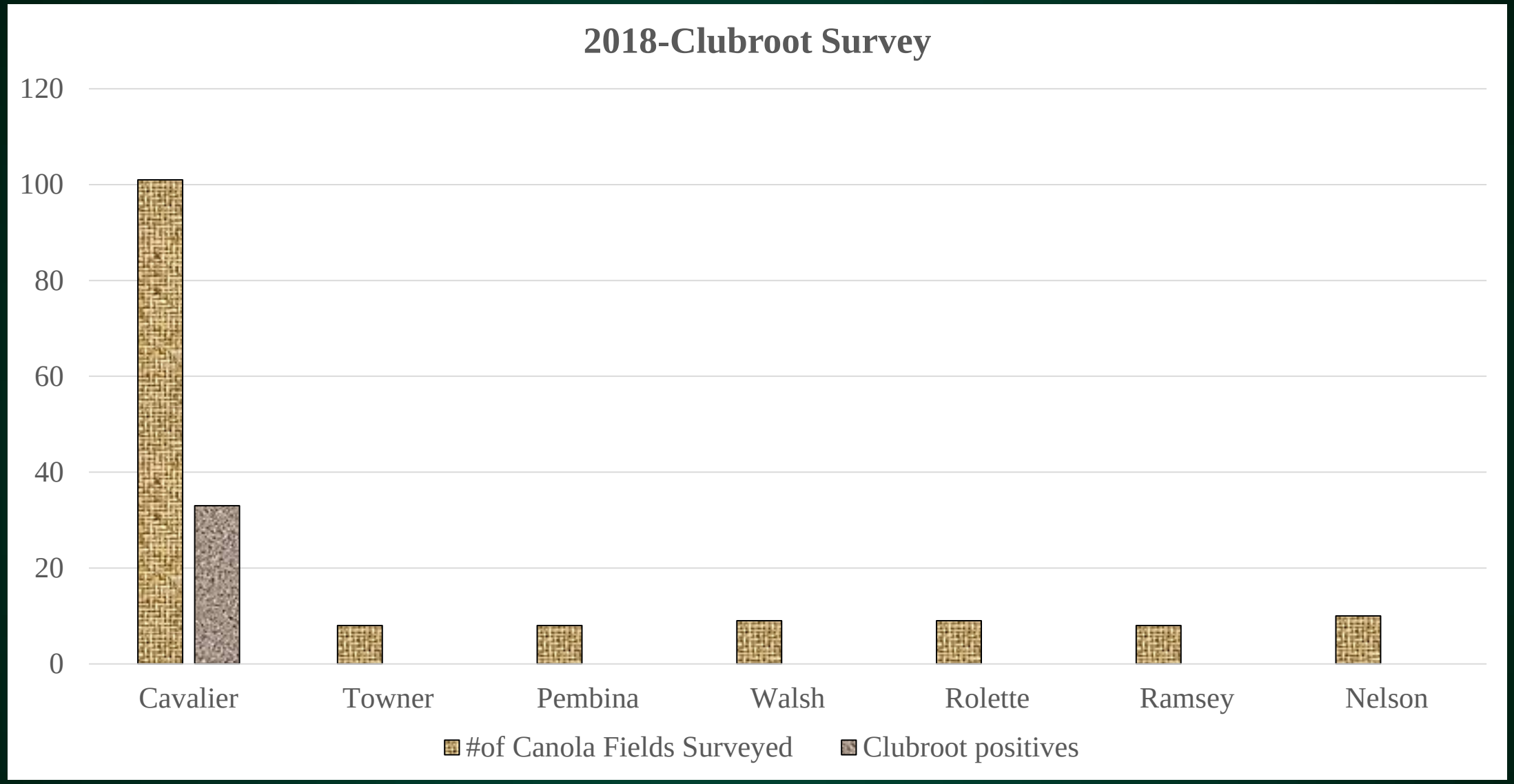

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