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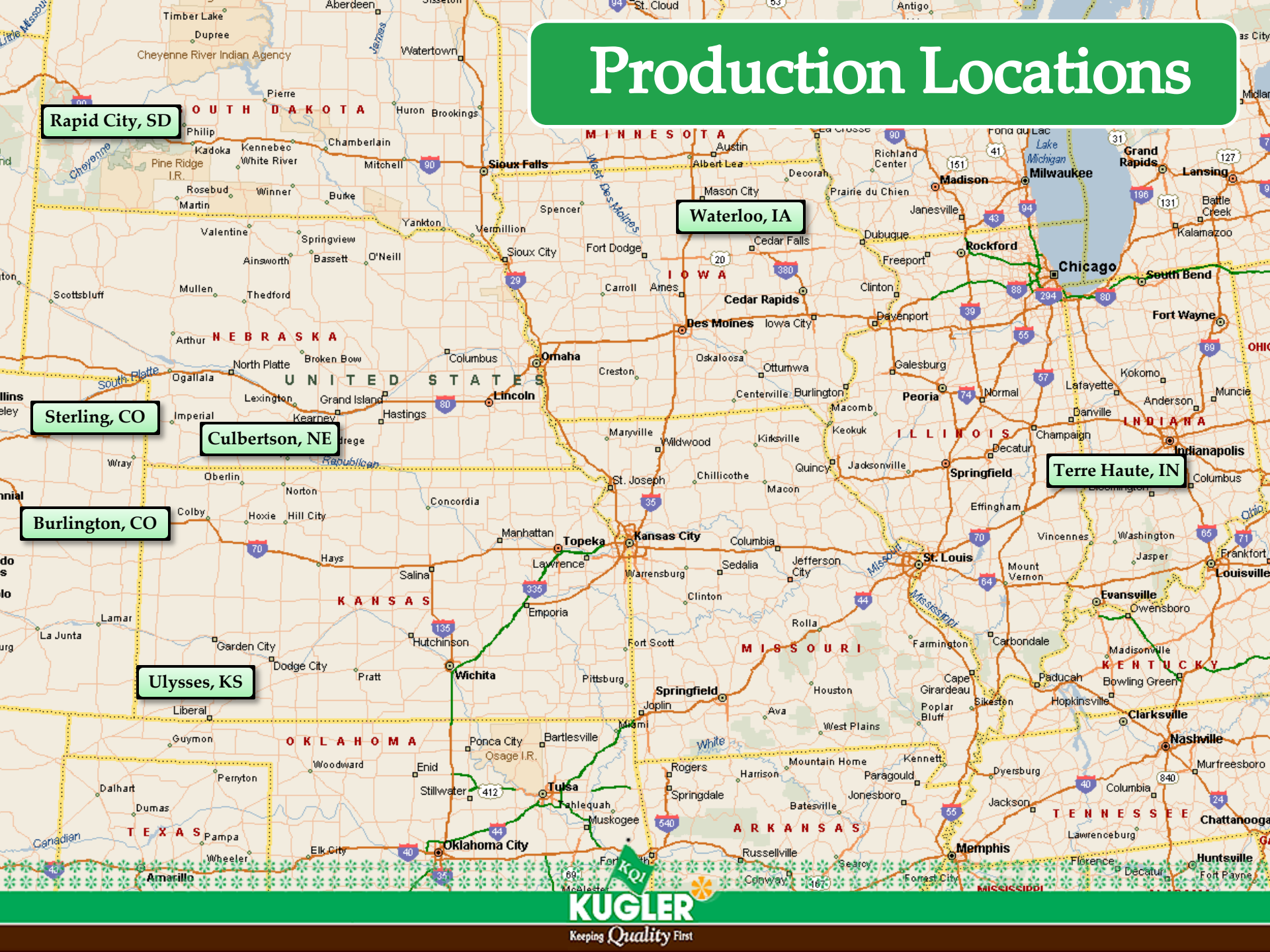
Keeping Quality First
Since 1924

Production Locations



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The Future of Fertilizer

The Future of Fertilizer

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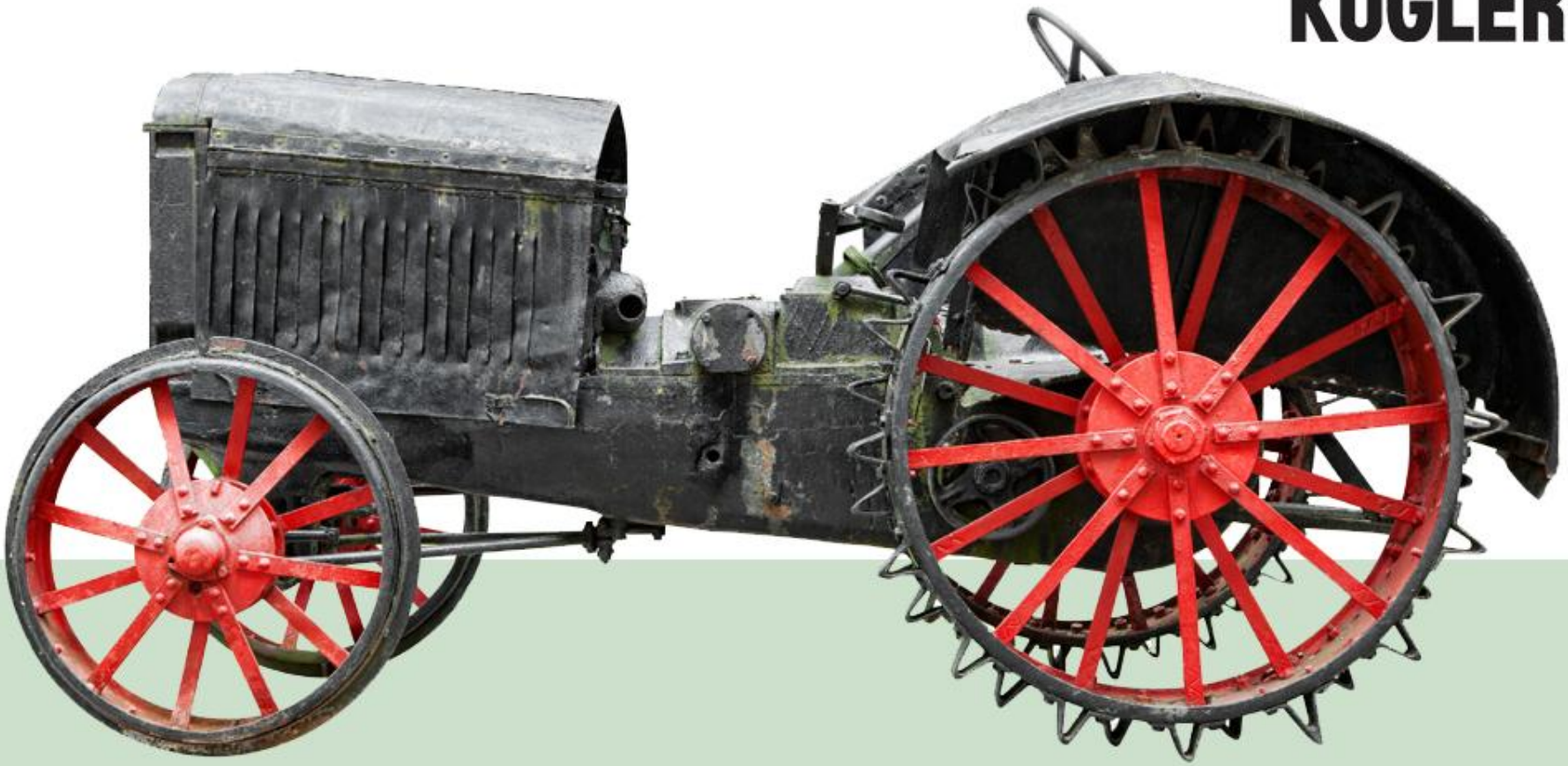

