Mid to late fall yield and forage quality of brassica, oat, and pea mixes for grazing

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Strengths of brassica forages

- Fast growth rate
- High energy
- Good protein content
- High digestibility
- Cold tolerant

Drawbacks

- Low in fiber can cause health issues unless mixed with other forages
- Some concern about effects on milk and meat flavor
- Often only suitable for grazing

Questions about mixed brassica, oat, and pea fall forages

How are yield and forage quality affected by:

- **Varying seeding ratios?**
- **Grazing timing and frosts?**

Experiments in South Deerfield MA

- **Brassica, oat, and pea mixes were planted in mid-August of 2021 and 2022.**
- **For each mix, total yield, and forage quality were measured.**
- **Harvested in mid-fall before frost.**
- **Individual variety forage quality and yield was evaluated before and after hard frosts in mid and late fall.**
- **Four rep factorial RCBD in each year.**

Brassica Variety and Seeding Rate Treatments

Appin turnip

Barkant turnip

Barsica colza

Groundhog radish

Pacific Gold mustard

T-Raptor hybrid

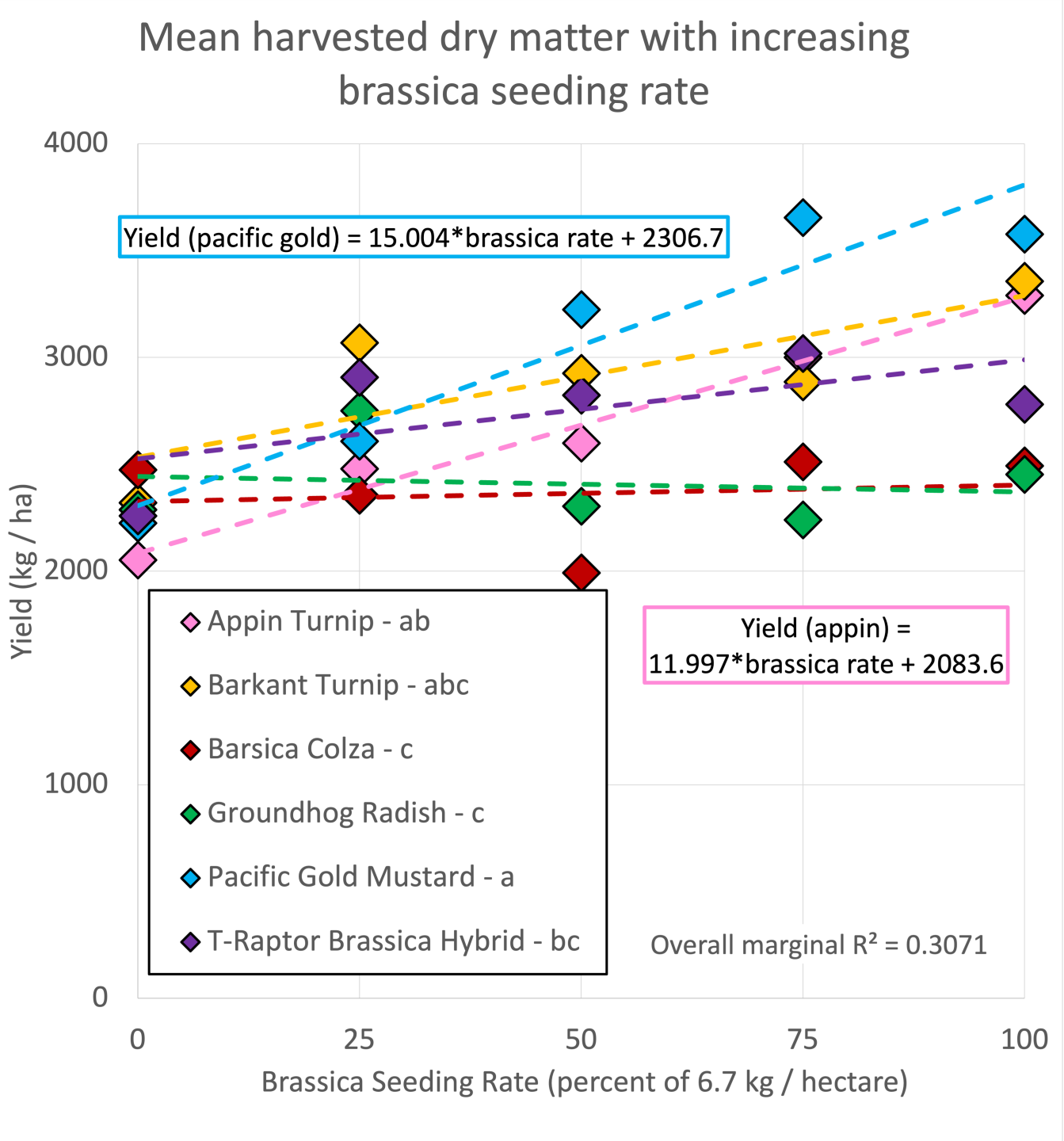
Everleaf oats

4010 peas

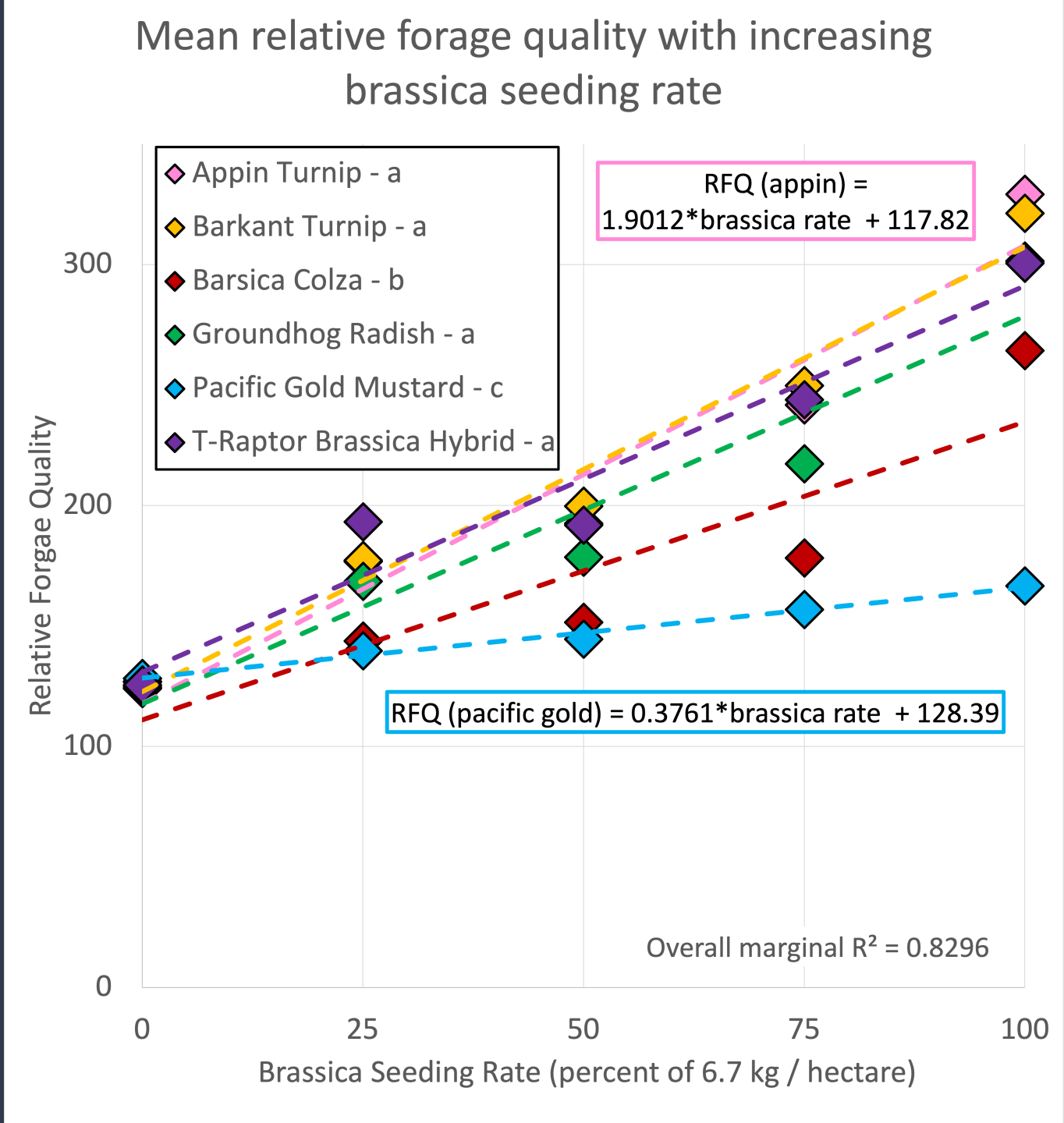
Brassica Seeding Rate	Brassicas kg / ha	Oats kg / ha	Peas kg / ha
0 %	0	100	67
25 %	1.7	75	50
50 %	3.4	50	34
75 %	5	25	17
100 %	6.7	0	0


