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Effect of Black Medic (*Medicago lupulina*) and Nitrogen Fertilizer on Crop Yield and Soil Nitrogen

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Why Black Medic?

- **Legume**
 - **Contribute Nitrogen (N) to cropping system**
- **Self Seeding**
 - **You do not have to seed each year**
- **Limited amount of growth in first 60 days**

Potential Problems with Black Medic?

- **Self Seeding**
 - Builds up a large seed bank
 - May never be able to remove after introduction
- **Growth after 60 days may hurt weak non-competitive crops**
- **Uses water**
- **Weed control more complicated**





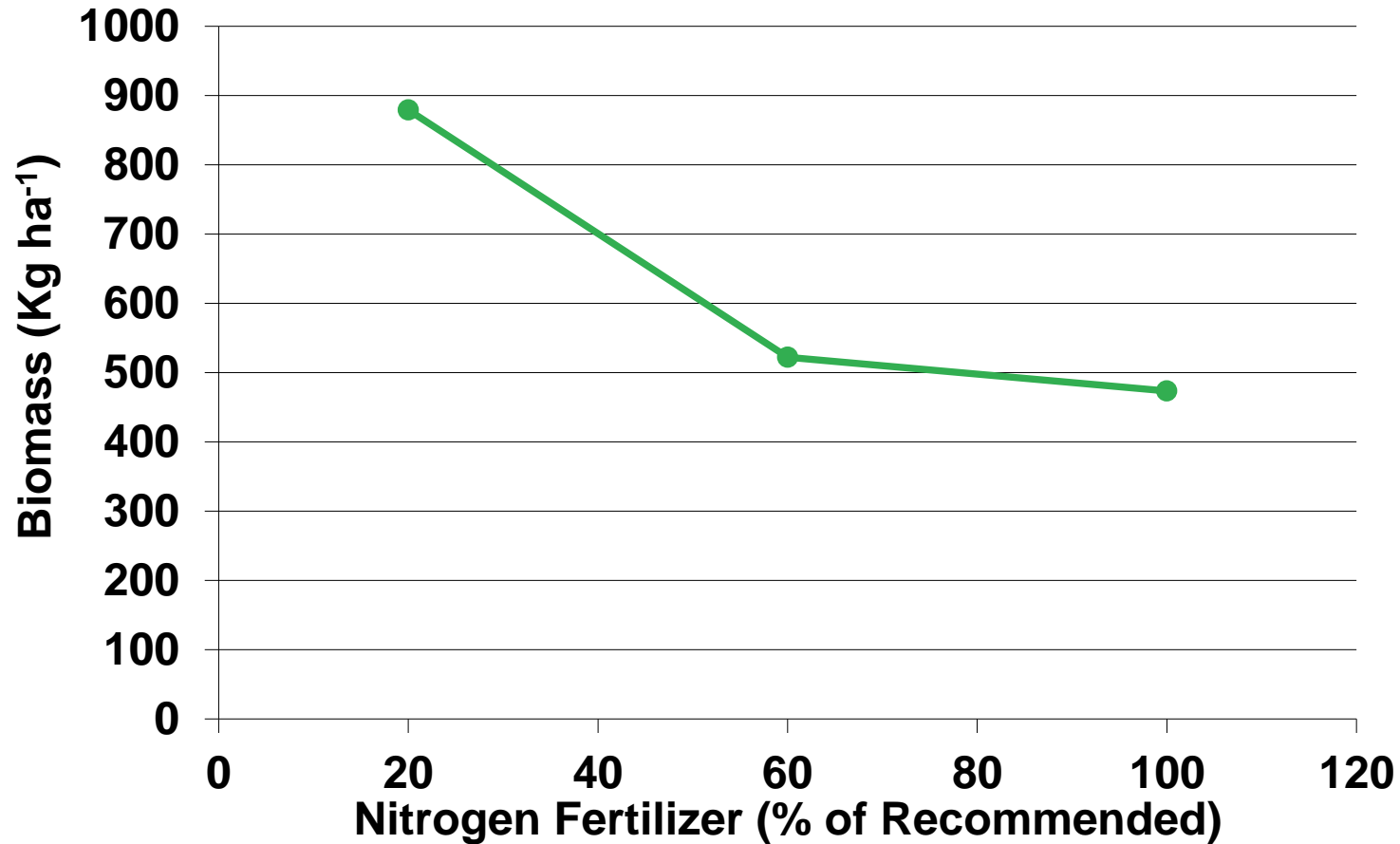
Experiment

- **Medic and non-Medic Blocks**
- **Flax - Wheat - Oat Rotation**
- **Three levels of N, 20, 60 and 100% of recommended N (applied + residual)**
 - **Flax 110 kg ha⁻¹**
 - **Oats 100 kg ha⁻¹**
 - **Wheat 135 kg ha⁻¹**

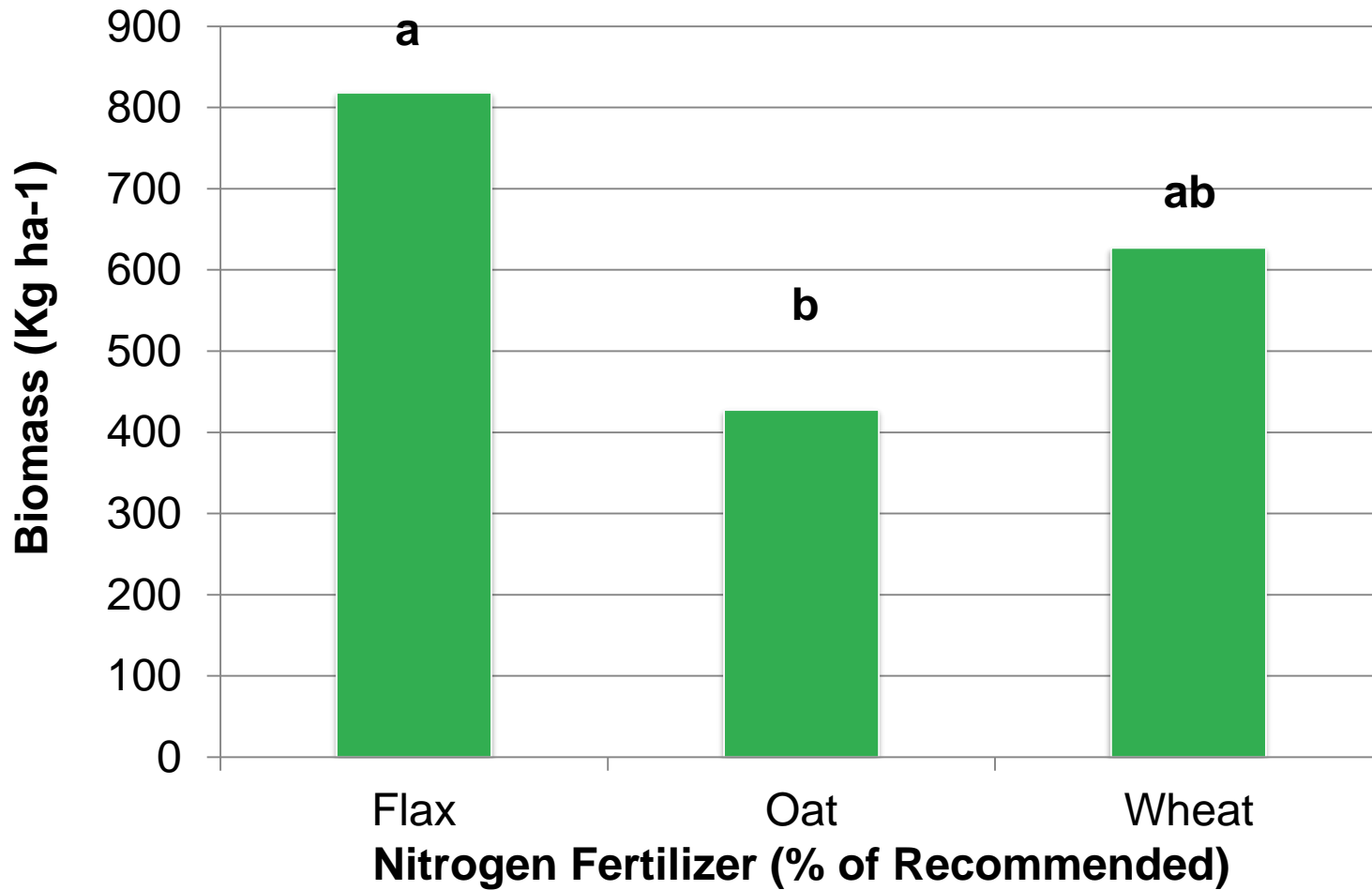
Experiment

- **Statistical Analysis**
 - **PROC MIXED procedure of SAS**
 - **replicate and year as random effects**
 - **medic treatment, crop, and N fertilizer rate as a fixed effects**
 - **Residual variance heterogeneity among years also was modeled**

