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Beginner School 2008 - Cranberry Nutrition and Fertilizers

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Cranberry Nutrition and Fertilizers

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Most critical minerals in cranberry fertility programs

- Nitrogen
- Phosphorus and potassium
- Magnesium and (calcium)
- (Minor elements)



How cranberries get mineral nutrients

- From soil
 - Cranberry soil very sandy - holds little
 - Organic matter - 1-2% only
- From recycling in the plant
 - Some stored in stems and roots
- From fertilizer



Fertilizer availability

- Soil applied
 - Similar to soil native elements
 - Must dissolve in soil water prior to uptake
 - Foliar applied
 - Limited by cuticle thickness
 - mobility to target organ
 - concentration of spray
 - wet period/washoff
- Advantages when root uptake limited



Nitrogen and Cranberries

- Nitrogen is arguably the most important fertilizer element applied to cranberries.
- Research has focused on N rates, forms, and timing
- Cultivars appear to respond differently
Ones with large fruit need more N



N is correlated with yield

- Moderate rate of applied N associated with greatest yield
- N applied this year, last year, and year before all play a role in this year's yield
- %N tissue test standard
 - 0.9 - 1.1% in mid-August
 - as high as 1.3% ok in Stevens

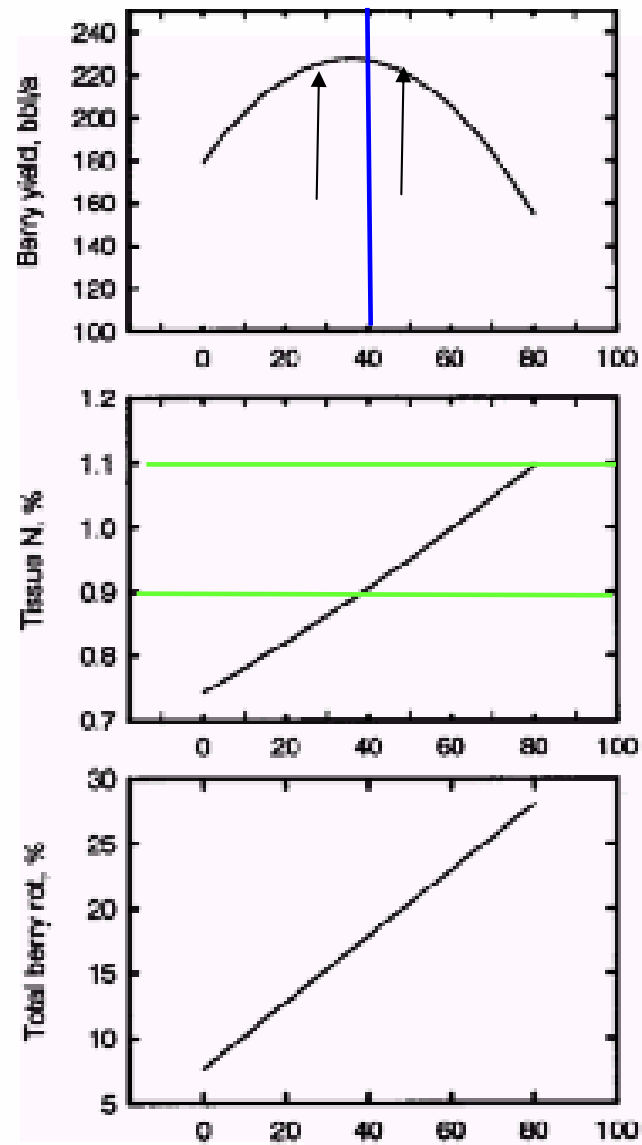


J. Smith - N tracer study

- Only 1/3 of N in new tissue and fruit came from applications made in the current season
- Tracer was stored in old stems in second year - then recycled to new growth



Figure 11.—Yield, tissue N, and rot of cranberries with various N fertilizer rates.*



*Massachusetts-grown 'Stevens'



Low vs. high N rates

Low rate = 25-30 lb/a

High rate = 50-60 lb/a

N rate	year 2 bbl/A	year 3 bbl/A
low	183	164
high	143	127
sig.	***	***

Two blue arrows point from the 'sig.' row to the '***' values in the 'year 2' and 'year 3' columns.

