

Monitoring and management of *Plasmodiophora brassicae* on canola in North Dakota

V. CHAPARA¹, N. Kalwar¹, L. Lubenow¹, A. Chirumamilla², K. Chittem³ and L. E. DelRio³

¹Langdon Research Extension Center, North Dakota State University, Langdon, ND, 58249 U.S.A.,

²NDSU Extension Service, Langdon, ND-59249, ³NDSU, Department of Plant Pathology, Fargo, ND-58108



Introduction

Materials and Methods

Results

- Clubroot caused by *Plasmodiophora brassicae*
- A serious yield robbing disease of brassica crops
- 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 17 years
- Pathogen infects roots; causes galls thereby restricting the flow of water and nutrients to the plant
- If 100% of plants infected results in 50-80% reduction in yields
- Current research project was laid out with an objective to monitor clubroot movement in North Dakota since its first detection and to evaluate soil amendments to management *P. brassicae* on canola in North Dakota

Product	Trade name	Dosage
Cyazofamid	Ranman	7.5 L/ha
Fluazinam	Allegro	1.75 L/ha
PCNB	Blocker	67.5 Kg/ha
Wood ash	Fly Ash	7.5 T/ha
Lime	Pellet Lime	7.5 T/ha
Beet lime	Versa Lime	15 T/ha
Gypsum	Gypsum	7.5 T/ha
Nano-Particle	Zn	500 ppm solution
Non-Ionic surfactant	Aqua-Gro 2000	10 g/m or row
Non-treated	Check	Non-Treated Control

