What Effect do Nitrogen Fertilization Rate and Harvest Date Have on Cranberry Fruit Yield and Quality?

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Thanks to:

Linda White, former Extension Agent, OSU

Joan Davenport, WSU

Cape Blanco Farms

Questions/objectives:

- Can our mild autumns be used to advantage to harvest fruit late?
- What are the advantages and disadvantages of harvesting later or “storing fruit on the vine”?
- What is the impact of N fertilizer rate on yield and fruit quality
- What is the impact of harvest date and N rate on fresh fruit storage quality?
- Can tracking growing degree data be used to predict harvest date?

Experimental details

- Site: Cape Blanco Cranberries, Port Orford
- Mature ‘Stevens’ (5 ft x 20 ft plots; 4 reps)
- 2007: Cranberry development over season
- 2008-09: Cranberry development. Impact of N rate & harvest date
    - 30, 50, 70 lb N/acre (21-0-0) ⅔ late June; ⅓ early July
    - 5 harvest dates from Oct. 1 through end of Nov.

Fruit collected from a 2 ft^2 area every two weeks, July – Dec.

Fruit collected from early July to mid-November, every 2 weeks

- Hand harvested
- Placed in bog water for 24 hours to simulate flood harvest conditions
- Fruit dried before shipping for storage or analysis for fruit quality

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- Shipped fruit packed in clam shells (340 g)
- Tested for fruit quality before and after cold storage (38 ºF) and room temperature storage
- Stored for 3 weeks and then re-evaluated for quality

Quality evaluated:

- Brix; TA; pH; total anthocyanins; berry weight; berry diameter; firmness; rot; decay; physiological damage and weight loss during storage

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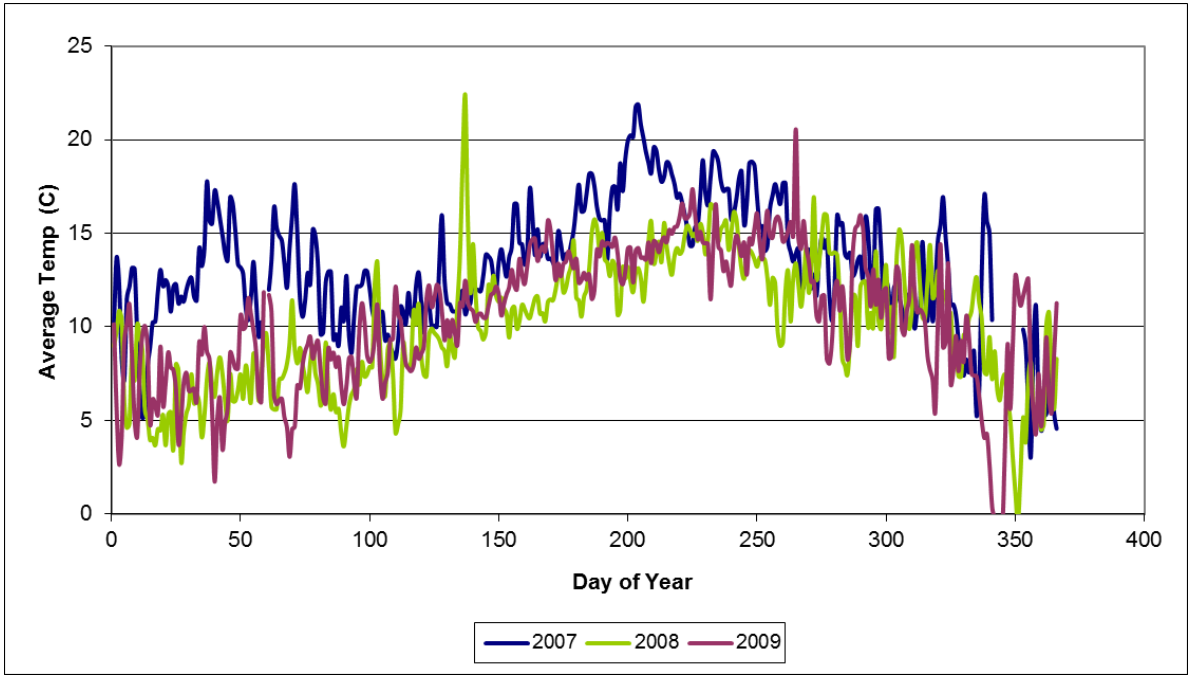
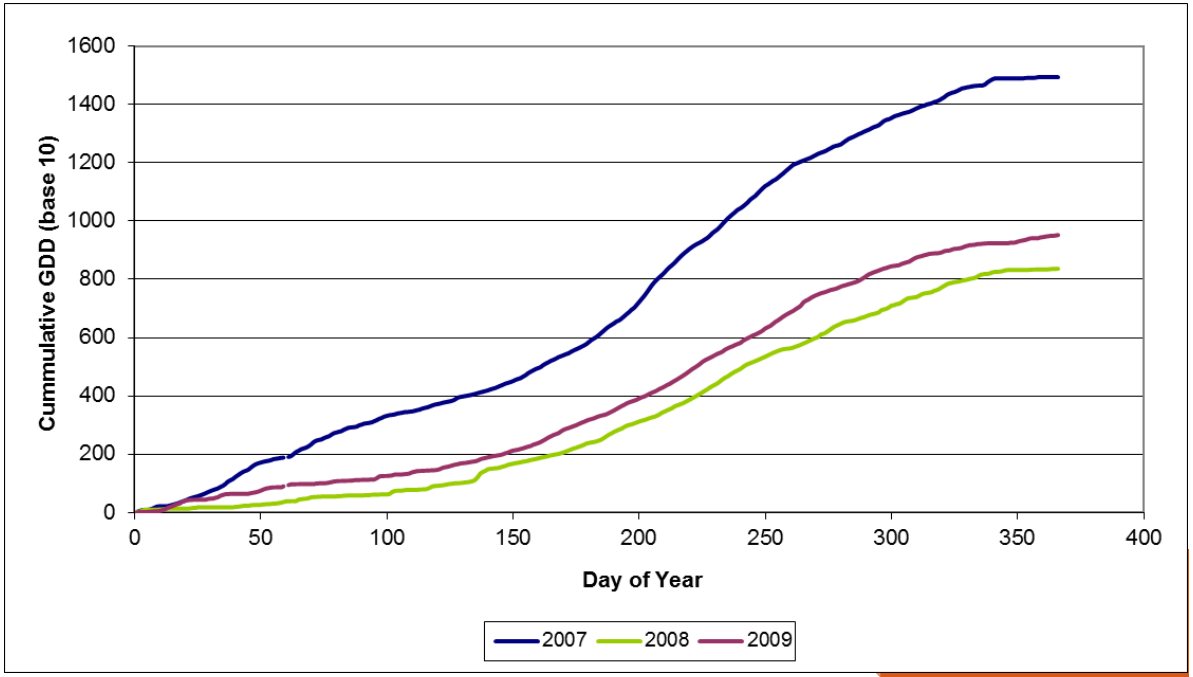
Weather

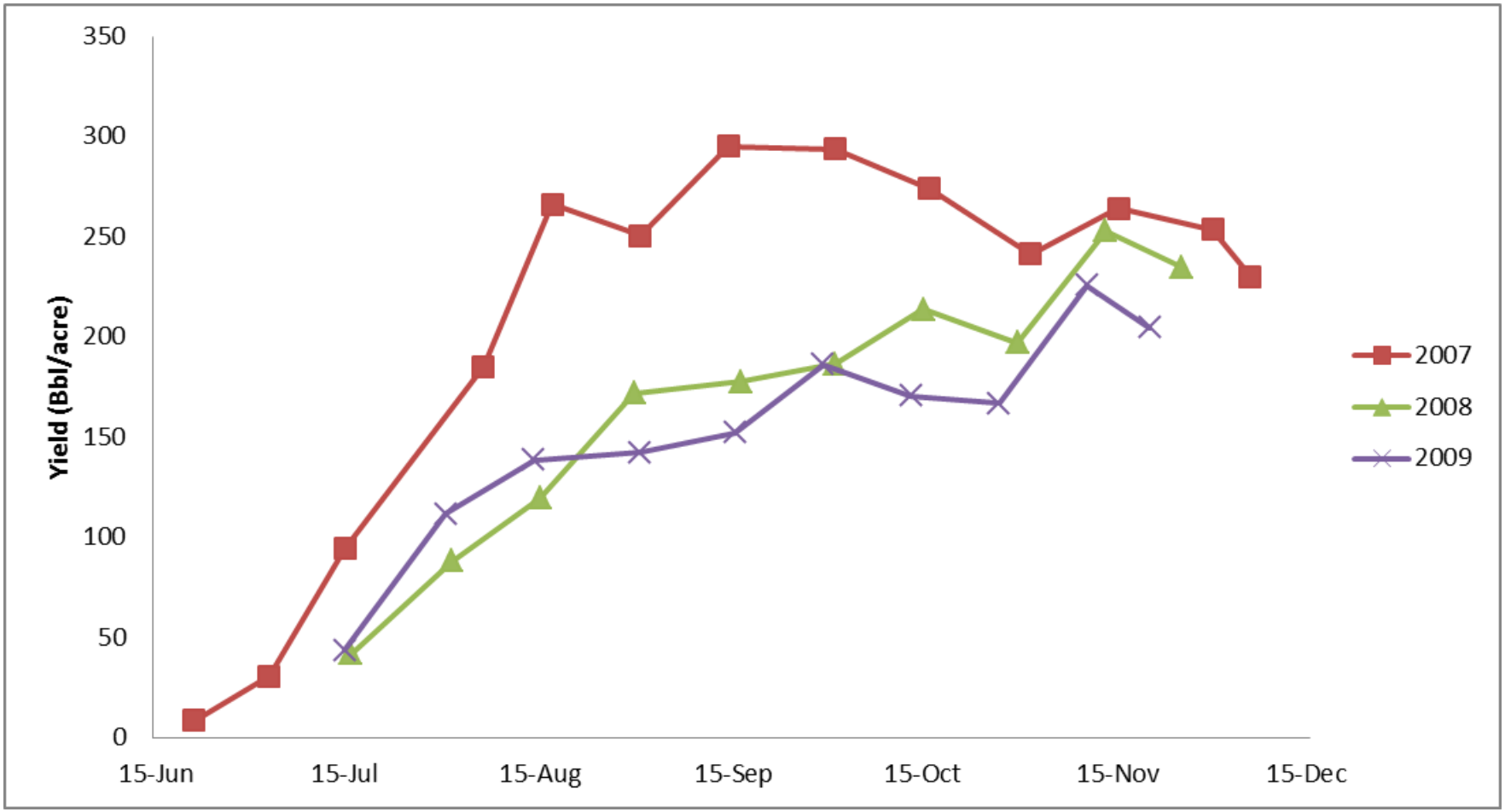
- 2007 warmer than 2008 & 2009
- GDD much greater in 2007
- 2008 & 2009 years for harvest date and N rate study were similar