The Future of Fertilizer

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The Future of Fertilizer

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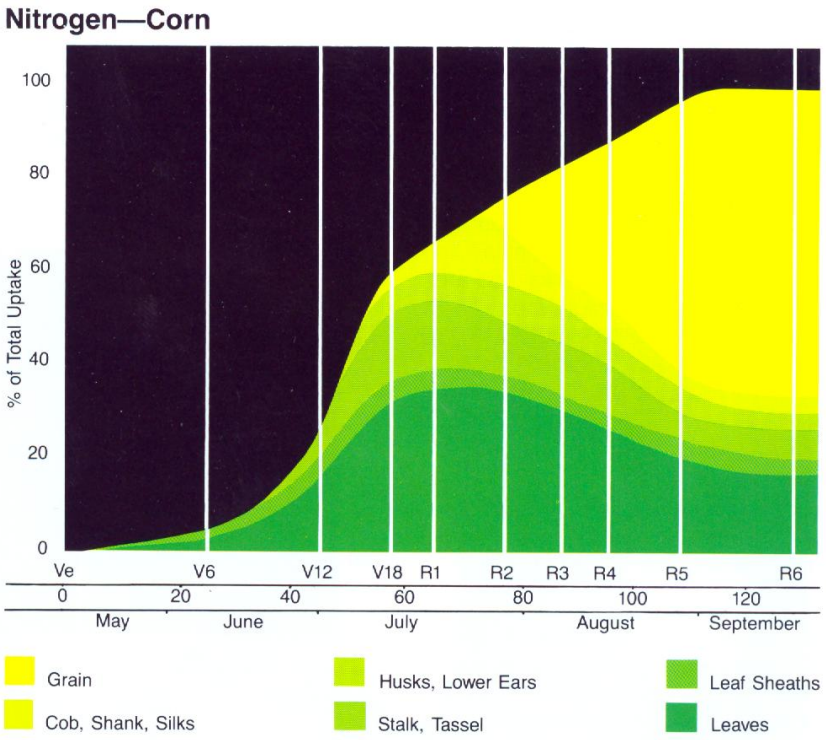
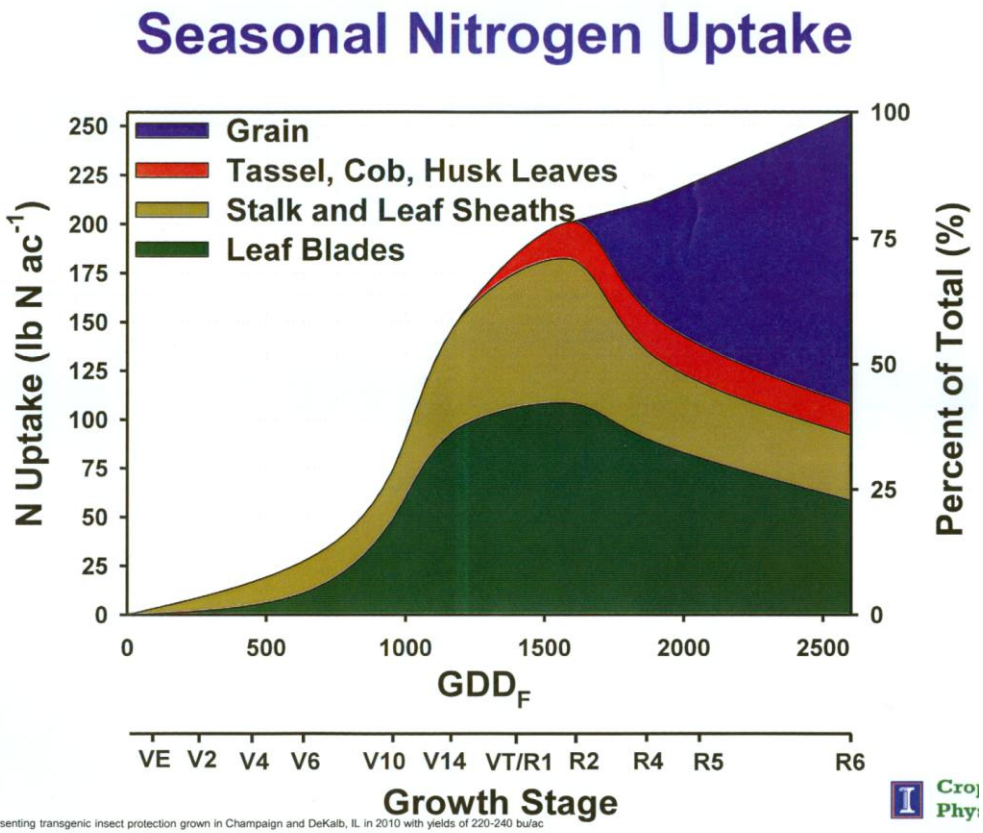
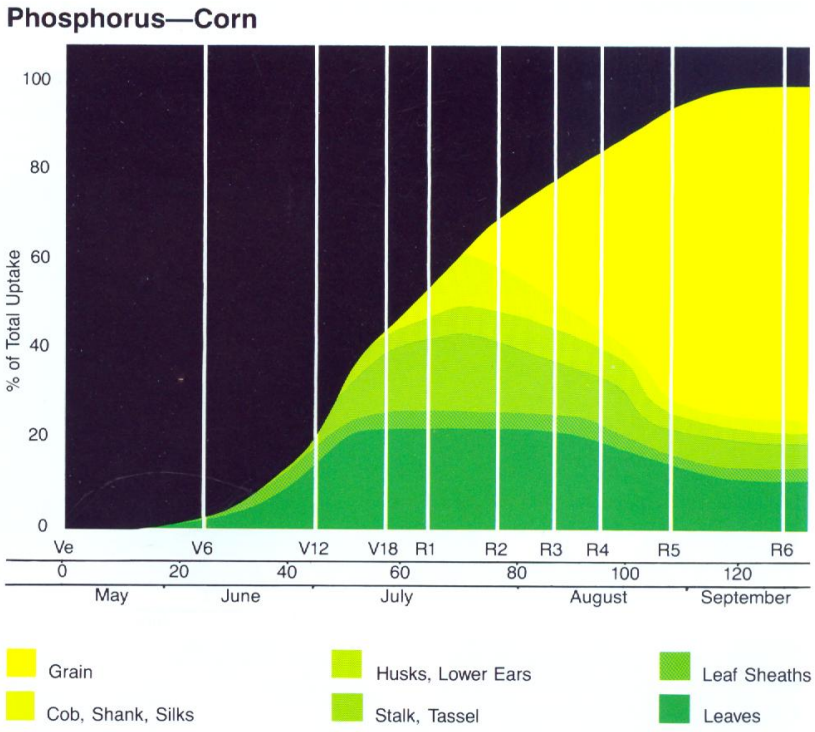
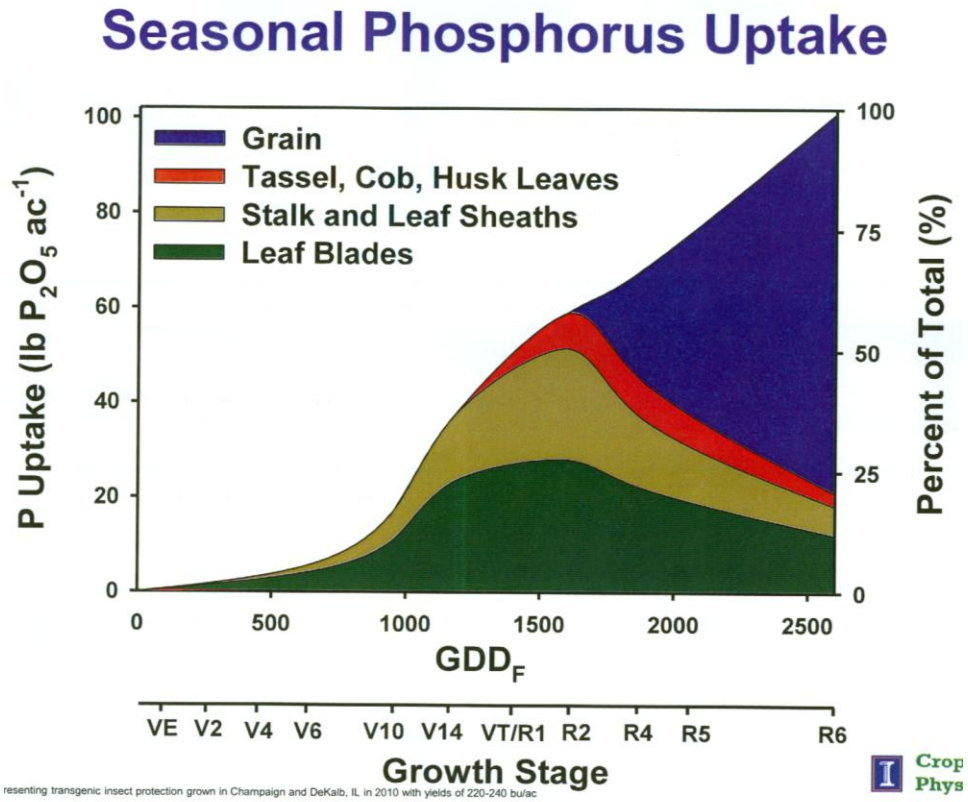
Seasonal Nitrogen Uptake



