



Dr. Thomas Quick

“Certified Organic Farming and Fertilizers – Future Cultural Practices”

A Review Of:

**Organic Fertility
Fertilizer Chemistry
Applied Fertility Issues**



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FOLIAR • FERTILIZERS
MICRONUTRIENTS • BIOSTIMULANTS
CHEMICAL SPECIALTIES

Manufacturing Chemist Since 1918
675 Products Globally

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OFAC
(Board Member)



? What Are ORGANIC Fertilizers ?

Chemically: “Organic” = contains Carbon (element #6)

AAPFCO: State fertilizer control officials organization

Commercially: “Organic” means organic production of a product using natural and NOP compliant inputs.”

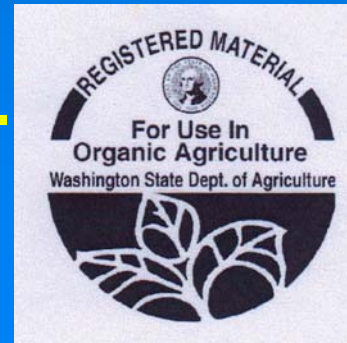
Organic Certification: **NOP (National Organic Program)**



OMRI (Organic Materials Review Institute)
WSDA (Washington State Dept. Of Ag.)



Many “Accredited Certifying Agencies” (ACAs):
ASCO, CCOF, Organic Certifiers, Oregon Tilth etc.



Let Us Talk CHEMISTRY Of Carbon



Let Us Talk CHEMISTRIES Of: Carbon and N – P – K:

Two Organic Fertilizer Forms: DRY Products and LIQUID Products

Some Sources of Organic Fertilizers:

Protein based products (Amino Acids)

Manures, Composts

Sugar and Starches

Crop Residues (Cover crops, Cellulose)

Lignins, Fats and Waxes

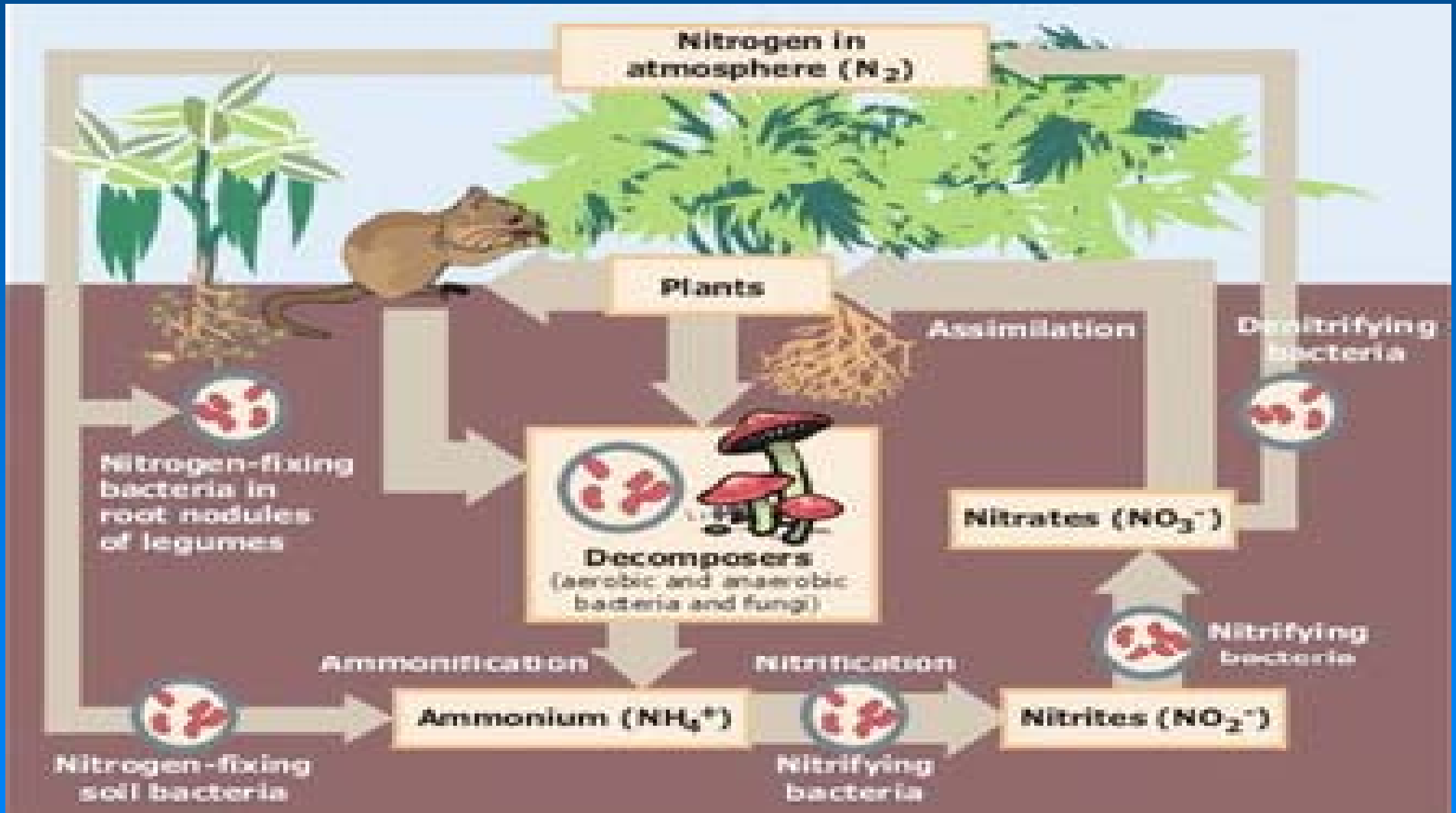
Humates (humic acid)