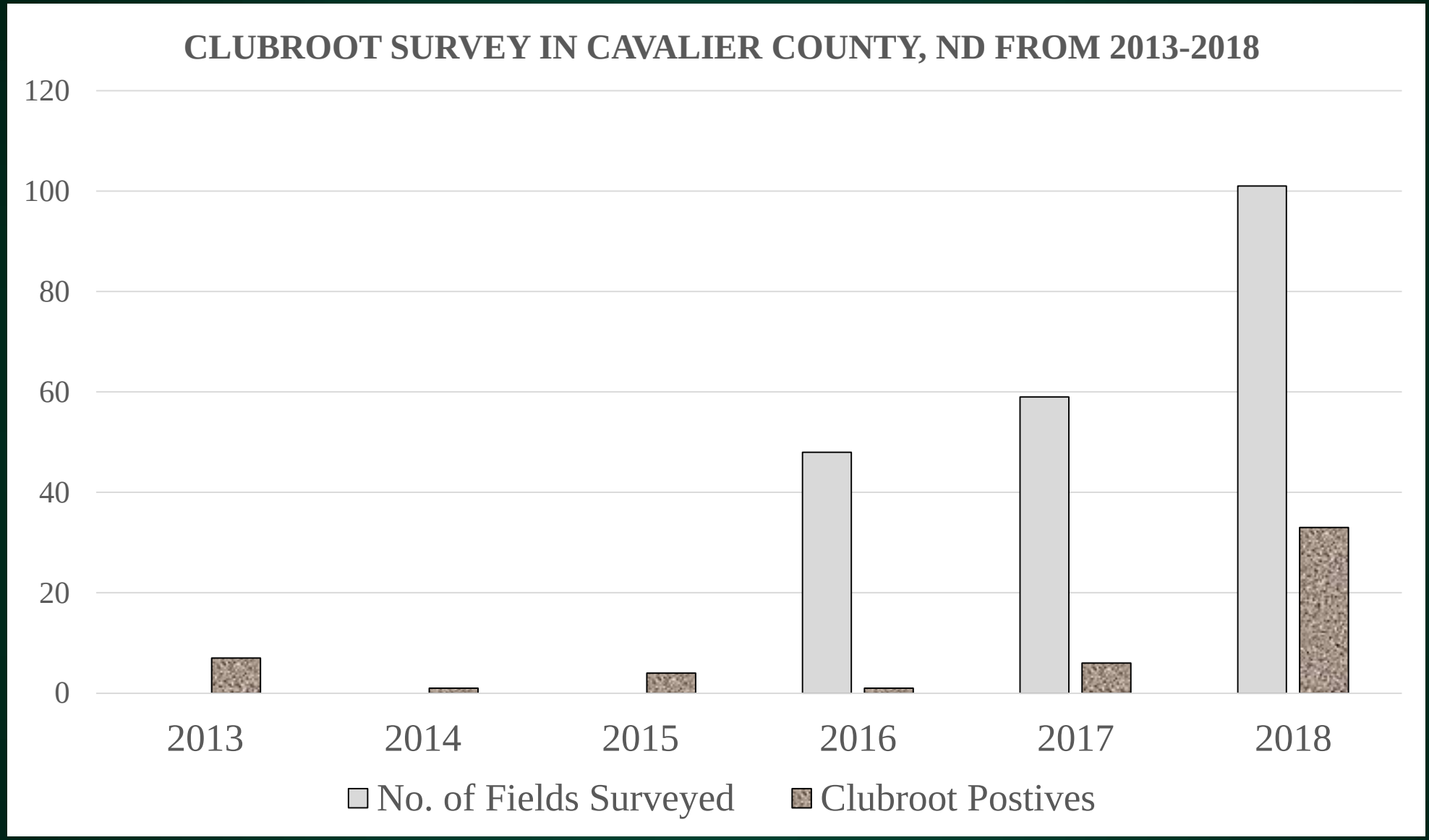

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Are we reaching Epidemic Status?

