2008

Beginner School 2008 - Cranberry Nutrition and Fertilizers

Carolyn J. DeMoranville
University of Massachusetts - Amherst, carolynd@umext.umass.edu

Cranberry Nutrition and Fertilizers

Carolyn DeMoranville
UMass Amherst
Cranberry Station

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

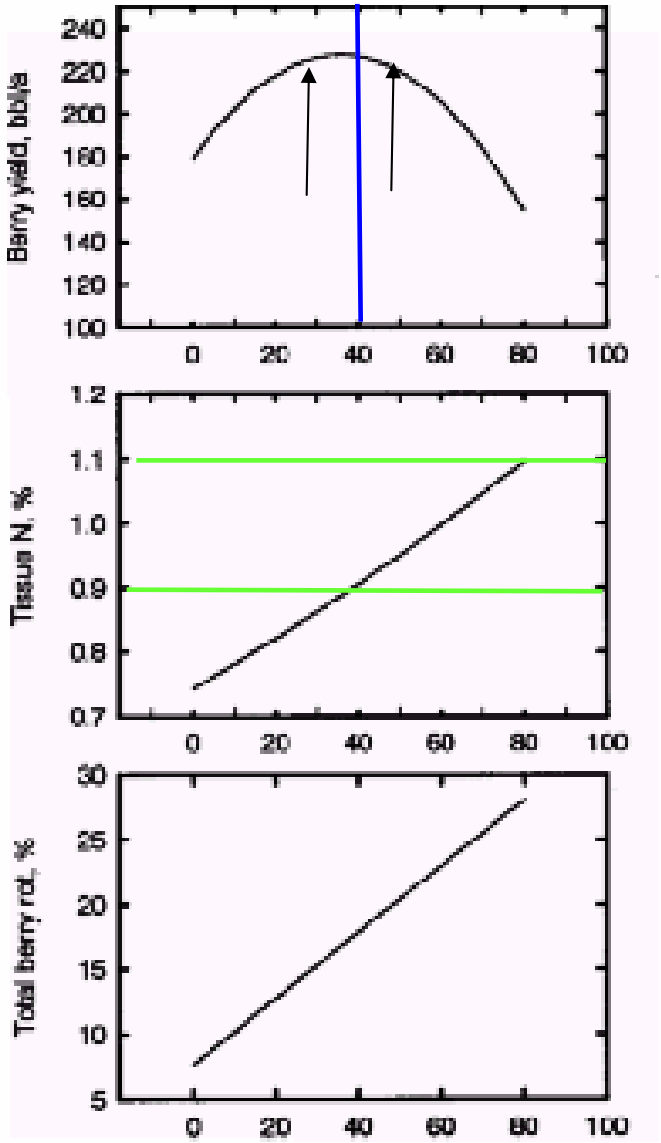
  0.9 - 1.1% in mid-August
  as high as 1.3% ok in Stevens

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.*

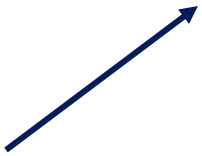


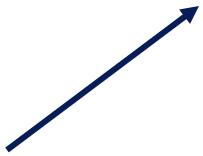
*Massachusetts-grown 'Stevens'