Table 1: List of soil amendments applied to soil to manage clubroot

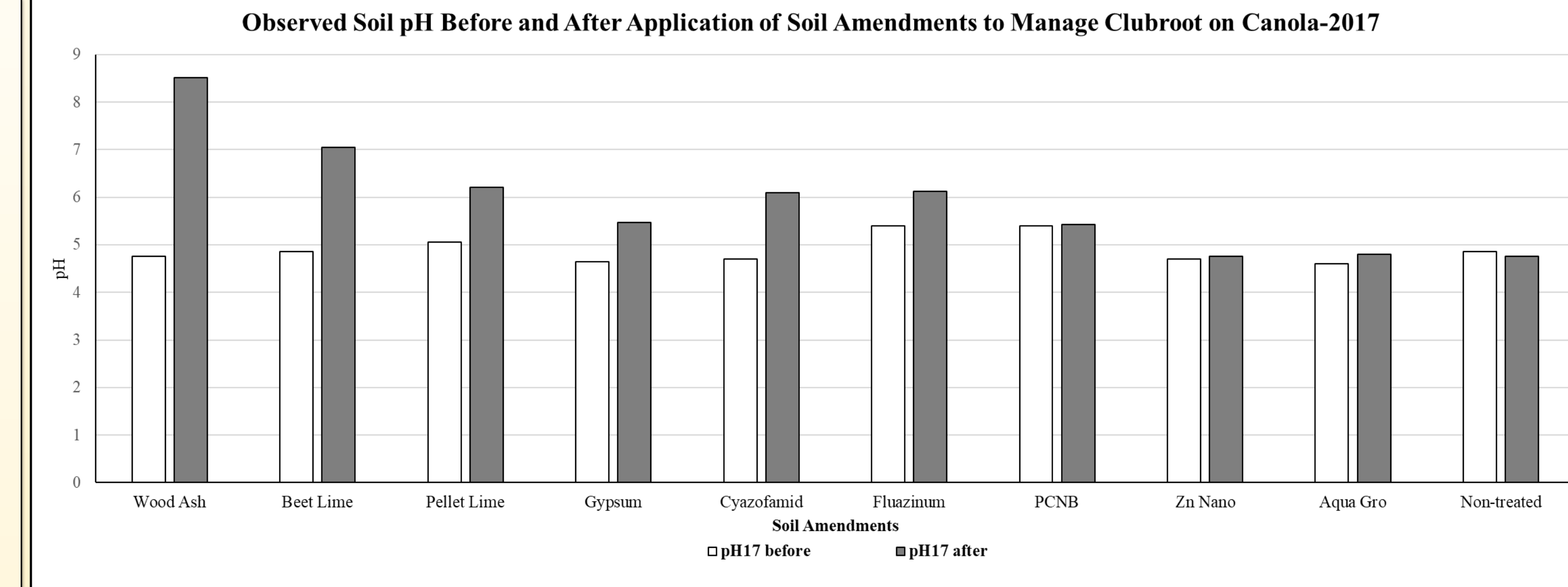


Figure 4: Variation in soil pH on application of various soil amendments in 2017

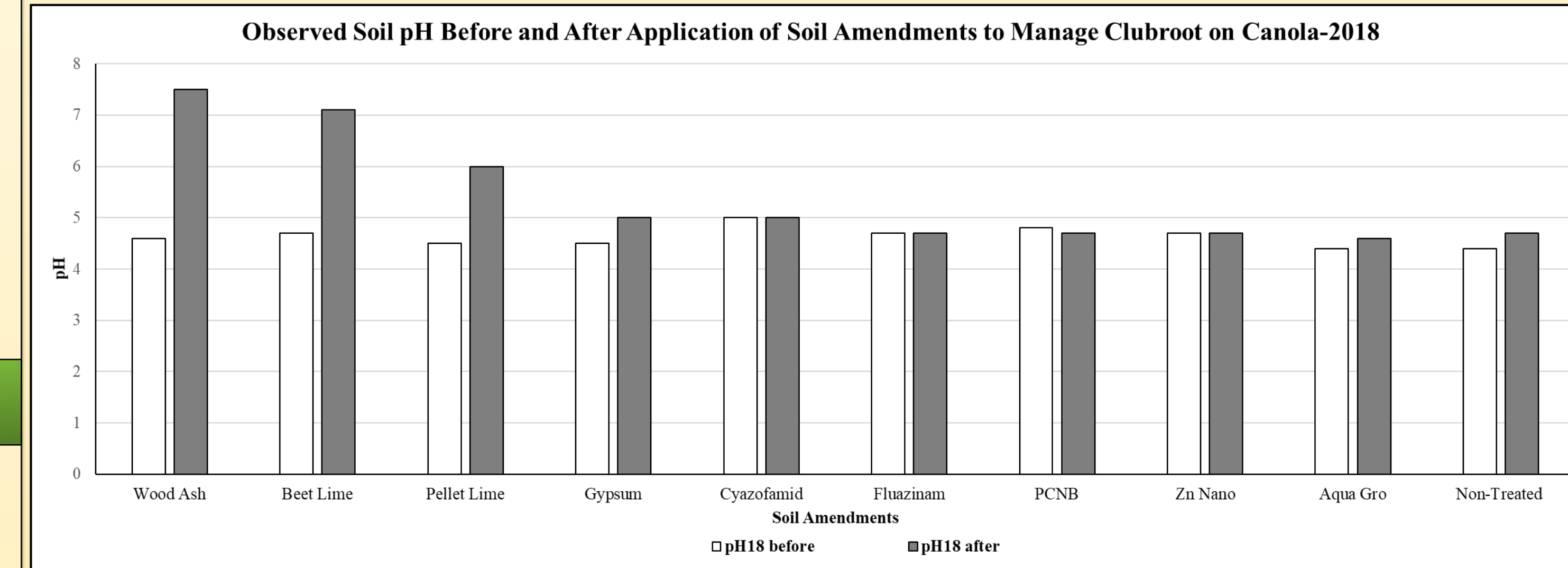


Figure 5: Variation in soil pH on application of various soil amendments in 2018

Materials and Methods

Results

- Objective 1: A survey group has been formed at Langdon Research Extension Center(LREC)/NDSU in 2016 to monitor the prevalence of clubroot to various major canola growing counties
- Information on number of clubroot positive fields before 2016 were collected from NDSU personnel, industries and commodity groups
- Scouting for clubroot incidence on canola has been done twice (at flowering and swathing in the growing season).
- Soil samples have been collected to determine pH at which clubroot identified
- Objective 2: Two year research trial was laid out in a growers field infected with clubroot that was first identified in 2013 to evaluate soil amendments in field condition
- Four soil ameliorating products along with four fungicides and one treatment of Zinc nano-particles have been compared with non-treated control (Table 1)
- Laid out in RCBD with four replications
- Treatments were evaluated 60 days after planting and clubroot disease index (CRDI) as described by Strelkov et al. 2007 was calculated.