Black Medic Biomass

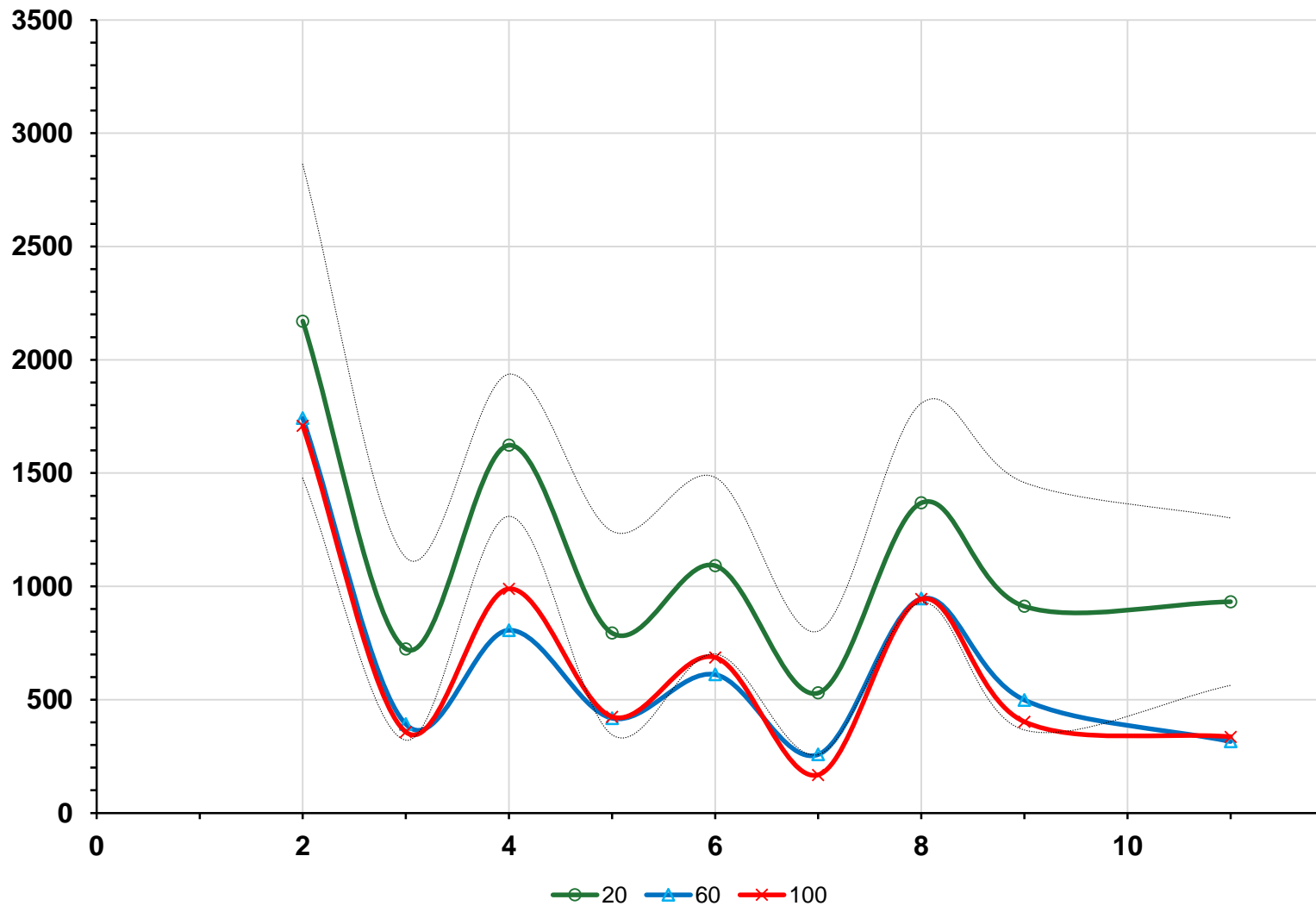


Black Medic Biomass

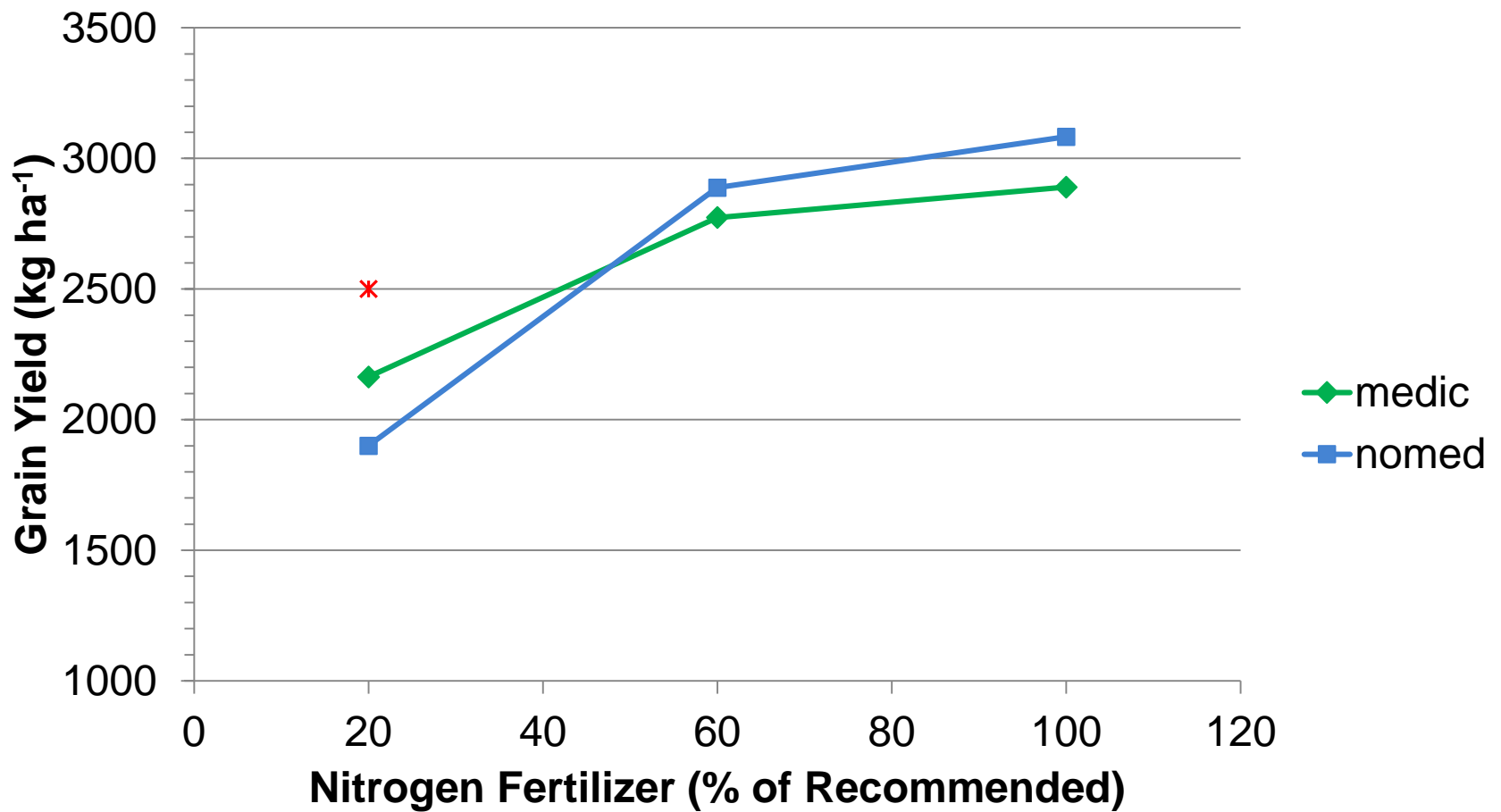


Black Medic Biomass

Flax - Medic

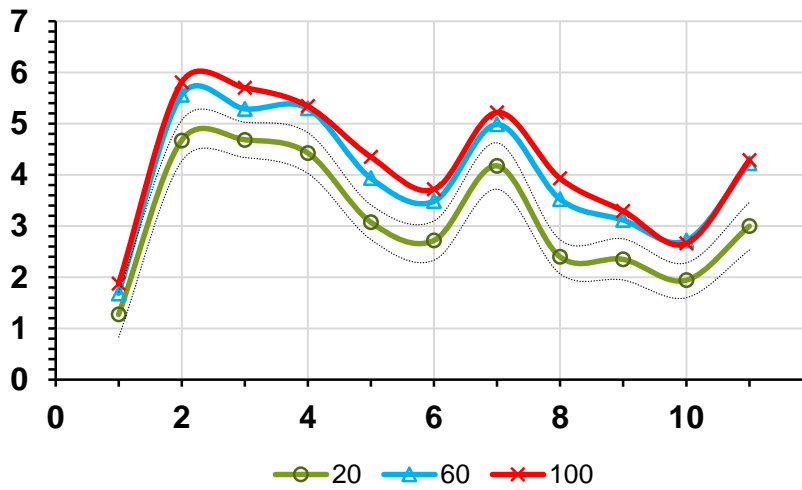