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.	***	***

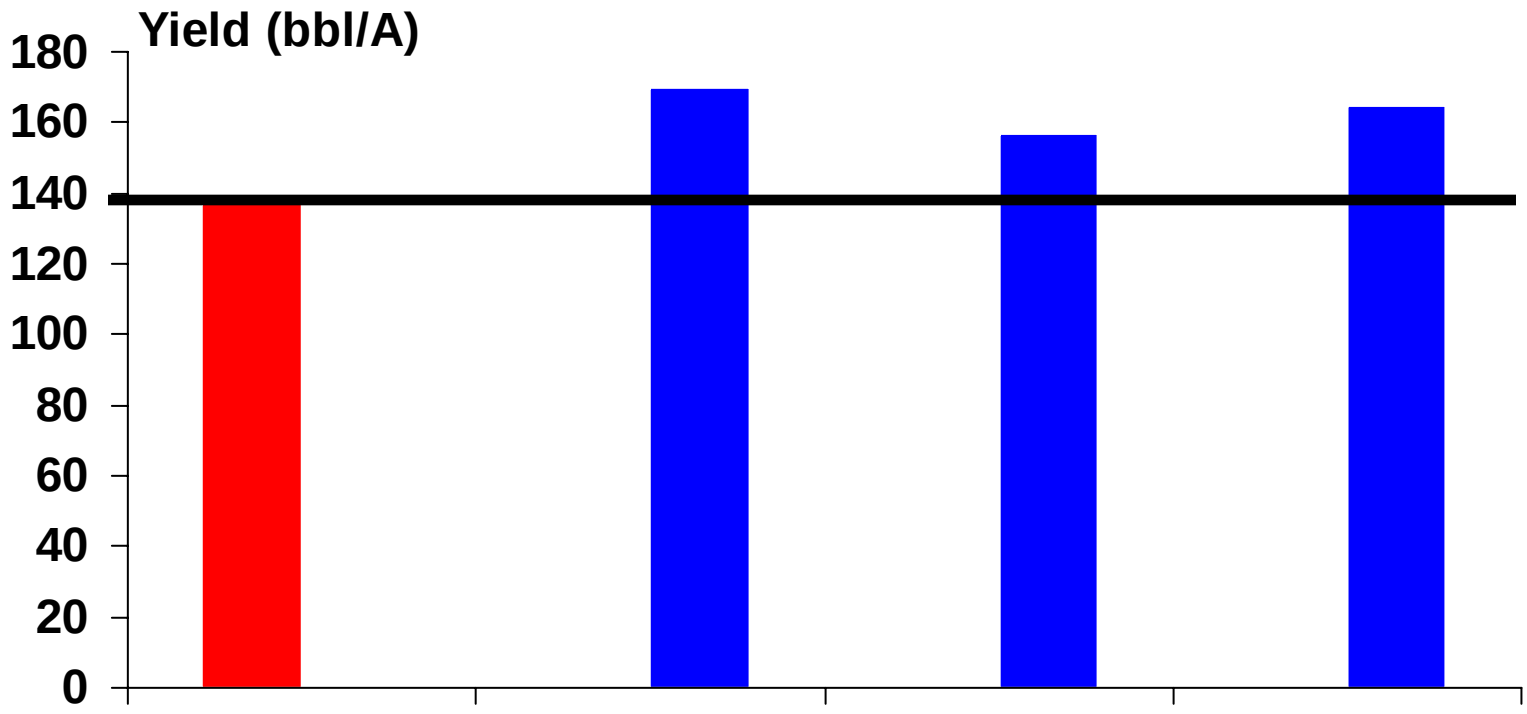




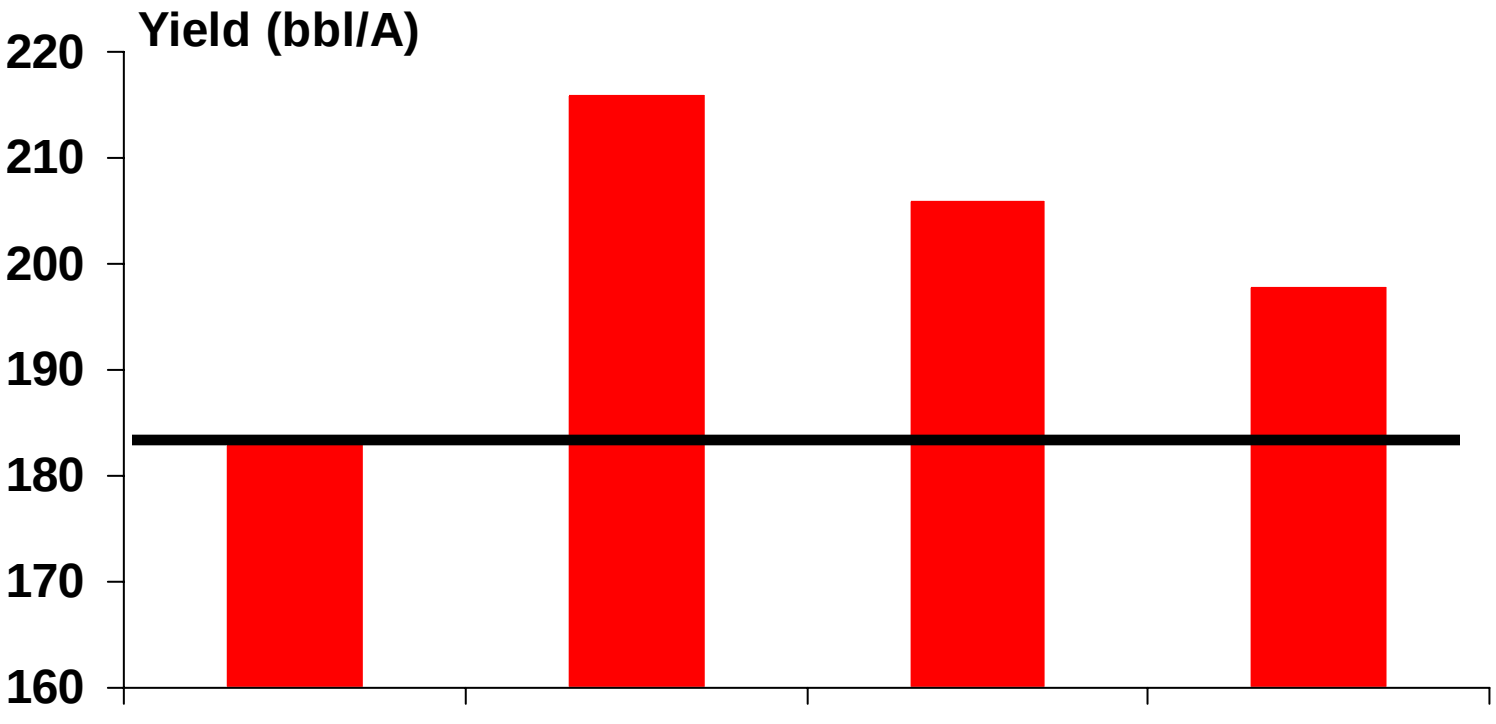
Phosphorus and potassium requirements

- 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



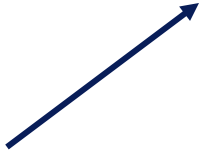
Yield vs. K rate

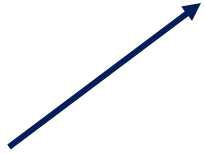


Study of K forms with no K as control

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.	*	*

