



Nitrogen Availability from Cereal Cover Crops Terminated at Different Growth Stages



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Acknowledgement

Funding:

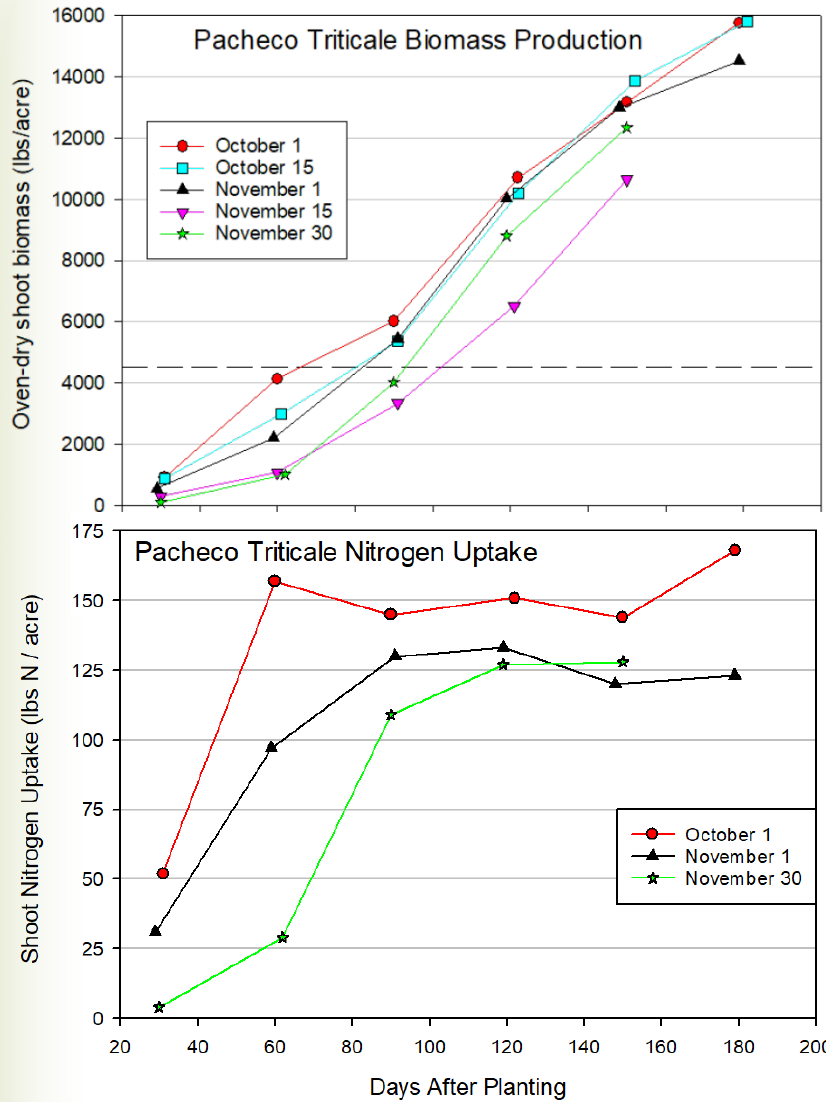
- California Leafy Greens Research Board

Co-Principal Investigators:

