IMPROVED WEED MANAGEMENT DECISIONS USING CROP-WEED SIMULATION MODEL.

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An improved understanding of plant competitive interactions for resources of light, water, and nutrients, and their impact on growth, is necessary for predicting crop yield loss and making weed management decisions under different environmental conditions. These plant competitive interactions can be simulated with dynamic ecophysiological crop-weed competition models. The ALMANAC (Agricultural Land Management Alternatives with Numerical Assessment Criteria) model was parameterized to simulate both monoculture corn and corn:shattercane competition for Manhattan, Riley County, Kansas. The plant densities for the simulations were 6.0 plant m^{-2} for monoculture corn and 6.0:5.3 plant m^{-2} for corn:shattercane competition, respectively. A representative county soil was chosen and Manhattan, KS weather data were used. Simulated grain yields were compared with grain yields reported by the National Agricultural Statistical Service (NASS) for 1991 to 2003 and yearly trends were similar. The simulated 13 year mean grain yield was 0.47 Mg ha^{-1} greater than the mean NASS grain yield. Simulated and NASS grain yield were correlated with a coefficient of 0.68. Cumulative frequencies indicated that the model closely simulated corn grain yields less than 6.5 Mg ha^{-1} in 60% of the years studied and overestimated higher yields, when compared to the NASS yield. Simulated shattercane competition of 5.3 plants m^{-2} with corn resulted in a 20% mean yield reduction. Monthly precipitation of May to August appeared to predict potential corn yield, which was correlated to simulated yield reductions with shattercane. Based on these initial simulation studies, the ALMANAC model would be useful to evaluate crop yield potential and crop yield reductions from crop:weed competition to improve weed management decisions under different environmental conditions.

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