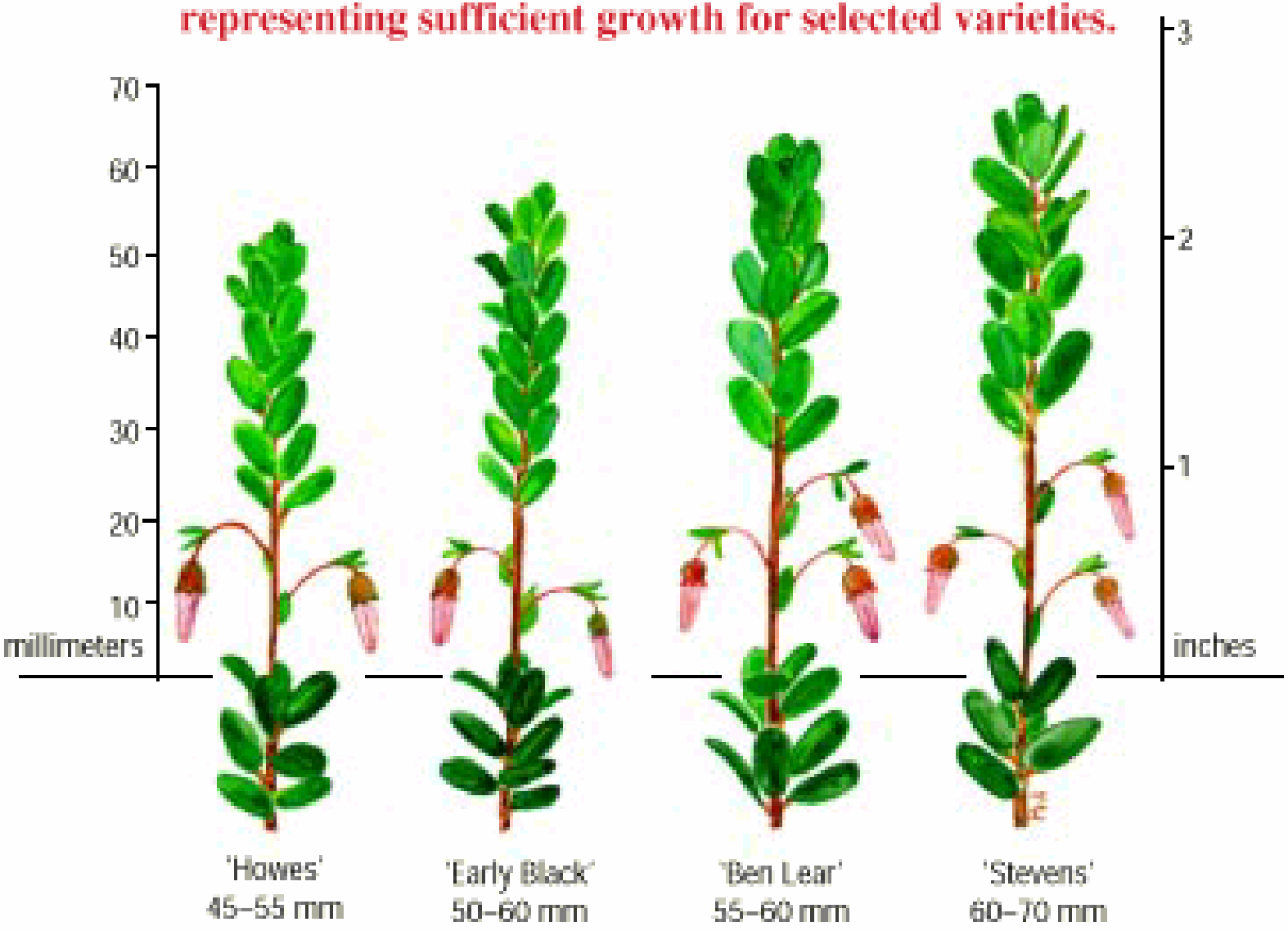




Ways to evaluate nutrient status as basis for fertilizer use

- 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. 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 x (12 x 0.01) = 24

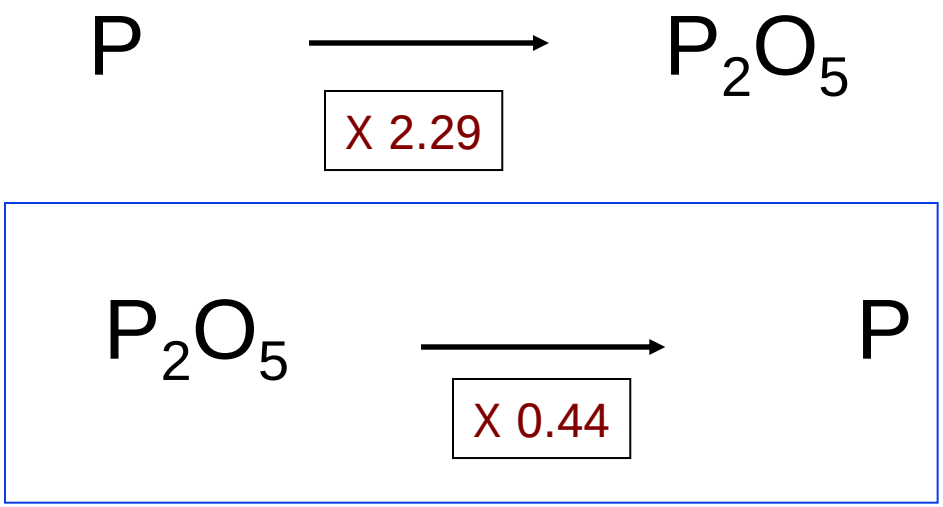
How to calculate N

- 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 x 0.01) = 333

Calculating phosphorus