- Eric Brennan, Richard Smith

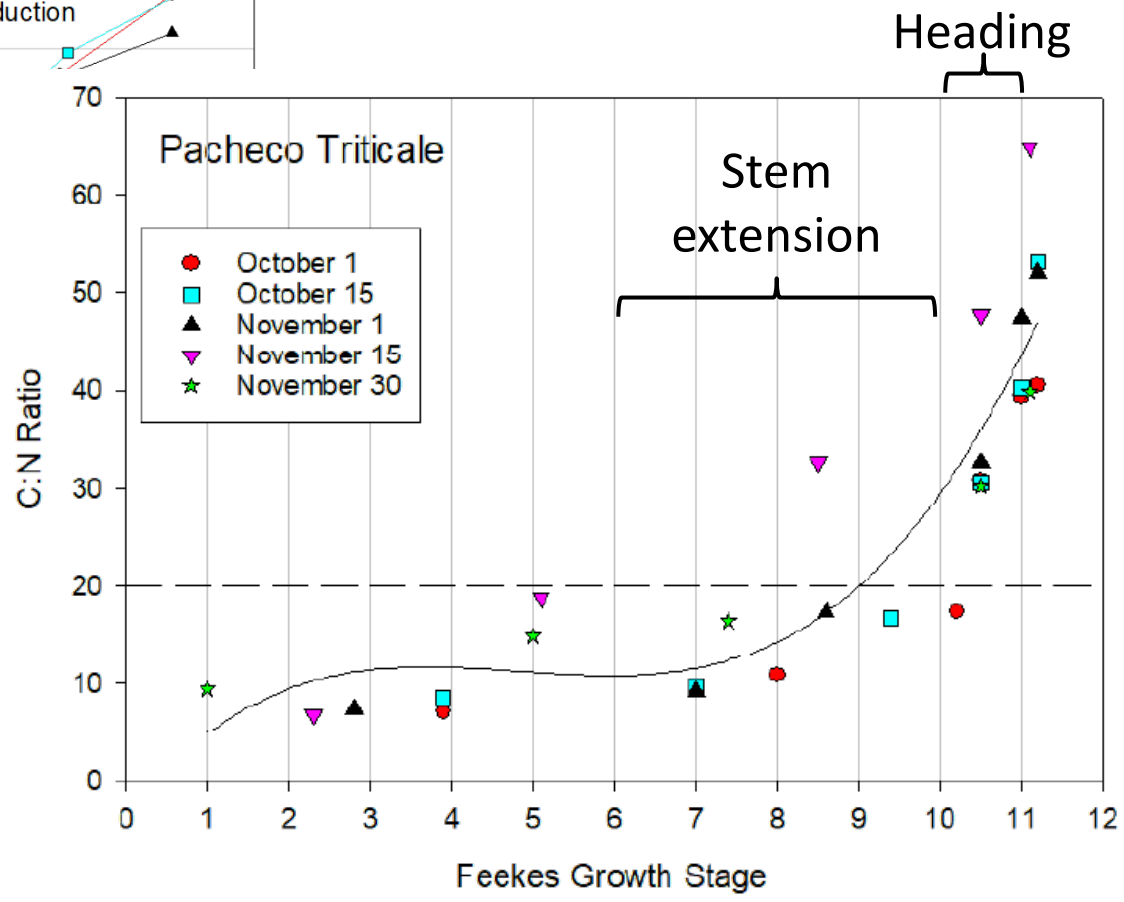
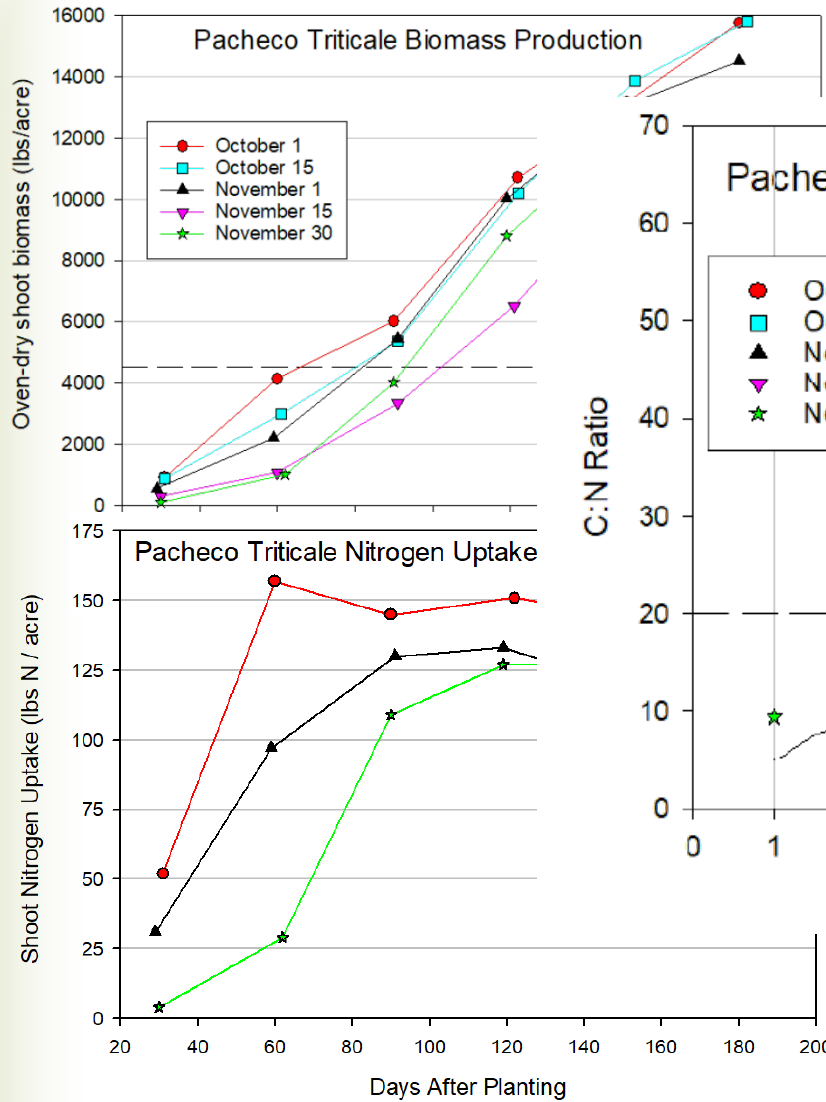


Previous research





Previous research





Objective

- Determine nitrogen mineralization and immobilization rates of cereal cover crops terminated at different growth stages



Nitrogen mineralization

- Soil microorganisms decompose residue
- Need N and C as building blocks for their own biomass
- C is also used as energy source
- **N mineralization:** Release excess N in the form of NH_4^+ into soil solution
- **N immobilization:** Uptake of NO_3^- or NH_4^+ from soil solution and incorporation into microbial tissue



Methods

Approach:

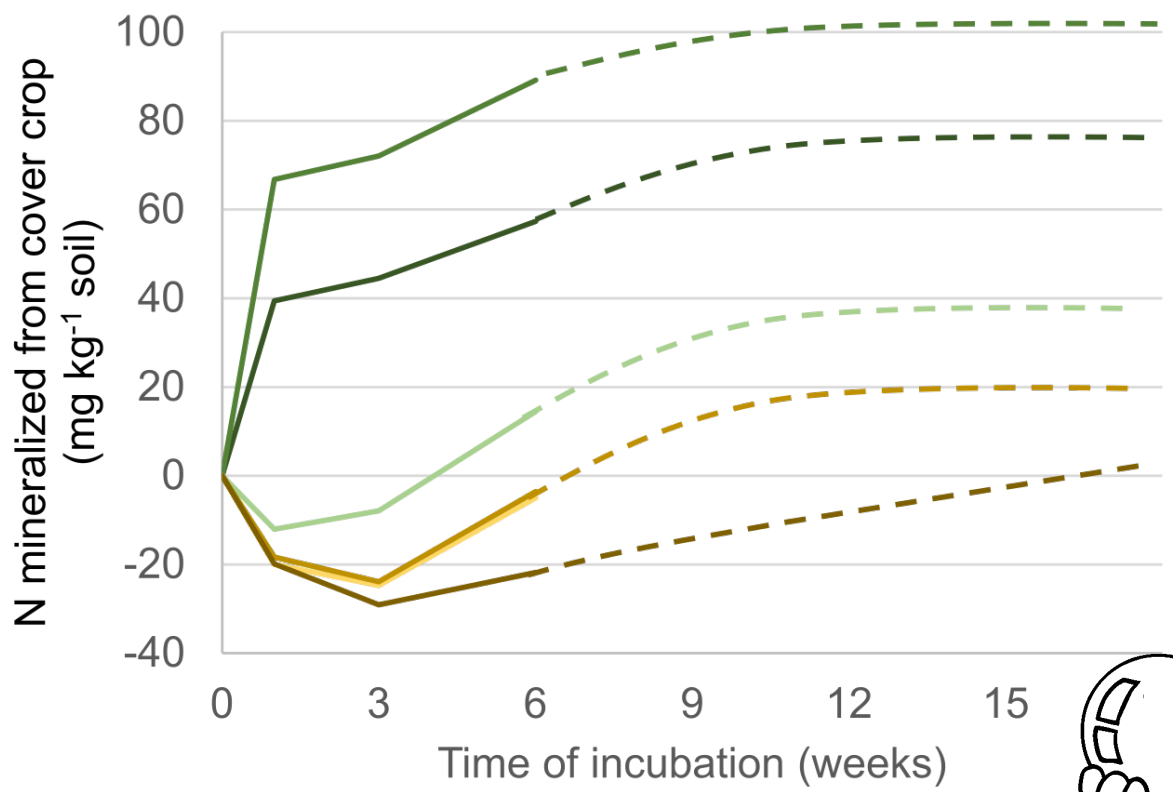
- 18-week laboratory incubation at 77 °F and optimal soil moisture content
- Sample analysis for ammonium-N and nitrate-N after 1, 3, 6, 12, and 18 weeks
- 4 replicates