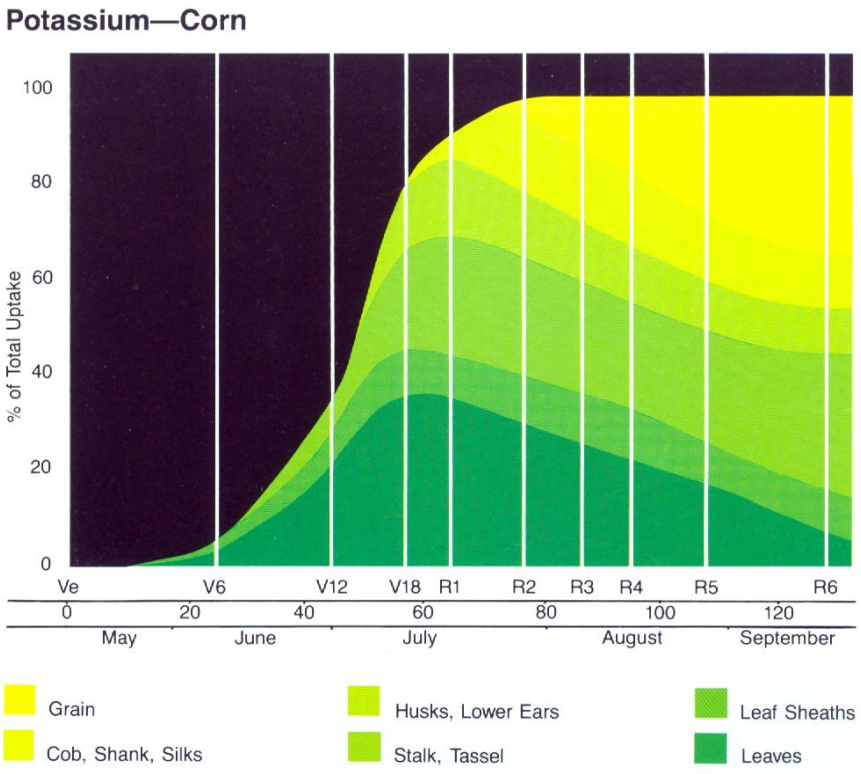


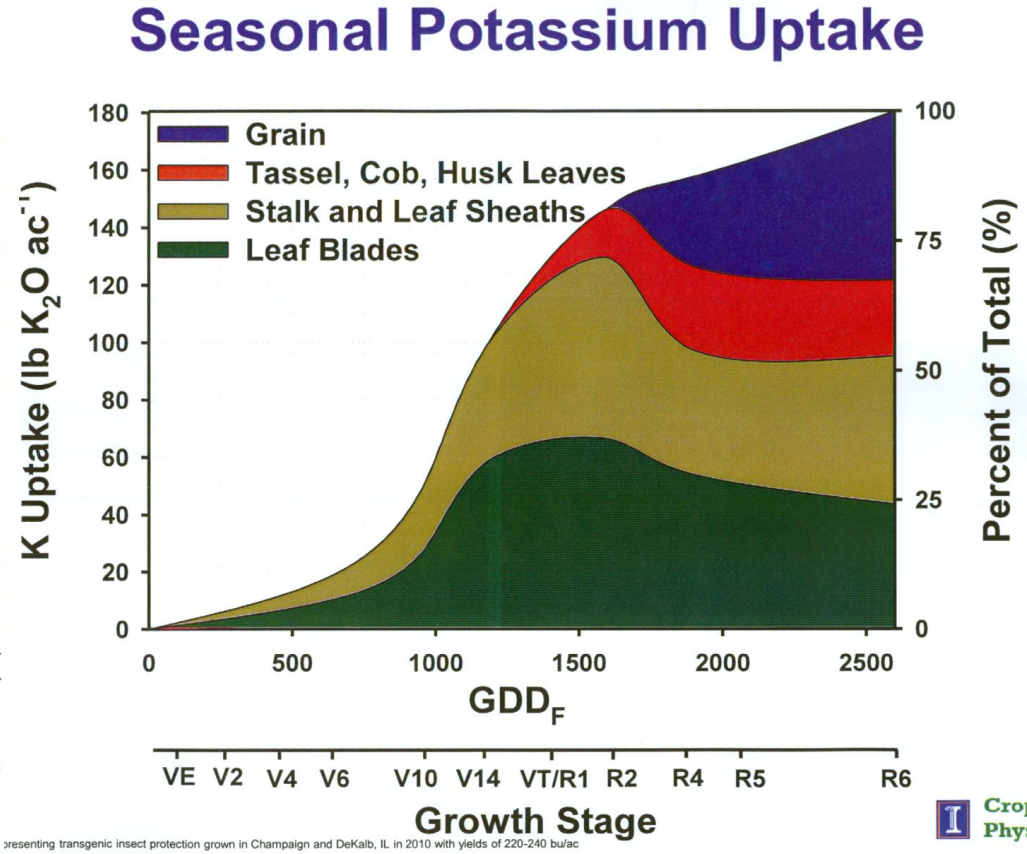
Seasonal Phosphorus Uptake





Seasonal Potassium Uptake





Foliar Applications – Why Foliar Feed

Foliar Applications Have Limitations

Foliar applications cannot by themselves meet the total nutrient demand of the plant. There will always be a need for soil applied fertilizers.

Foliar Feeding

- **Myth = "Nutrients cannot be absorbed thru the leaves".**
- **Research has proven otherwise**

Foliar Feeding

- Interest in foliar feeding is not new
- Proper application equipment and fertilizer products have renewed interest
- Advanced crop genetics

Foliar Benefits

Source: http://www.seaagri.com/docs/foliar_application_study.pdf

"Foliar nutrients are mobilized directly into plant leaves, which is the goal of fertilization to begin with, increasing the rate of photosynthesis in the leaves, and by doing so stimulate nutrient absorption by plant roots."

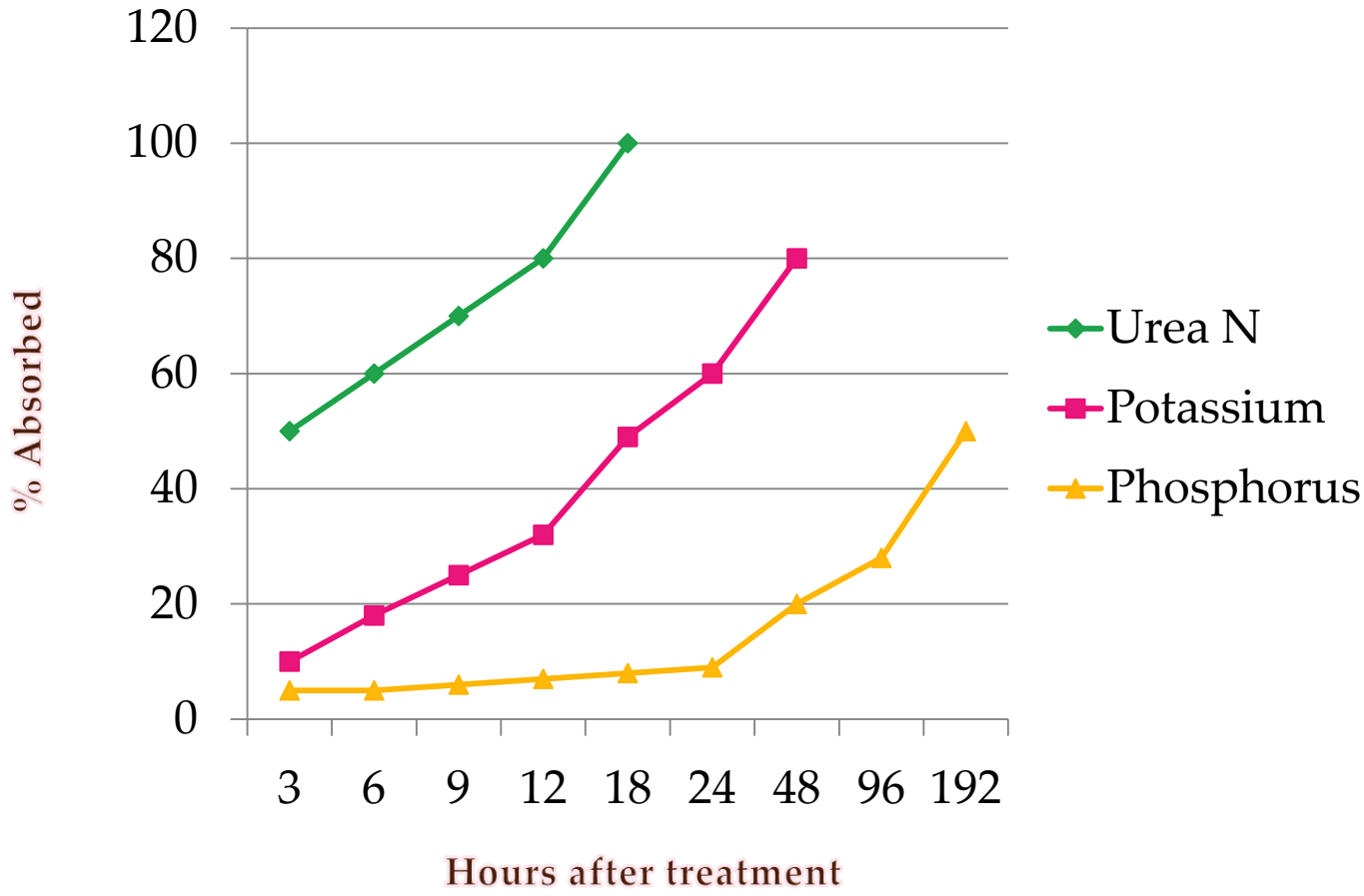
Foliar Benefits

Source: http://www.seaagri.com/docs/foliar_application_study.pdf

"Where isotopes showed that it was 8 -10 times more effective to foliar feed a plant as far as the amount of nutrients required and the speed with which those nutrients were utilized, the above authorities found the figure to be between 12 and 100 times more effective."

Foliar Absorption of Mineral Nutrients

As determined by use of radioactive tracers, Michigan State University



Foliar Absorption Rates

Absorption Rates For Nutrients Applied to Plant Foliage	
Nutrient	Time for 50% Absorption
Nitrogen (as urea)	½ - 2 hours
Phosphorous	5-10 days
Potassium	10-24 hours
Calcium	10-24 hours
Magnesium	10-24 hours
Sulfur	5-10 days
Chlorine	1-4 days
Iron	10-20 days
Manganese	1-2 days
Zinc	1-2 days
Molybdenum	10-20 days

Foliar vs Soil-Applied Nutrients

Nutrient	Foliar	replaces	Soil
N	1		4-12
P	1		20
K	1		6
Fe	1		100
Mn	1		30
B	1		30

Univ. of Cal Davis

Main Factor Affecting Phosphorus Movement

- **Diffusion: Motion of Molecules**
  - Phosphorus will only move one 500ths of an inch in a day.