Canola Acreage in United States

Year	Area Planted (1000 acers) in ND
2016	1460
2017	1590
2018	1650

Evaluation of chemicals, fungicides and soil ameliorating products

Treatment	Tradename	Dosage
Cyazofamid	Ranman	7.5 l/ha
Fluazinam	Allegro	2000 g/ha
PCNB	Blocker	67.5kg/ha
Wood ash	Fly Ash	7.5t/ha
Calcium Carbonate	Pellet Lime (Lime)	7.5t/ha
Beet lime	Versa Lime	15 t/ha
Gypsum	Gypsum	7.5 t/ha
Nano Particle	Zn	500mg/L of Zn
Non-Ionic surfactant	Aqua-Gro 2000	10g/m just before planting Incorporated into rows
Non-treated	CHK	

Planted on: 6/8/2017
Plot size:5ft Length
3ft. Width
Replicated 4 times
Rated on:7/31/2017

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Objectives

Plot lay out of three objectives

1. Chemical efficacy
2. Host susceptibility
3. Response of Commercial cultivars

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Methodology

Evaluation of chemicals, fungicides and soil ameliorating products

Clubroot rating scale

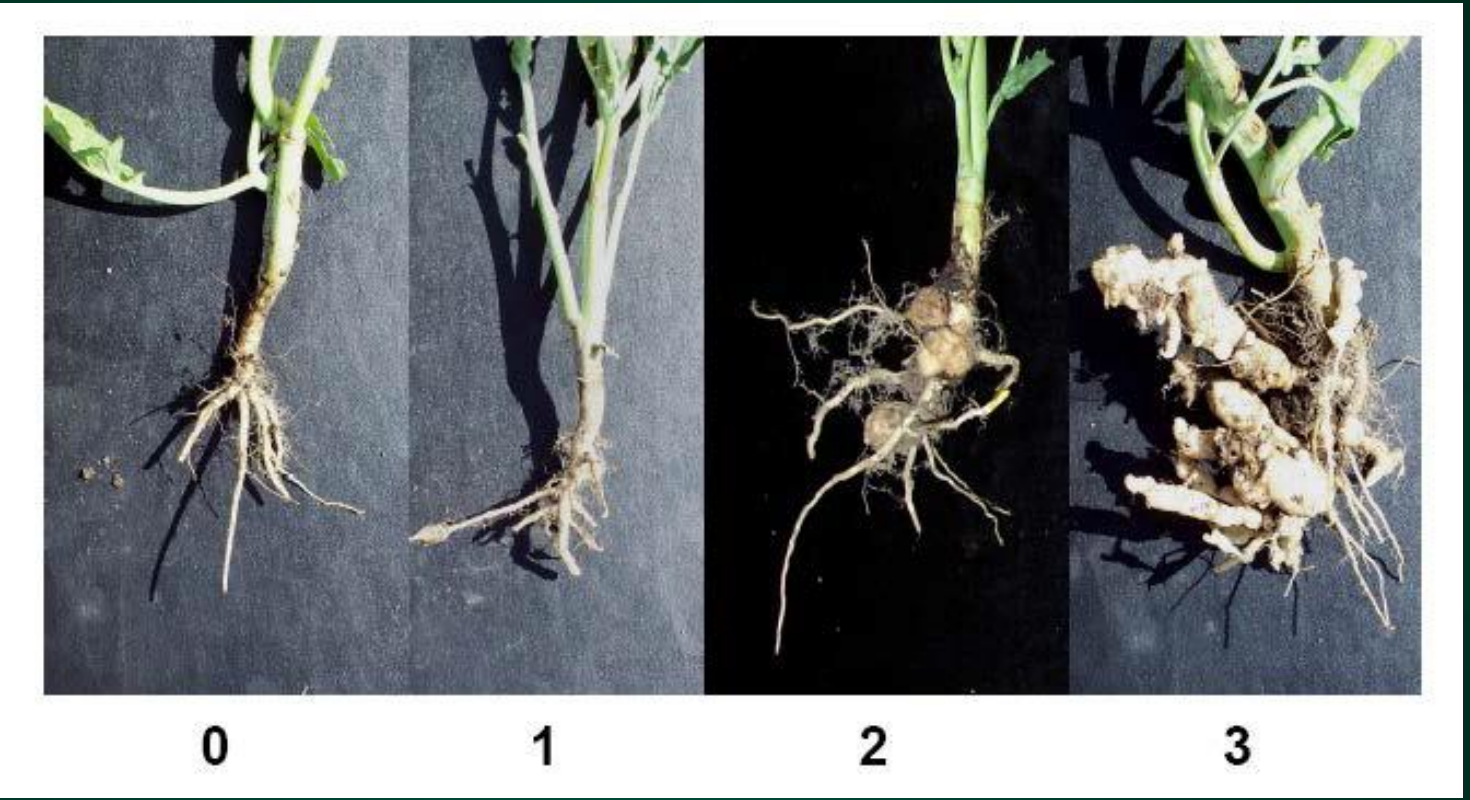
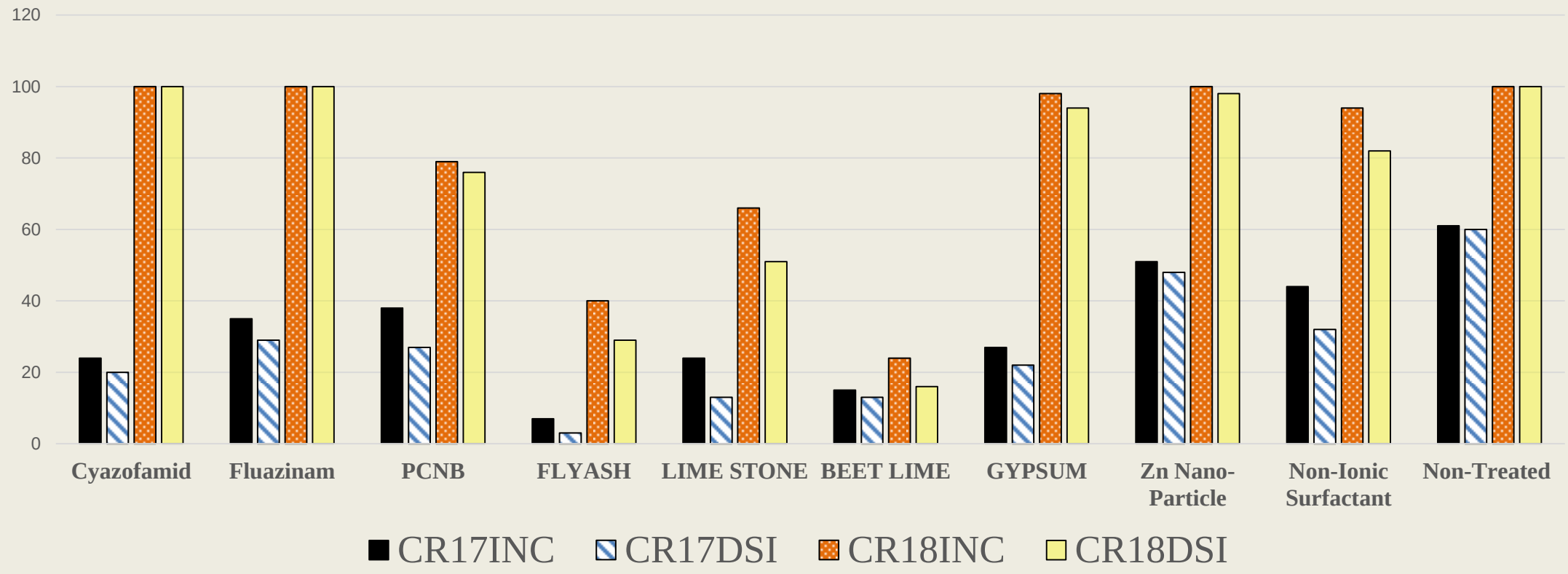