GDD = Growing Degree Days
Cumulative from Jan. 1 of each year
[(daily avg. temp) – 50 ºF base)]

Yield progression over time (Bbl/acre estimated)



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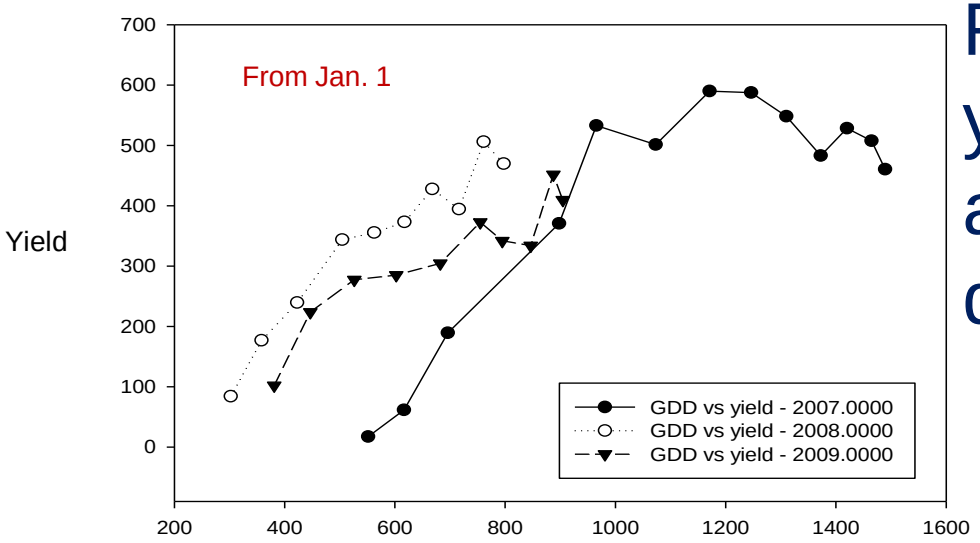
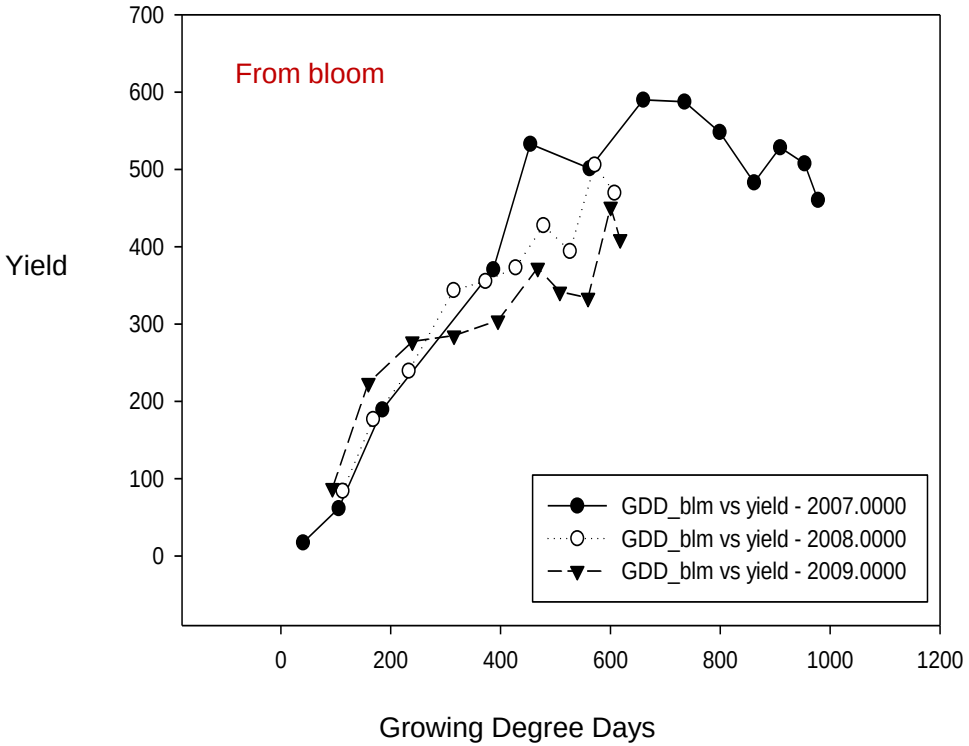
Development over time, 2007-2009

Relationship between yield and GDD from Jan. 1 and from estimated bloom date





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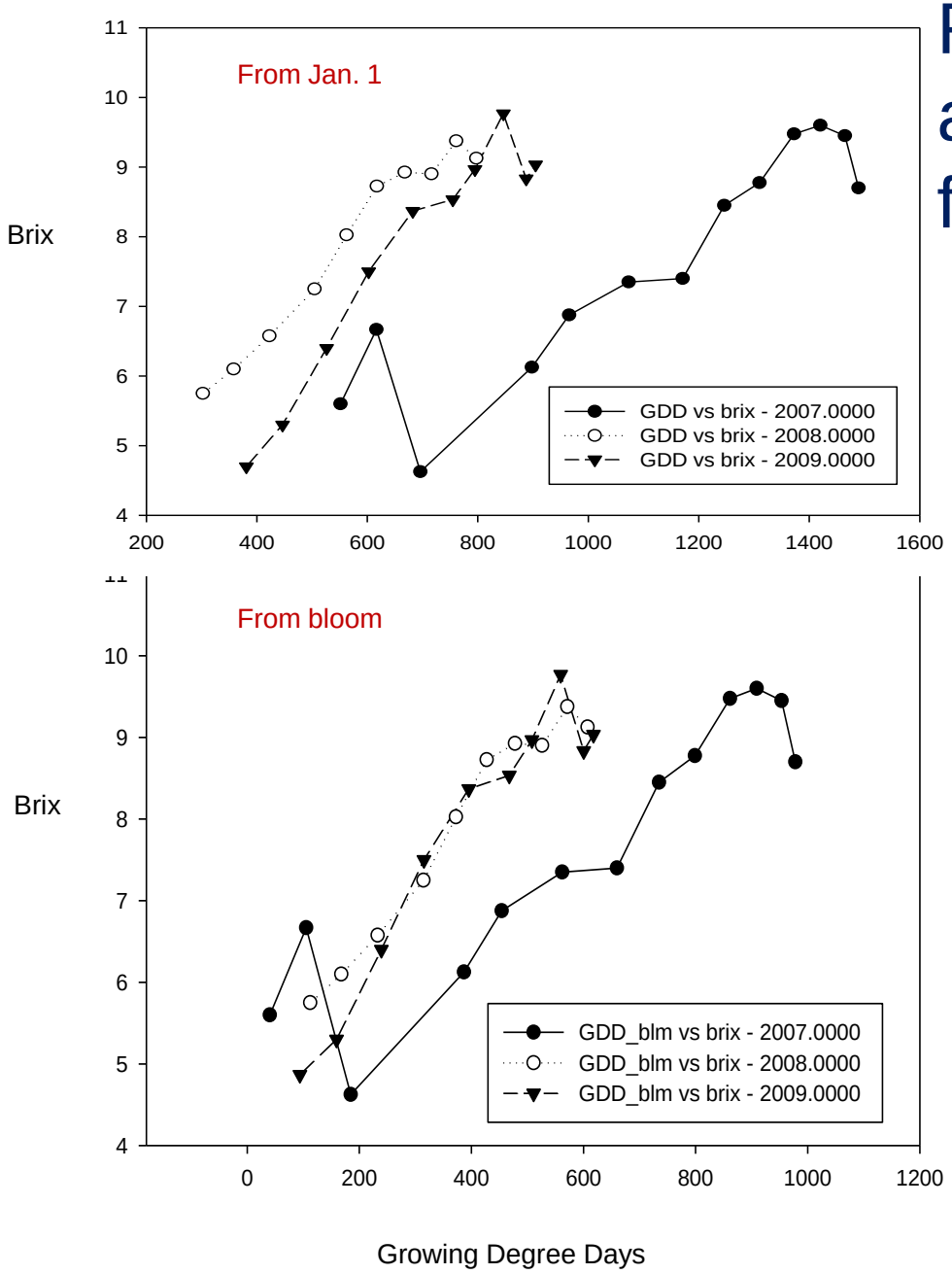
Relationship between Brix and GDD from Jan. 1 and from estimated bloom date