- **Roots**
  - Roots only occupy 1% of soil volume.

Dr. Stanley Barber, Purdue University

Phosphorous: Reaction in Soil

- If P in a silt loam soil is more than ¼ inch from a root won't move close enough to be taken up by the root.
- P must be dissolved in water that surrounds the soil particles and roots.

Foliar Benefits

Source: http://www.seaagri.com/docs/foliar_application_study.pdf

"Foliar fertilization is by far the most effective way to apply micro nutrients or trace elements, and supplement the major elements. The readily vailable nutrients are more easily utilized, because they do not have to be dissolved by moisture and go into the soil solution."

Foliar Feeding

For best results foliar fertilizer should contain Nitrogen.

Foliar Feeding

- **Introduction of non-burning forms of N has created opportunities for foliar applications.**

Foliar Nitrogen

KQXRN – NON BURNING NITROGEN

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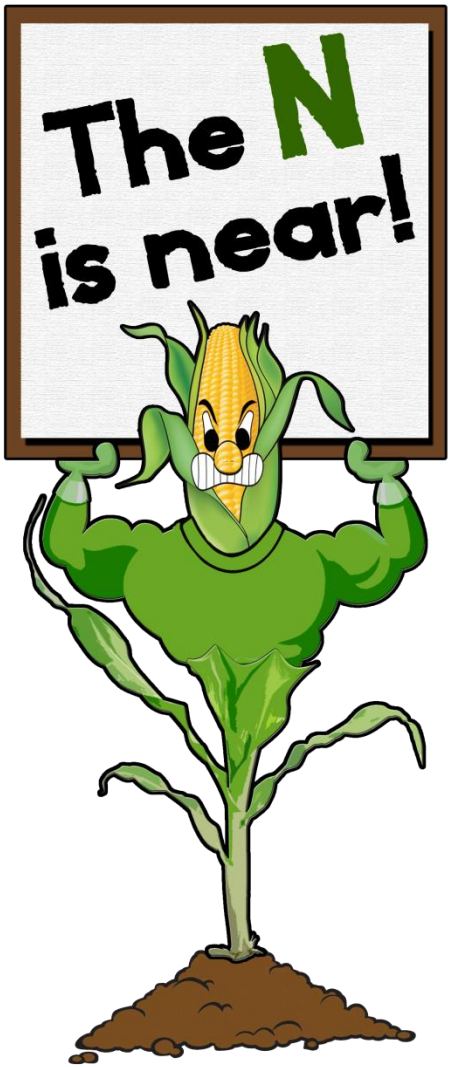
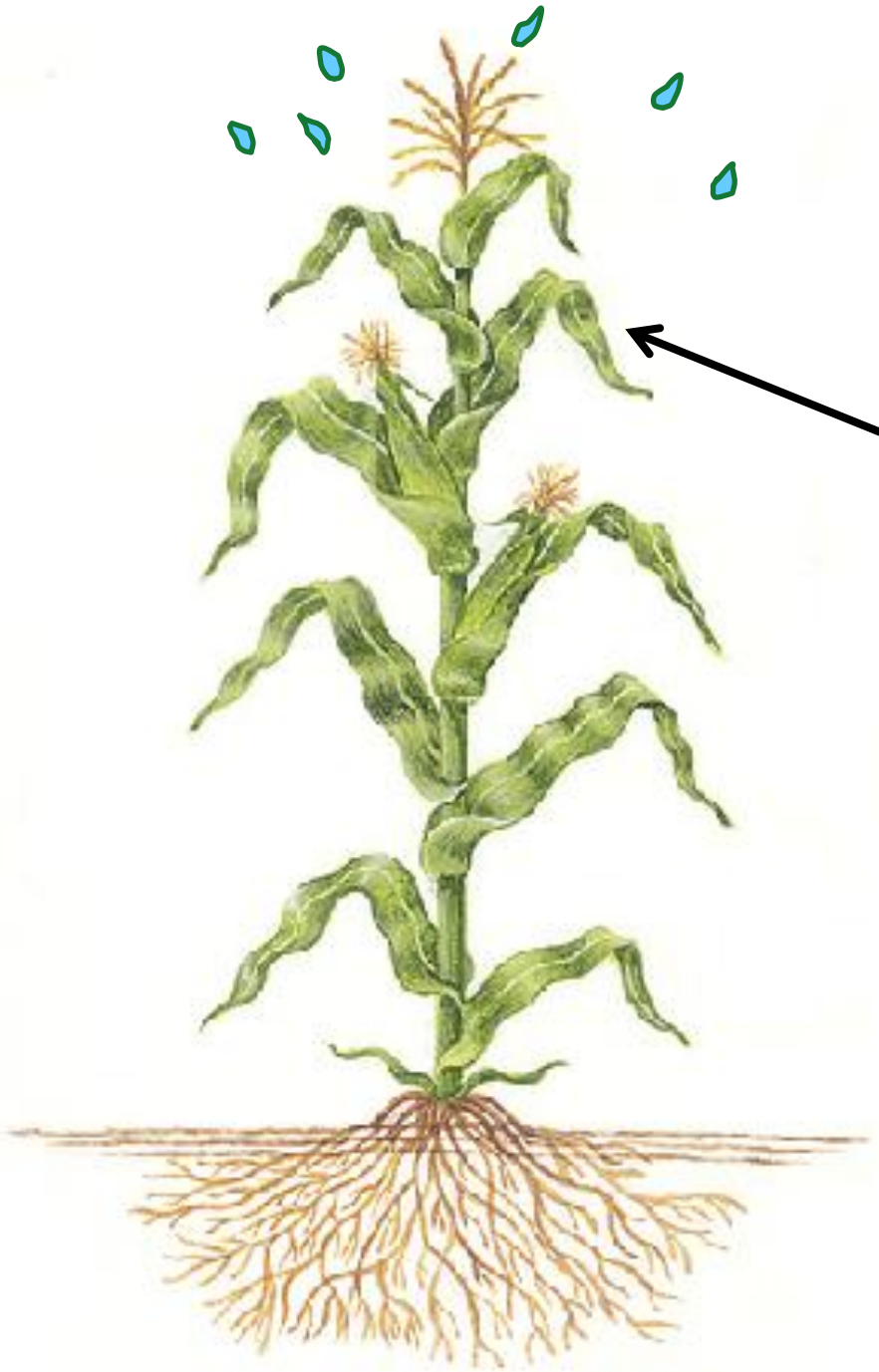
Kugler KQ-XRN®



