

Managing Kochia Seed Production by Using Alternative Wheat Seeding Systems

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Introduction

- Wheat (*Triticum aestivum* L.), the second most-produced cereal after maize (known as corn), contributing as a food source for more than 40% of the world's population.
- Wheat production is generally challenged by abiotic (heat, soil, drought etc.) and biotic (insects, weeds, diseases etc.) factors but currently weeds are the most significant and consistent pest worldwide (Oerke 2006).
- Kochia [*Brassia scoparia* (L.) A. J. Scott] is the most problematic of the various weeds in the Central and Northern Great Plains (Geddes et al. 2021b).
- Reason for concern of kochia is that multiple resistance to herbicide groups such as resistance for Group 2 (thifensulfuron and tribenuron) (Beckie et al. 2013), Group 9 (glyphosate) (Hall et al. 2014 and Beckie et al. 2015), and Group 4 (dicamba), including triple-resistant kochia populations (Beckie et al. 2019) have been noted and it limits herbicide control options.

Objectives

- Overall Objective:** Determine how alternative wheat seeding systems can be used to target the phenology of kochia seed production.
- Specific Objectives:** Determine whether the timing of wheat planting alters the kochia critical period for weed seed control.

Materials and Methods

- Factor 1 = Wheat seeding system (4)**
 - Winter wheat (seeded late August/early September)
 - Ultra-early spring wheat (seeded March or early April)
 - Typical spring wheat (seeded late April or early May)
 - Fallow (no crop)
- Factor 2 = Component curve (2)**
 - Critical period for weed emergence (CPWE) (8 planting dates)
 - Critical period for seed production (CPSP) (8 harvest dates)

✓ **Treatment Design:** Two factor factorial

✓ **Experimental Design:** Split plot RCBD with 4 Replicates (main plot factor and sub plot factor)

✓ **Location:** Carman & Lethbridge

✓ **Plot size:** 8 m²

Data Collection:

- Kochia Biomass
- Kochia Seed Retention
- Kochia Seed Shatter

*Total seed production = seed retention + seed shatter.



Fig 1. Kochia Retention Viable Seed Counts (seeds/m²)



Fig 2. Seed shatter (seeds/m²)

Results

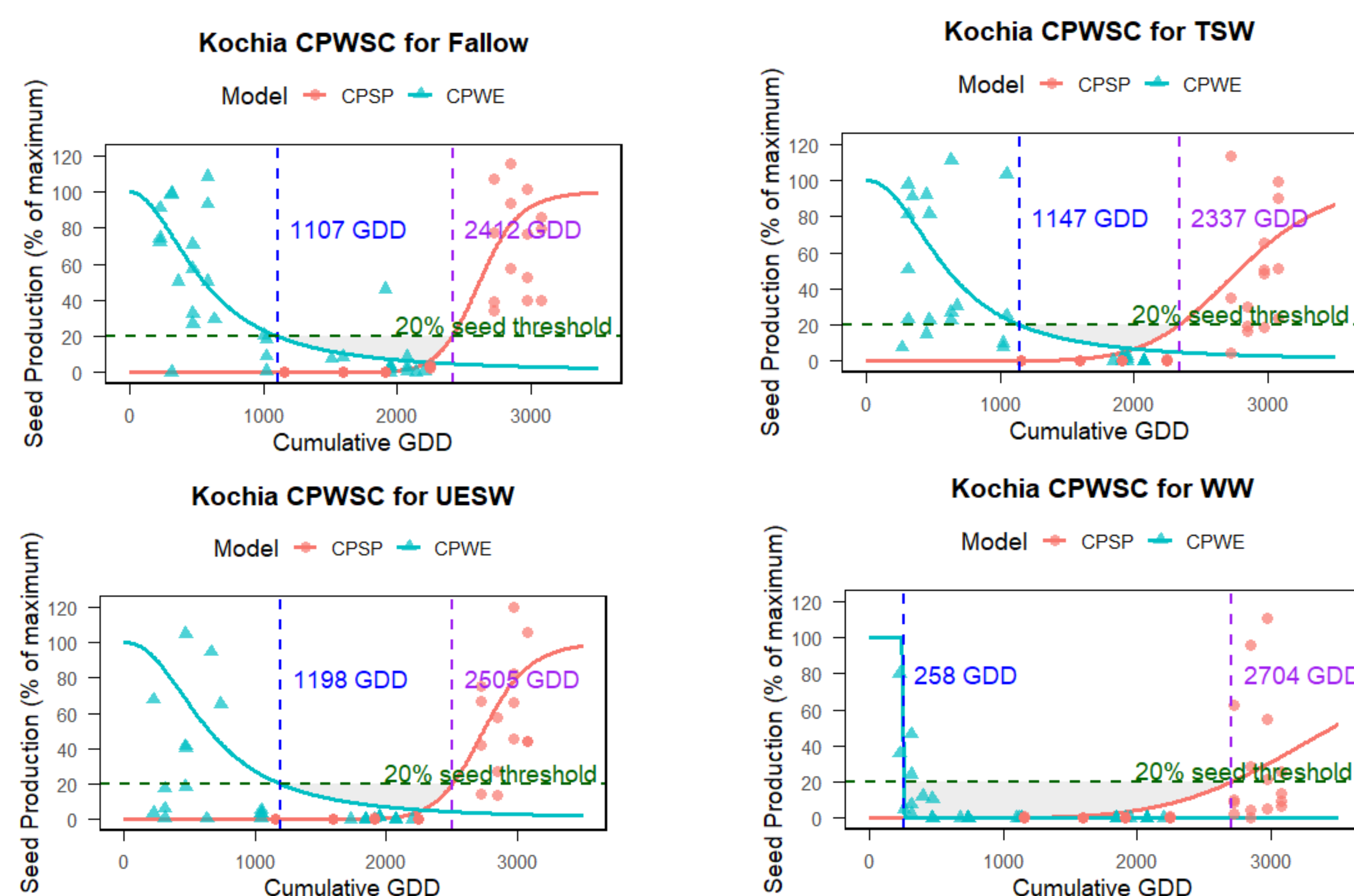


Fig 3. Kochia CPWSC for four wheat seeding systems: fallow, TSW, UESW and WW in Carman, MB in 2024