Mixed Forages in Mid-Fall Before Frost

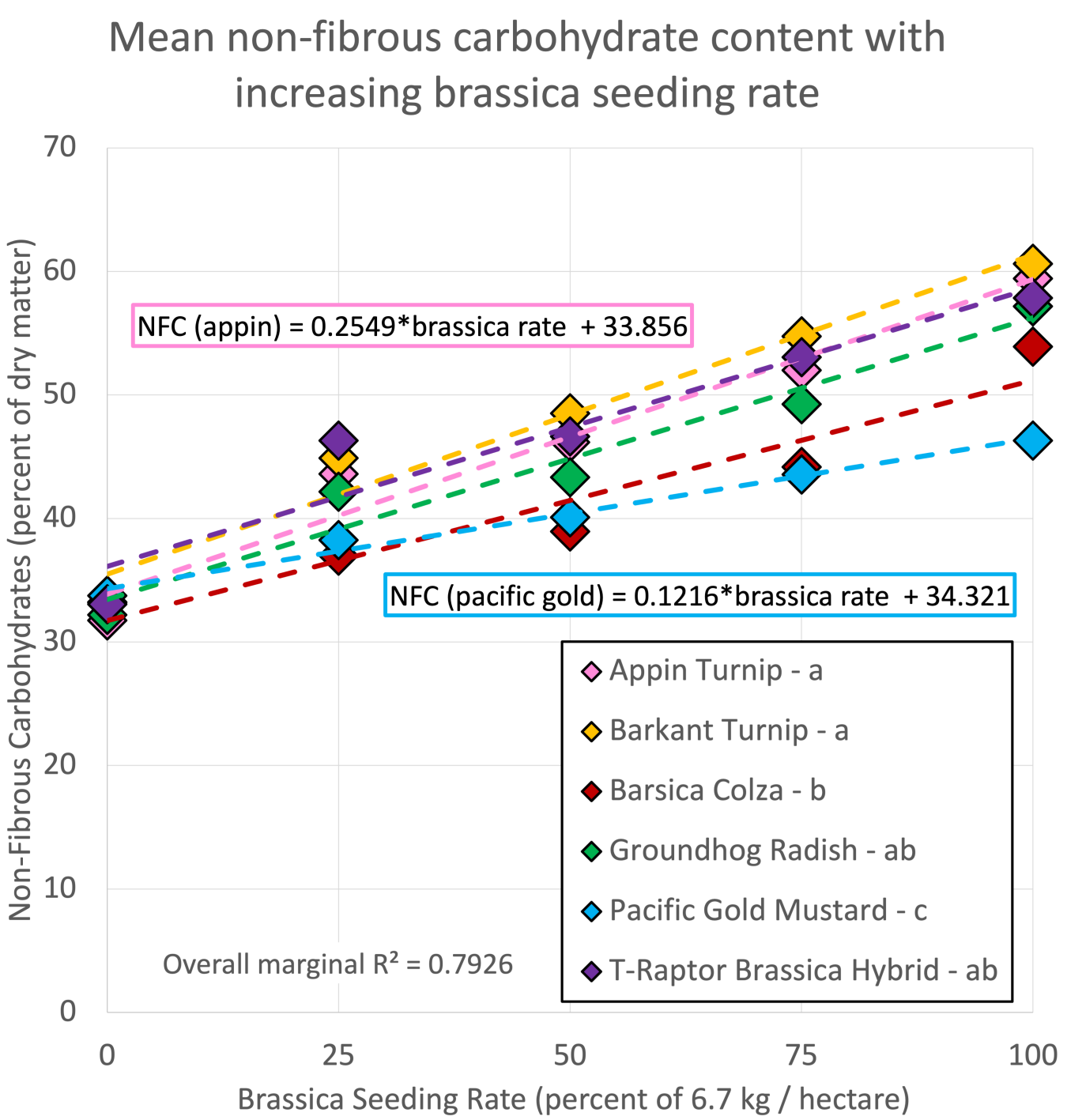
Total Yield


Mean harvested dry matter with increasing brassica seeding rate
Yield (pacific gold) = 15.004*brassica rate + 2306.7
Yield (appin) = 11.997*brassica rate + 2083.6
Overall marginal R² = 0.3071
Appin Turnip - ab
Barkant Turnip - abc
Barsica Colza - c
Groundhog Radish - c
Pacific Gold Mustard - a
T-Raptor Brassica Hybrid - bc
Yield (kg / ha)
4000
3000
2000
1000
0
0
25
50
75
100
Brassica Seeding Rate (percent of 6.7 kg / hectare)