KQ XRN

72% SRN

Right Place



Foliar
KQ-XRN
KS 2075
KS 1515
KS 1022
KS1410
MicroMax


KQ-XRN: *Plant #1*
Right After Application

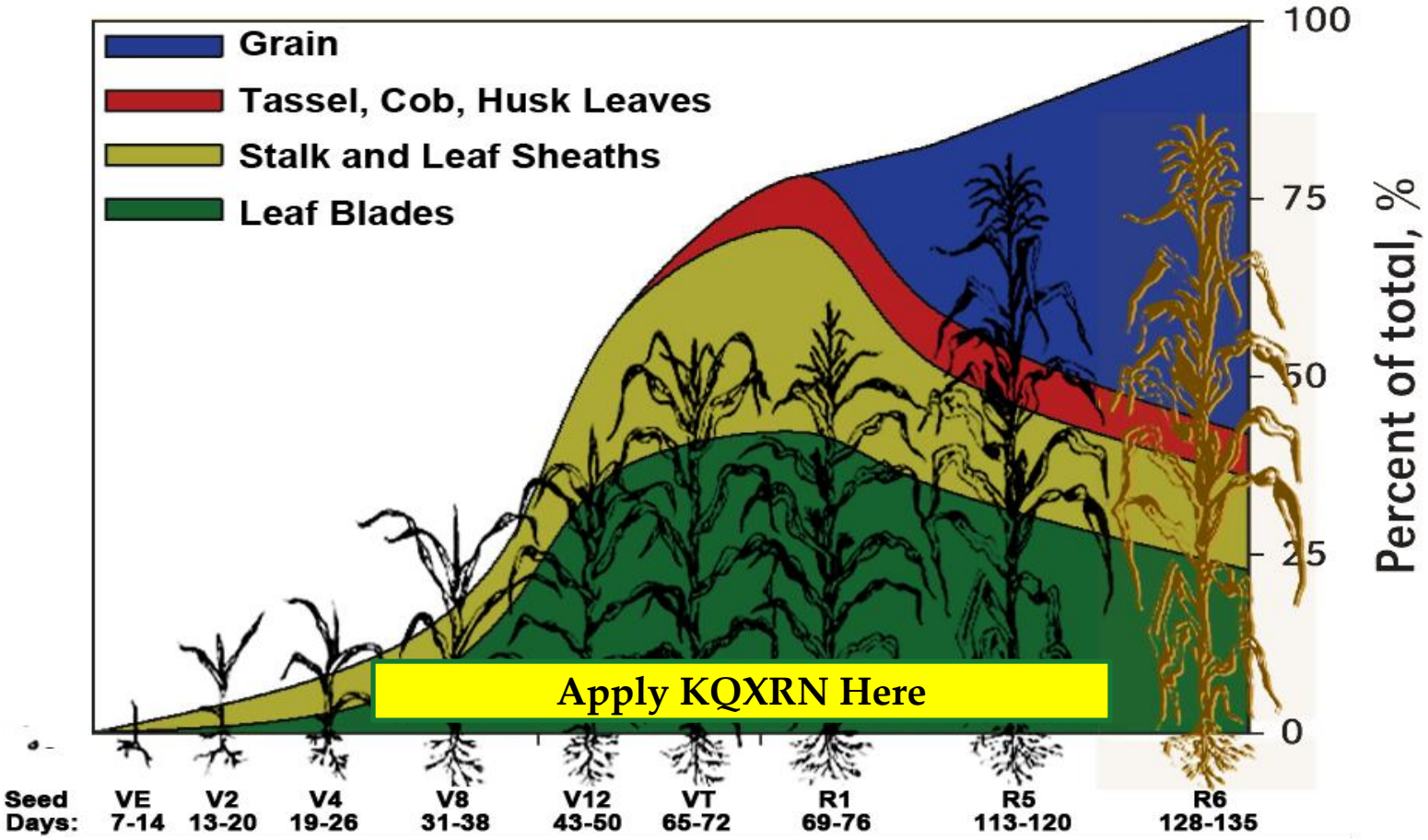

KQ-XRN: Plant #1
48 Hours After Application


KQ-XRN: Plant #1
72 Hours After Application

Right Time For Foliar Feeding

Best timing for foliar applications is when plants are changing from vegetative to reproductive stage to help meet increased nutrient demand during this time.