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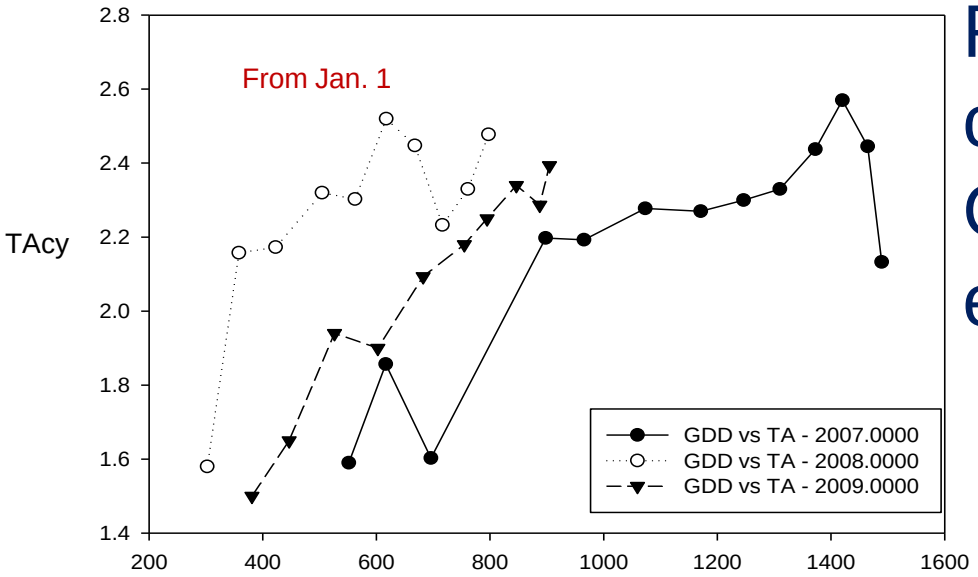
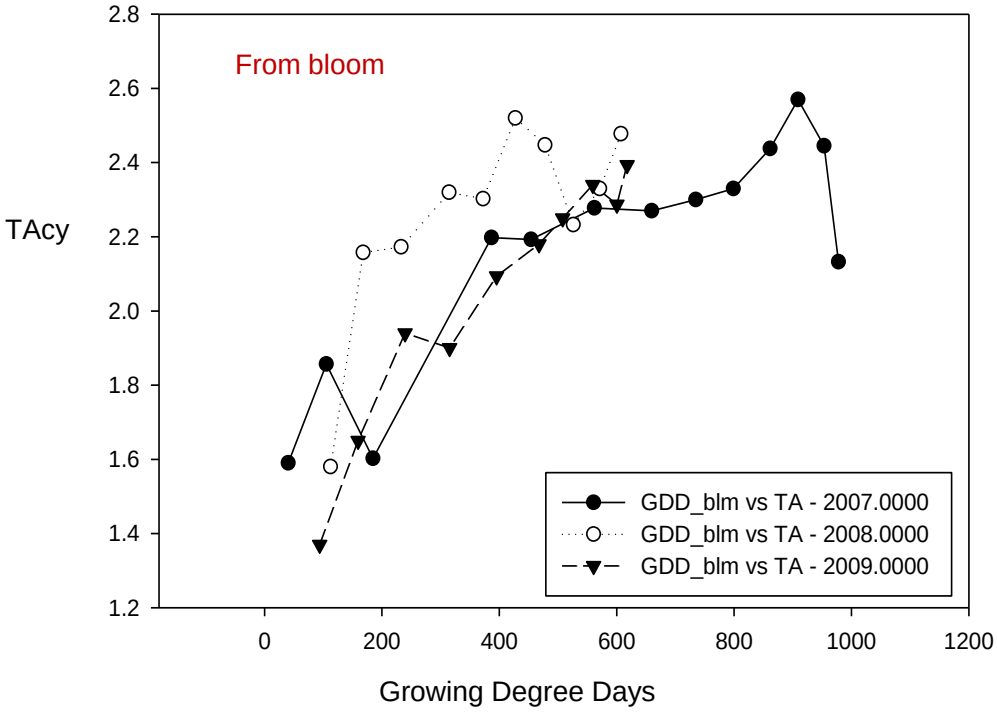
Relationship between color (anthocyanins) and GDD from Jan. 1 and from estimated bloom date





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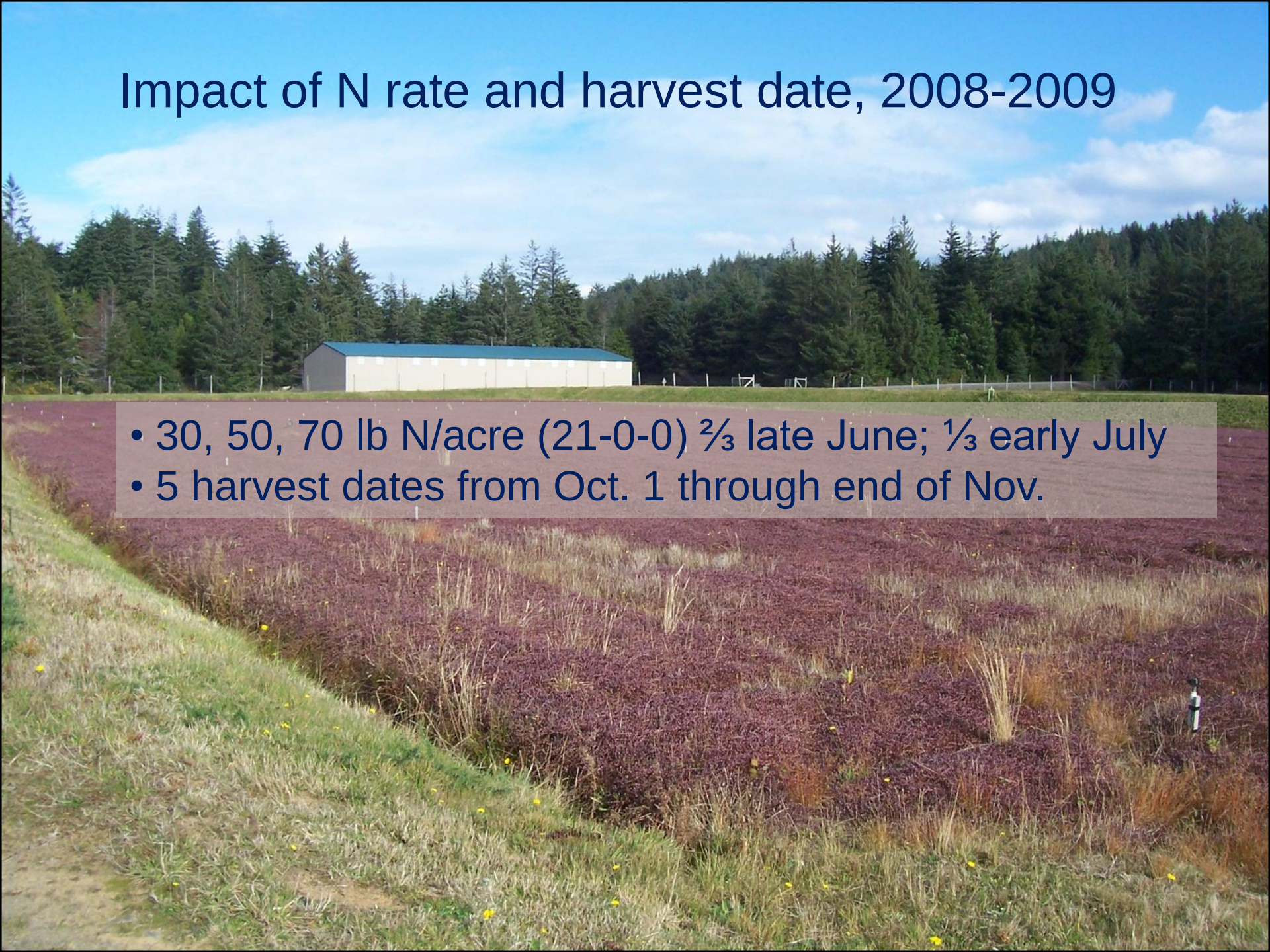
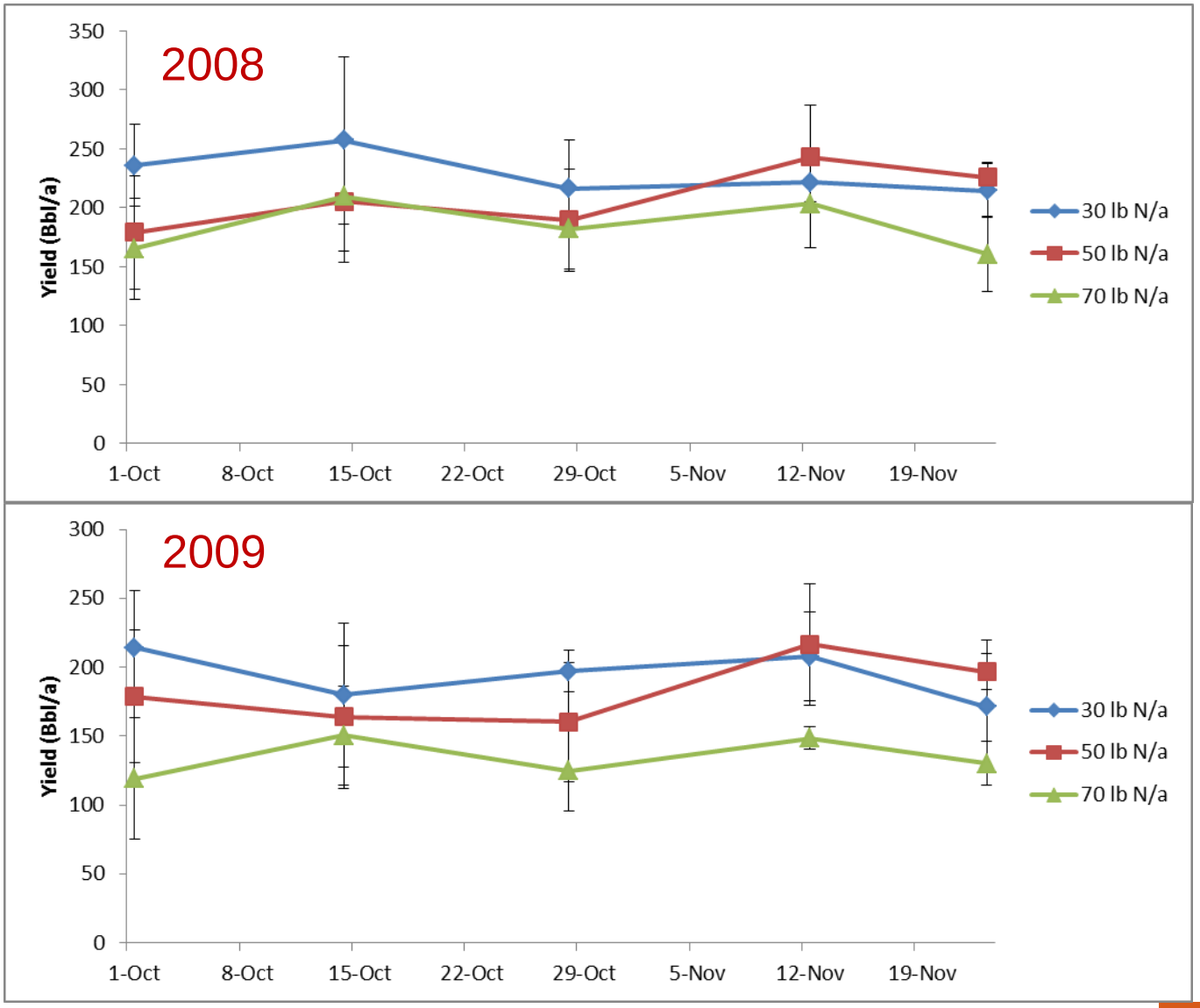
Impact of N rate and harvest date, 2008-2009



- 30, 50, 70 lb N/acre (21-0-0) ⅔ late June; ⅓ early July
- 5 harvest dates from Oct. 1 through end of Nov.