Fig. 1. Clubroot rating scale: 0 = no galling; 1 = a few small galls (small galls on less than 1/3 of roots), 2 = moderate galling (small to medium-sized galls on 1/3 to 2/3 of roots), 3 = severe galling (medium to large-sized galls on more than 2/3 of roots) (S.E. Strelkov)

Evaluation of Soil Amendments to Manage Clubroot in Field Condition



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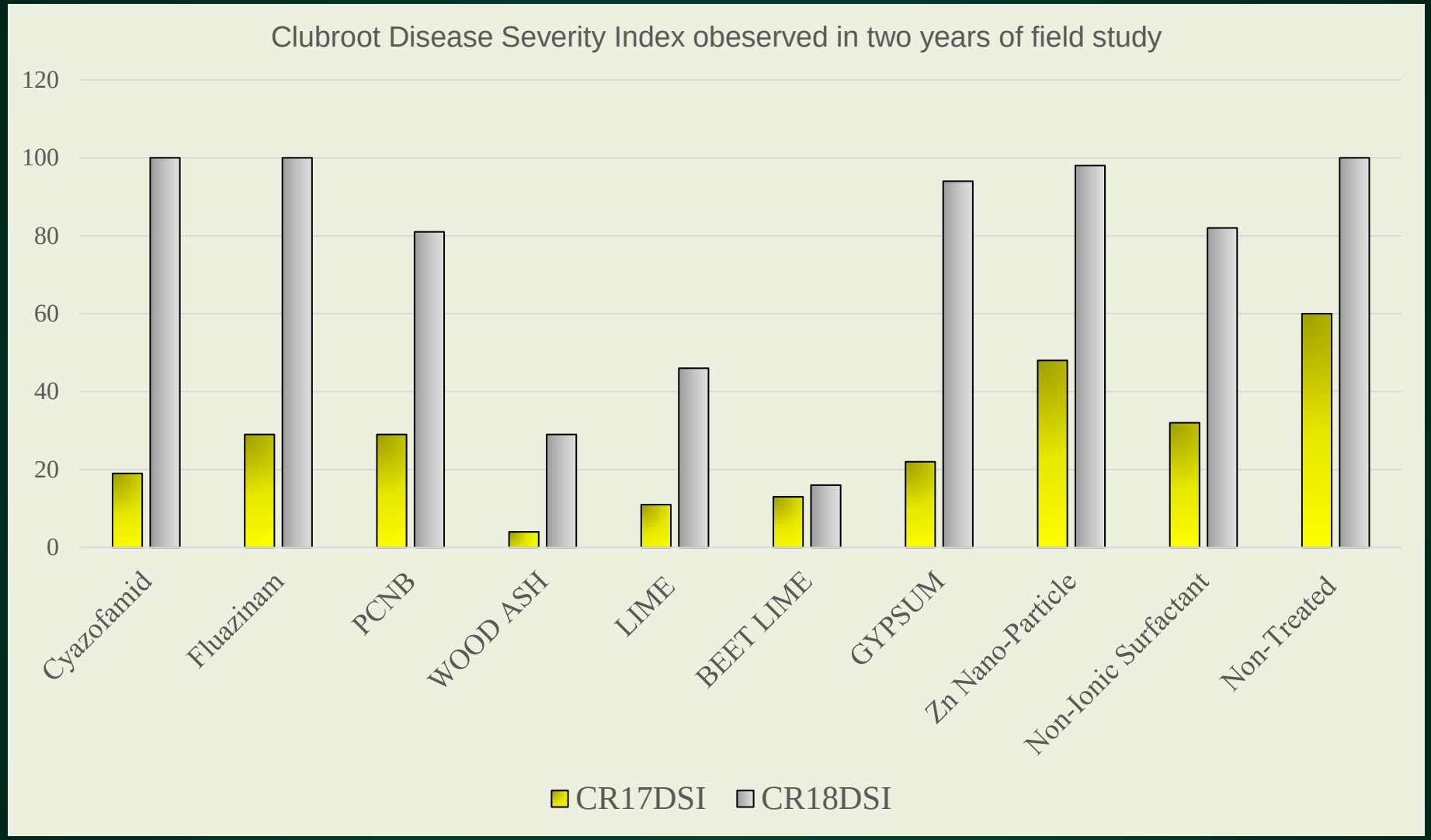