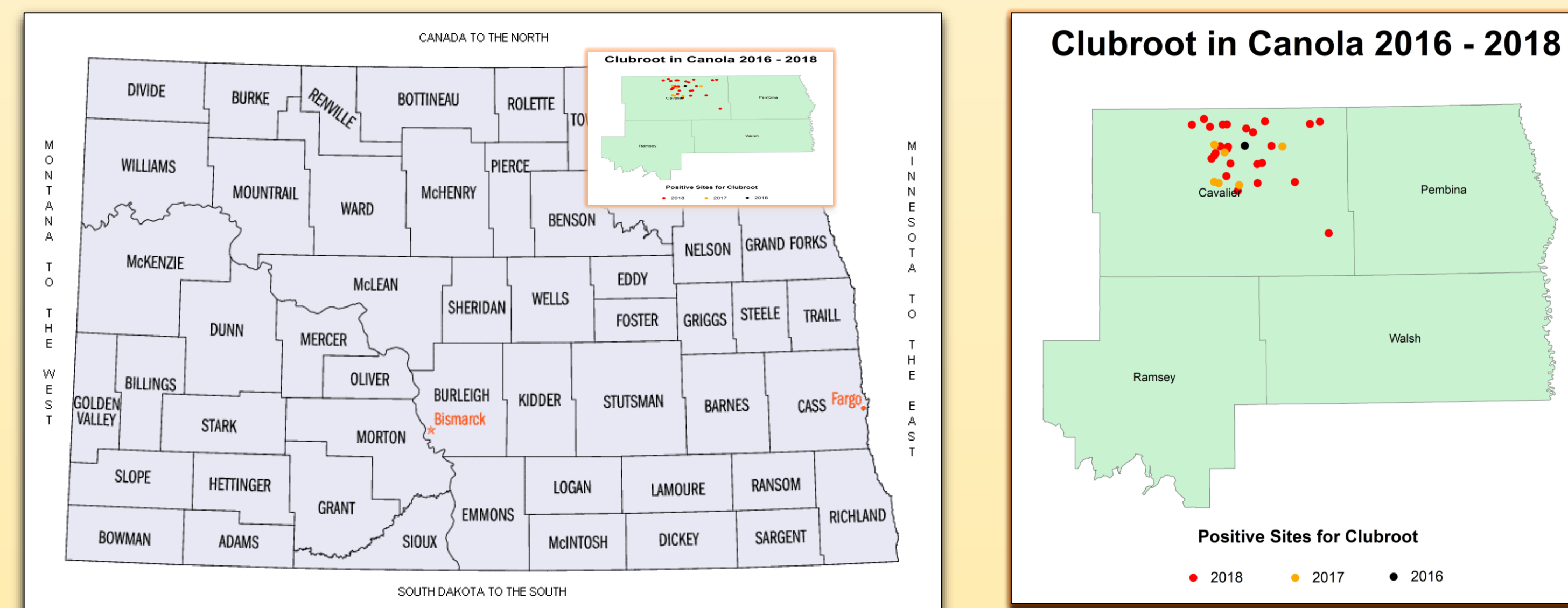


Figure 1: Canola Fields found positive to Clubroot from 2016 to 2019 in North Dakota