- The second number on the bag is <u>not</u> 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 x 0.24 x 0.44 = 39.6 lb/acre

  0.24 is the second bag number converted to a decimal

  [24 x 0.01 = 0.24]

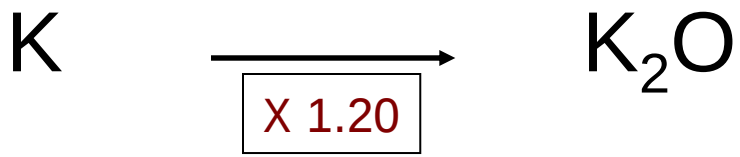
  0.44 converts P_2O_5 to actual P

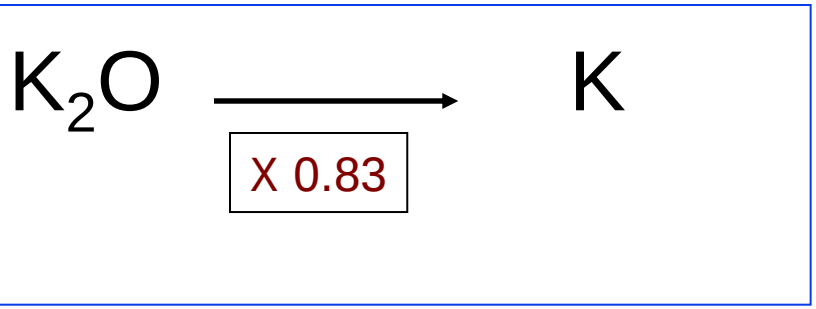
Potassium forms

- 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 <u>not</u> actual K!!