Total yield (estimated BBl/acre) – harvest date & N rate



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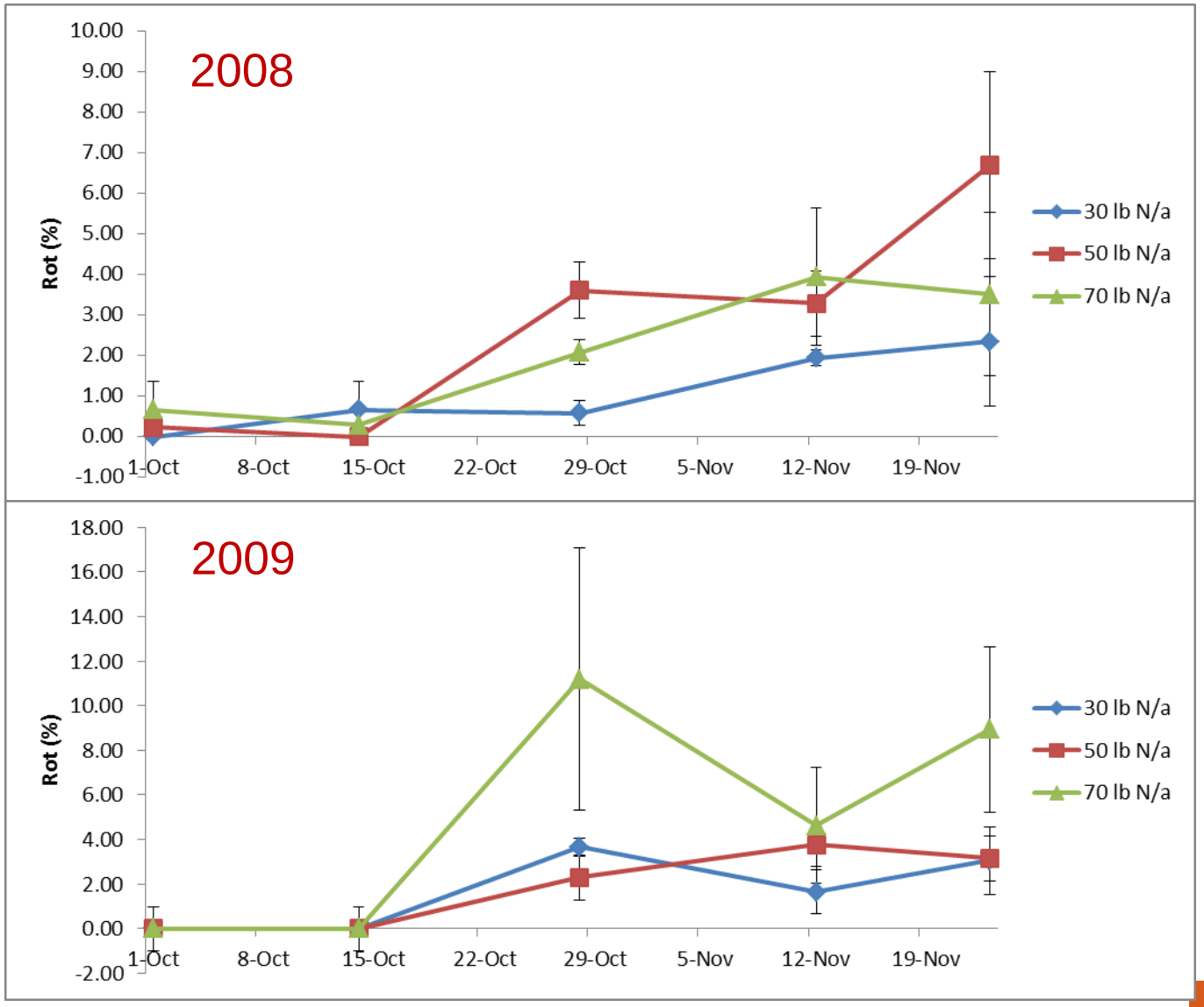
Rot (%) – harvest date & N rate



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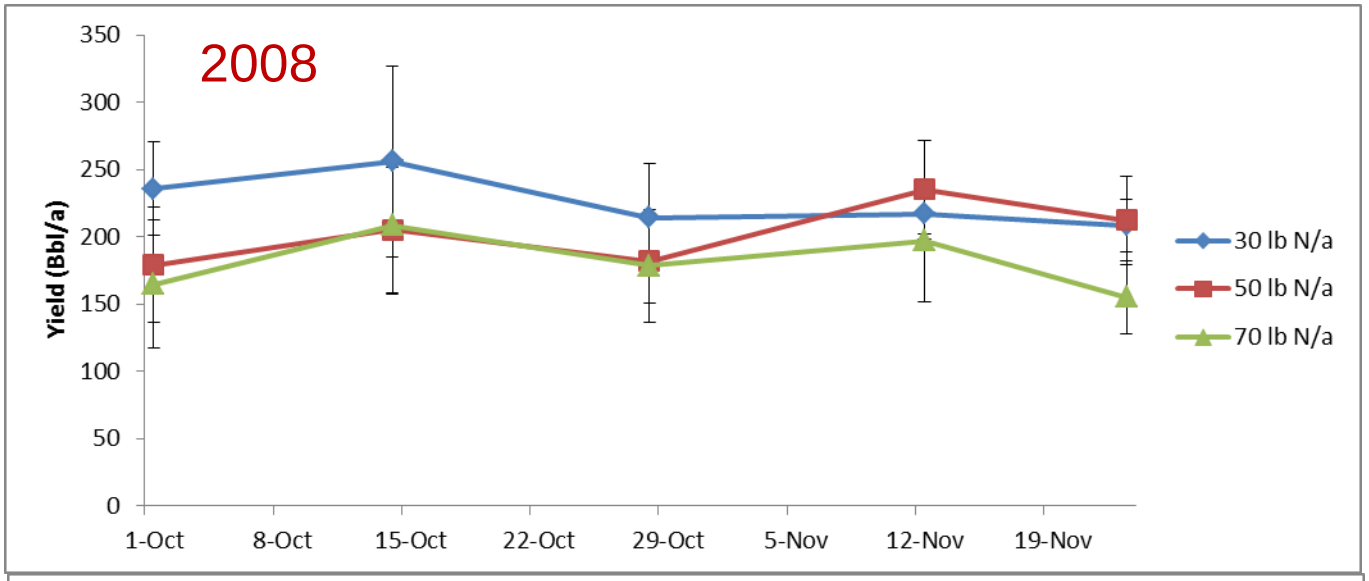
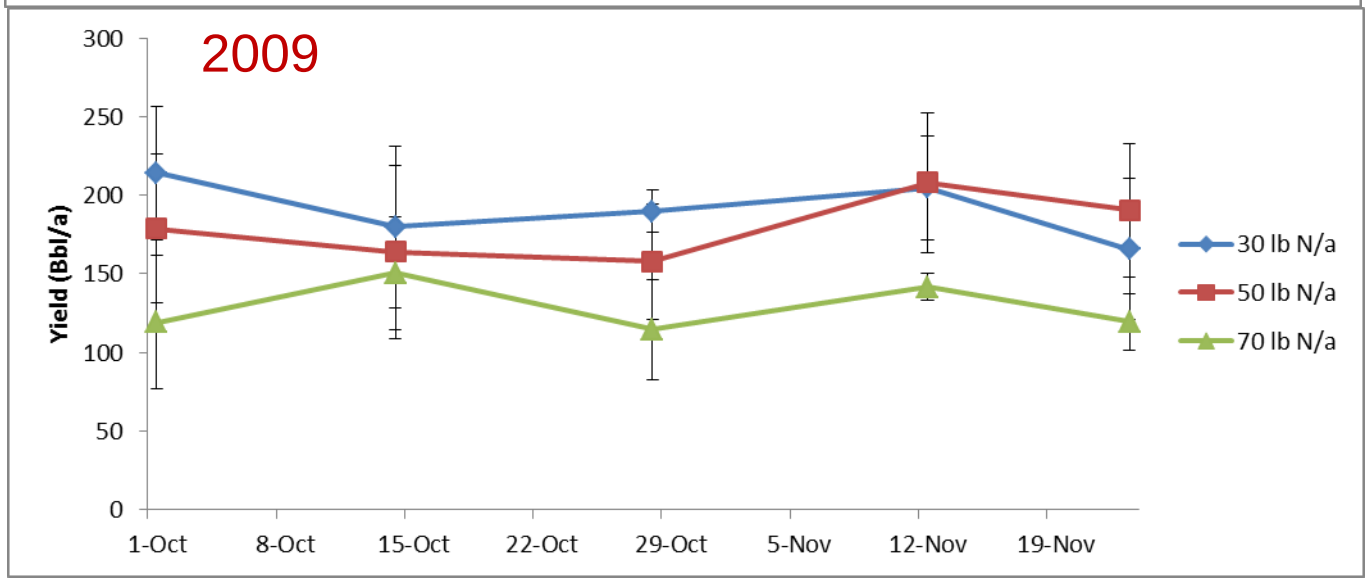
Marketable yield (estimated BBl/acre) – harvest date & N rate