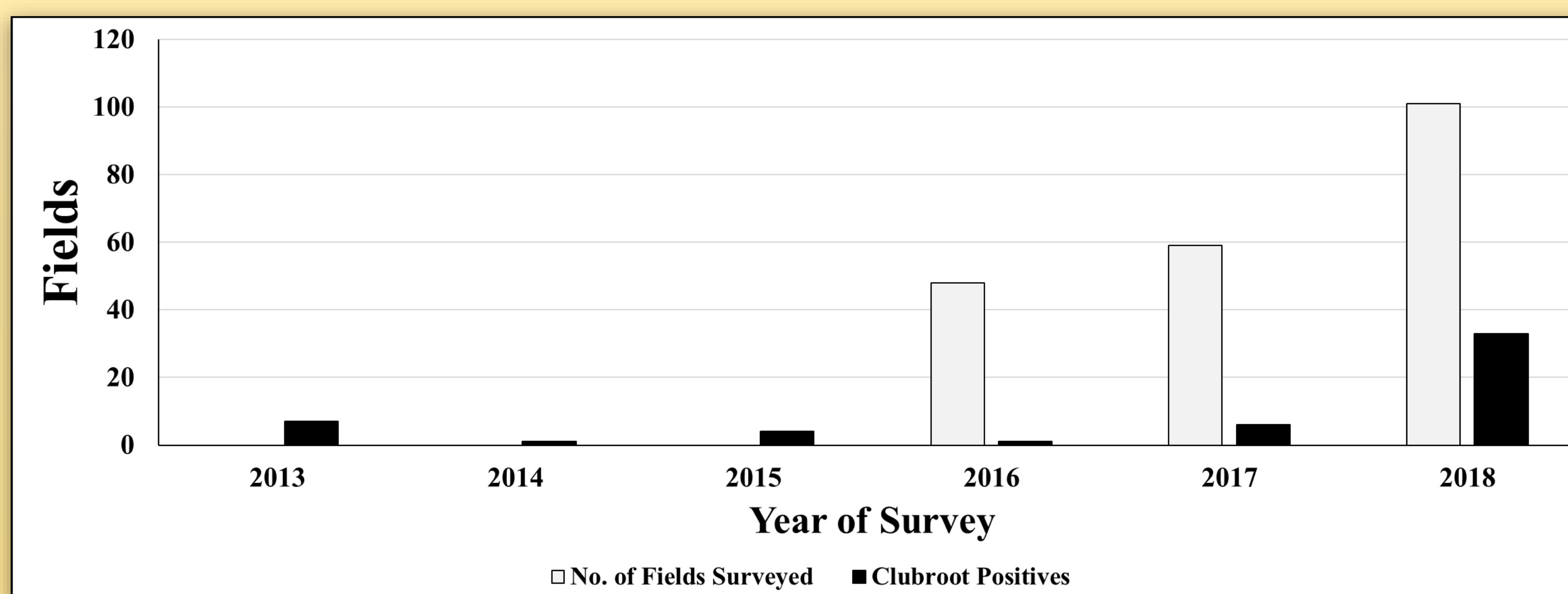


Figure 2: Rapid spread of clubroot since its first report in 2013 in Cavalier County, North Dakota