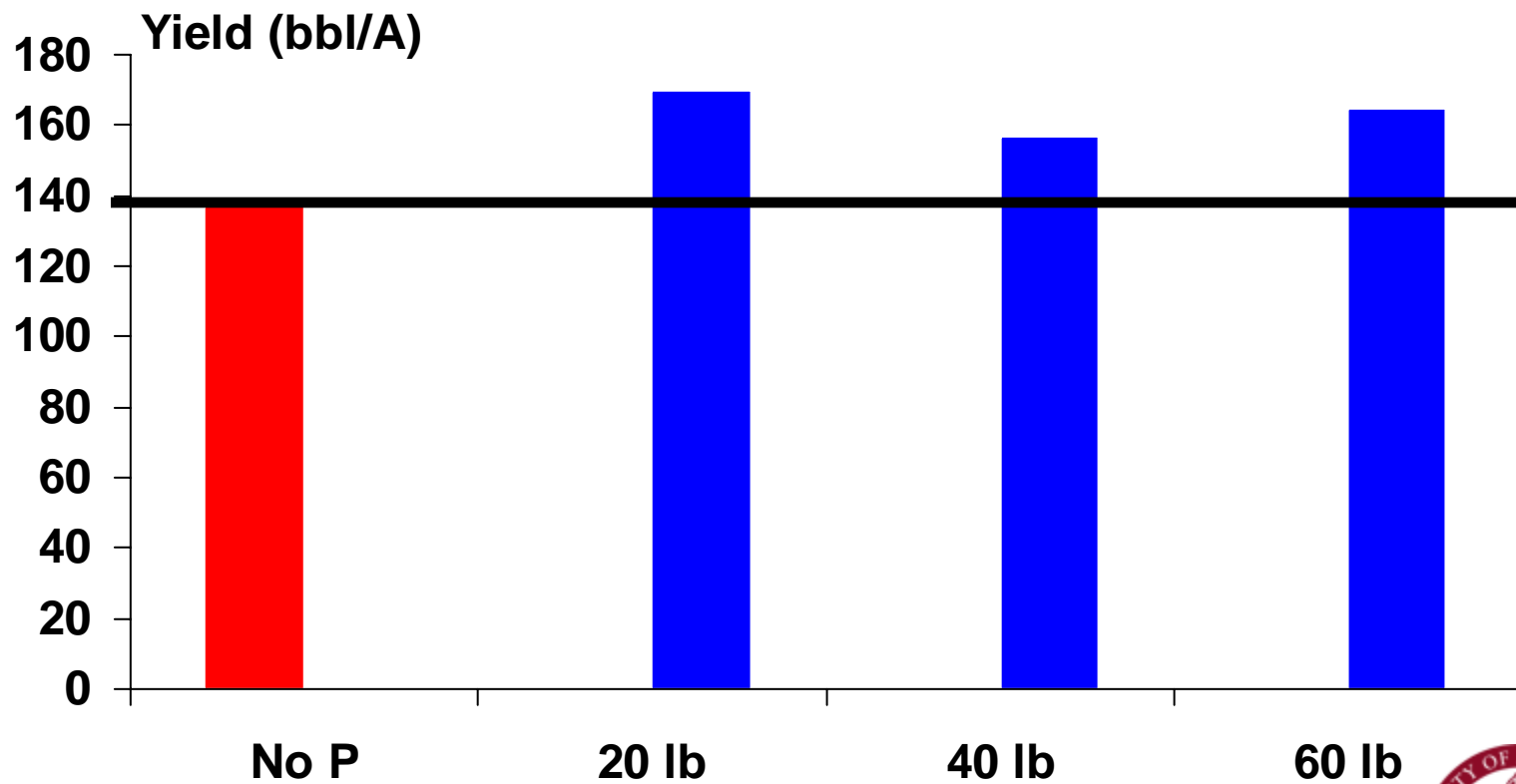


Phosphorus and potassium requirements

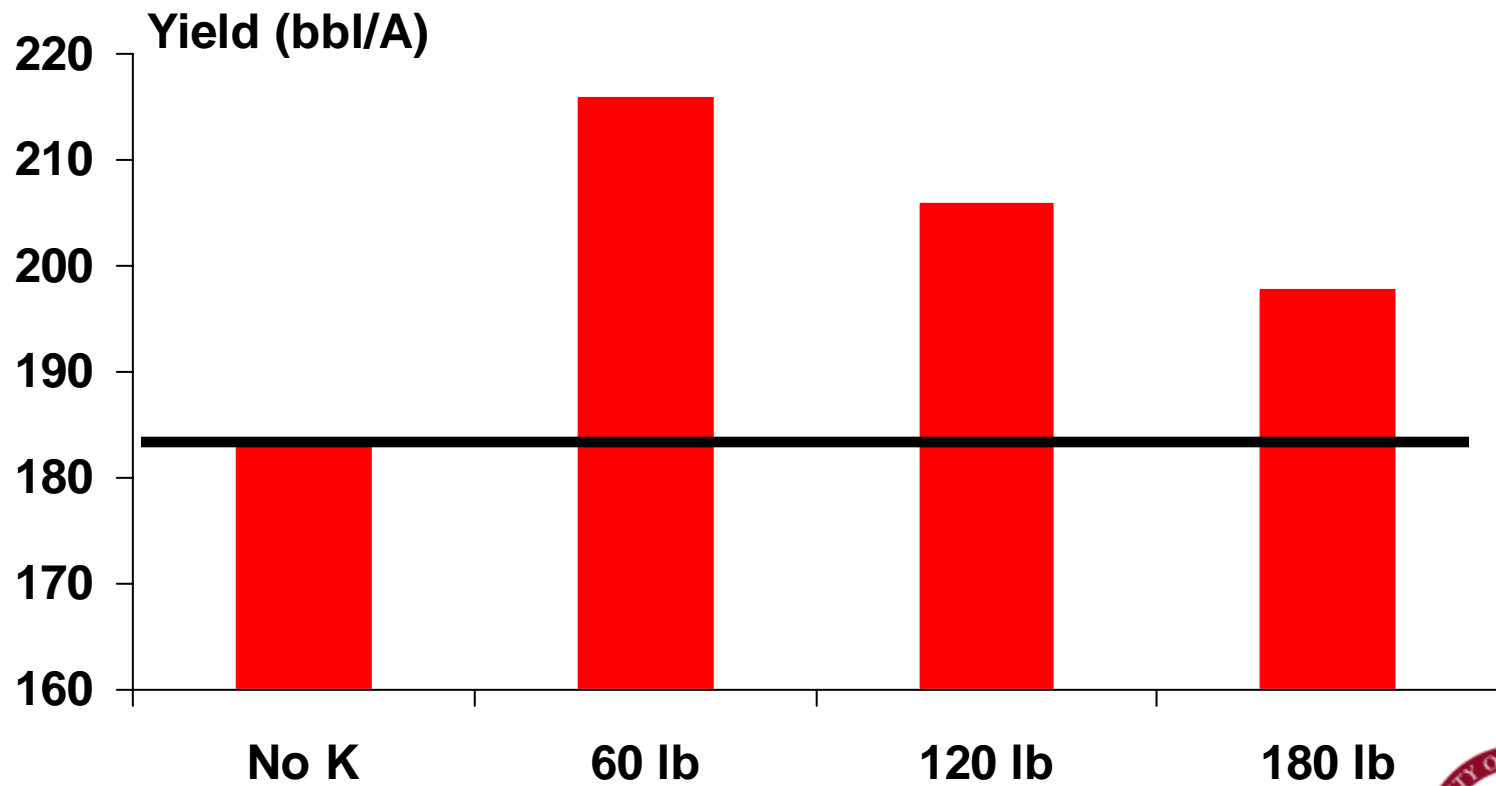
- P rate studies
 - need more than 0 lb/a but no more than 20 lb/a actual P (about 45 lb P_2O_5)
- P and K rate study
 - After 2 years, best yield with moderate rates - lowest yield with **no** P and K or **high** dose P and K
 - Yield reduced with 0 lb/a K