Grain Yield: Medic and N Fertilizer

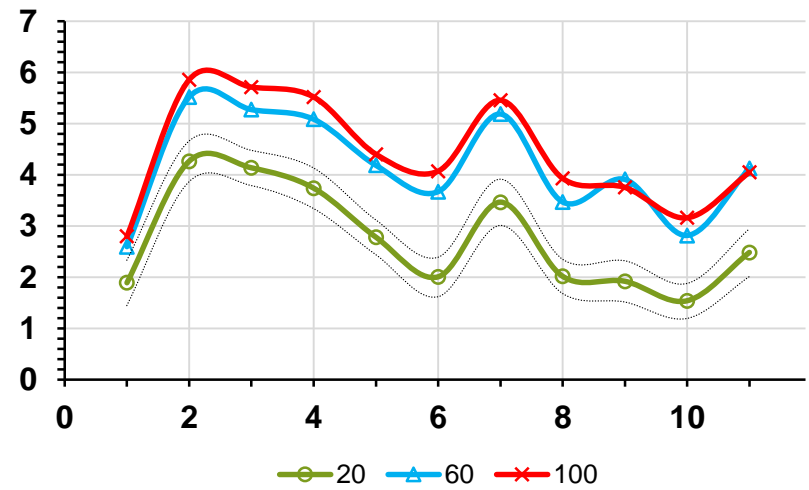


Grain Yield

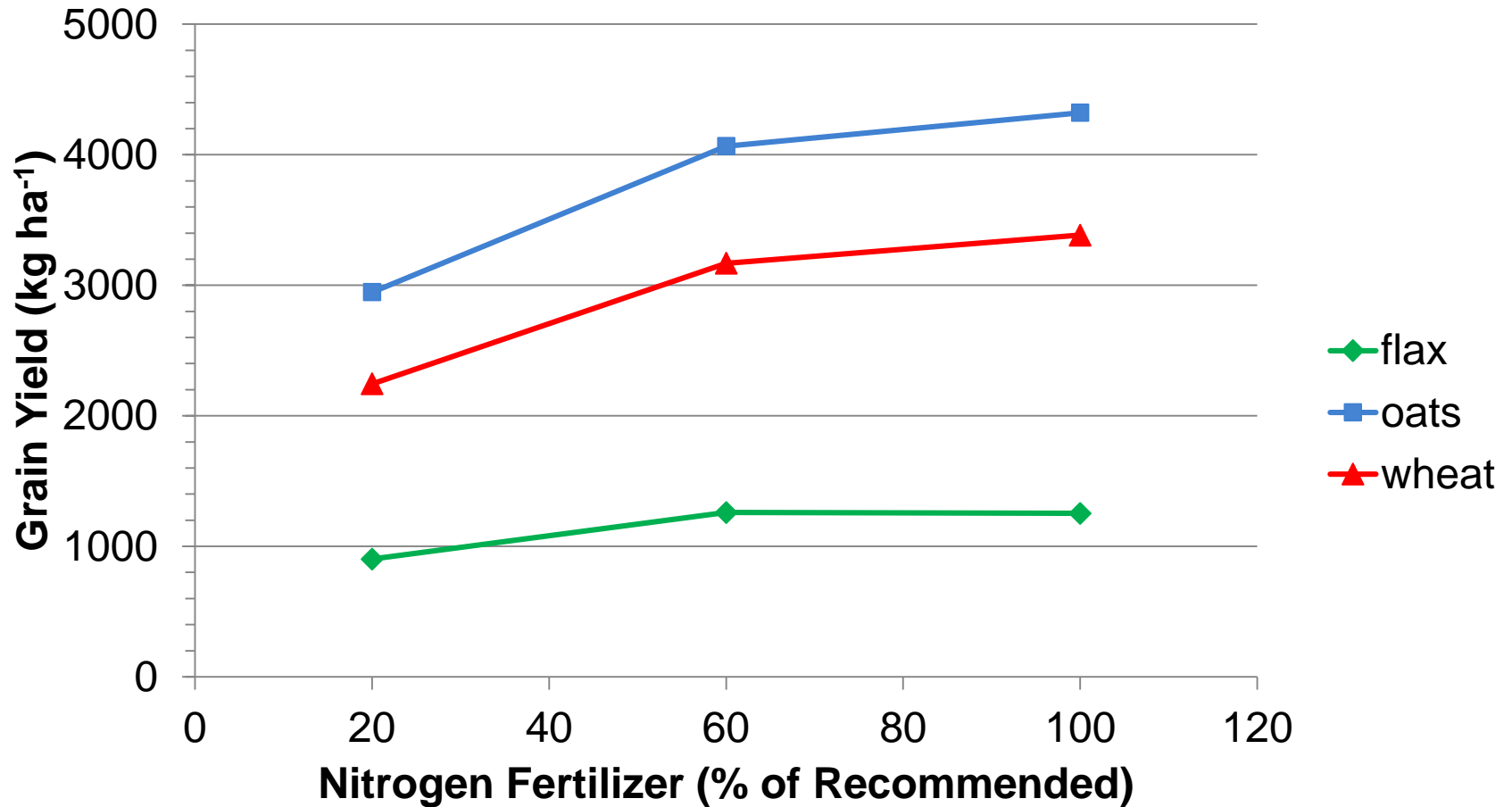
Oats - Medic



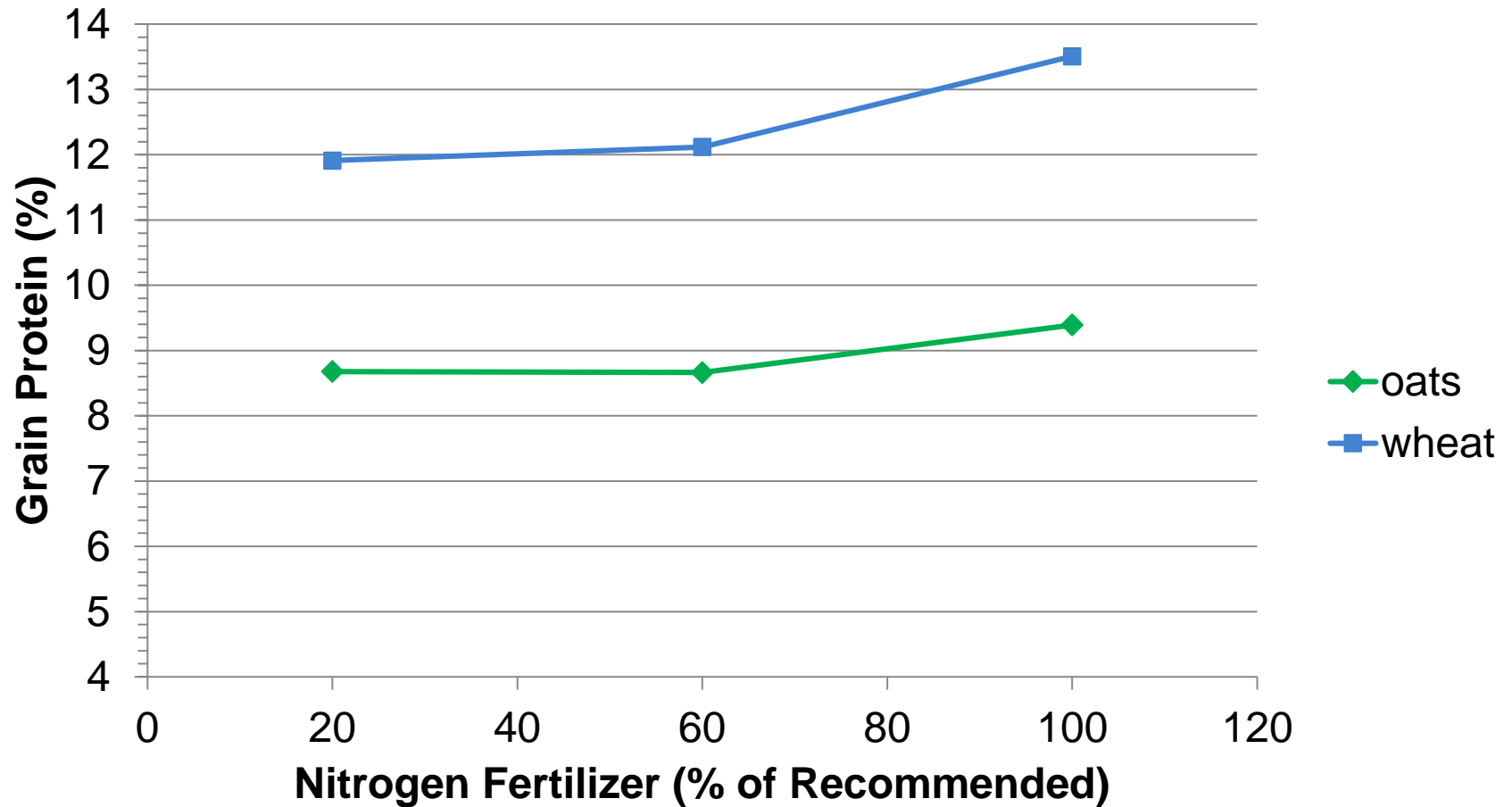