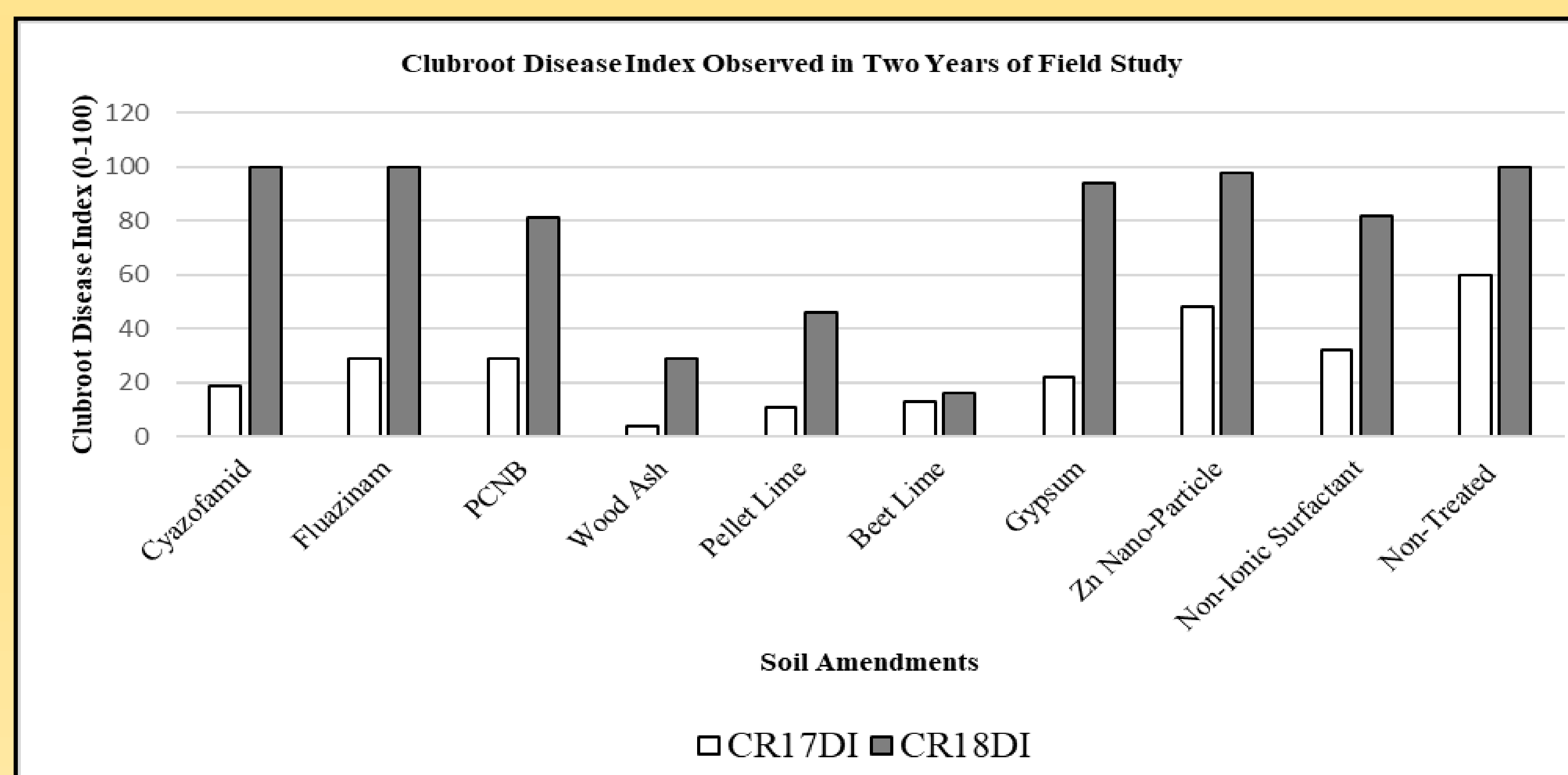


Figure 3: Efficacy of soil amendments to manage clubroot incidence in field conditions



Clubroot Rating scale of 0-3 (Strelkov S.E., Alberta, Canada)

Conclusion

- Clubroot on canola in North Dakota has been spreading faster than expected (Fig. 1)
- Survey group of LREC found a 5 fold increase in clubroot positive fields from 2017 to 2018 (Fig. 2)
- Positive clubroot fields has a soil pH range of 4.5 to 6.4.
- Soil amendment with beet lime showed significant clubroot control in both years (Fig. 3)
- Control of clubroot showed correlation to increased pH of soil on application of soil amendments (Fig. 4 & 5)
- Beet lime followed by wood ash and lime showed less Clubroot Disease Incidence (DSI) and were significantly different (p value < 0.0001) from other treatments along with non-treated check in both years
- Initial *P. brassicae* population in soil was 5.5 millions spore/g where the research trail has been conducted

Literature Cited

Chapara V, Kalwar N, Lubenow L, Chirumamilla A. 2019. Prevalence of Clubroot on Canola in North Dakota. *J Agron Agri Sci* 2: 008.
 Strelkov S. E., Manolii V. P., Cao T., Xue S., and Hwang S. F. 2007. *J. Phytopathology* 155: 706-712

Acknowledgments

Northern Canola Growers Association, Northern Canola Research Program (USDA/NIFA) and ND Crop Protection PHB, SBARE for funding the proposal, Amanda Arens, Randy Mehlhoff, Todd Christianson, Dr. Knodel, Dr. Honggang and growers in Cavalier County.