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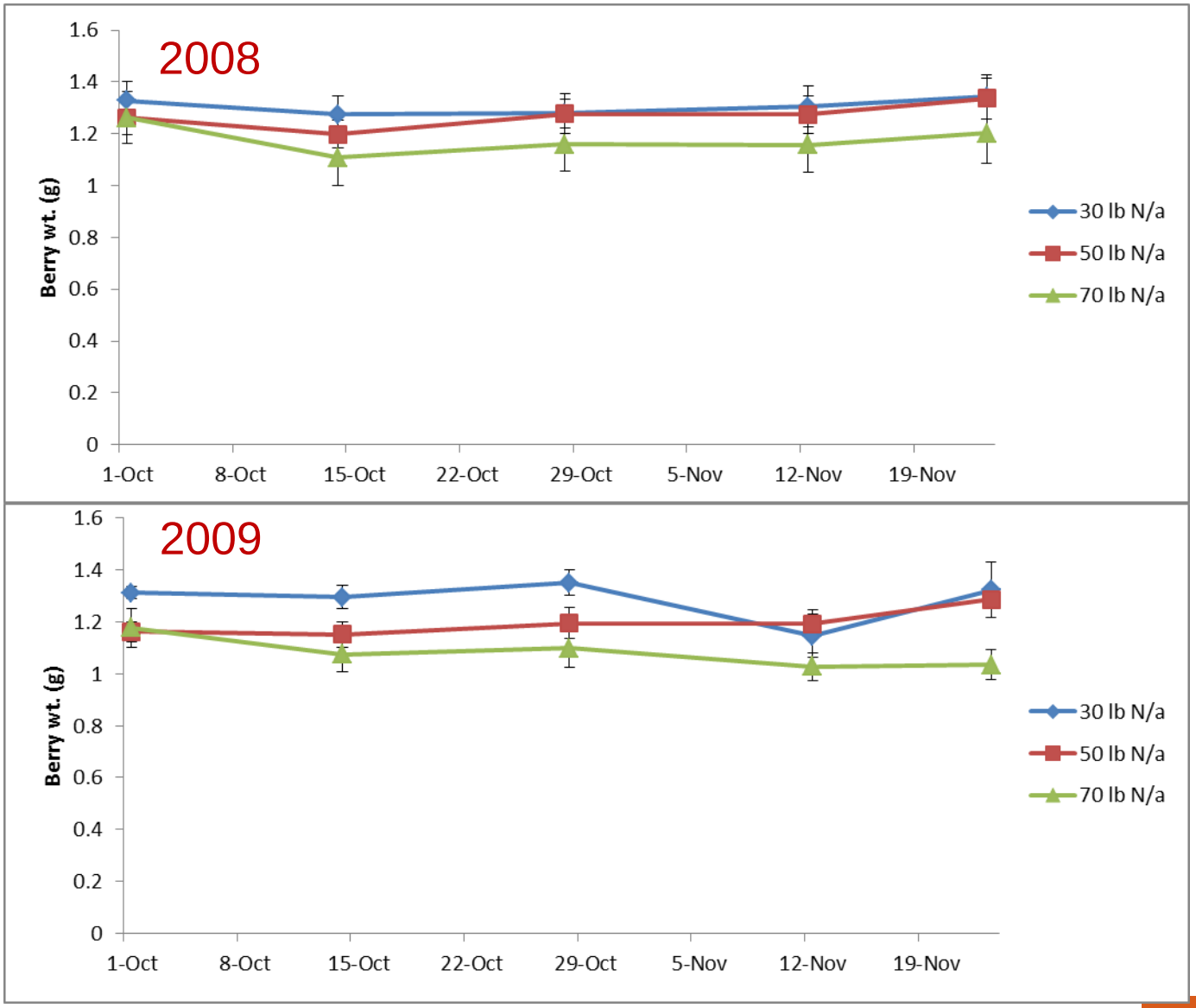
Berry weight – harvest date & N rate



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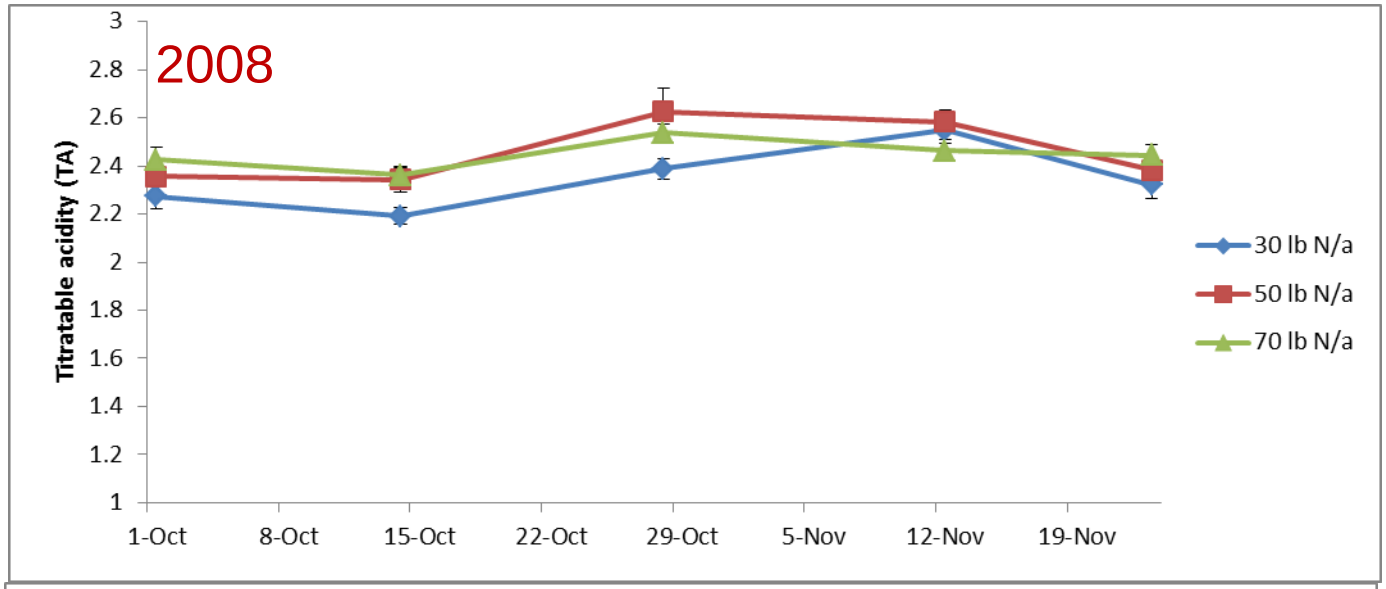
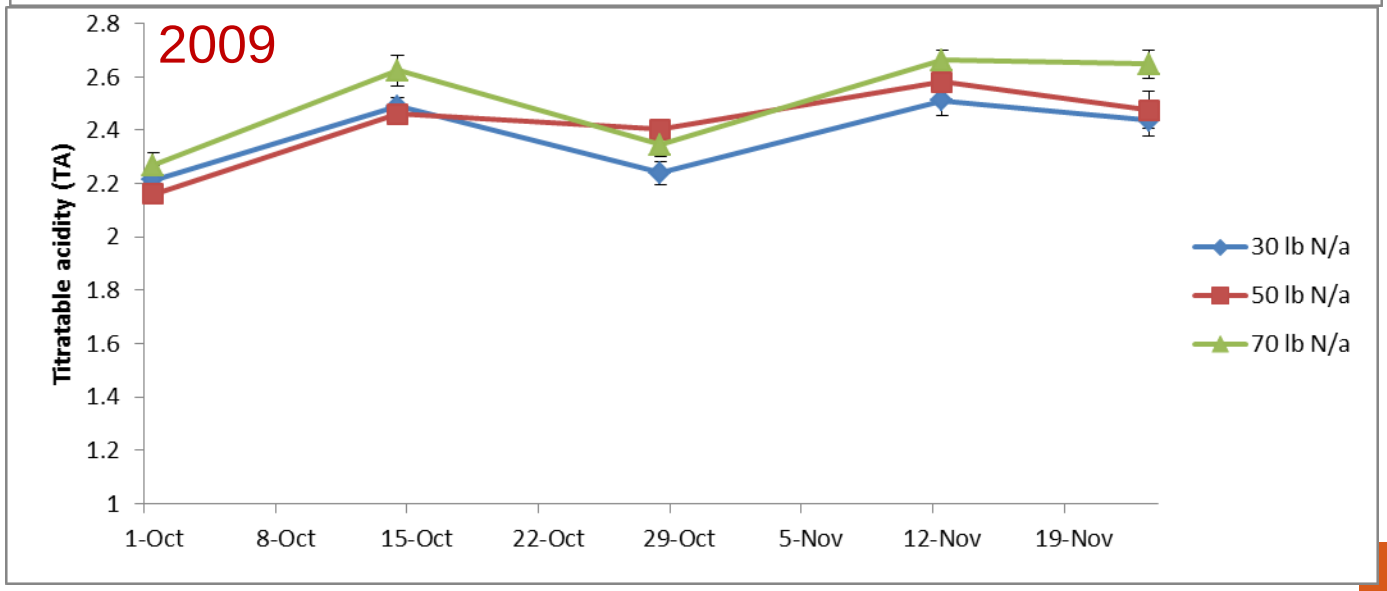
TA (titratable acidity) – harvest date & N rate