Mined Materials

? Which Of These Contains Significant Nitrogen [N] ?

? Why Would We Care About Nitrogen & Carbon ?

When we use organic fertilizers we are feeding plants, microbes both N & C
Nitrogen [N] is generally the most difficult nutrient to manage organically
because: release rates vary, the N cost is high and losses can occur



? What Is Mineralization?

Organic residue is decomposed in soil by living organisms, primarily bacteria and fungi.

MINERALIZATION PROCESS:

“To convert organic material into a mineral”

In plant fertility work this means: “microbial hydrolysis to make organic nutrients plant available”

** Remember the living part of this process and the soil rhizosphere! (Feed your soil and good micros!)

Urea: The King Of **Synthetic** **“Organic” Fertilizers!**

First discovered in urine 1773 (H.M. Rouvelle)

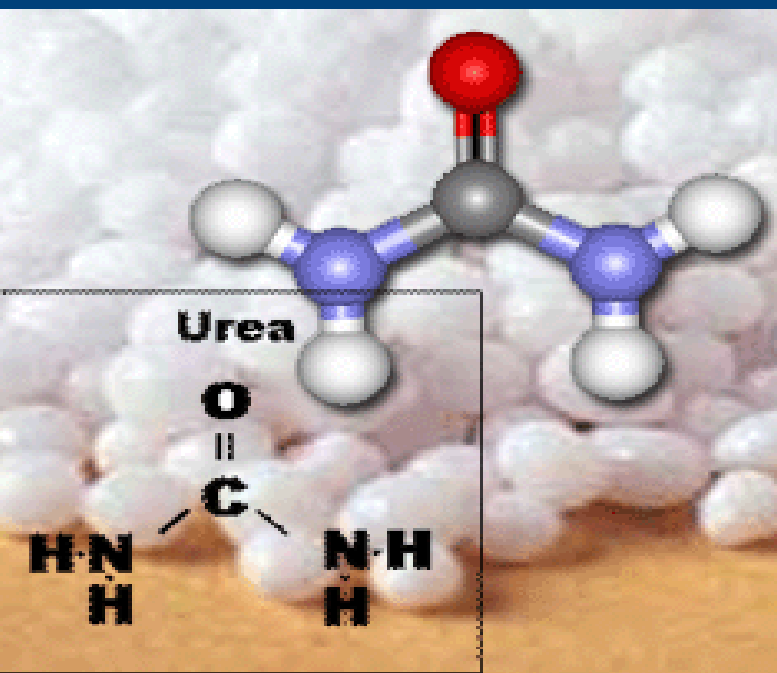
Synthesized 1828 by Friedrich Wohler
“The first organic compound to be made from inorganic starting materials!”