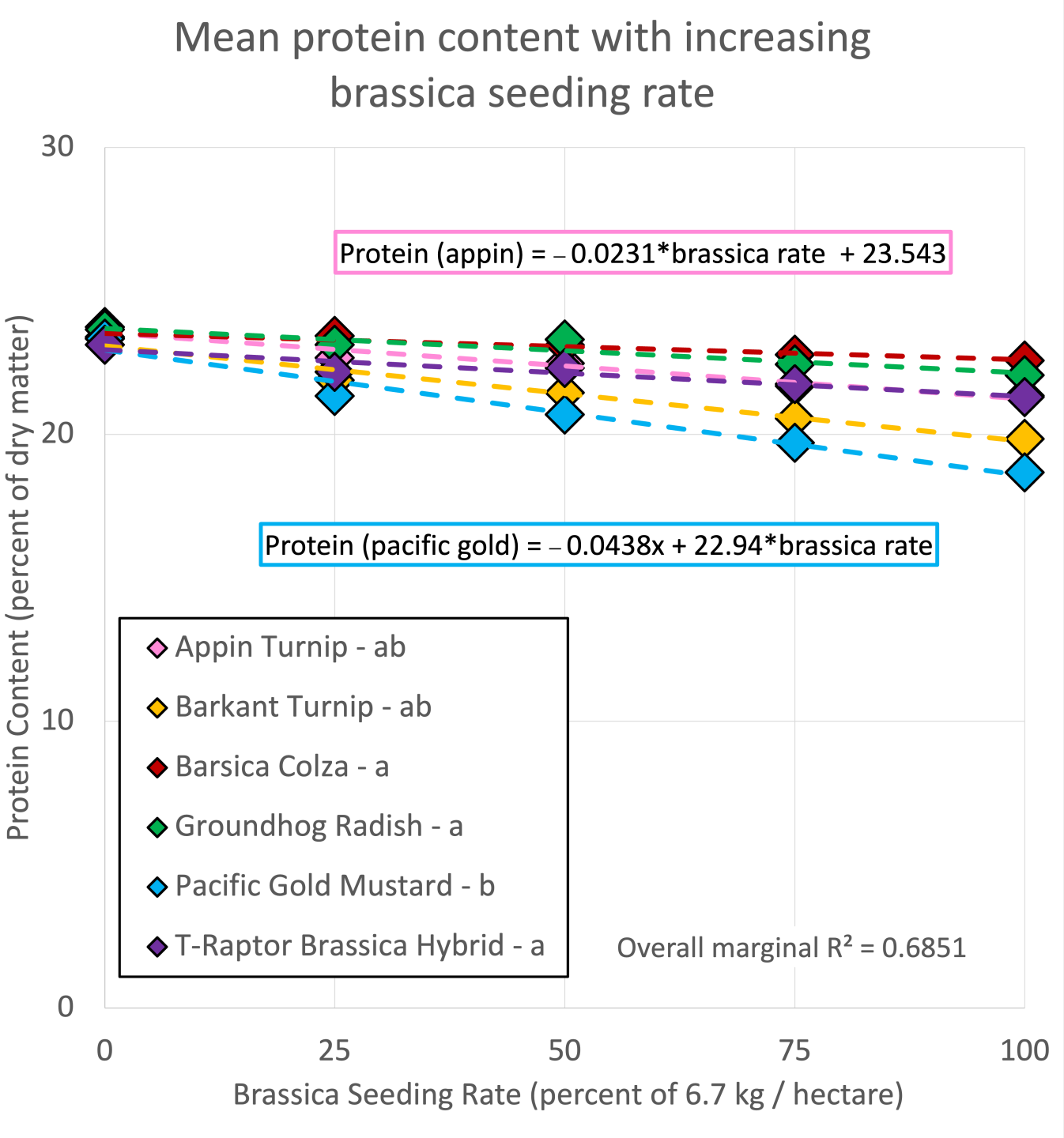
Relative Forage Quality



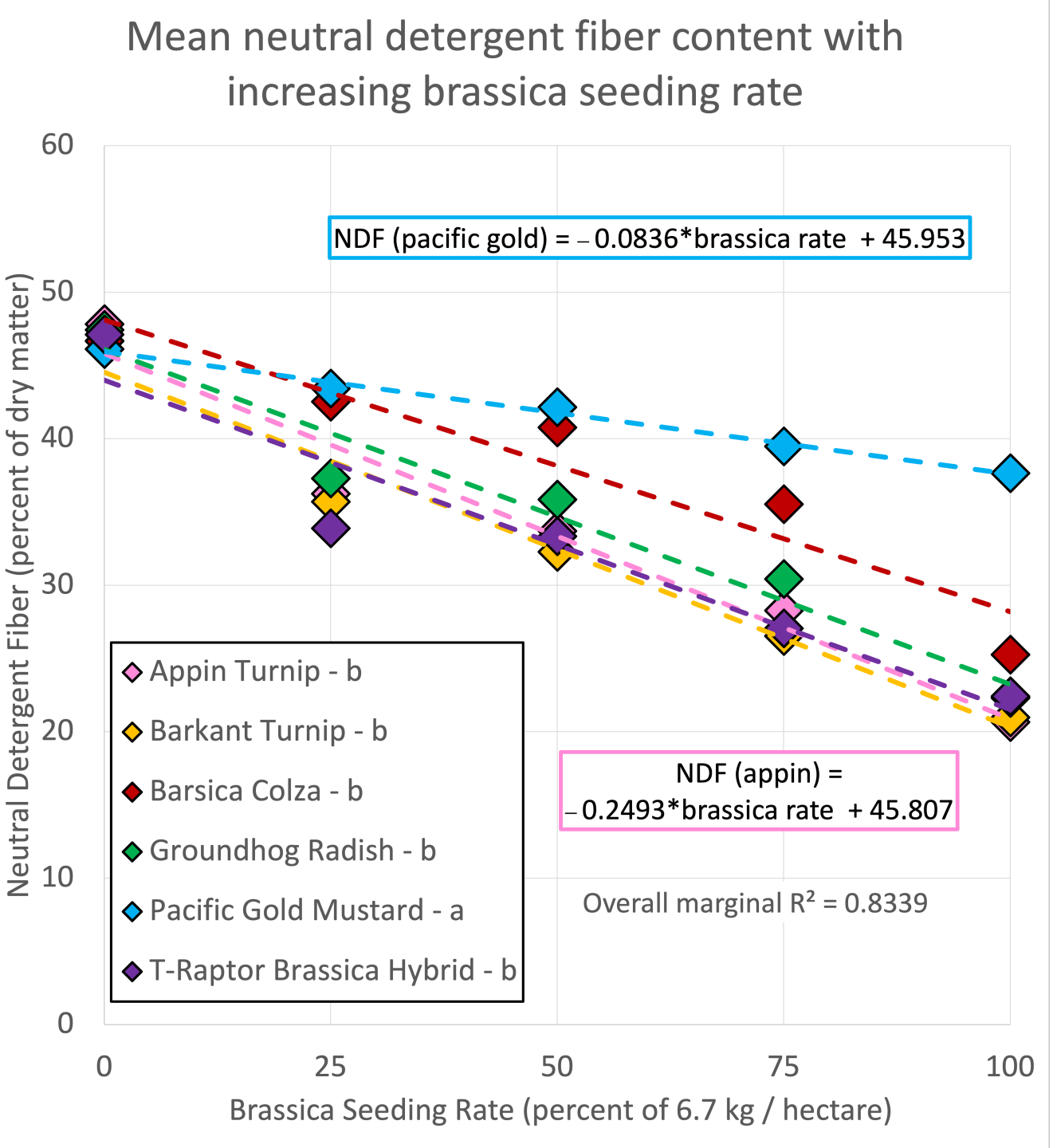
Non-fibrous Carbo-hydrates



Protein


Mean protein content with increasing brassica seeding rate
Protein (appin) = – 0.0231*brassica rate + 23.543
Protein (pacific gold) = – 0.0438x + 22.94*brassica rate
Appin Turnip - ab
Barkant Turnip - ab
Barsica Colza - a
Groundhog Radish - a
Pacific Gold Mustard - b
T-Raptor Brassica Hybrid - a
Overall marginal R² = 0.6851
Protein Content (percent of dry matter)
0
10
20
30
0
25
50
75
100
Brassica Seeding Rate (percent of 6.7 kg / hectare)