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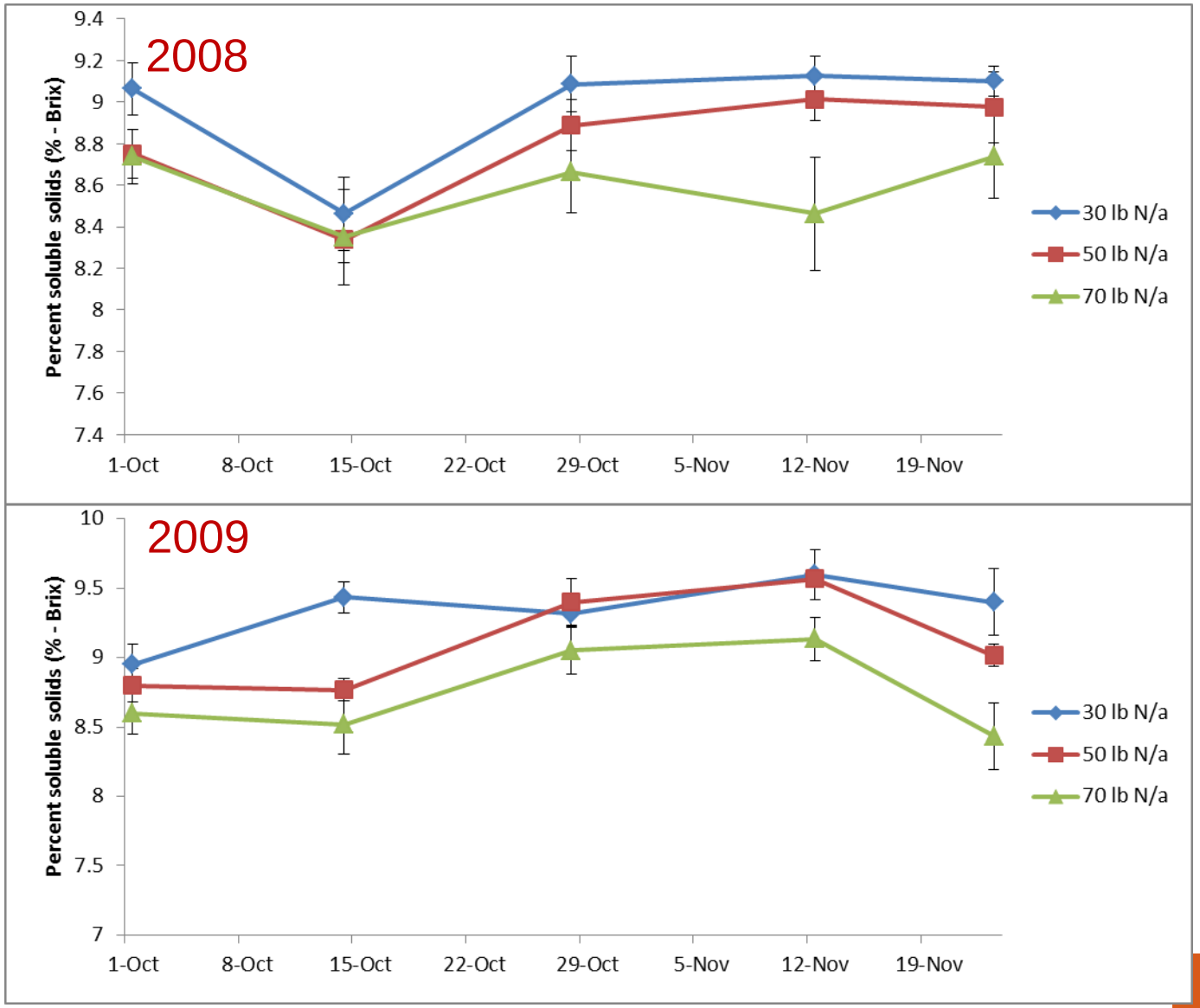
Brix – harvest date & N rate



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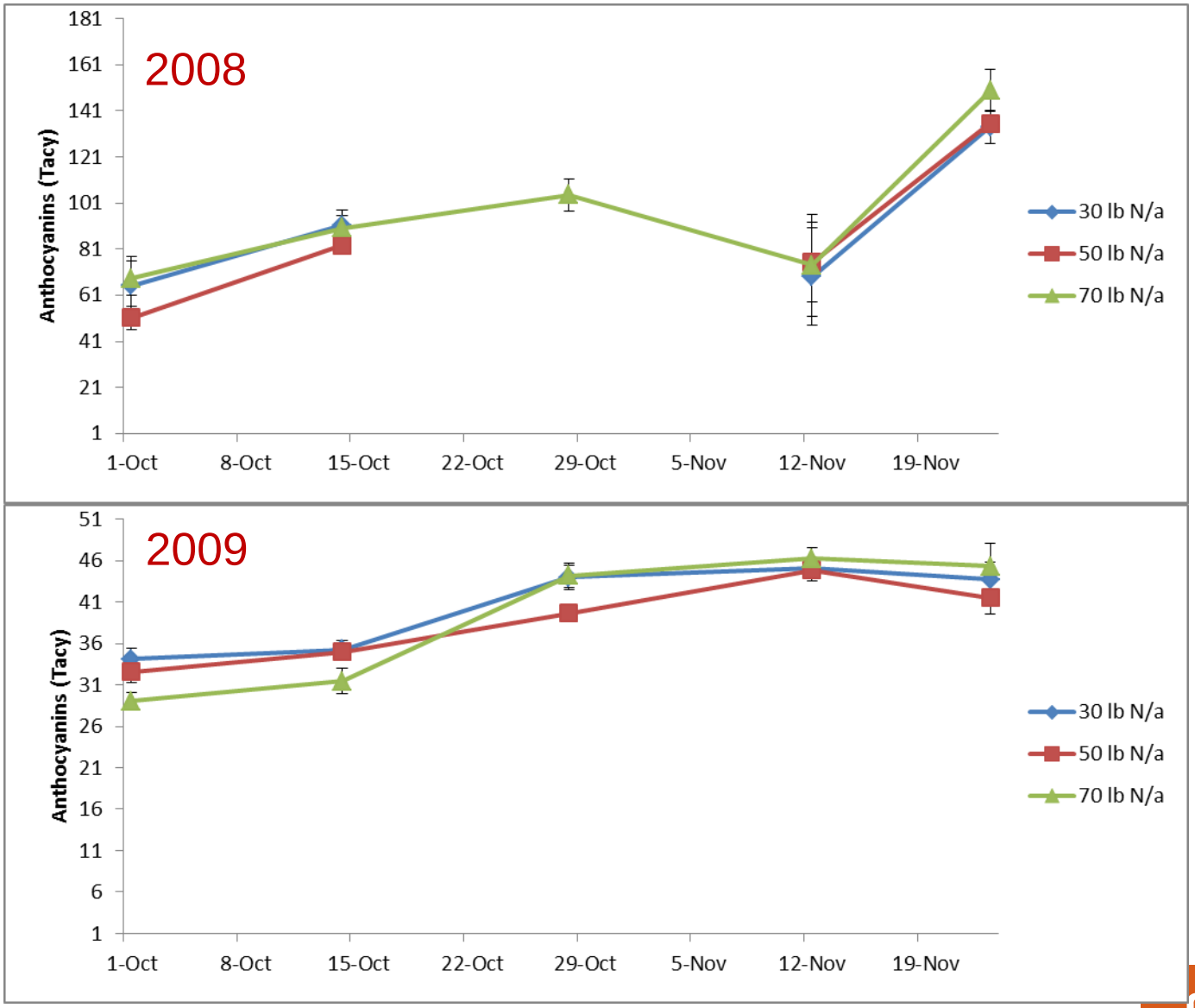
Anthocyanins – harvest date & N rate



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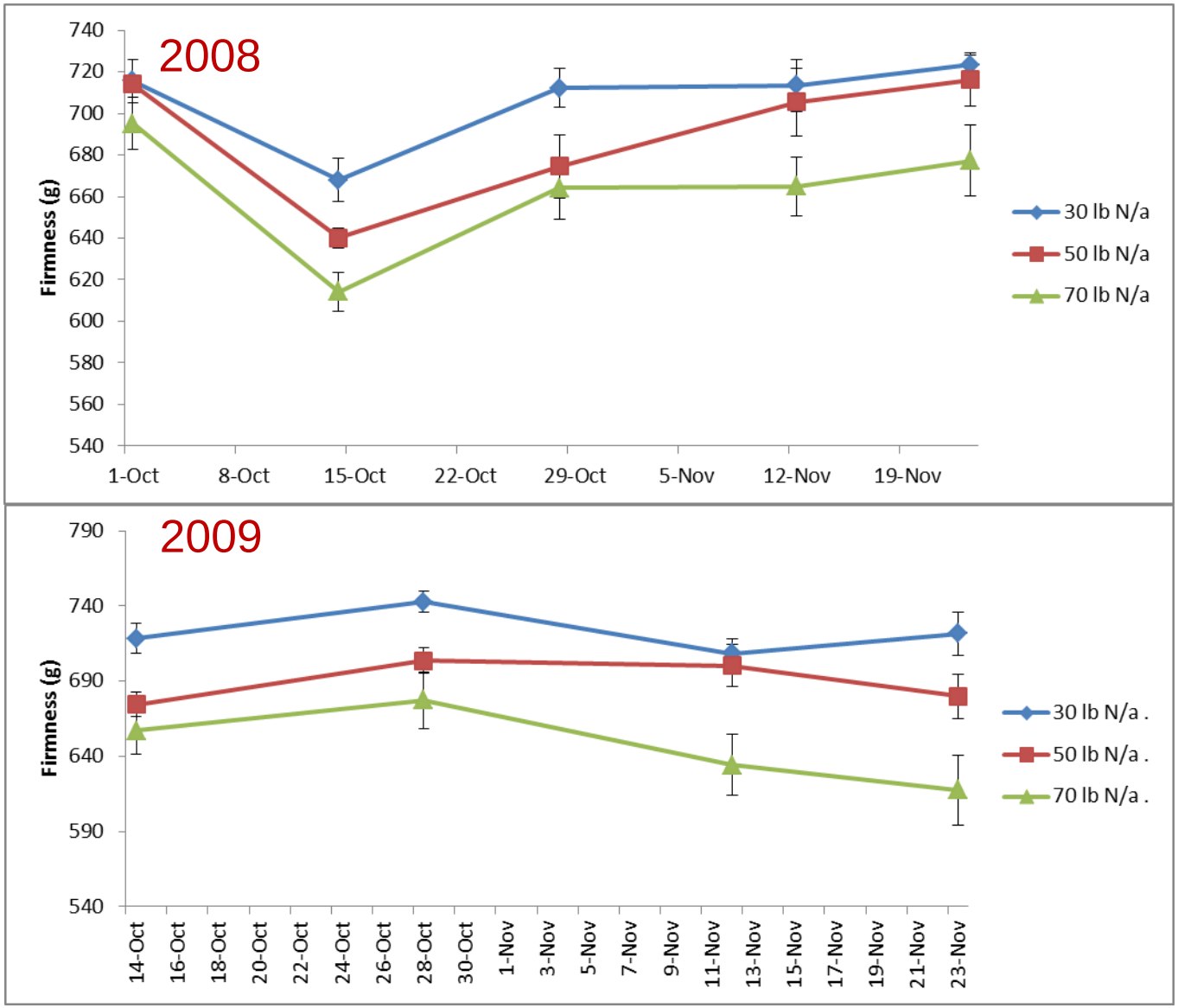
Firmness – harvest date & N rate



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Impacts on storage

- Fruit shipped to us (5 - 6 days) evaluated
- Stored for 21 days (re-evaluated) at cold storage (~ 38° F) or room temperature (~ 65-70 F)
  - 3 N rates
  - 5 harvest dates
    - Sept. 29 - Oct. 1
    - Oct. 13 - 14
    - Oct. 27 - 29
    - Nov. 10 – 12
    - Nov. 21 - 25