Oats - No medic



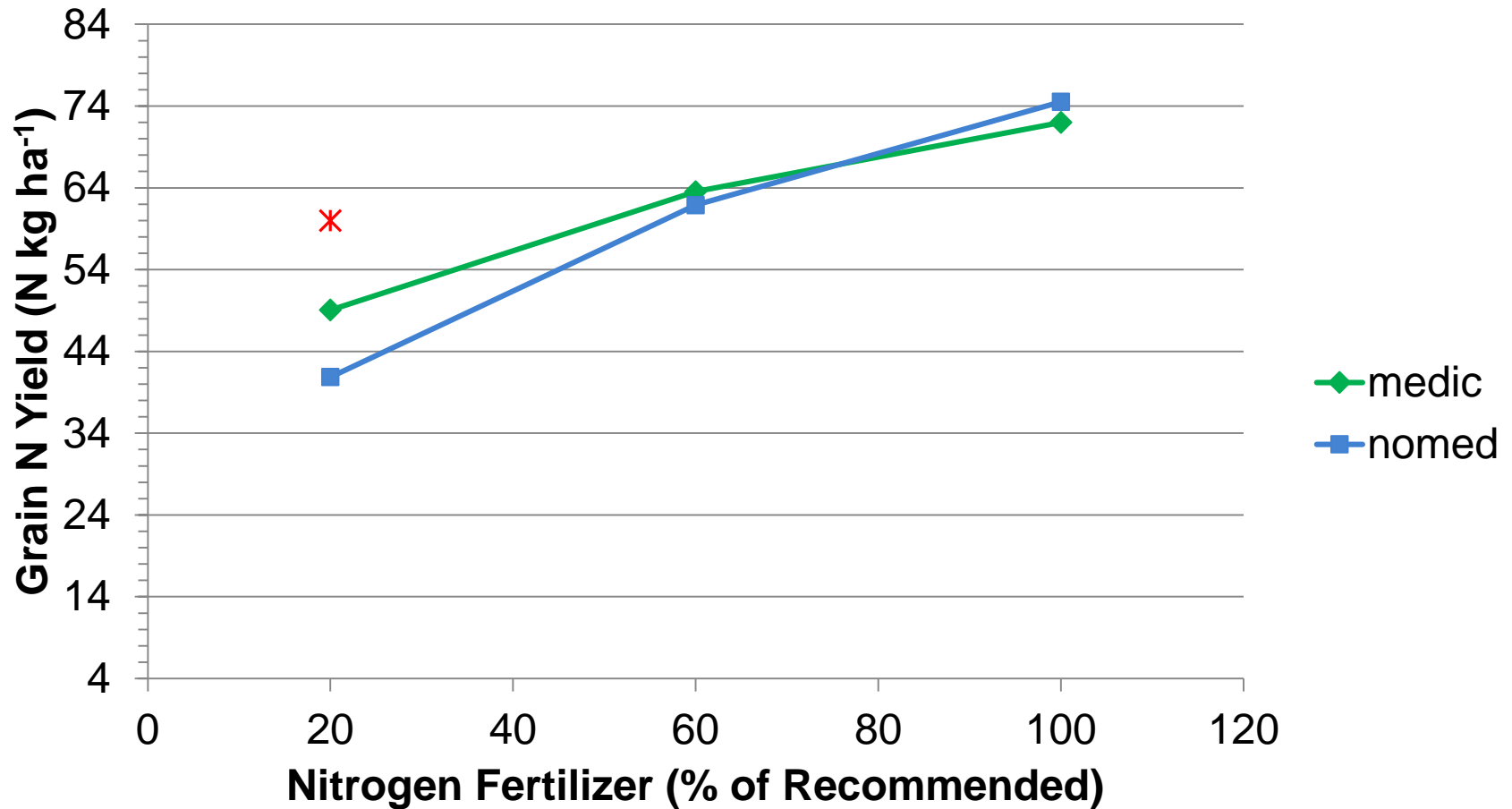
Grain Yield: Crop and N Fertilizer

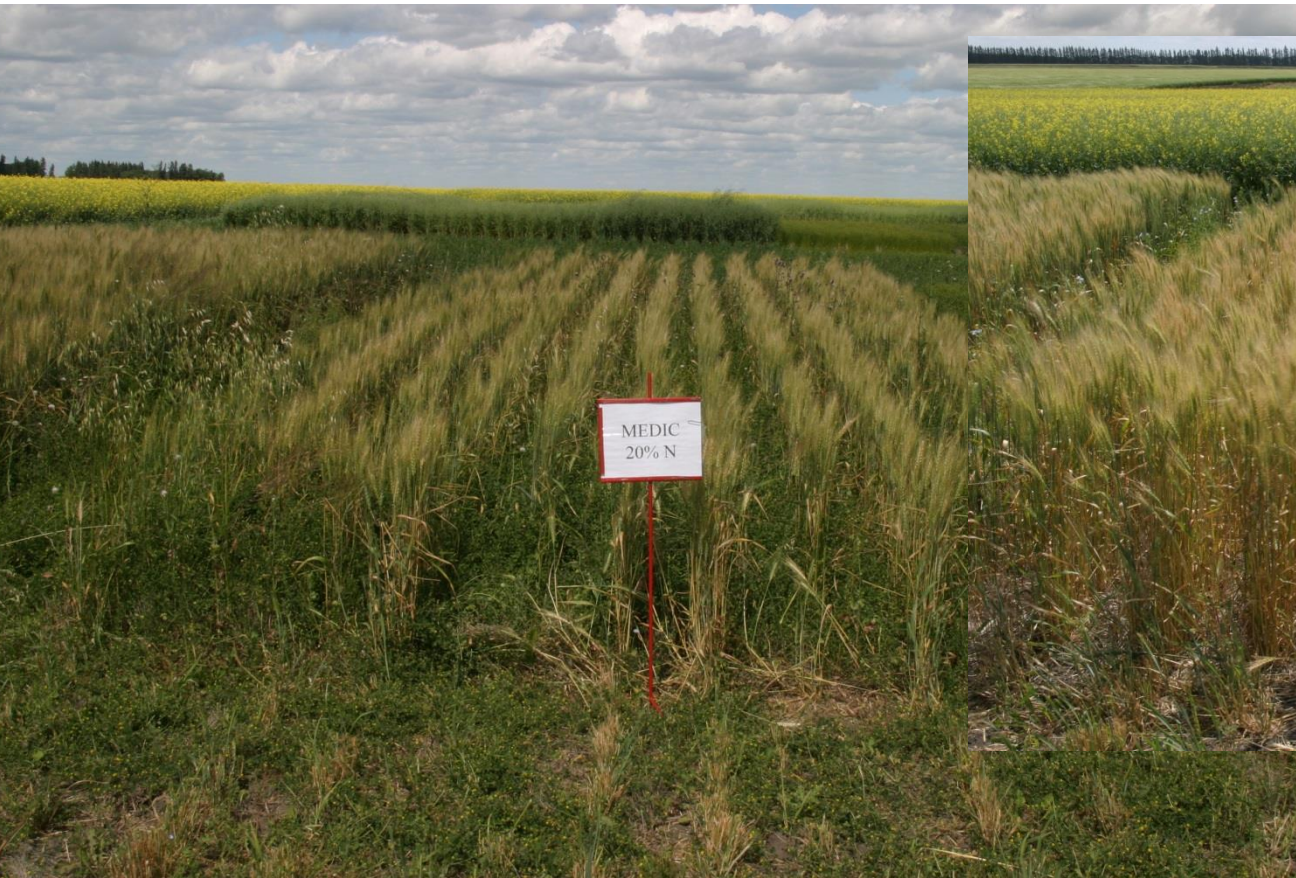


Grain Protein: Crop and N Fertilizer