Phosphorus rates



Yield vs. K rate



Study of K forms with no K as control

In 2 out of 3 years "no K" rows had significantly lower yield than that in rows receiving K

K	1996 bbl/A	1998 bbl/A
yes	158	154
no	129	114
sig.	*	*

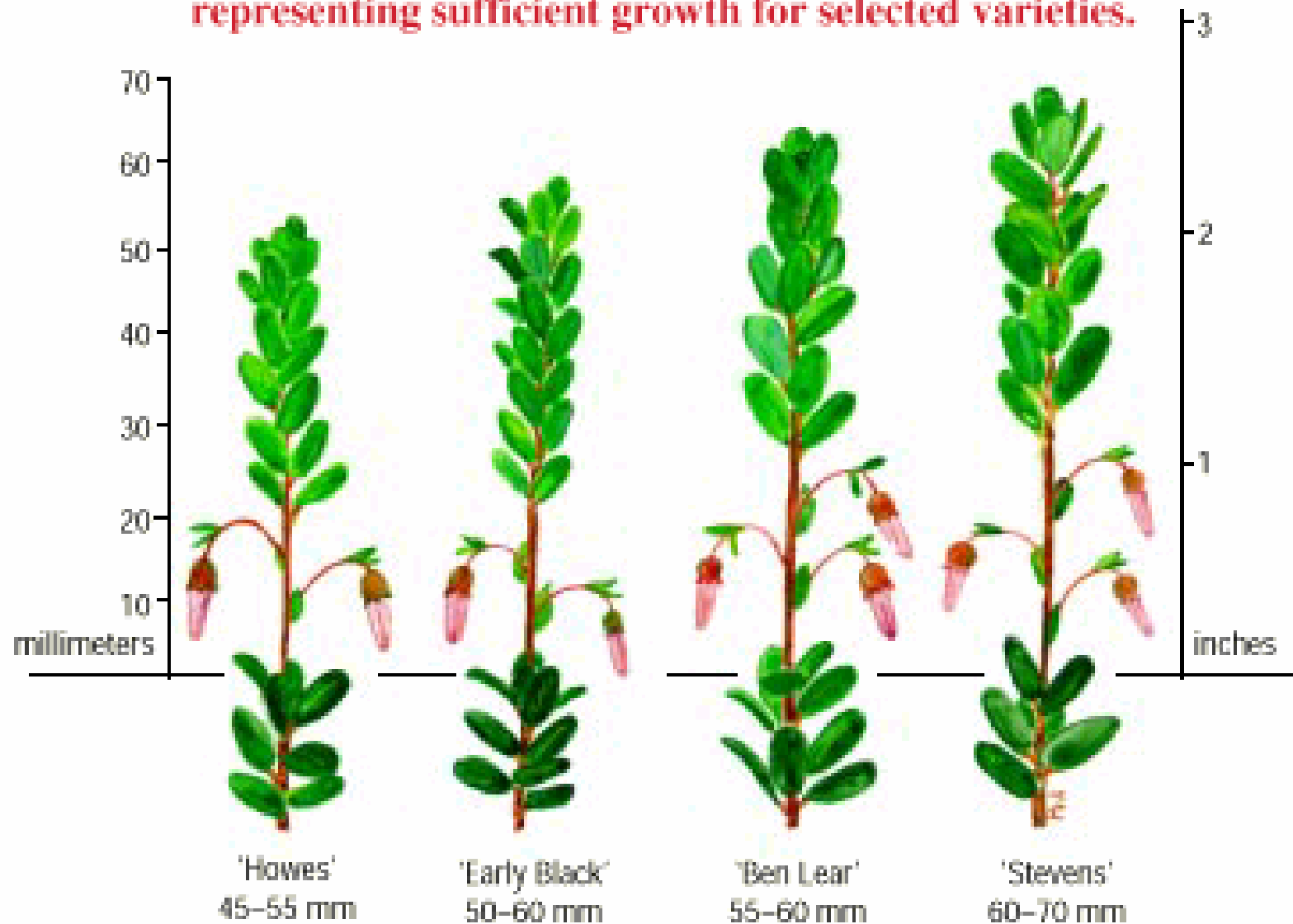


Ways to evaluate nutrient status as basis for fertilizer use

- Growth (June) and leaf area
- Cultivar requirements (Stevens more)
- Appearance (green hue)
- Tissue testing
- [Soil testing]



Figure 6.—Average length of mixed uprights representing sufficient growth for selected varieties.



Use of soil and tissue testing

- Mandated in NRCS nutrient management standard (excerpt in handout)
- Cranberry Station recommends every 3-5 years unless for specific diagnosis
- Soil test not very reliable for N or P
- Tissue tests are good but taken in August/September



What the tests can do

- Soil test
 - Monitor pH
 - Look for balance of K, Mg, Ca
- Tissue tests
 - Monitor all elements
 - Diagnose deficiencies
 - Act as a ‘report card’ on current practices
 - Help to plan nutrient management for the following season



What the tests cannot do

- Soil test
 - Determine needs for N or P
 - Be used to design a fertility program
- Tissue tests
 - Stand alone without information on plant growth, appearance, production, AND more
 - Be used as the basis of a fertilizer prescription (without additional information)
 - with the exception of deficiency correction recommendations



Optimal N rate (lbs/a)

Research