Fiber


Mean neutral detergent fiber content with increasing brassica seeding rate
NDF (pacific gold) = – 0.0836*brassica rate + 45.953
NDF (appin) = – 0.2493*brassica rate + 45.807
Overall marginal R² = 0.8339
Appin Turnip - b
Barkant Turnip - b
Barsica Colza - b
Groundhog Radish - b
Pacific Gold Mustard - a
T-Raptor Brassica Hybrid - b
Neutral Detergent Fiber (percent of dry matter)
Brassica Seeding Rate (percent of 6.7 kg / hectare)
0
10
20
30
40
50
60
0
25
50
75
100

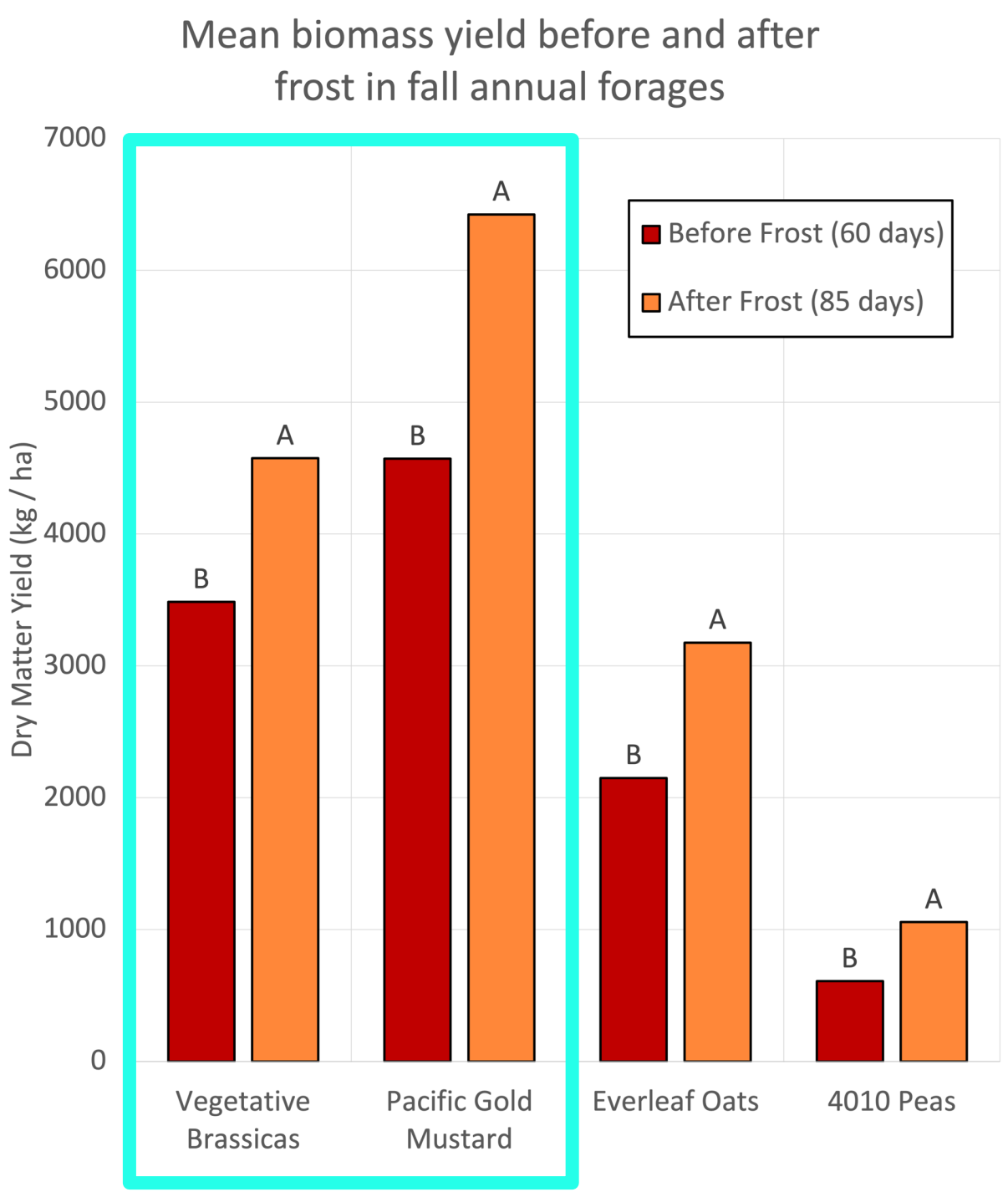
Results

In mid-fall harvests:

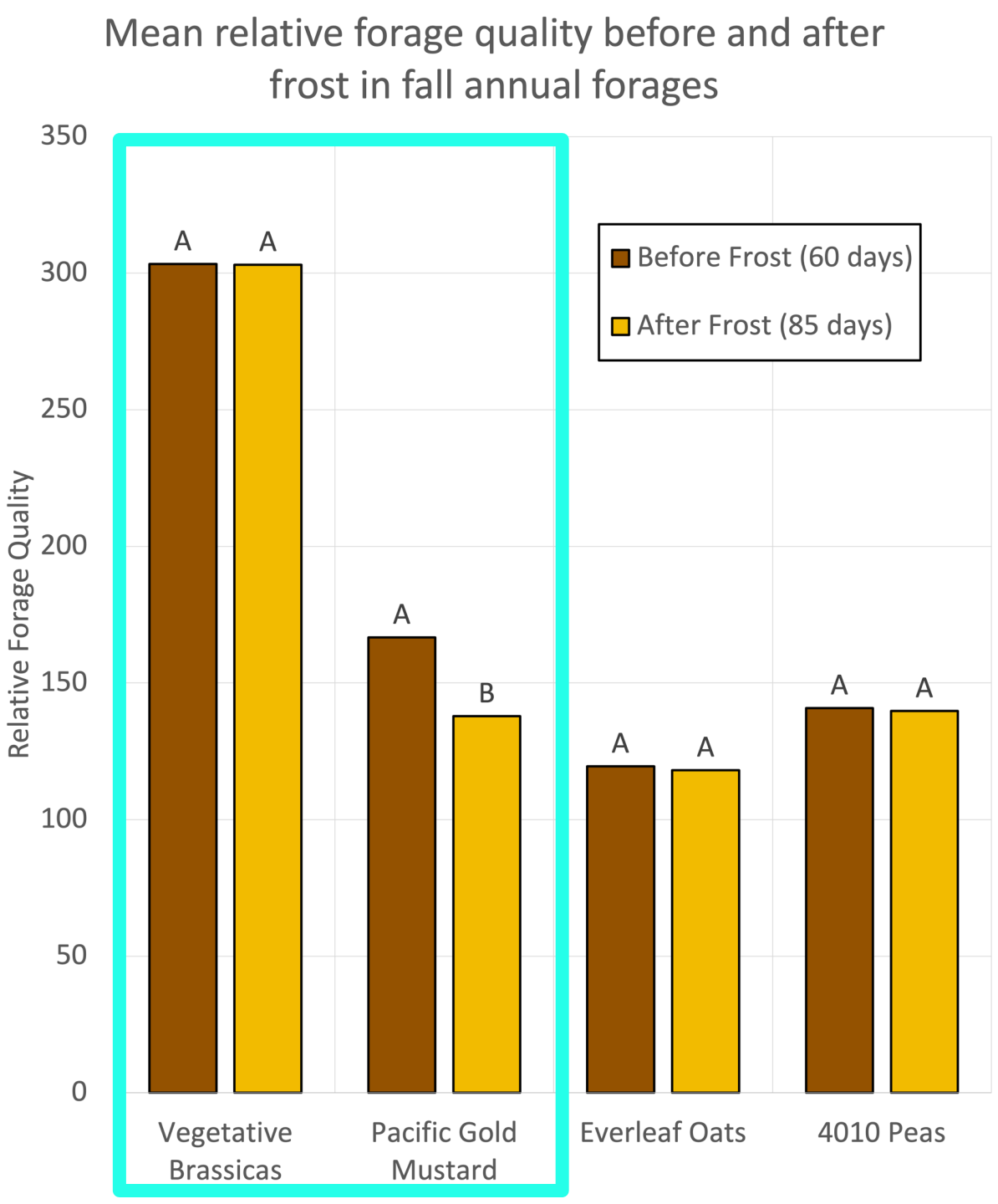
- **Forage mixture yield was higher when Appin turnip and Pacific Gold mustard were included.**
- **Mixtures with vegetative brassicas dramatically improved forage quality.**
- **Improvements in forage quality were driven by higher levels of non-fibrous carbohydrates and low fiber levels in vegetative brassicas.**
- **Mixes with up to 50% vegetative brassica seeding rate provides sufficient fiber to avoid health issues.**