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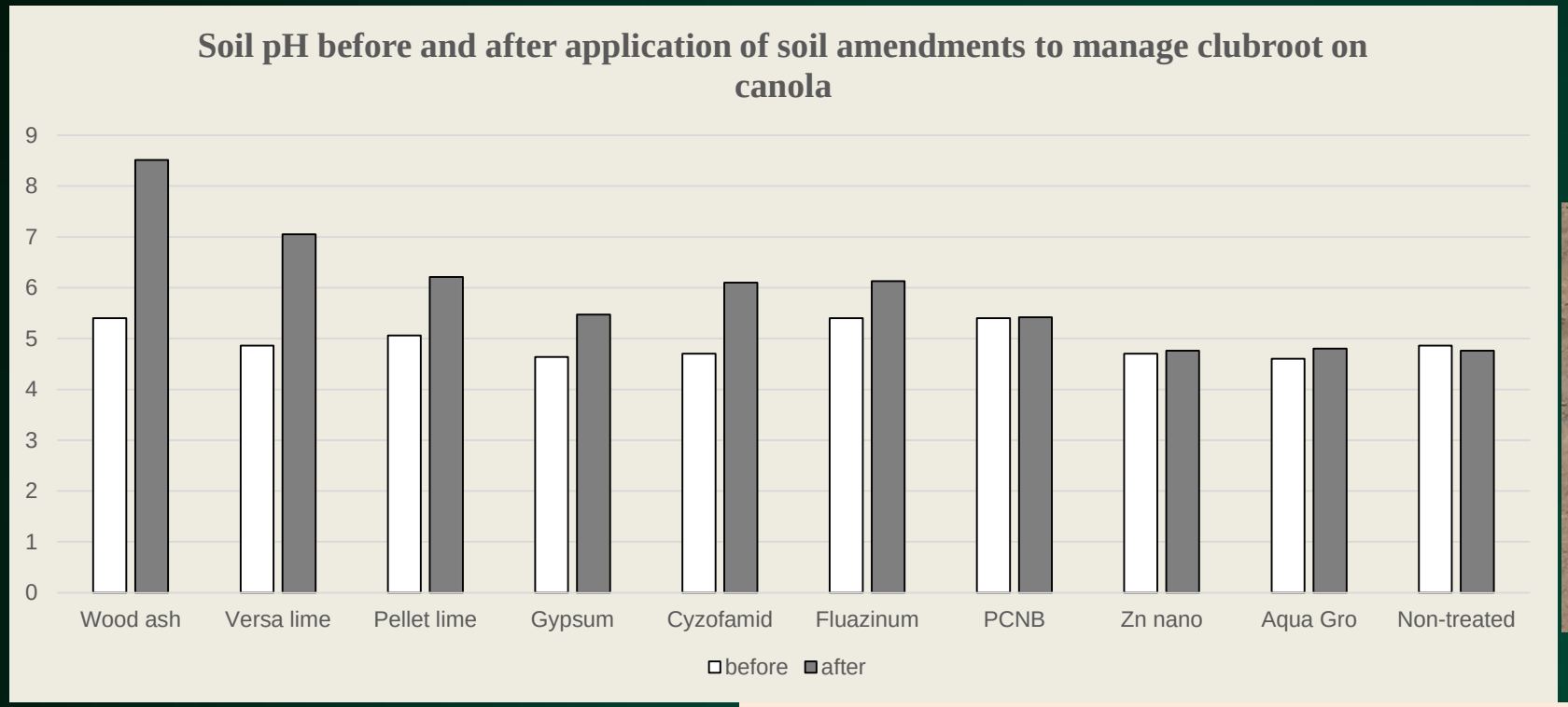