- Davenport – all 20
 - Davenport - S in WI 40
 - Hart et al. - S in OR 60
 - DeMoranville –
EB in MA 30
 - Davenport/DeMoranville
- S in MA 20-60
- Good starting point:
20-25 lb N for EB/H
30-40 lb N for S



Nitrogen Form - Ammonium

- Several studies show best growth and N uptake with ammonium (compared to nitrate)
- Ammonium taken up 10x faster than nitrate
- Little conversion of ammonium to nitrate at low pH + ammonium leaches less



Common choices

- NPK ammoniated
- NPK blends
- NPK slow release
 - IBDU
 - MU
 - Osmocote
- Ammonium sulfate
- Urea
- All of these are granular
- Some liquids
 - fish



Fertilizer examples

- 18-8-18, 12-24-12, 15-15-15 fast acting
- Urea granules or liquid (very quick)
- Minor element foliar supplements
SulPoMag
- Slow release and organic



How to calculate nitrogen

- First number on the bag is the percent N in the fertilizer
 - eg. $\textcircled{12}$ -24-12 is 12% N
- To calculate pounds of N in a certain amount of fertilizer
 - Pounds of fertilizer x first number as a decimal
 - eg. 200 lbs 12-24-12 has 24 lbs N
$$200 \times (12 \times 0.01) = 24$$



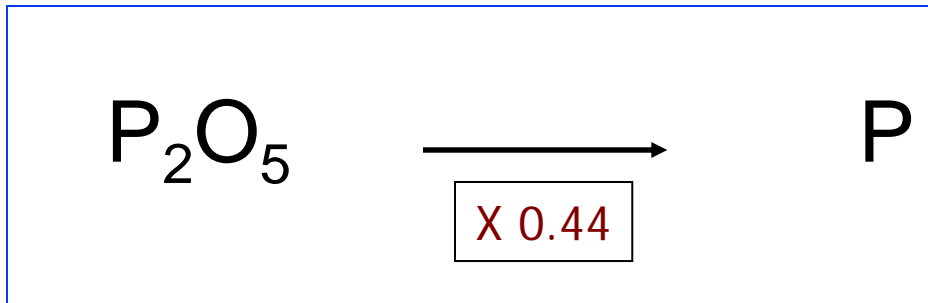
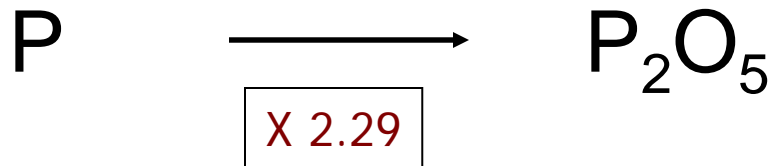
How to calculate N

- To calculate how much fertilizer to use to get a set number of pounds of N
 - Pounds of N / first number as a decimal
 - eg. 40 lbs of N needed using 12-24-12
$$40 / (12 \times 0.01) = 333$$



Calculating phosphorus

- The second number on the bag is not actual P!!