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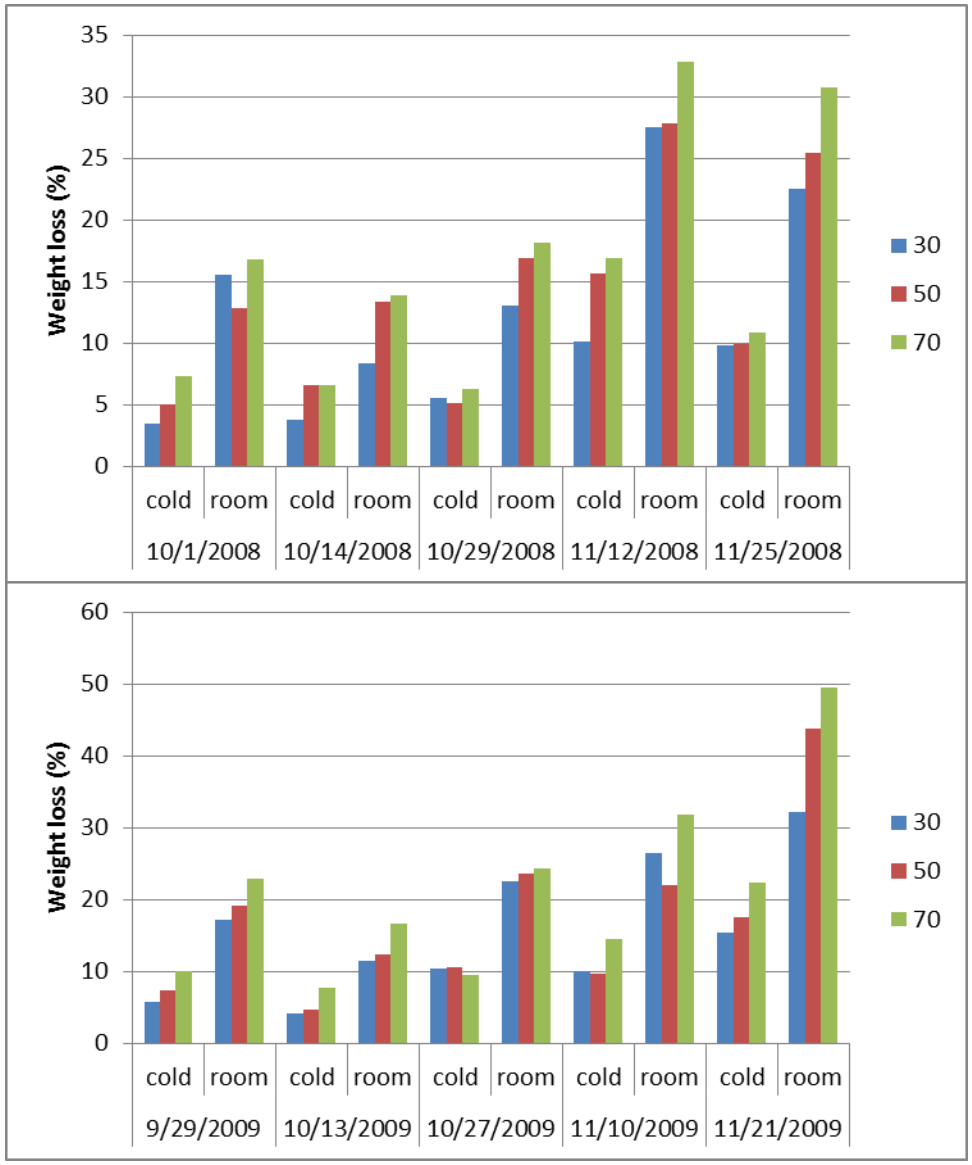
Weight loss during cold & room storage – harvest date & N rate



- Lowest weight loss at 30 lb N/a rate
- Weight loss similar between Oct 1 through Nov. 1 harvest dates but increases with later harvests
- Much greater weight loss at room temp. storage

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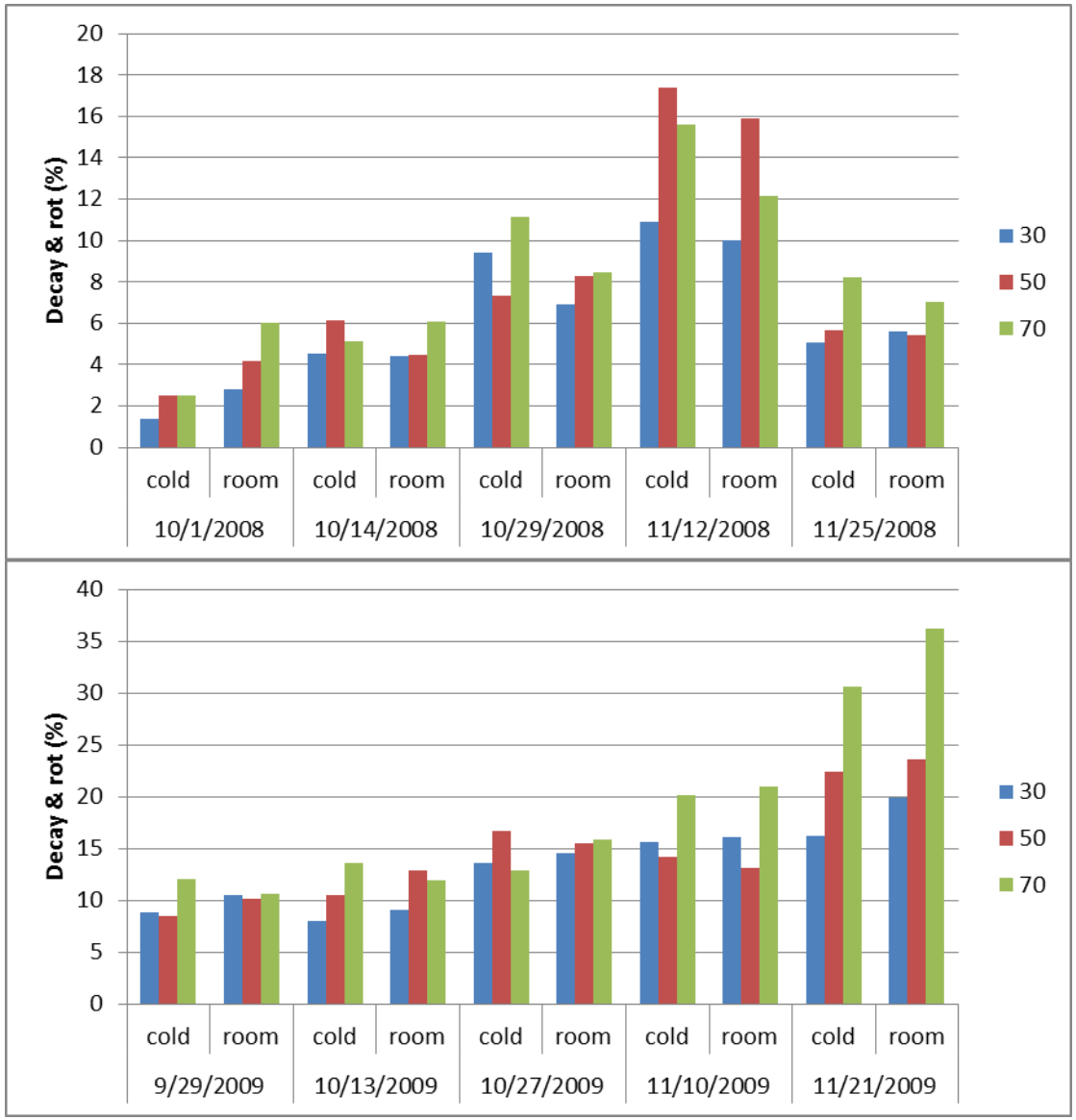
Decay (& rot) during cold & room storage – harvest date & N rate



- More decay at 70 lb N/acre than at 30 lb N/acre rate
- Storage temperature had little impact on percent decay

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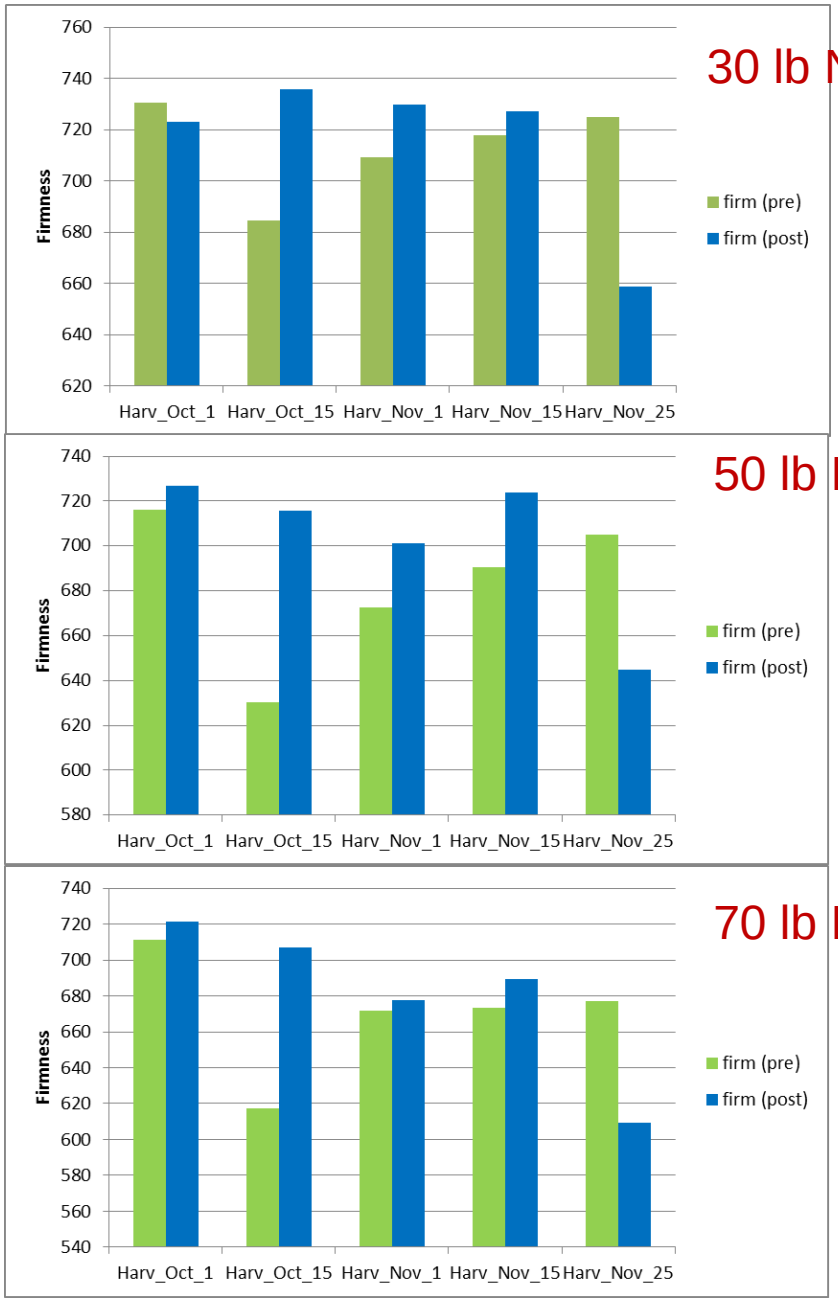
Firmness before and after cold storage – harvest date & N rate