Total Grain N: Crop and N Fertilizer



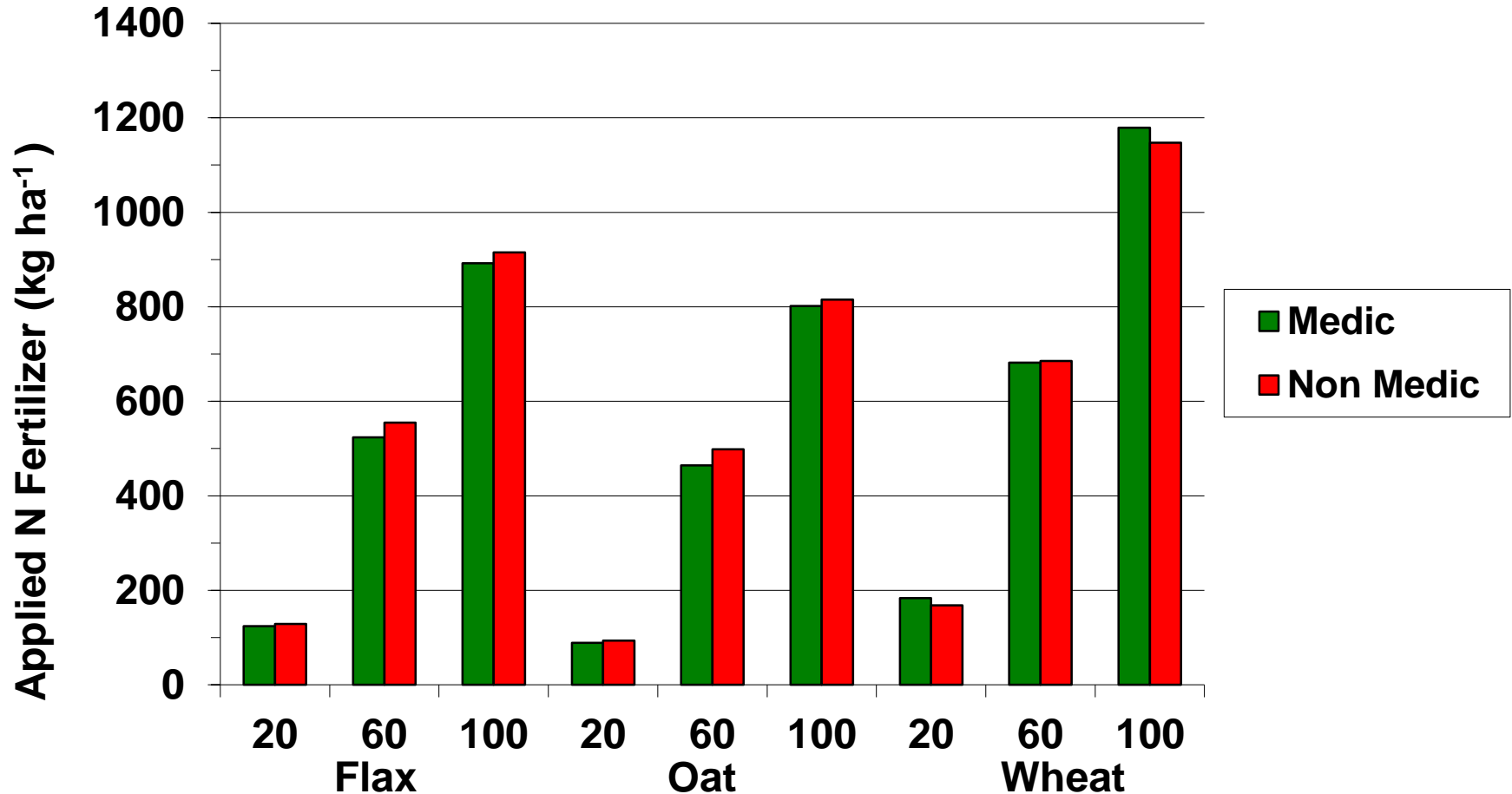




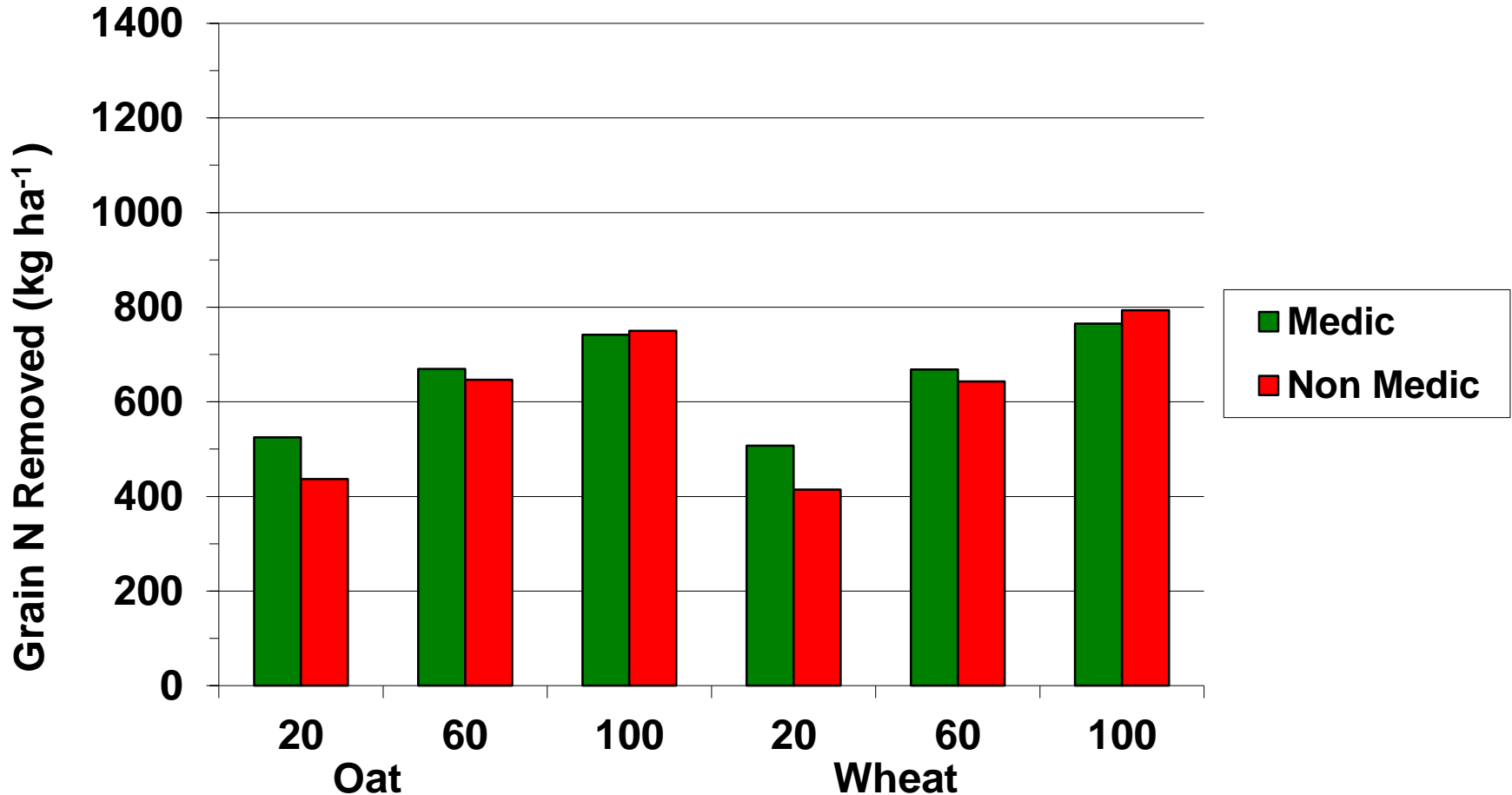




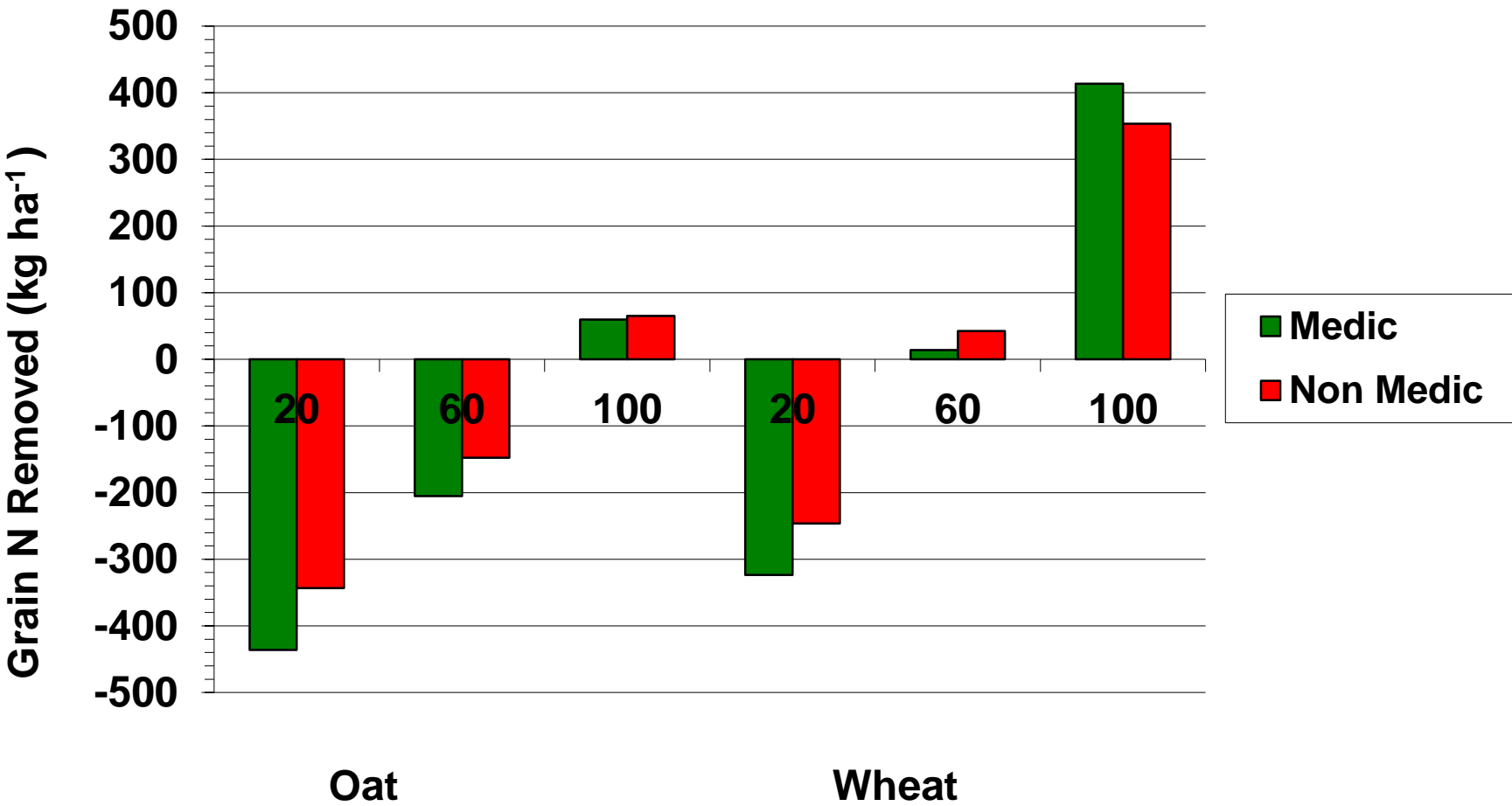
Applied N Fertilizer over Duration of Study