What's on the bag!



Calculations

- Example #1 – 45 lb N

I used 375 lb/acre 12-24-12 – how much P?

$$375 \times 0.24 \times 0.44 = 39.6 \text{ lb/acre}$$

0.24 is the second bag number converted to a decimal

$$[24 \times 0.01 = 0.24]$$

0.44 converts P_2O_5 to actual P



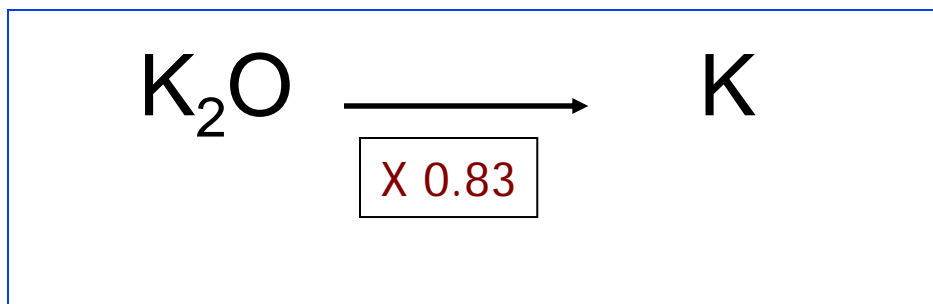
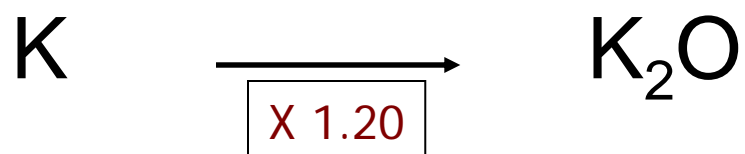
Potassium forms

- K forms - potassium sulfate and potassium chloride (0-0-50 and 0-0-60) performed equally in field trials
- However, based on related plants and greenhouse studies of cranberry - chloride may be a problem long-term



Calculating potassium

- The third number on the bag is not actual K!!



What's on the bag!



Calculations

- Example – 45 lb N

I used 375 lb/acre 12-24-12 – how much K?