What's on the bag!

Calculations

- Example – 45 lb N

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

  375 x 0.12 x 0.83 = 37.4 lb/acre

  0.12 is the third bag number converted to a decimal

  [12 x 0.01 = 0.12]

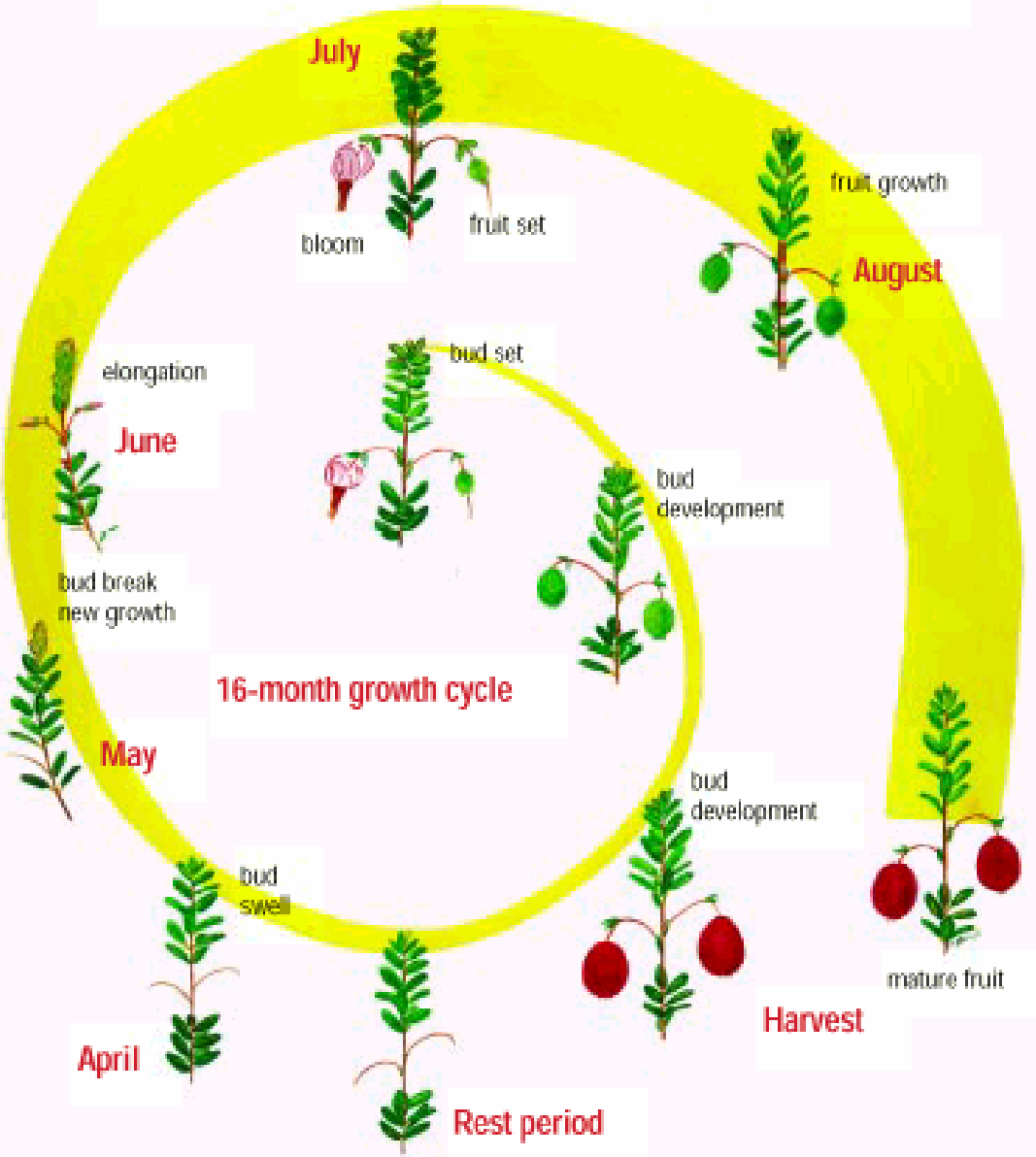
  0.83 converts K_2O to actual K

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