1870, Urea made from heating ammonium carbamate ($\text{NH}_2\text{-COO-NH}_4$) in a sealed vessel.

You make this by reacting
AMMONIA + CO₂ (air: N = 78%, O₂ = 21%, CO₂ = 0.033%)

Interesting Note: Urea + Malonic Acid react to form: barbituric acid (Adolph Bayer)

Globally 128 MILLION Tons/year (2007) !



ORGANIC SOURCES OF N: (Not including

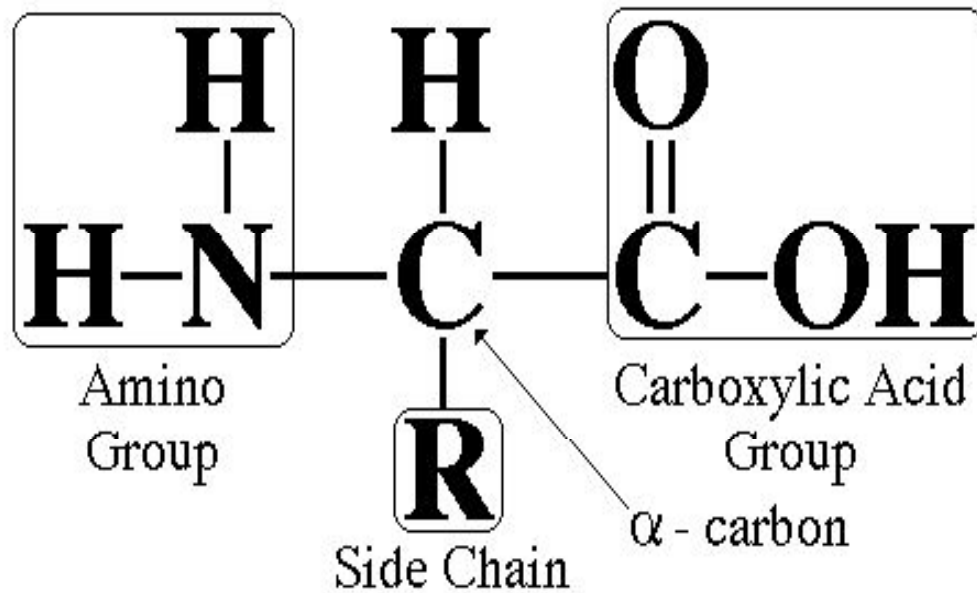
Proteins (amino acids)

Urea and Uric Acid (M

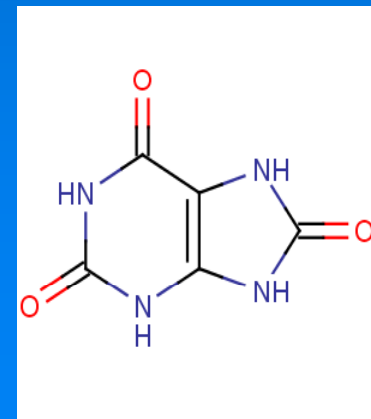
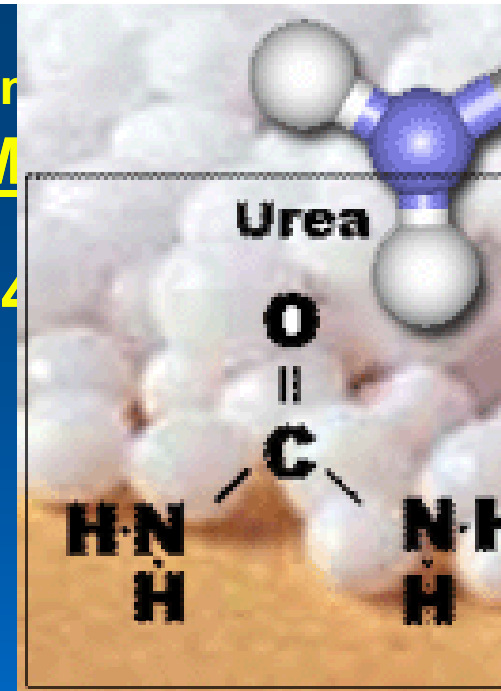
Proteins (polypeptides)