Treatments:

- Soil amended with Pacheco Triticale and Merced Rye with C:N ratios ranging from 10-40, plus an unamended control.
- 15 treatments in total



What will happen in the coming weeks?





Work done since October

- Completed 18-week incubation
- Analyzed samples for total C and N
- Had samples analyzed for hemicellulose, cellulose, and lignin
- Analyzed incubation data

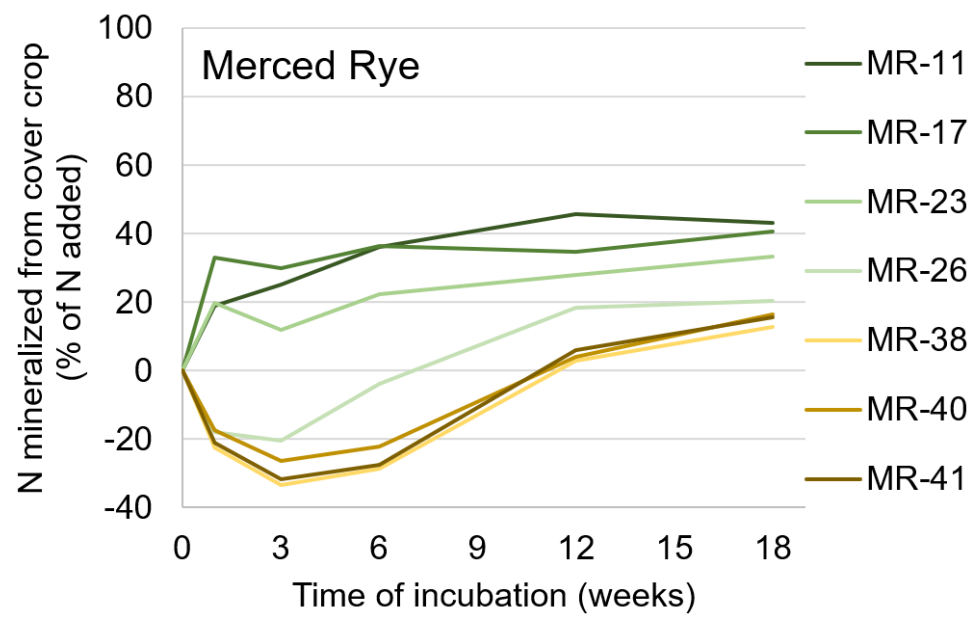
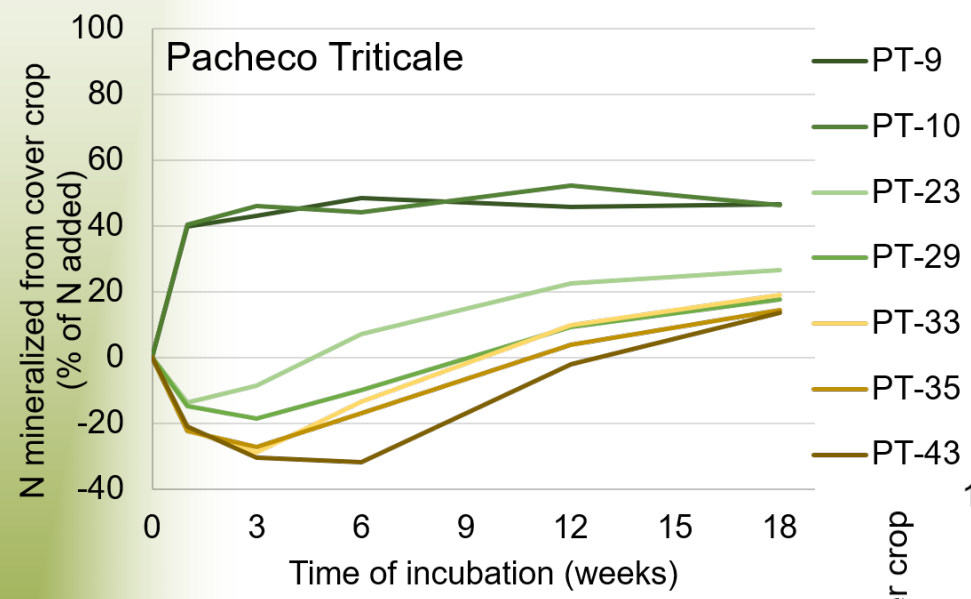


Sample properties

Sample ID	N (%)	C (%)	Observed C:N Ratio	Lignin - Ash Free	Cellulose	Hemi-cellulose
PT-9	4.5	40.9	9.1	1.7	16.4	19.2
PT-10	3.9	40.2	10.3	1.9	20.1	20.6
PT-23	1.8	40.2	22.8	1.7	19.6	20.1
PT-29	1.4	40.4	28.7	4.1	28.9	23.6
PT-33	1.2	41.0	33.5	4.0	28.3	22.5
PT-35	1.2	41.1	34.8	4.3	30.7	24.9
PT-43	0.9	40.7	42.9	3.5	23.1	18.9
MR-11	3.8	41.5	11.0	<1.0	10.2	14.1
MR-17	2.4	41.2	17.1	4.0	29.3	23.9
MR-23	1.8	41.9	23.1	4.5	32.9	27.1
MR-26	1.6	41.5	26.5	2.6	25.7	23.9
MR-38	1.1	42.7	38.0	5.6	31.0	25.9
MR-40	1.1	42.3	39.8	5.5	29.1	24.6
MR-41	1.0	41.9	40.5	5.8	32.2	25.5