$$375 \times 0.12 \times 0.83 = 37.4 \text{ lb/acre}$$

0.12 is the third bag number converted to a decimal

$$[12 \times 0.01 = 0.12]$$

0.83 converts K_2O to actual K



Calculation examples are on the
handout and in the 2008 Chart Book



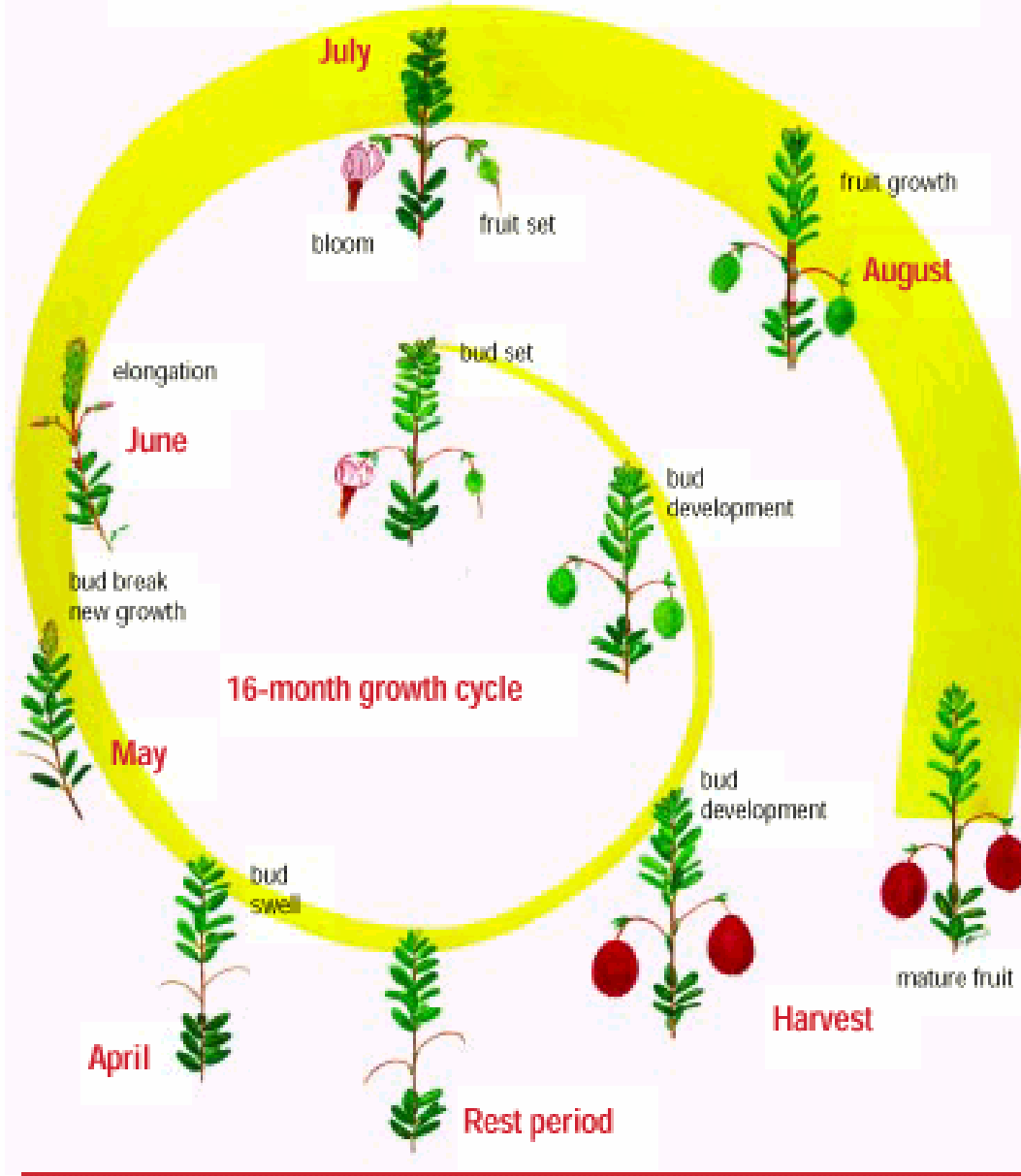
Fertilizer Timing:

Periods of high demand - nutrients must be available

- New vegetative growth expansion
- Fruit filling
- Bud initiation
- Root turnover (after initial growth and late Aug.)



Figure 5.—The cranberry growth and development cycle.



Fertilizer timing

- Time by growth stages and moisture status and temperature of the soil, also type of fertilizer
- N: bud break, bloom, fruit set, bud set
- P: sandy bogs all season; others when dry
- K: early if 'crunchy'; bloom and later



Cranberry nutrient management plan elements

- Choose a management unit
- Soil and tissue tests as baseline information and for future planning
- Careful observation of conditions in the field
- N and P starting target rates
- Plan for adjusting N and P as conditions change/warrant
- Plan for reducing P inputs to <20 lb/a actual
 - Use of low P ratio materials



Nutrient management is an organic process

- It is not carved in stone
- It is responsive to changing conditions
- It takes into account environmental factors (weather) and other dynamic elements (primarily pests) that will impact production



Websites of interest

- Cranberry Station
 - www.umass.edu/cranberry
- Nitrogen and phosphorus publications
 - <http://www.hort.wisc.edu/cran/>
 - or Wisconsin newsletter link on our page
 - Click on “Nutrient management” link there

