DEVELOPMENT OF A CONSTRAINED RESOURCE MODEL TO SUPPORT INTERCROPPING DECISIONS

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ABSTRACT

Crop producers are interested in intercropping due to its potential to increase profitability, yield stability, and sustainability. Our objective was to extend a simulation model to forecast crop yields (PRS® CropCaster®) to pulse-oilseed intercrops. This tool would provide crop producers with forecasts of yields of each crop component under different management and environmental conditions.

Field trials were conducted for three years at two locations in southern Alberta and for one year at one location in Washington. When intercropped with lentil, oilseed crops took up more than 80% of soil and fertilizer N even when outnumbered 10:1. When intercropped with pea, canola was still more competitive for fertilizer N, but mustard and pea had similar competitiveness (Figure 1). In comparison, pulse crops were more competitive for water and light due to the sufficiency of symbiotic N_2 fixation. Accounting for the partitioning in these resources in the model was sufficient to reasonably forecast partial yield and land equivalent ratio (LER) in pulse-oilseed intercrops. Values of LER increased with N deficiency of the oilseed crop and were highest when competitiveness for soil and fertilizer nitrogen favored the oilseed crop. Reduced heat stress and harvest losses also contributed to intercropping benefits for pea.

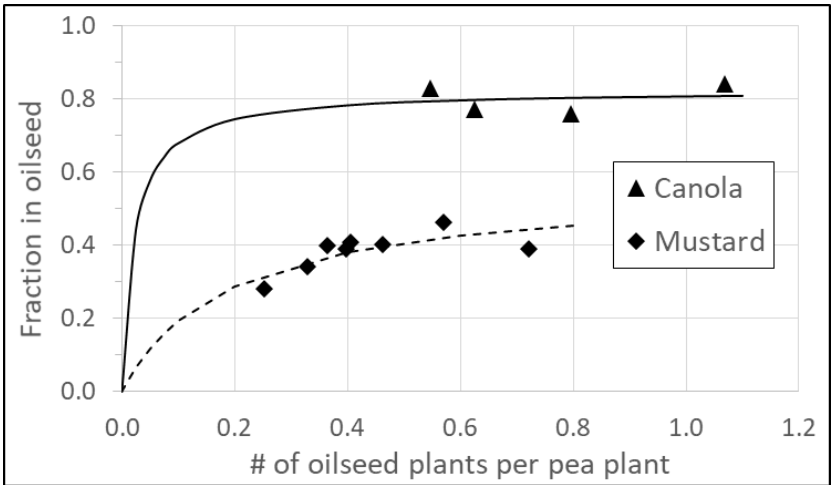

Figure 1. Recovery of fertilizer N (^{15}N-enriched UAN) in an intercropped oilseed crop as a fraction of total plant recovery in pea-oilseed intercrops grown in field trials in southern Alberta from 2018 to 2020.