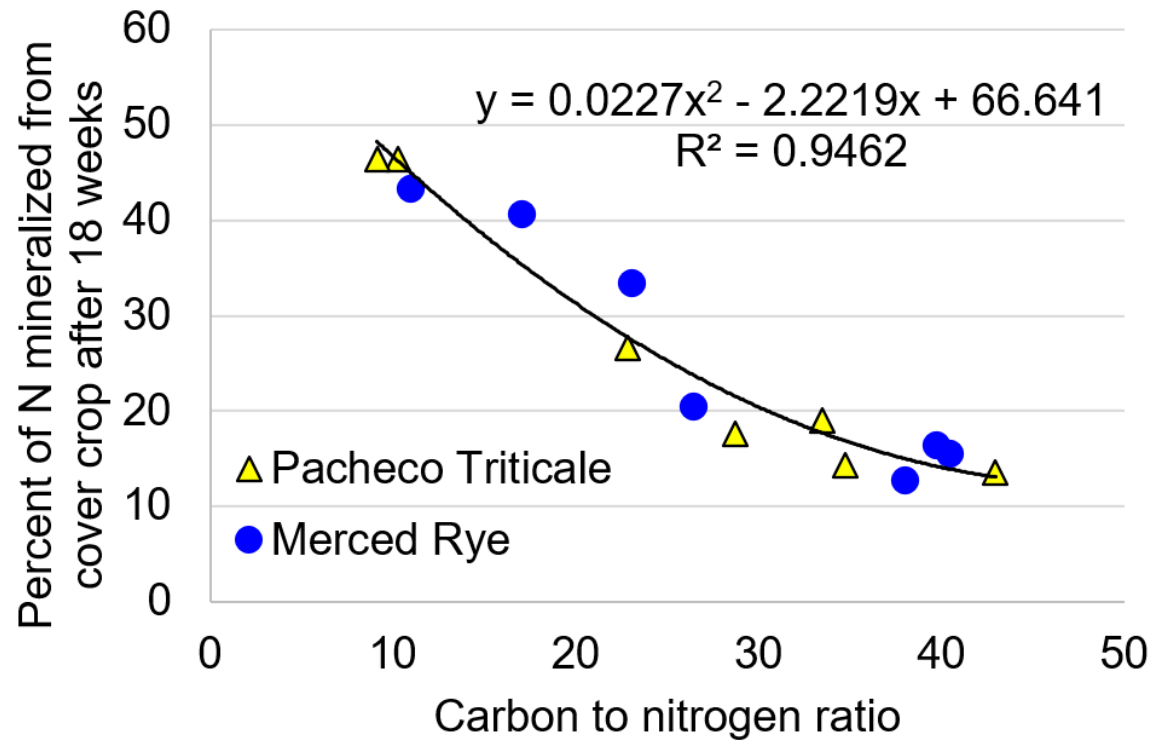


Net nitrogen mineralization





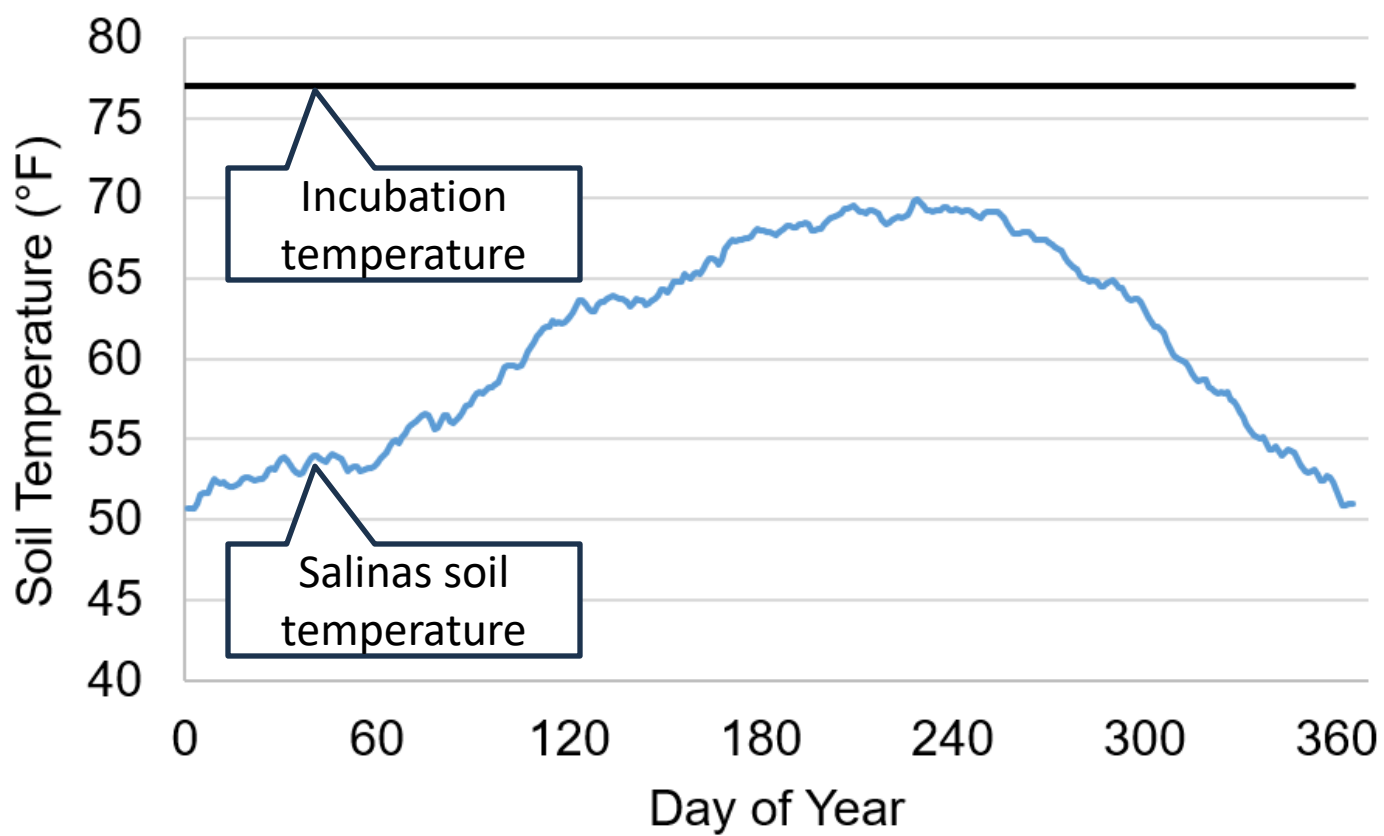
Net N mineralization as affected by C:N ratio