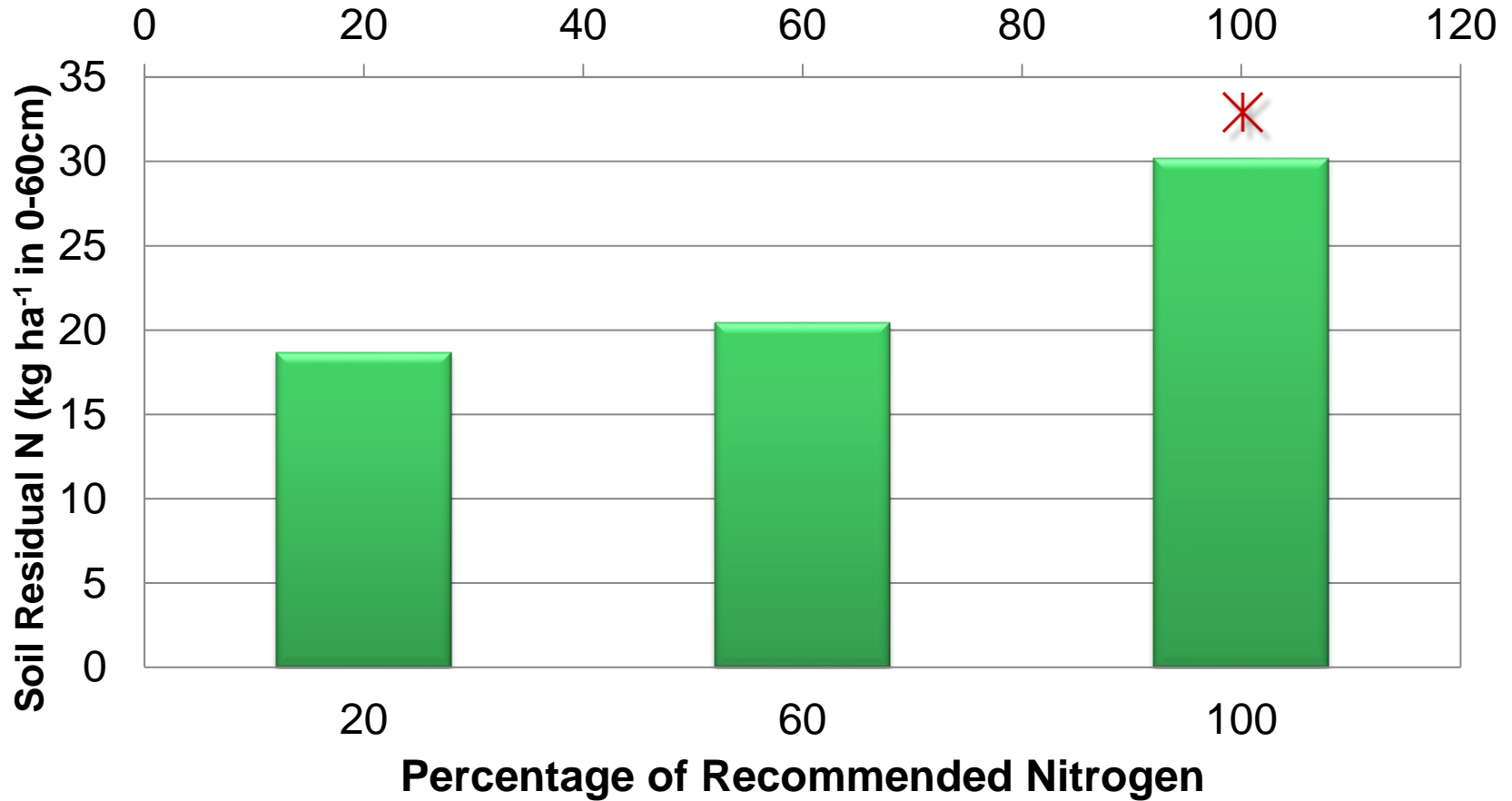
Grain N Removed over Duration of Study



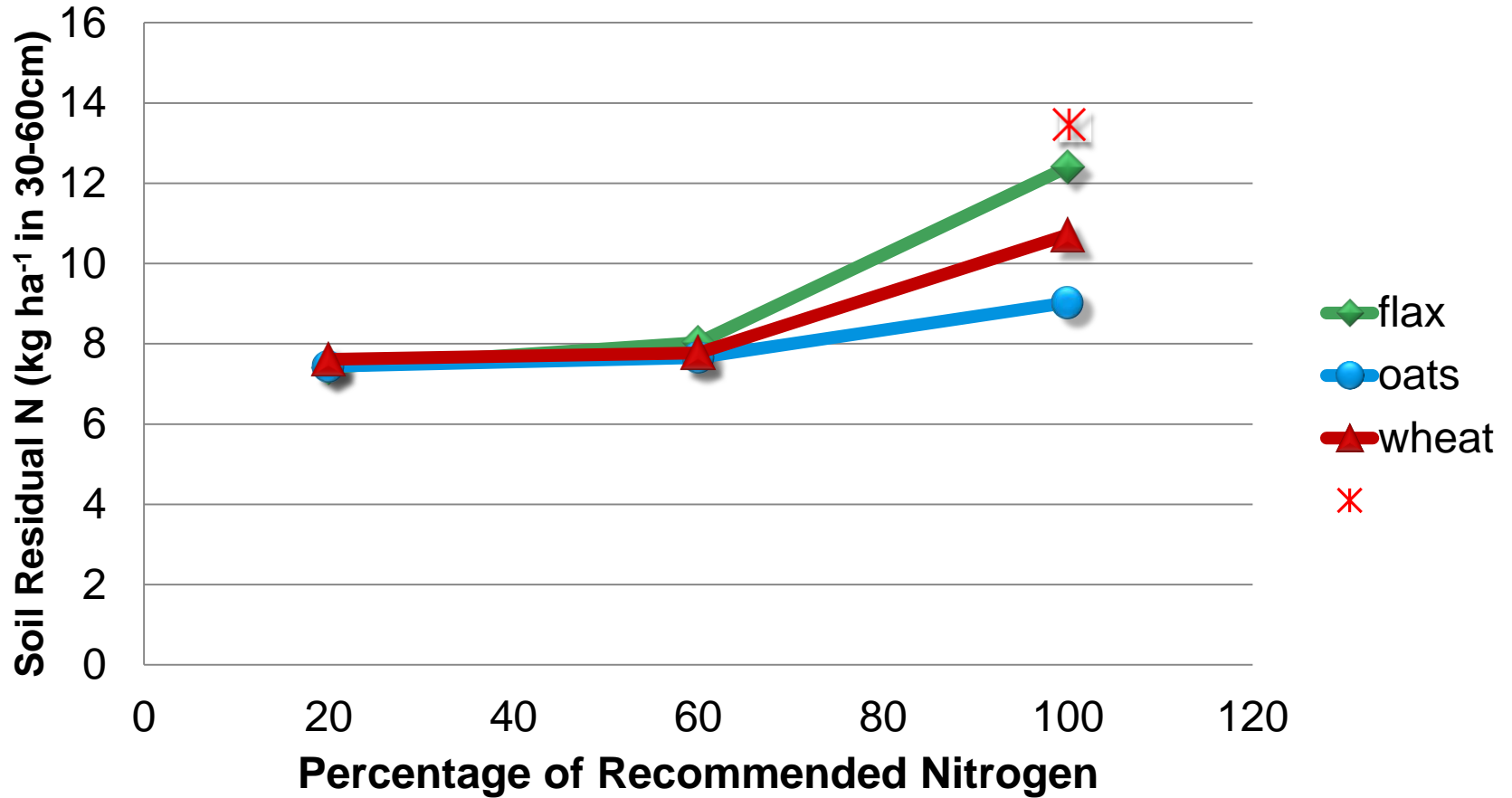
Change in N Due to Fertilizer Addition and Grain Removal