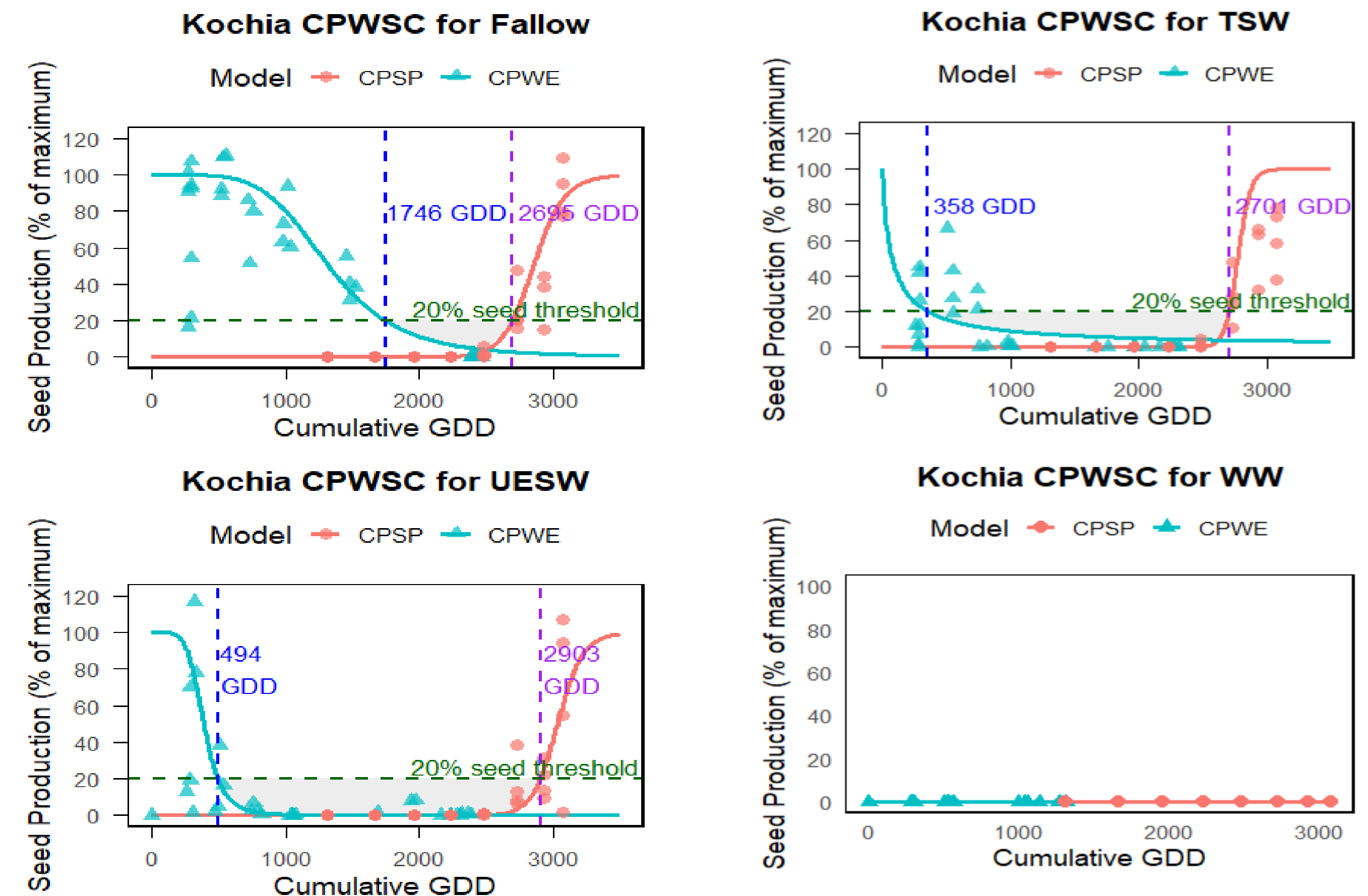


Fig 4. Kochia CPWSC for four wheat seeding systems: fallow, TSW, UESW and WW in Lethbridge, AB in 2024

Key findings:

- Results from this study show that kochia seed production may be reduced by 80% (below the 20% seed threshold) by targeting management practices during this period (CPWSC).
- Winter wheat exhibited the longest management window (May 6 to September 24) for controlling kochia seed production, corresponding to the lowest or no seed production at the end of the growing season compared to other seeding systems. However, Fallow, having a shorter GDD range, resulted in the highest kochia seed production among all the seeding systems.

Conclusions

- Alternative wheat production systems such as different planting times consistently reduced kochia seed production and retention.
- Earlier wheat seeding like winter wheat was the most effective system due to an extended management window resulting in the lowest or no final kochia seed production

Key Take-Home Messages:

- ✓ Strategic wheat seeding time can reduce kochia seed production
- ✓ Early crop establishment enhances competition and suppresses weed growth
- ✓ Emphasize non-chemical management strategies

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Acknowledgements

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