Predicting N turnover at local soil temperatures

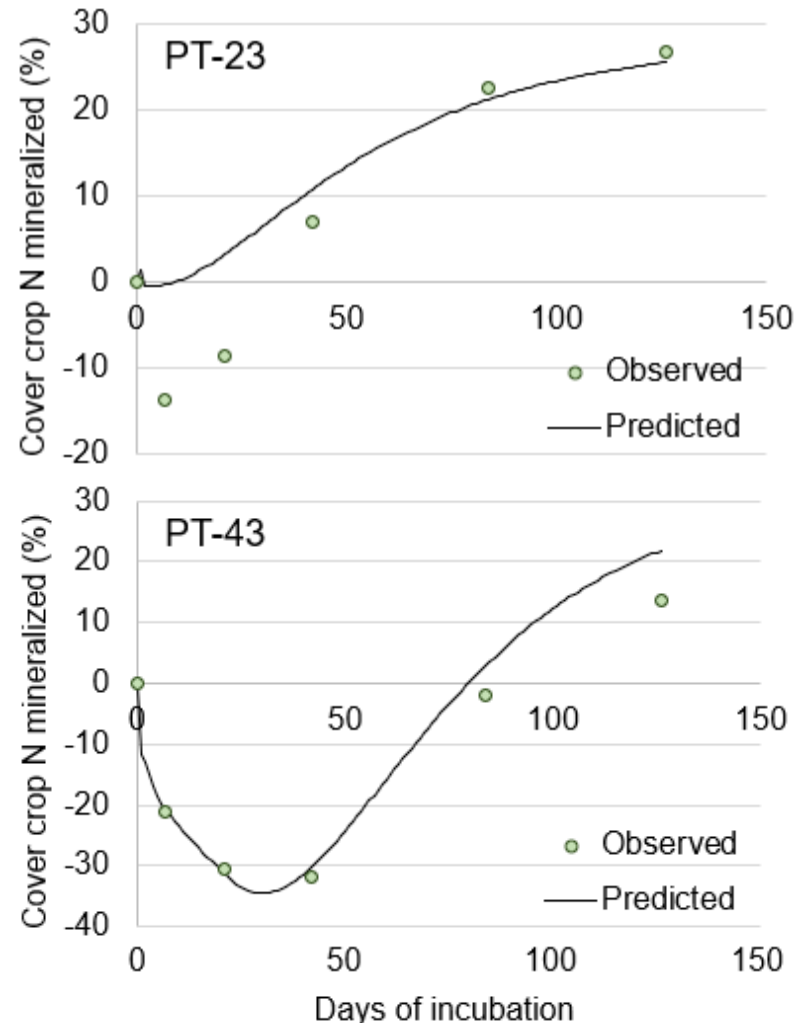
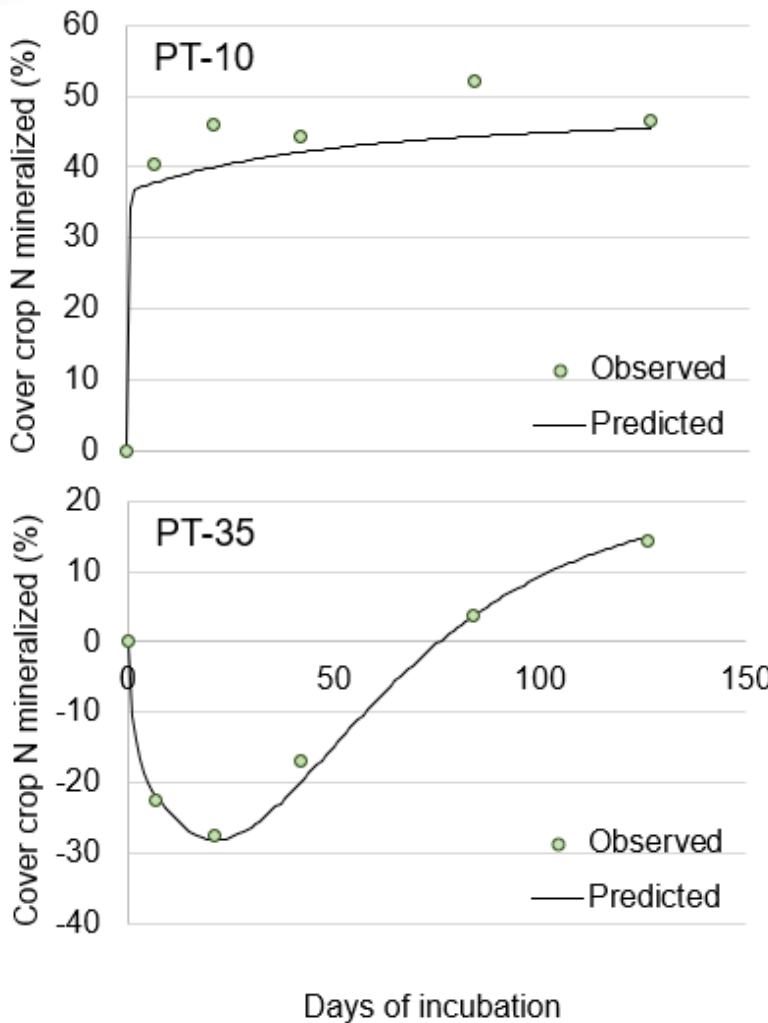
1. Get temperature data from CIMIS station