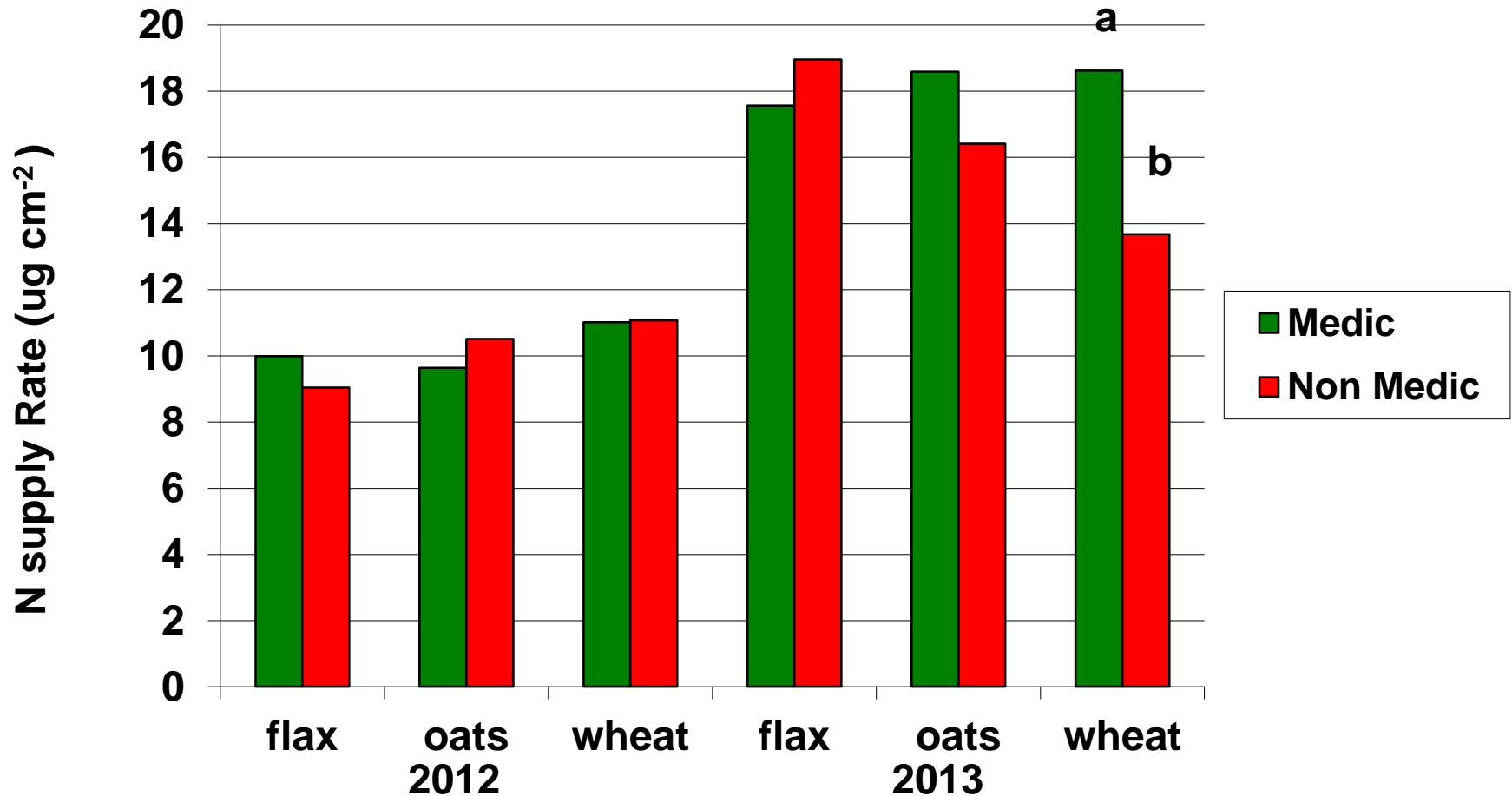
Fall Residual Soil N (NO_3)



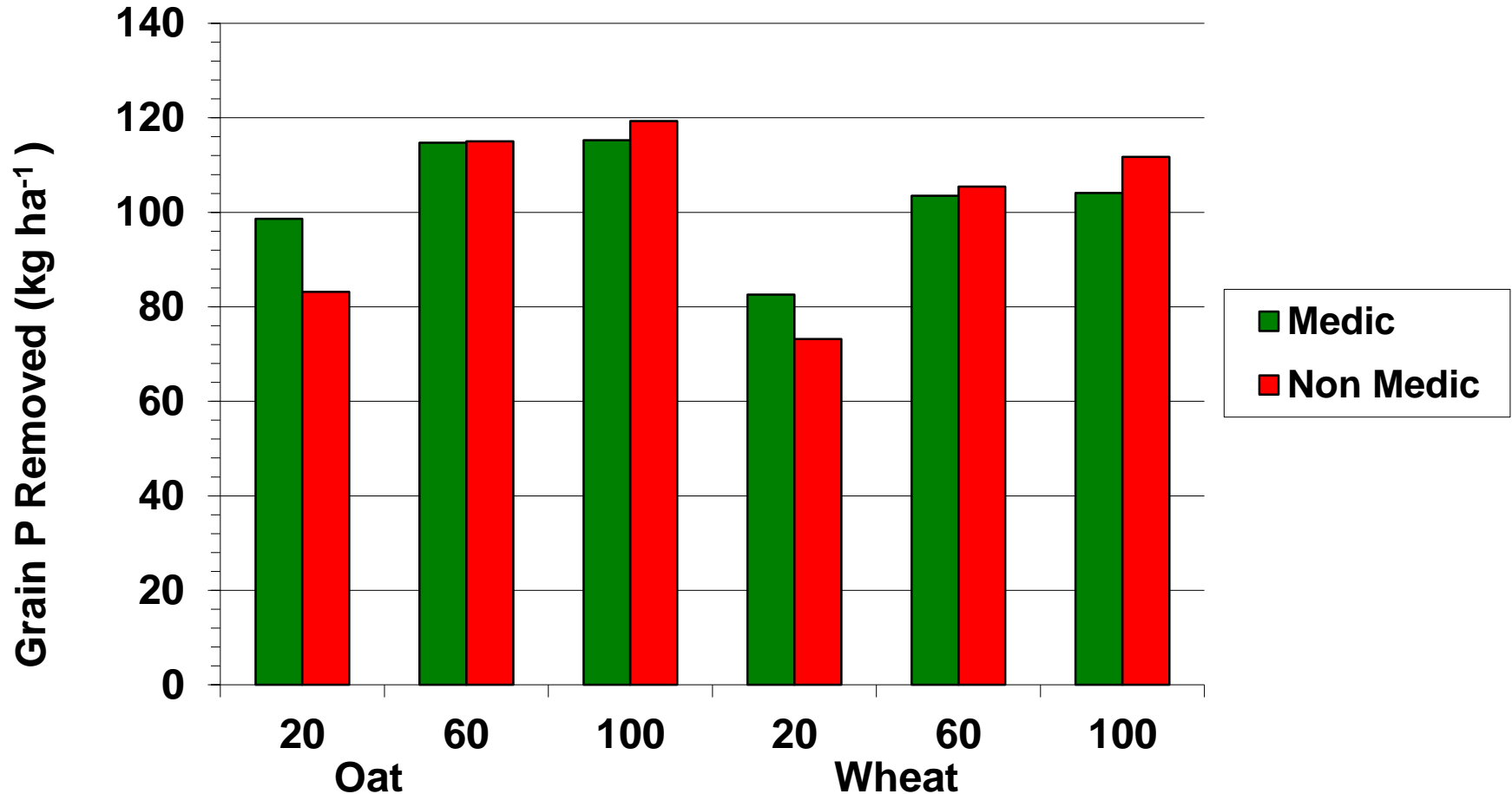
Fall Residual Soil N (NO₃ 30-60cm)



