

Preceding Crop and Residue Management Effects on Dry Beans

Pinto beans can be grown successfully following a range of crops (wheat, corn, canola or dry beans) and under direct seed conditions in Manitoba with no penalties to plant stand nor yield.

CROP SEQUENCE WITHIN a rotation can influence yield through various agronomic factors, such as nutrient cycling, residue, soil moisture and pest pressure. Farmers in Manitoba seed dry beans most commonly following wheat > corn > canola > dry beans and oats.

According to MASC data from 2011 to 2020, 23% of navy bean acres were planted into spring wheat stubble, 29% into canola stubble, 10% into navy bean stubble and 15% into corn stubble, and relative navy bean yield produced by those previous crop types was 111%, 89%, 91% and 111%, respectively. There is currently no research data available for Manitoba on the effect of preceding crop and residue management on dry bean yield and productivity. The objective of these experiments was to determine the effect of preceding crop type and residue management on dry bean production.

From 2017 to 2020, experiments were established at Carman and Portage la Prairie on land that had not seen dry beans in at least five years. Windbreaker pinto beans were planted into four crop residues (wheat, canola, corn and pinto beans) that had been split into tilled and direct seed treatments.

Preceding crop did not affect pinto bean yield in these experiments, with bean yield ranging from 2908–3041 lbs/ac among preceding crop type, suggesting that there is flexibility in where to place dry beans in a crop rotation. In two out of six site-years, at Carman in 2018 and 2019, direct-seeded pintos yielded 10–17% greater than those seeded into tilled stubble (Figure 1). Pinto beans at Carman may have benefitted from some moisture conservation associated with direct seeding as the soil texture at that site is lighter.

Overall, pinto beans seeded into tilled residue resulted in a slightly higher plant population (74,000 plants/ac) than direct-seeded beans (70,000 plants/ac). Pinto beans seeded into canola stubble (76,000 plants/ac) resulted in a higher plant population than corn stubble (68,000 plants/ac) overall, but the trend was not consistent among environments. All plant populations were near the target plant stand of 70,000 plants/ac. An important finding is that bean plant stands following corn were similar in both direct seed and tilled treatments since corn residue management can be challenging. Seeding equipment varied by environment, but all sites used double- or single-disc openers and seeding took place between the preceding corn rows to avoid root balls. Minimal hair pinning occurred in corn stubble but was sometimes a problem where wheat residue was not standing or well distributed.

Crop residue and tillage treatments influenced grassy weed control. Grass weed density was lower when beans followed corn (13 plants/ft²) compared to beans following wheat (47 plants/ft²). In all preceding crop types, grass weed

density was lower in direct seeded pintos (24 plants/ft²) compared to pinto beans seeded into tilled residue (43 plants/ft²). In fields where grassy weeds are a problem, especially herbicide-resistant populations, consideration of where pinto beans occur in rotation and how residue is managed can help reduce weed competition and selection pressure.

Root rot severity was the greatest in pinto beans following pinto beans and lowest in beans following corn. Environment accounted for the greatest range in root rot severity. Fields with a long history of bean production or fields prone to wetness are likely to see more significant effects of root rot. It is possible that the dry growing season conditions (39–69% normal precipitation) and lack of dry bean field history resulted in lower disease levels. White mould was not a yield-limiting factor in these experiments.

Throughout this study, dry conditions were favourable for yield and highlighted the resilience of pinto beans to direct seed conditions when residue management and seeding equipment facilitate good crop establishment. ■

Figure 1. Average pinto bean yield (lbs/ac) by tillage system at Carman and Portage la Prairie, MB from 2018–2020 (n=48).