Predicting N turnover at local soil temperatures

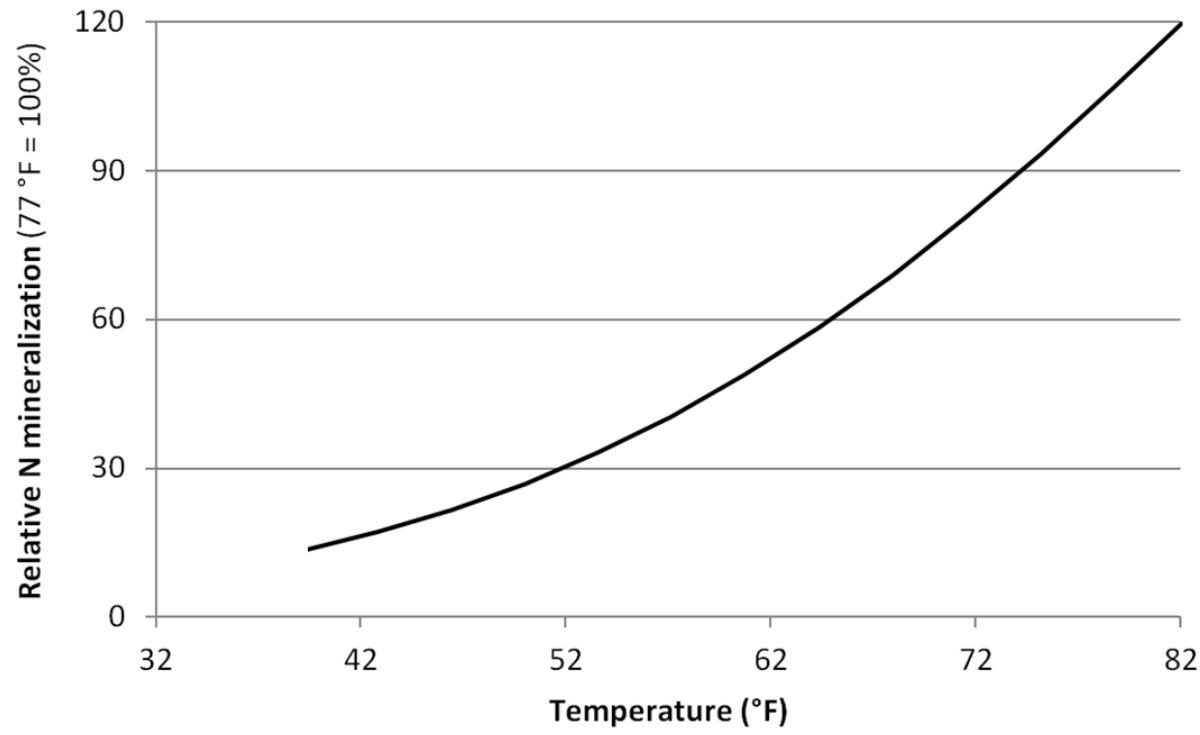
2. Simulate N turnover





Predicting N turnover at local soil temperatures

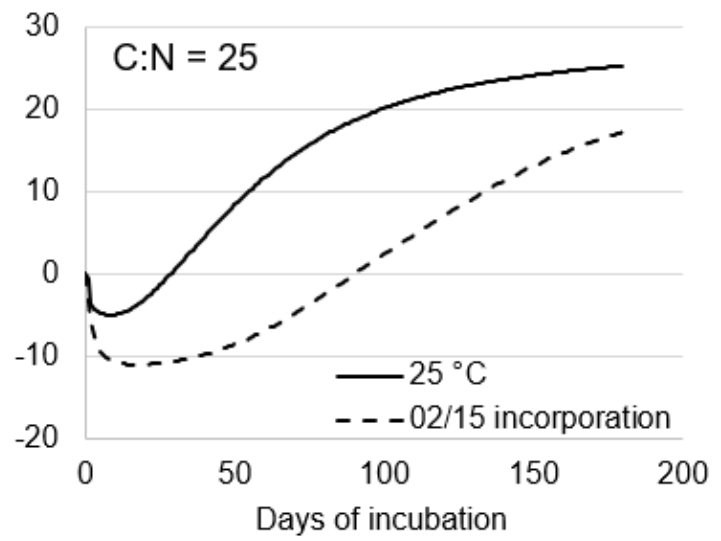
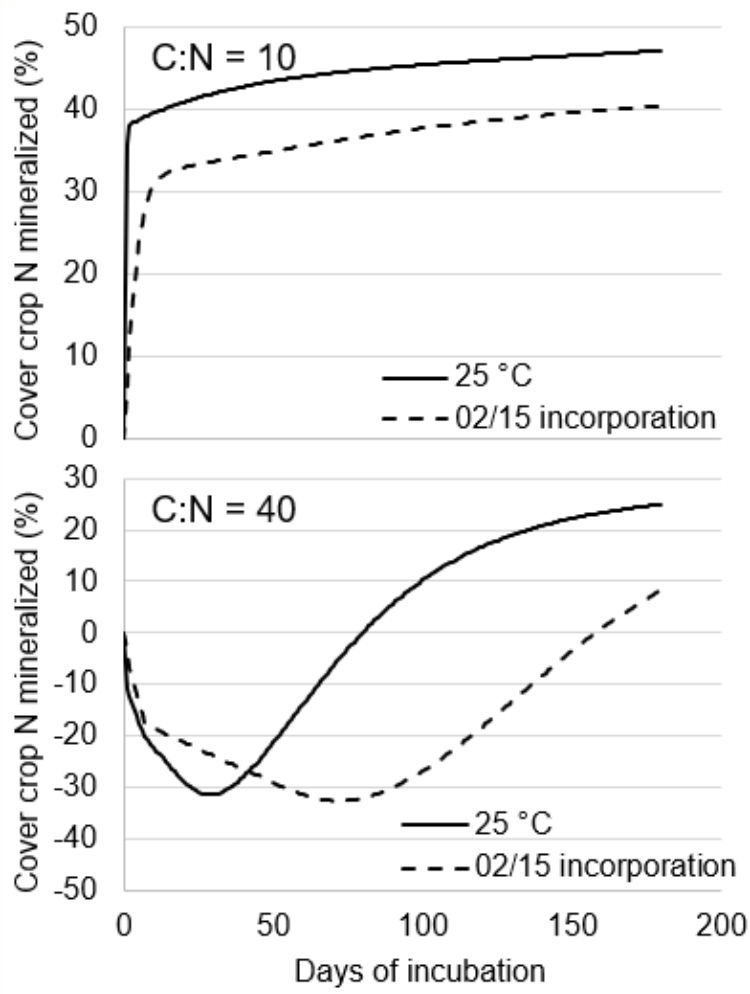
3. Use temperature correction