Seasonal Nitrogen Uptake

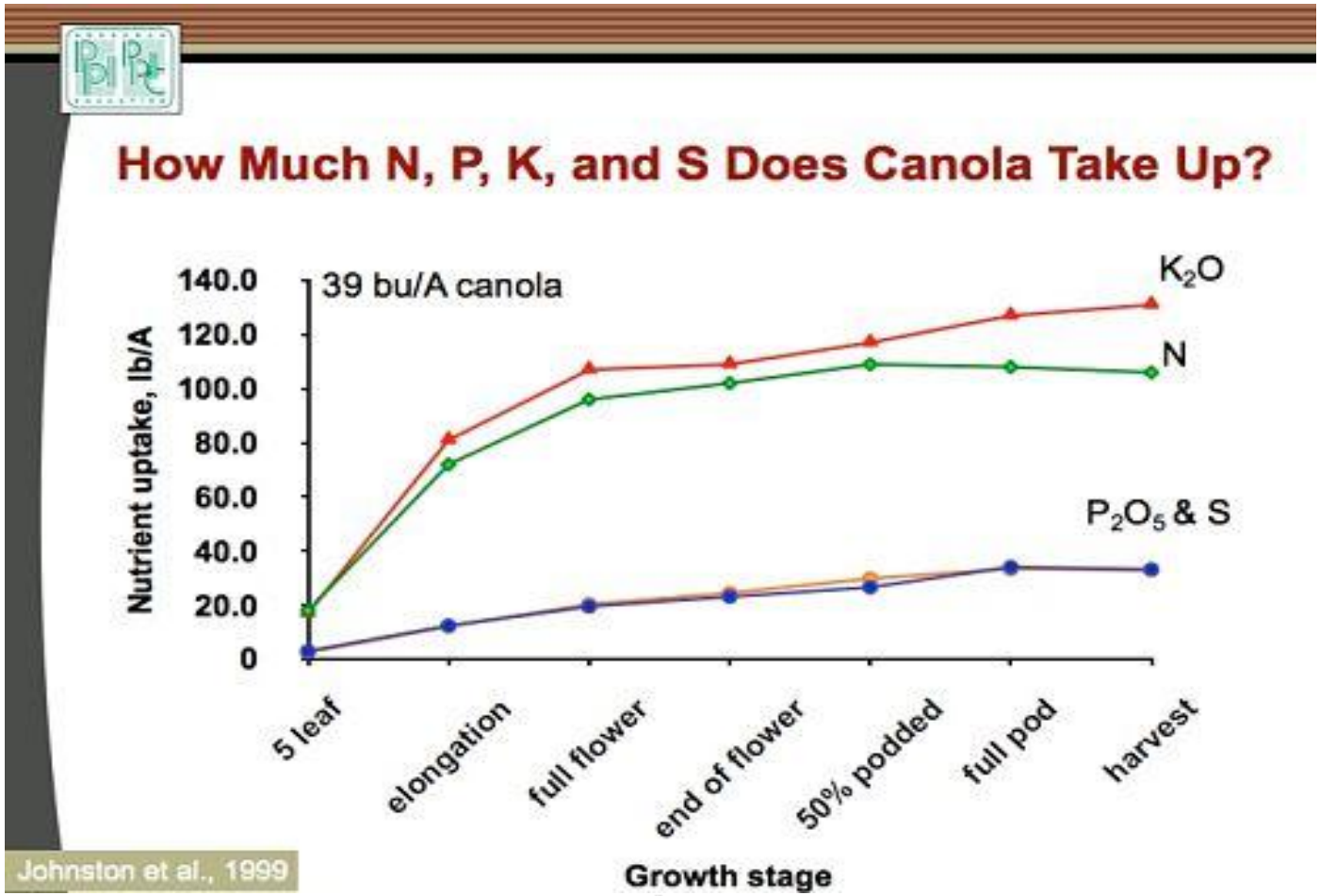


Crop Nutrient Uptake By High Yielding Corn and Soybeans

Source: *Fluid Journal* Vol. 18 No. 3, Issue #69

308 Bu/A Corn Nutrient Uptake							
R. Flannery, Rutgers University							
Corn		Nutrient Uptake per Day			Cummulative Nutrient Uptake		
Stage	Days	N	P^2O^5	K^2O	N	P^2O^5	K^2O
		lb/a/day			lb/a		
a-leaf	32	0.4	0.1	0.6	12	3	19
8-leaf	12	1.6	0.4	3.4	32	7	59
12-leaf	15	3.4	0.9	3.4	83	20	109
Tassel	13	11.1	2.9	15.3	227	57	308
Silk	12	-1.4	0.9	2.6	210	68	340
Blister	18	1.0	0.7	0.7	228	80	352
Early Dent	31	3.7	1.4	1.4	343	125	396
Maturity	13	0.2	1.2	-1.7	345	140	375
101 bu/A Soybean Nutrient Uptake							
R. Flannery, Rutgers University							
Soybean		Nutrient Uptake per Day			Cummulative Nutrient Uptake		
Stage	Days	N	P O	K O	N	P O	K O
		lb/a/day			lb/a		
3rd trifoliate	40	0.8	0.3	0.7	30	10	27
6th trifoliate	11	1.5	0.6	2.7	46	16	57
Full Bloom	16	7.8	1.8	5.8	171	44	149
Early Pod	15	9.1	2.3	9.6	308	78	293
Soft Seed	21	11.4	2.8	2.4	548	136	344
Maturity	16	-3.4	-1.3	-2.3	494	116	308

Nutrient Uptake

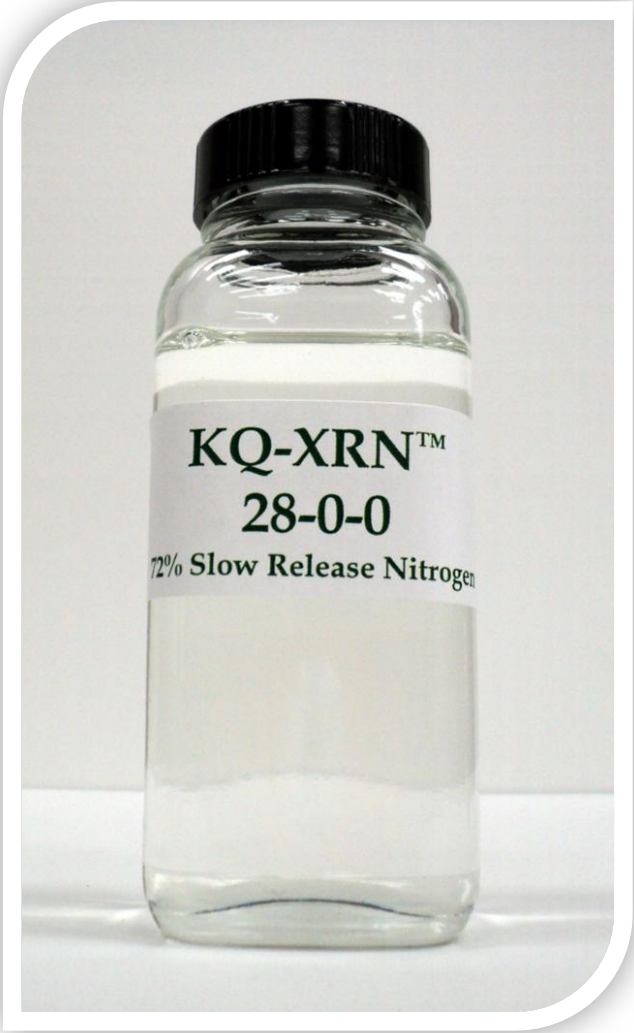


Foliar Feeding

Adding KQXRN to pesticides, herbicides, and fungicides improves performance resulting in better plant health and resulting in more yield.

KQ-XRN Technology

- Technology of Foliar Feeding
- Plant Structure and Nutrient Uptake
- Nutrient Transfer
- Slow Release Components
- How and Why KQ-XRN Works
- NPK Uptake Rates



Why Foliar Feed?

- **Increases the plants ability to uptake water and fertilizer ions.**
  Researchers suggest a 6:1 return

- **Increases activity in the leaf, increases chlorophyll and thus photosynthesis**
  - Increases need for water
  - Increases water uptake by the plants vascular system
  - Increases uptake of nutrients from soil
  - Increasing photosynthesis = increasing production and efficiency
  - As nutrient demand increases in plants, the physiological capacity to supply itself with nutrients decreases.