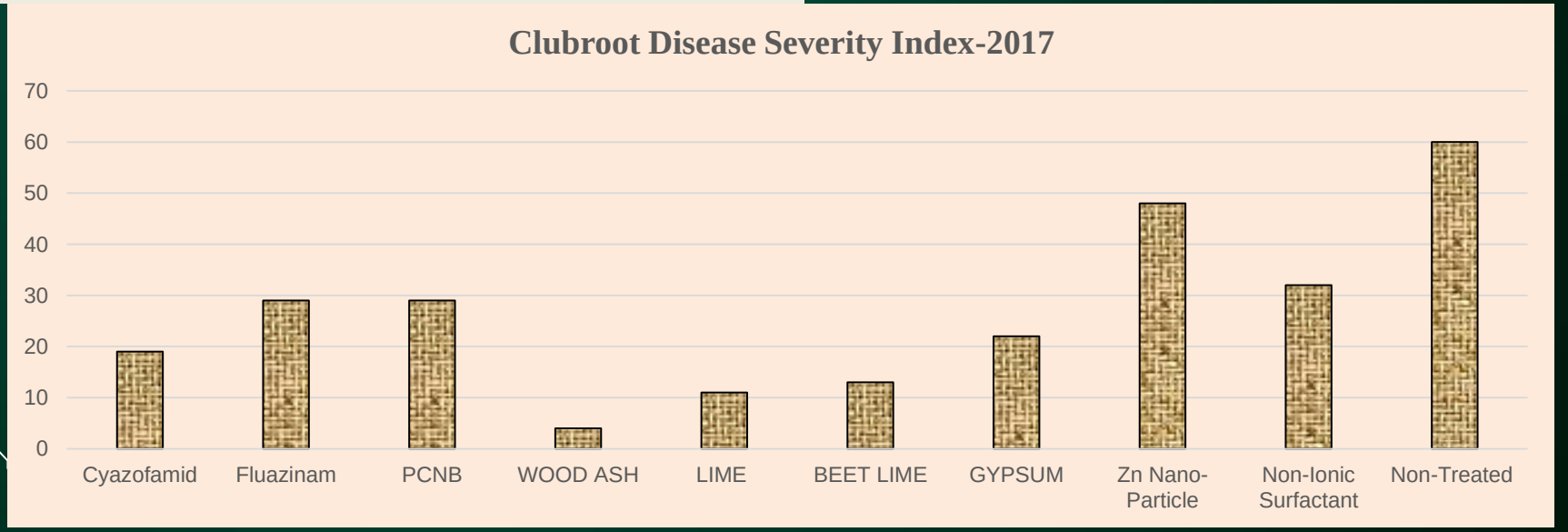

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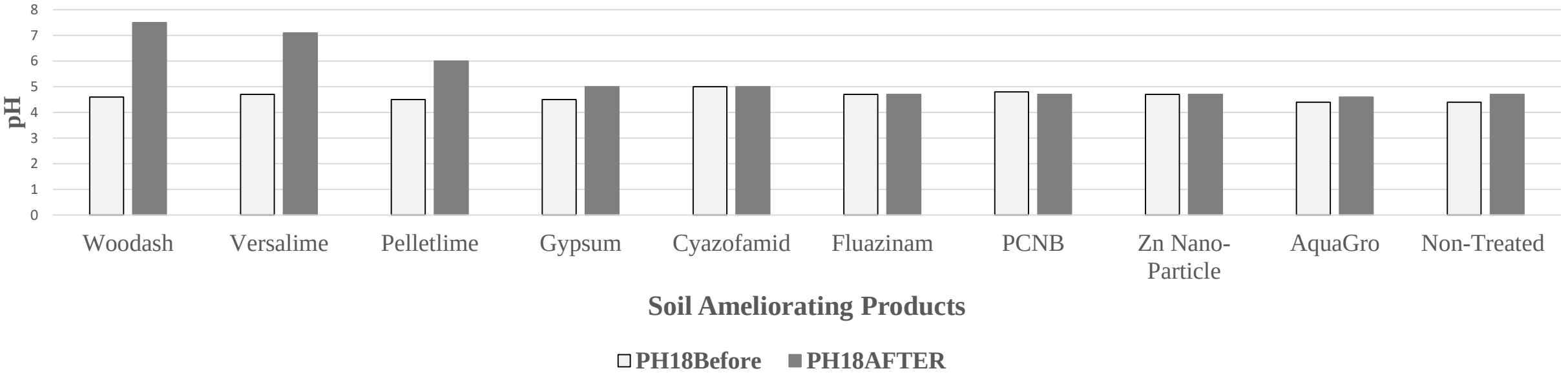
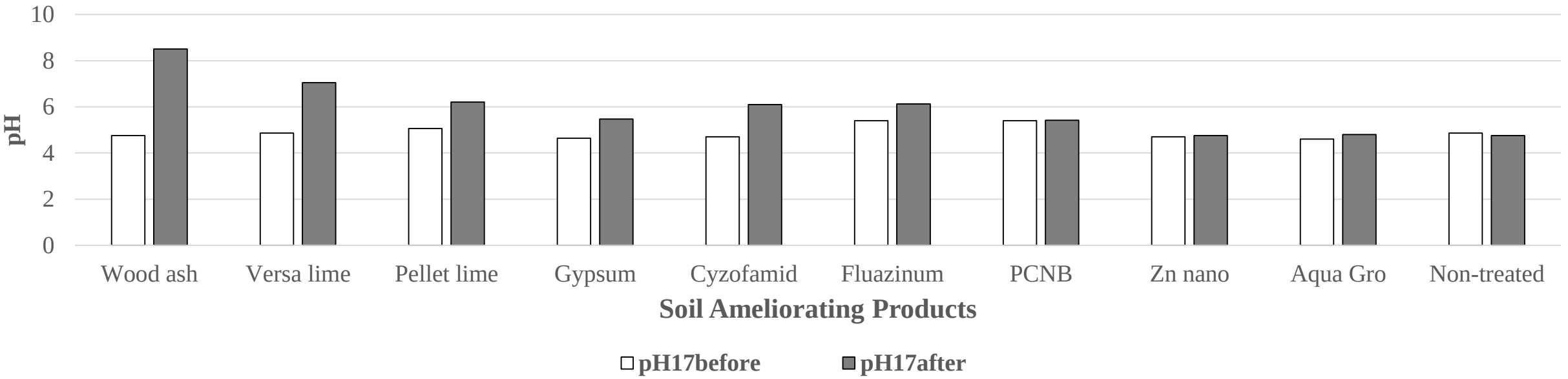
Soil pH before and after application of soil amendments to manage clubroot on canola in 2018 trial



Soil pH before and after application of soil amendments to manage clubroot on canola in 2017 trial



RESULTS

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Summary

- Beet lime (Versa lime) showed promising results followed by Pellet Lime in both the years of research
- Wood ash (Fly ASH) has efficacy potential, dose determination needed
- Urgent need of more products to be tested under field condition

Future research

- Combination of a resistant variety and beet lime worth testing in high soil population to allow growers for a shorter rotations as their current practice
- Pathotype/race typing need to be done ASAP

Acknowledgements

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- Drs. DelRio and Chittem

To all my colleagues and to MANY OTHERS

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- Thank You
- Questions and Suggestions are welcome