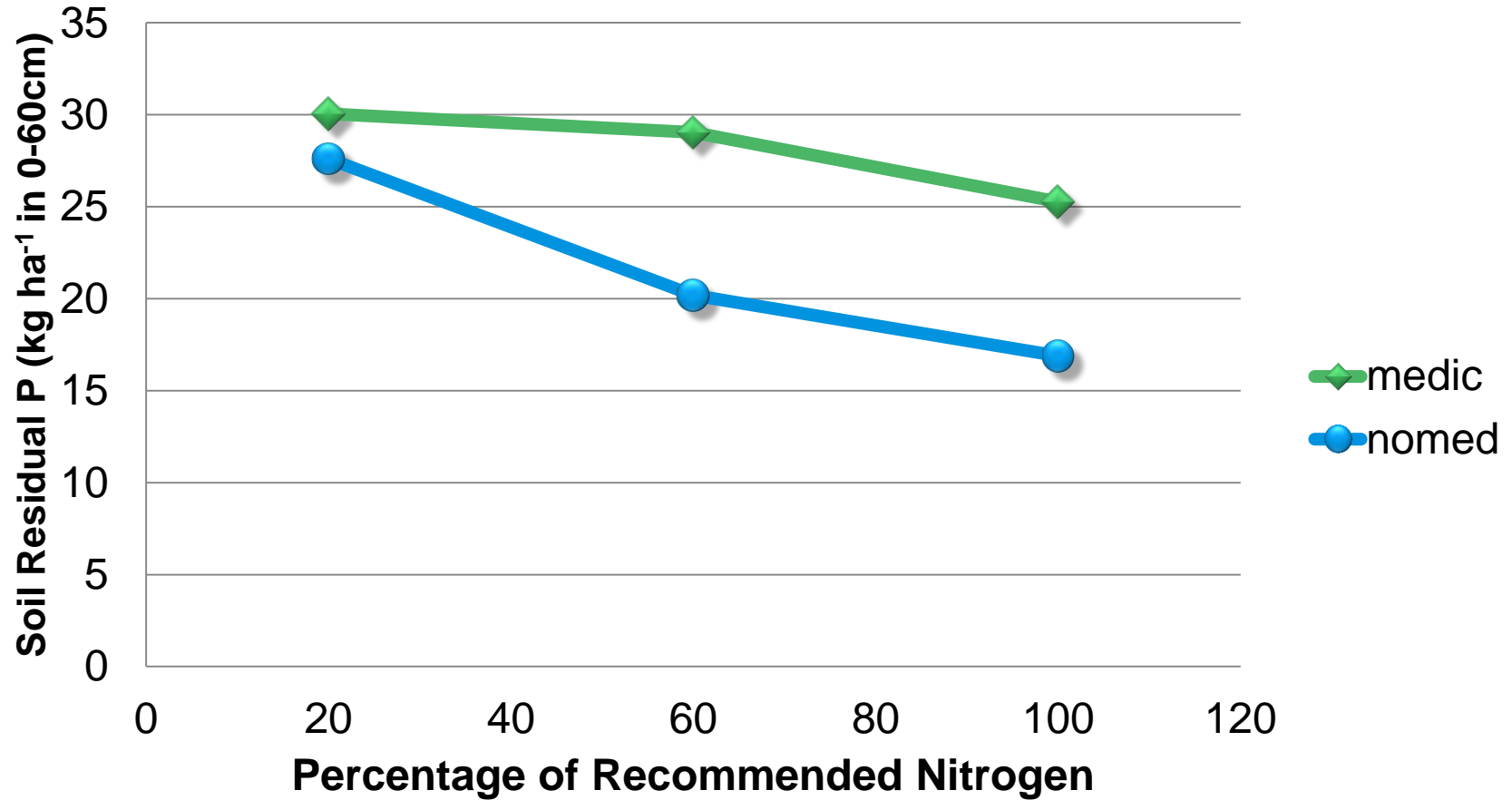
Fall Residual Soil N (NO_3)



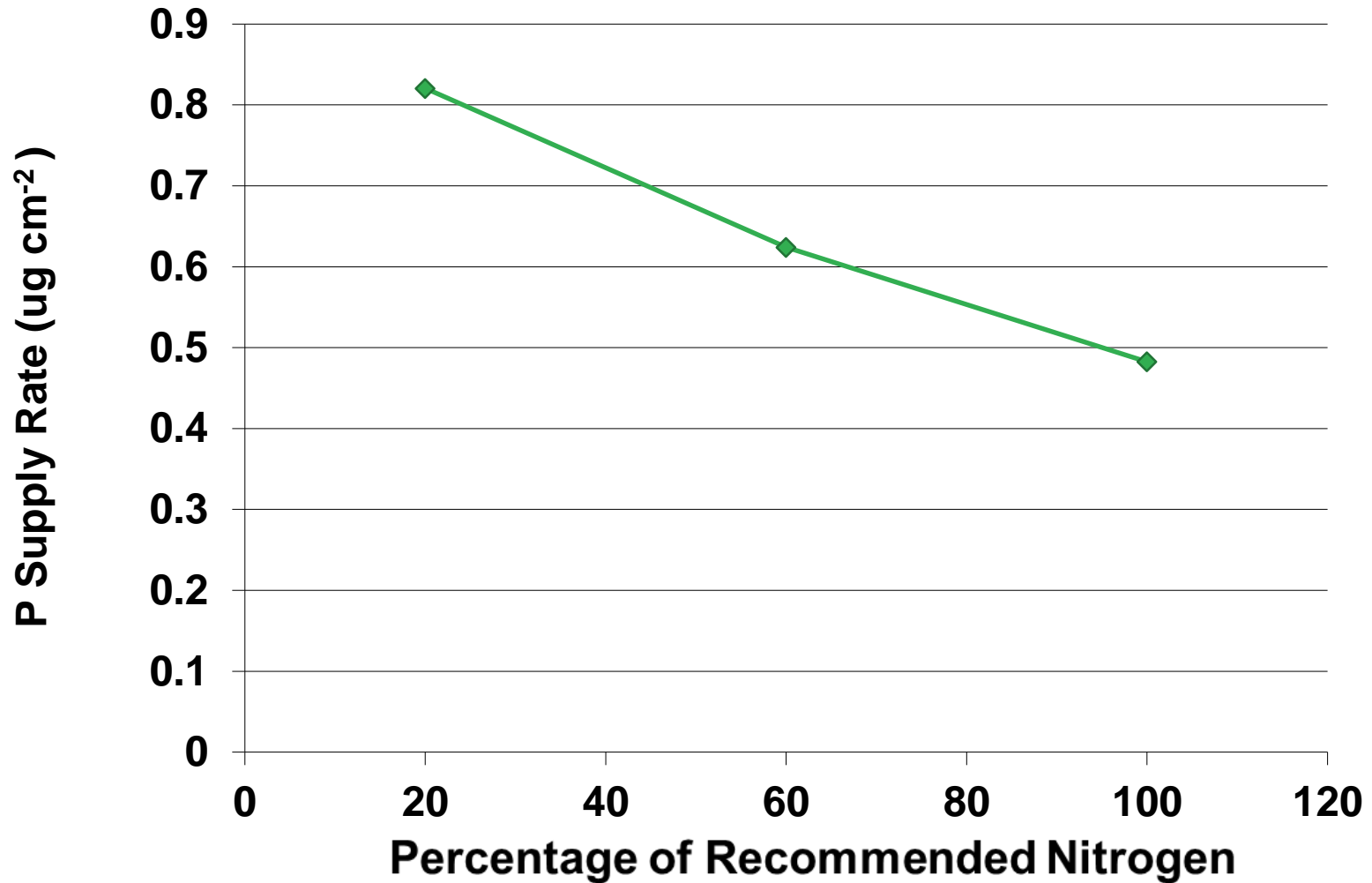
Grain P Removed over Duration of Study



Fall Residual Soil P (0-60cm)



Fall Residual Soil P



Conclusions

- **Applied N had larger effects than medic**
- **Medic tended to increase yield and quality at low N rates**
- **N fertilizer suppressed the growth of medic**
- **Medic is suited for low N farming systems and organic farming systems**