Predicting N turnover at local soil temperatures

4. Simulate N turnover with temperature adjustment

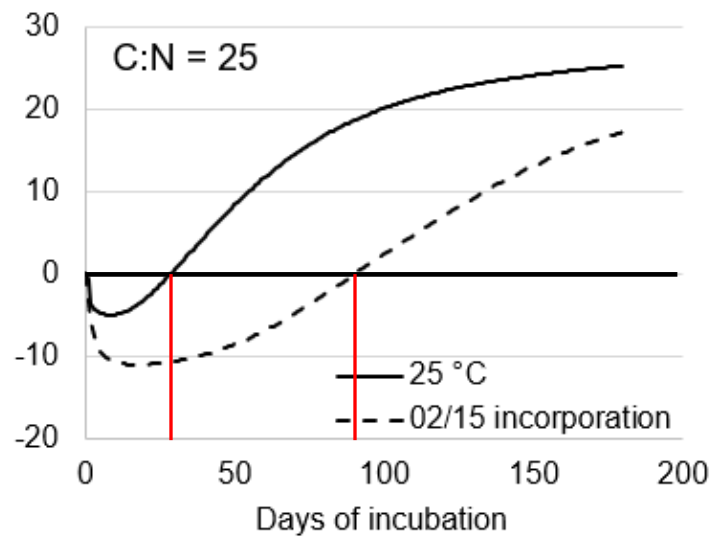
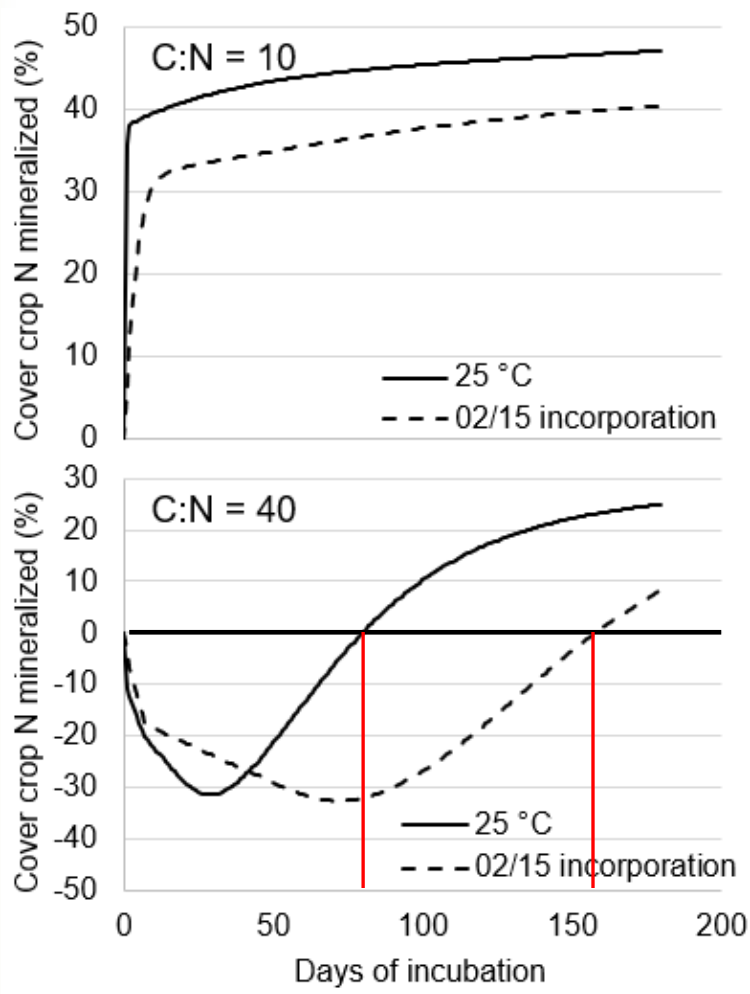


