Optimizing Nitrogen Strategies for Sustainable Canola Production in Manitoba

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Agricultural practices are major contributors to greenhouse gas emissions, with nitrous oxide (N_2O) from fertilized soils posing a particular challenge due to its exceptionally high global warming potential. In Western Canada, increased fertilizer application has amplified N_2O emissions, complicating progress toward national reduction targets. This study assessed how different N fertilizer sources, placement strategies, and application timings influence N_2O emissions while sustaining canola (*Brassica napus* L.) yields on coarse-textured soils. Five field experiments conducted from 2019 to 2021 in southern Manitoba. Treatments were grouped by N fertilizer source, placement, and time of application. Results indicated that shallow-banded urea led to the highest cumulative N2O emissions. Surface or shallow-band application of SuperU proved most effective at reducing emissions among all trials while boosting canola yield. The use of nitrification inhibitors with deep banding of N fertilizers reduced N_2O emissions to levels close to Control (0 N) while maintaining high canola yields. Compared with conventional urea, nitrification inhibitors reduced emissions by 43-62%. Although split N application lowered cumulative N_2O emissions, it did not improve canola yields and therefore cannot be recommended for the Prairies. Overall, these findings demonstrate that application of enhanced-efficiency fertilizers can substantially curb N_2O emissions, offering a more sustainable framework for canola production in Manitoba.