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Surveys of the chickpea health issue were inconclusive

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A survey from 2021 through 2023 for the causes of the emerging chickpea health issue was inconclusive. However, interactions of abiotic and biotic factors and the potential for sedaxane-containing seed treatments to reduce severity require further research.

A chickpea health issue was first noted in July 2019 in southwest Saskatchewan. In subsequent years, the health issue expanded to many areas of southern Saskatchewan. The health issue symptoms included foliar damage that occurred in patches or across the entire field.

The symptoms included chlorosis of the edges of leaflets, wilting, yellowing, browning and/or necrosis of the apex of plants, chlorosis and/or death of branches, generally near the top of plants, and sometimes entire plant death. These symptoms often co-occurred with ascochyta blight or drought stress, but it was unclear if the health issue was related to drought.

Surveys of commercial chickpea fields were undertaken in 2021, 2022 and 2023 to assess biotic and abiotic stresses and their relationship with the health issue. The objectives of this study were to evaluate:

- the spatial distribution and the severity of the chickpea plant and foliar damage and associated plant health symptoms in southern Saskatchewan;

- the severity of plant foliar damage among cultivars;
- the influence of fungicide, herbicide, seed treatment and rhizobium inoculum and fertilizer application on severity;
- potential relationships between the symptoms and nutrient contents in plant tissues;
- the identities and densities of nematodes in soils from chickpea with and without the symptoms;
- the effect of preceding crops, chickpea field history, seeding rate and weather on severity.

The surveys were carried out in a total of 42 rural municipalities on 79 commercial chickpea fields in 2021, 81 fields in 2022, and 38 fields in 2023. They were selected randomly, with farmers' permissions. Fields were considered either healthy (H) or unhealthy (UH). Symptoms were rated on a 0-5 scale with 0 = no symptoms. Plants were collected at the time of survey around flowering to podding.

Widespread prevalence

In 2021 and 2023, all of the surveyed fields had symptoms of the chickpea health issue, and 80% of the fields in 2022 showed symptoms. Symptom severity was significantly higher in 2021 and 2023 at 2.3 and 2.1 on the 0-5 scale. Severity averaged 1.0 in 2022.

Across the different chickpea cultivars grown, symptom severity did not differ. However, when the most popular cultivars, CDC Leader and CDC Orion were compared separately, CDC Leader had higher symptom severity at around 2.0 than CDC Orion at about 1.5.

The range of chickpea seeding rate, ranging from 85 to 216 lbs/ac (95 to 243 kg/ha), was not significantly correlated to symptom severity.

The application of the most commonly applied inoculants were Tag Team Granular (*Penicillium bilaiae*, *Mesorhizobium ciceri*, *Bacillus amyloliquefaciens and Trichoderma virens*) or Verdesian Primo (*Mesorhizobium ciceri*), and these did not impact the severity of symptoms.

Of the two most common seed treatments applied to chickpea, Apron Advance (thiabendazole, fludioxonil, metalaxyl-M & S-isomer) and Vibrance Maxx (metalaxyl-M, fludioxonil and sedaxane), severity was significantly higher with Apron Advance (2.2) than Vibrance Maxx (0.5).

The most commonly used herbicides in the field were Group 14 herbicides, glyphosate (Group 9), and metribuzin (Group 5). Fields treated with metribuzin had more severe symptoms (2.4) than

those that were not (1.8). Group 14 and Group 9 herbicides did not have a significant impact on symptom severity.

The most commonly used foliar fungicides were Delaro (Prothioconazole; Group 3 + trifloxystrobin; Group 11) and Miravis Neo (Propiconazole; Group 3 + Pydiflumetofen; Group 7 + azoxystrobin; Group 11). Most other fungicides used by the farmers in the survey also contained a Group 11 active ingredient. Neither the fungicide applied nor the number of applications showed a significant correlation to symptom severity.

There was a significant increase in severity as the rate of phosphorus (P) fertilizer increased from 5 to 32 lbs/ac (6 to 36 kg/ha), resulting in an average increase in severity from 1.3 to 2.4. No significant correlation was found for the levels of nitrogen (N), P and chloride in plant tissues.

For potassium (K), there was a significant negative correlation with K leaf concentration – as concentration increased, severity decreased – especially in 2023.

Weather conditions as reported by farmers and agronomists did not affect symptoms of the health issue.

For crop rotations, chickpea following lentil or canola had more severe symptoms than those following durum and barley. The number of years since chickpea was most recently grown in the field, which ranged from four to 10, had no impact on severity.

Many different nematode genera were collected in both the healthy and unhealthy fields. The most common were from the taxonomic genuses *Paratylenchus*, *Helicotylenchus*, *Aphelenchoides*, *Tylenchorhynchus* and *Ditylenchus* and families *Tylenchidae* and *Aphelenchidae*. However, the average abundance of pin nematodes and spiral nematodes did not differ between areas with and without symptoms of the chickpea emerging health issue. Some fields, though, had very high levels of pin nematodes, and there is still a possibility that ectoparasitic nematodes are linked to the symptoms in some fields

Overall, the causes of the chickpea plant issue from this survey was inconclusive. However, interactions of abiotic and biotic factors such as cultivar susceptibility, metribuzin application, nematodes, drought, and K and P nutrition require further research into their potential as contributing factors. The potential for sedaxane-containing seed treatments to reduce severity also requires further research.

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