Leaf Structure

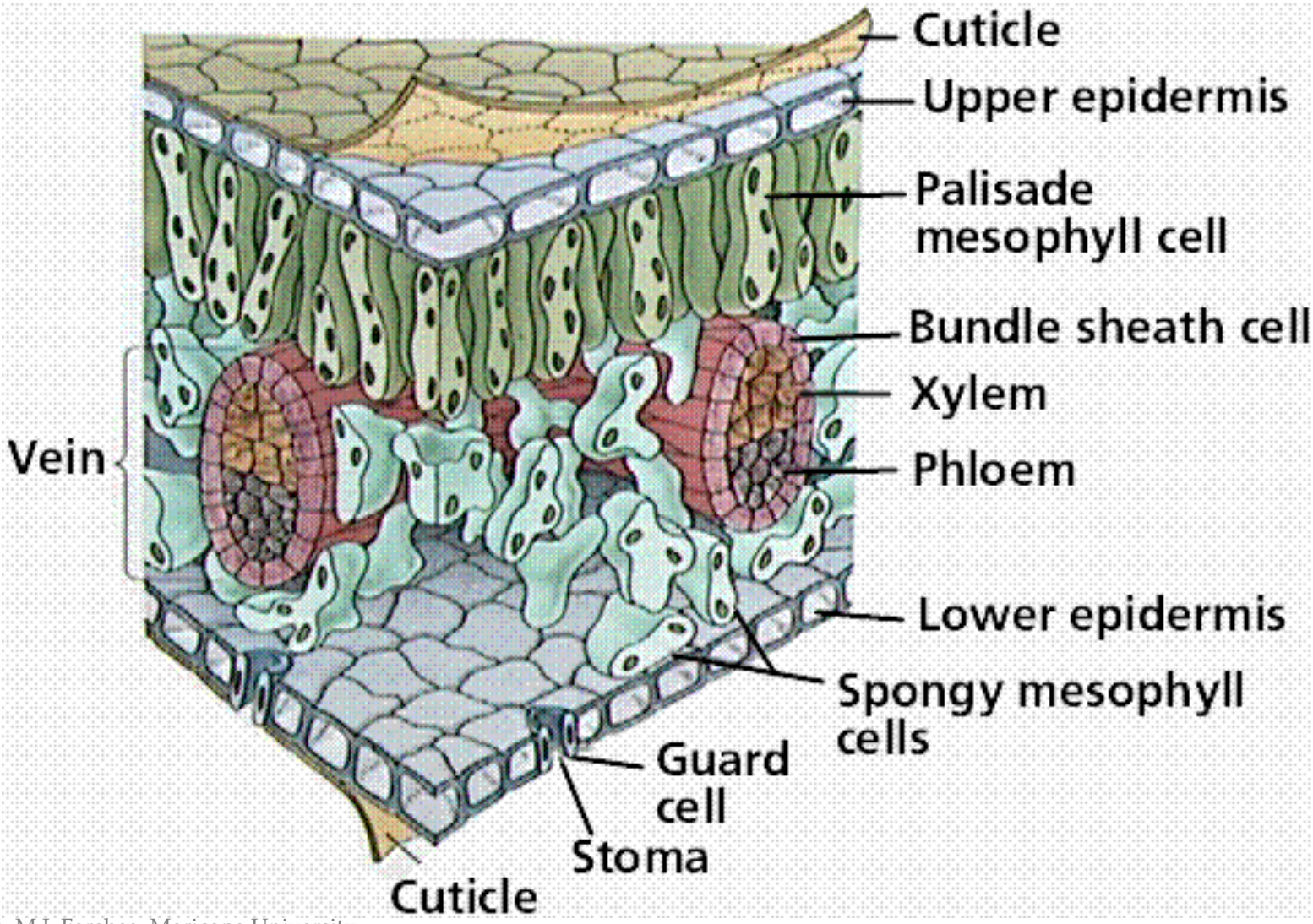


Image Source: M.J. Farabee, Maricopa University
(http://www.emc.maricopa.edu/faculty/farabee/biobk/biobookps.html)

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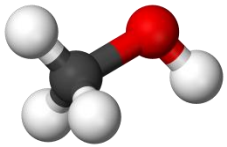
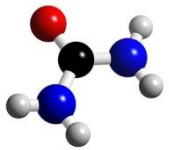
Slow-Release Components

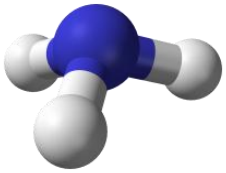


Urea Formaldehyde



Urea

Methanol



Ammonia

Dimethylolurea

Triazone

Ditriazone

Methylenetriurea

KOH

Polymethelyne Urea

Hydroxymethylenetriazone

Methylenediurea

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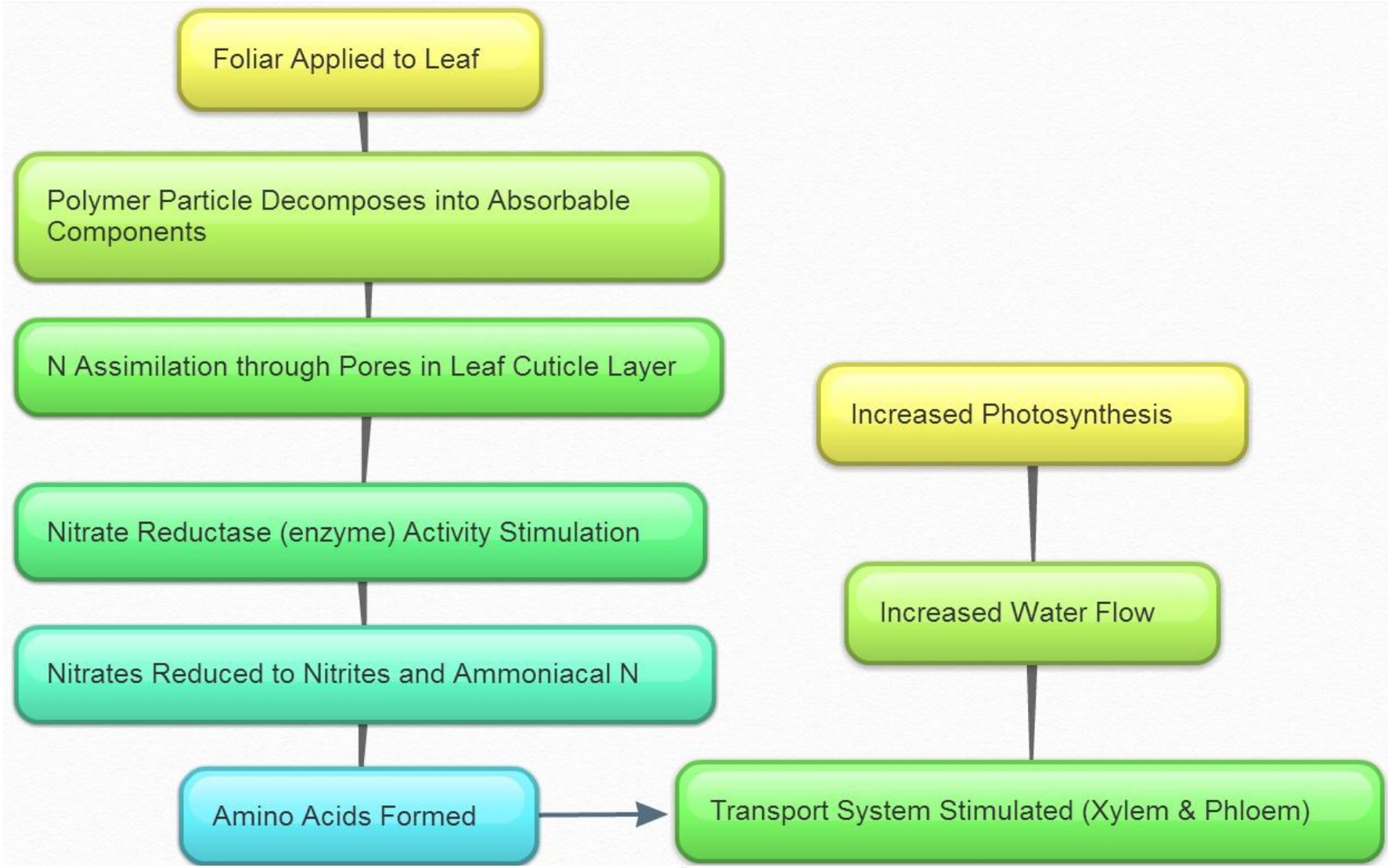
How & Why KQ-XRN Works



Thank You

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