Assumption:
Cover crop is incorporated
on February 15



Predicting N turnover at local soil temperatures

4. Simulate N turnover with temperature adjustment

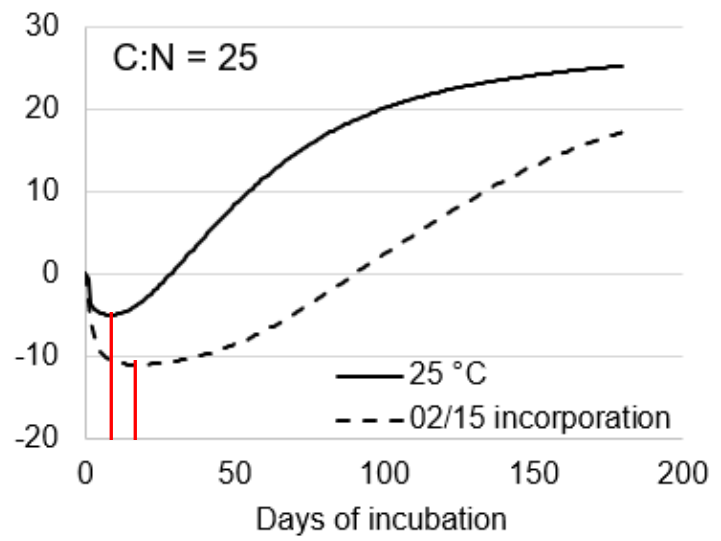
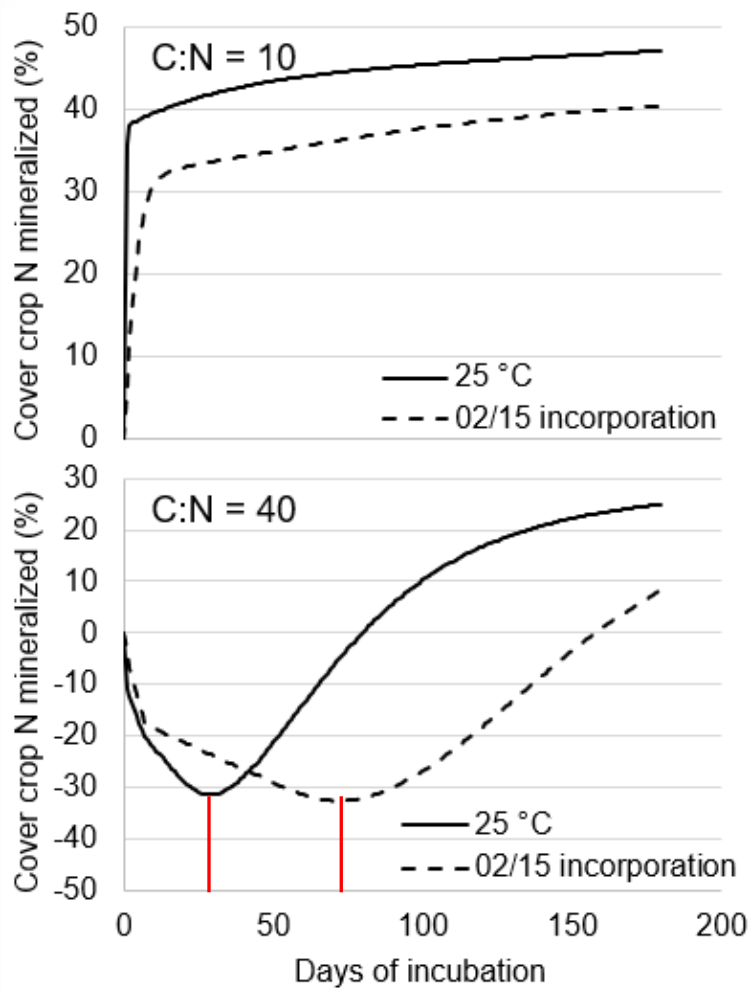


Assumption:
Cover crop is incorporated
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Predicting N turnover at local soil temperatures

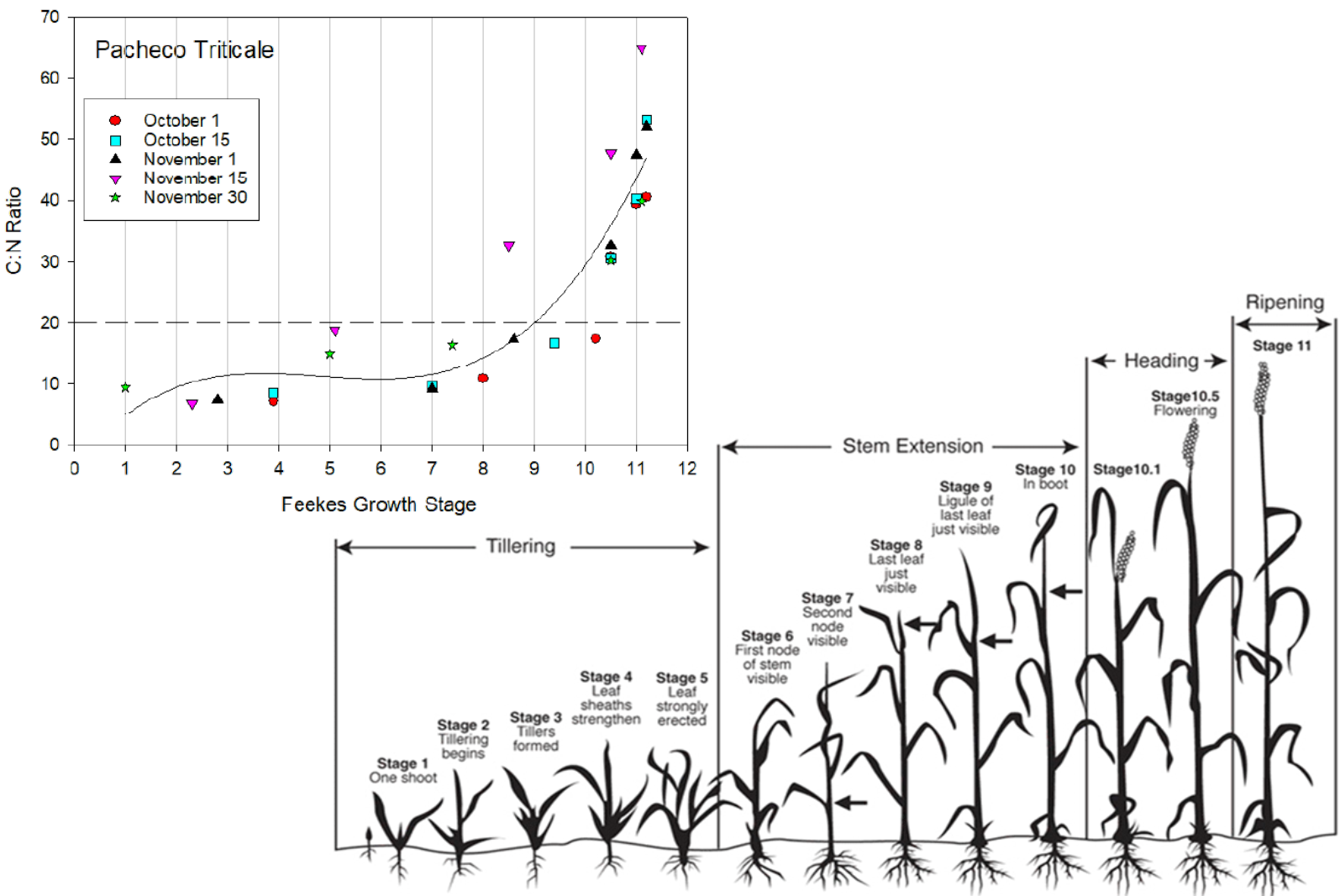
4. Simulate N turnover with temperature adjustment



Assumption:
Cover crop is incorporated
on February 15



Net N immobilization and growth stage





Conclusions

- Cover crops with a C:N ratio < 20 mineralized immediately
- Pacheco triticale and Merced rye showed very similar behavior
- In cooler soils, microbial activity is slowed down
- Effect of temperature is more pronounced for cover crops that immobilize N



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Thank you!