Late Fall: Growth and Quality Changes

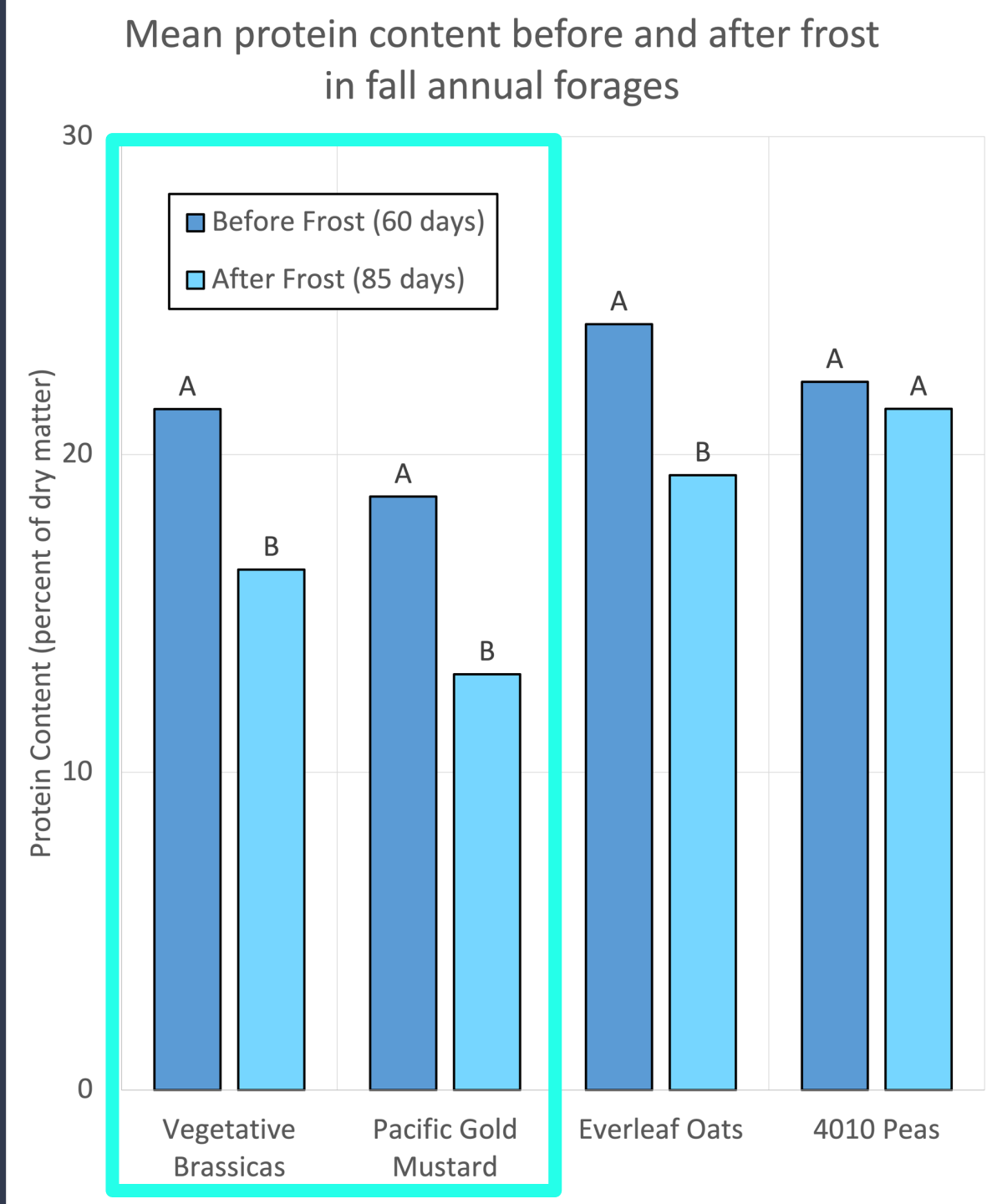
Growth from mid to late fall



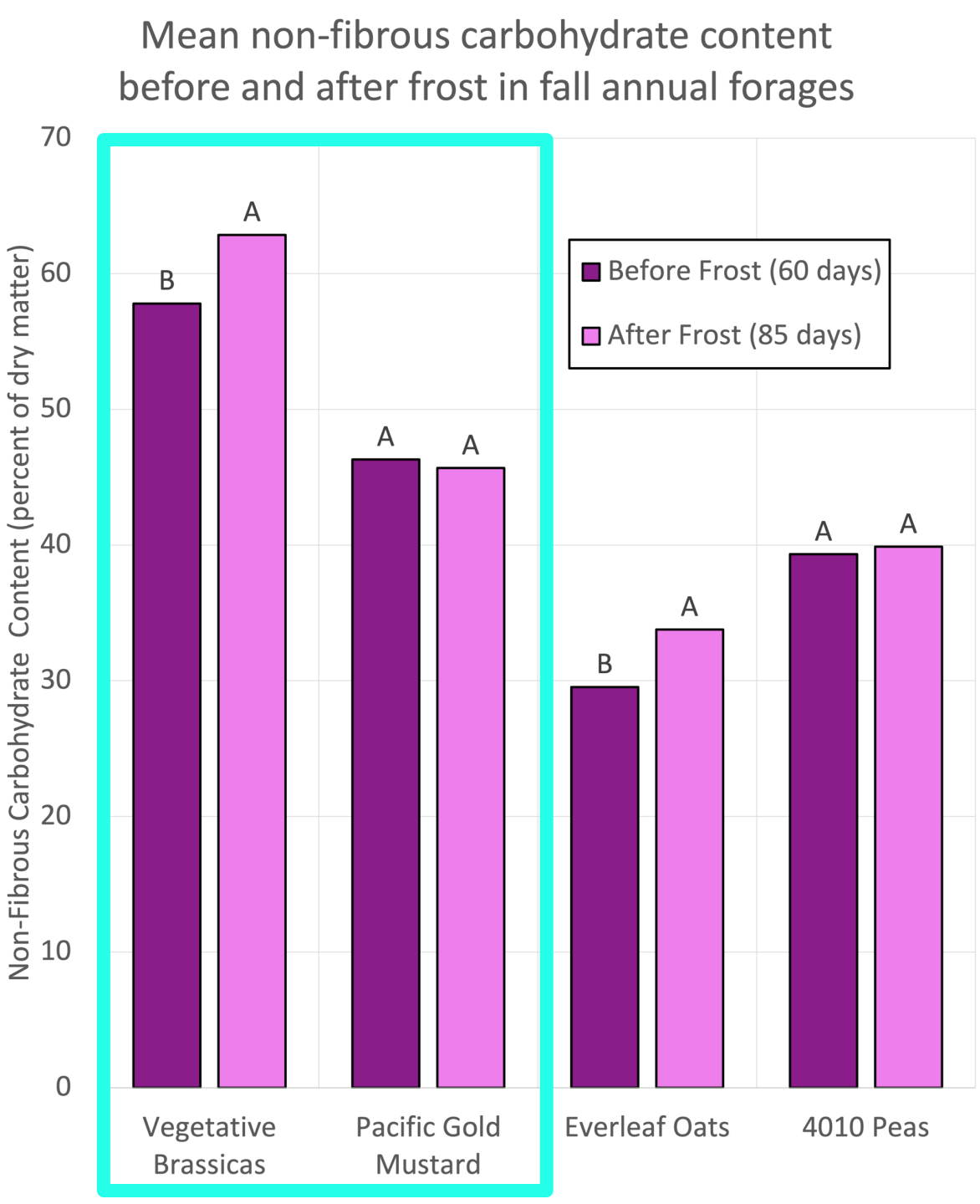
Relative Forage Quality



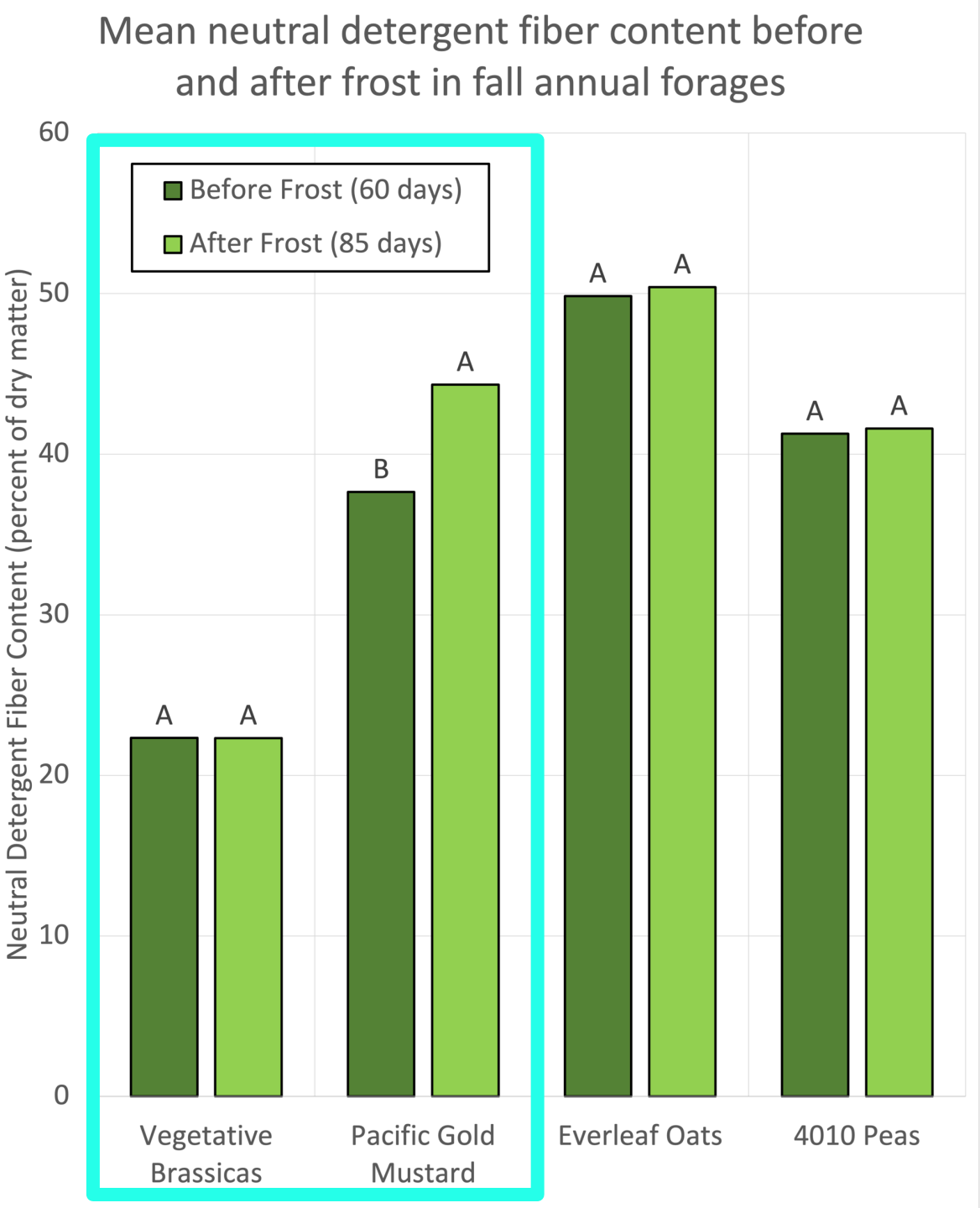
Protein


Mean protein content before and after frost in fall annual forages
Protein Content (percent of dry matter)
30
20
10
0
Before Frost (60 days)
After Frost (85 days)
A
B
A
B
A
B
A
A
Vegetative Brassicas
Pacific Gold Mustard
Everleaf Oats
4010 Peas

Non-fibrous carbohydrates



Fiber


Mean neutral detergent fiber content before and after frost in fall annual forages
Neutral Detergent Fiber Content (percent of dry matter)
60
50
40
30
20
10
0
Before Frost (60 days)
After Frost (85 days)
A
A
B
A
A
A
A
A
Vegetative Brassicas
Pacific Gold Mustard
Everleaf Oats
4010 Peas

Results

Delaying grazing until late fall after hard frosts led to:

- **Increase in brassica biomass was more than oats or peas.**
- **Vegetative brassicas maintained very high forage quality, while flowering mustard quality fell.**
- **Protein content decreased in all brassicas.**
- **Non-fibrous carbohydrates increased in vegetative brassicas.**
- **Fiber content increased in flowering mustard.**

Practical Conclusions

- **Vegetative brassicas can be mixed with oats and peas as a fall annual forage with 2500-3500 kg / ha yield and very high forage quality with adequate fiber.**
- **Yield increases into late fall.**
- **Forage quality remains very high after hard frosts.**

Thank you!

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Dr. Heather Darby

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