- Firmness increased during storage, especially for mid-Oct to early Nov. harvest dates.
- Firmness declined dramatically during storage for late Nov. harvest
- Less firm with highest rate of N

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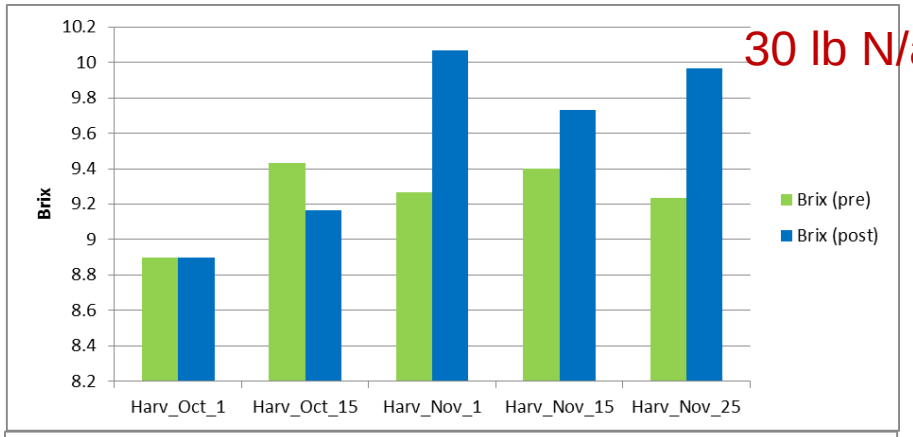
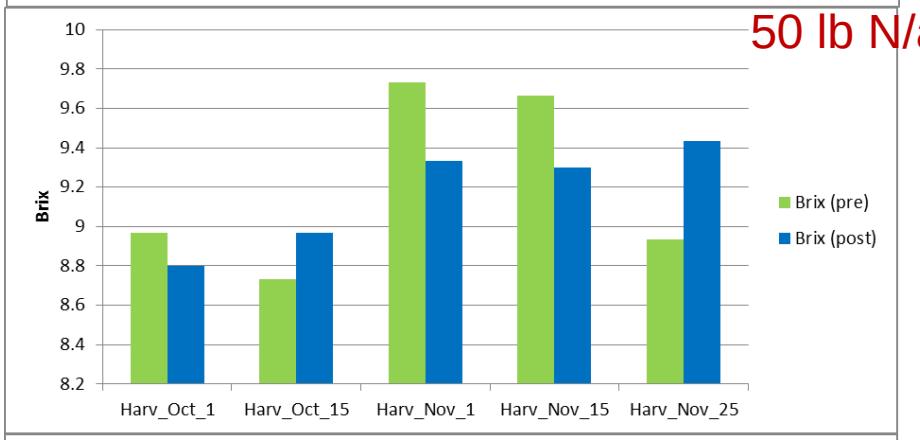
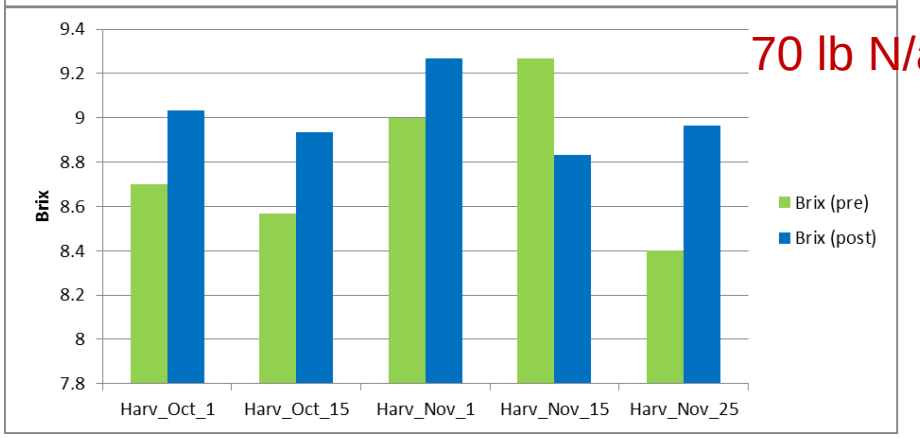
Brix before and after cold storage – harvest date & N rate (2009)







- Brix increased from Oct. 1 to Nov. 1 harvest
- Lowest Brix at highest N rate (70 lb N/a)
- Little change or increase in Brix after storage

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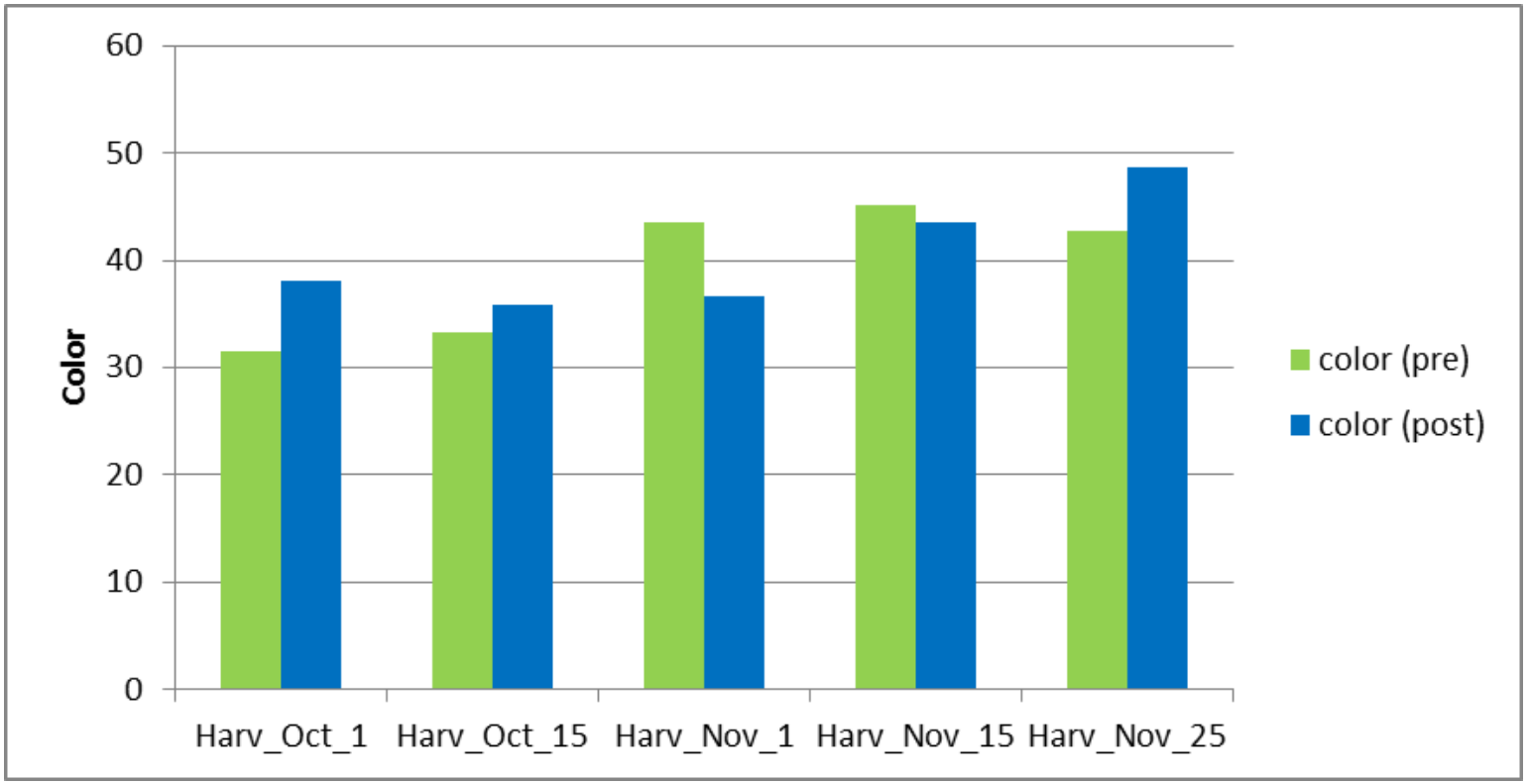
Color before and after cold storage – harvest date (no effect of N rate)



- Color increased with later harvests
- N rate no effect on color response in storage
- Little change to slight increase in color during storage

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Conclusions:

- No clear relationship between GDD and developmental stages – will look further
- Impacts of N fertilization rate are clear:
  - 30 lb N/a had greatest yield, least rot, greatest Brix and firmness and better storage (least weight loss)
  - 70 lb N/a reduced yield, increased rot, reduced Brix and firmness and storage quality
- Impacts of harvest date:
  - Delaying harvest from beginning of October to mid- to end October shows promise:
    - equal to greater yield, higher color, brix and similar weight loss in storage

Conclusions:

Impact of harvest date and N rate on relative yield

N rate	October 1	October 15	November 1
2008			
30 lb N/a	100%	108%	91%
50 lb N/a	76%	87%	77%
70 lb N/a	70%	89%	75%
2009			
30 lb N/a	100%	84%	89%
50 lb N/a	84%	77%	74%
70 lb N/a	56%	70%	53%