UREA (4

Amino Acid Structure



* Urea excreted in: Mammals, Amphibians
Salts of Uric Acid in: Birds, Reptiles, Bugs



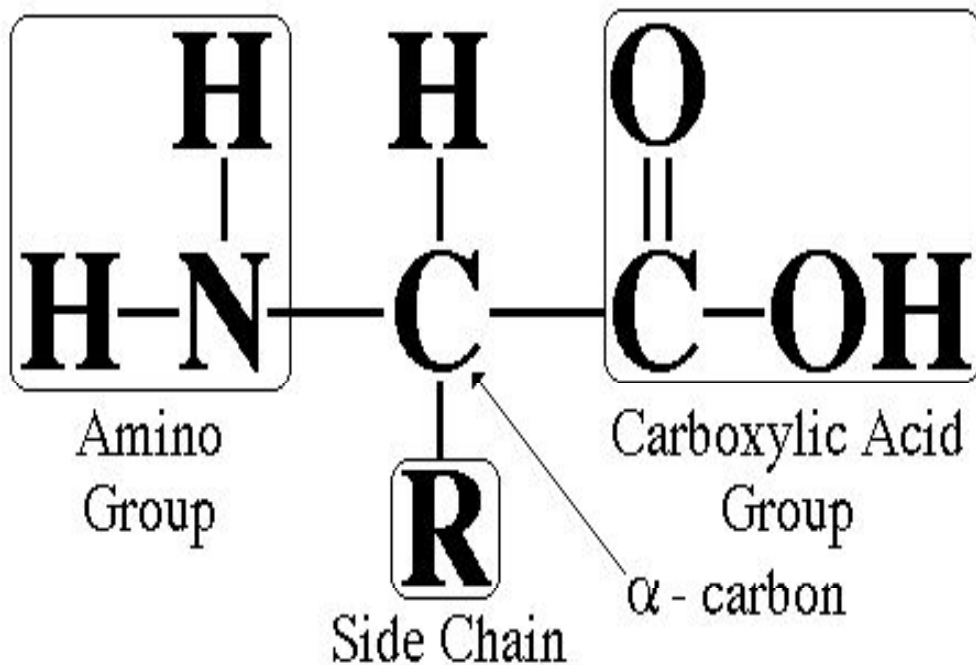
Uric Acid (33-0-0)

Protein Fertilizer Sources (amino acids)

Proteins (polypeptides)

Enzymatic hydrolysis or
acid hydrolysis
Of protein source materials:

Amino Acid Structure



Fish meal
Meat meal
Blood meal
Feather meal
Soy meal
Wheat and corn gluten
"hydrolysates" Etc.

The magic number =
[N] in protein is 6.25%

? So What Is Big Deal About Soil [P] Phosphate, I Have Plenty In My Soil?

Answer: It is there but **not available** to the plant during reproduction when we most need it!

Agricultural Limitations* [P] Availability:

[P] unavailable in alkaline pH soils or solutions

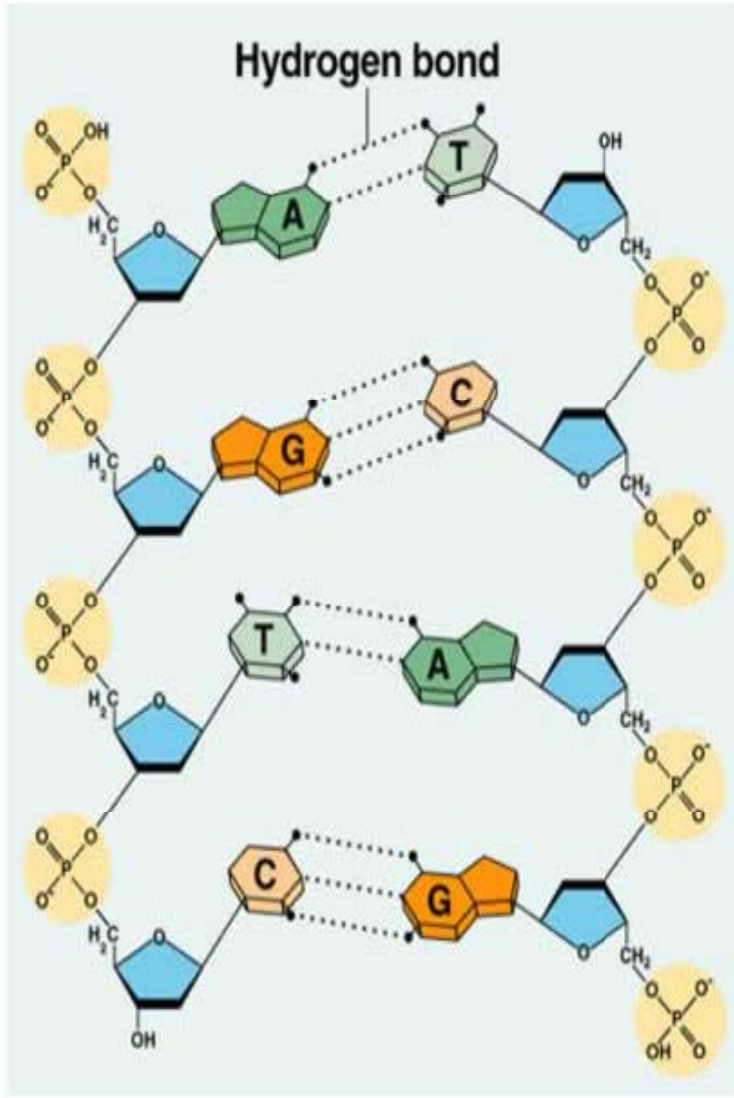
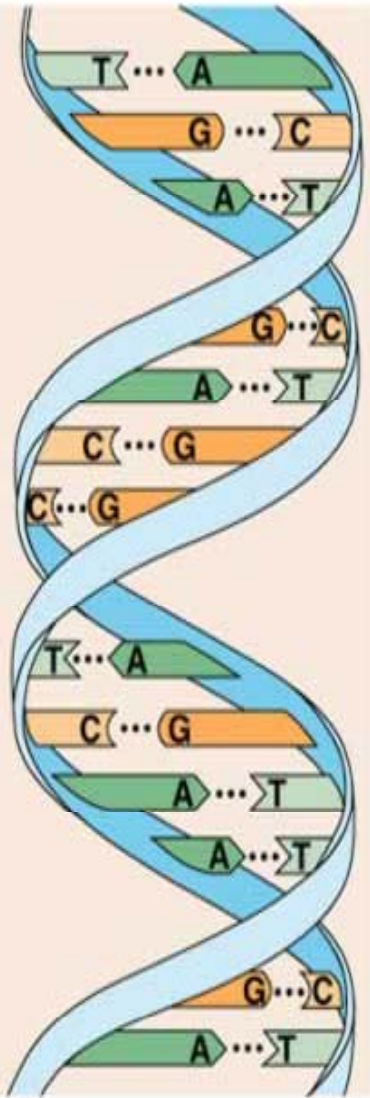
Saturated and anaerobic soils (water logged in Spring)

Cold soil temperatures (Frost control times!)

***Results In [P] Deficiencies In: Growing, Flowering, Fruiting,
(CELL DIVISION FOR FRUIT DEVELOPMENT)
This early deficiency can reduce yield potential!**

Limit [P] and you loose \$ PROFITS

PHOSPHORUS, A KEY FACTOR !



What Roles Does PHOSPHORUS Play In Plant Health and Yields?

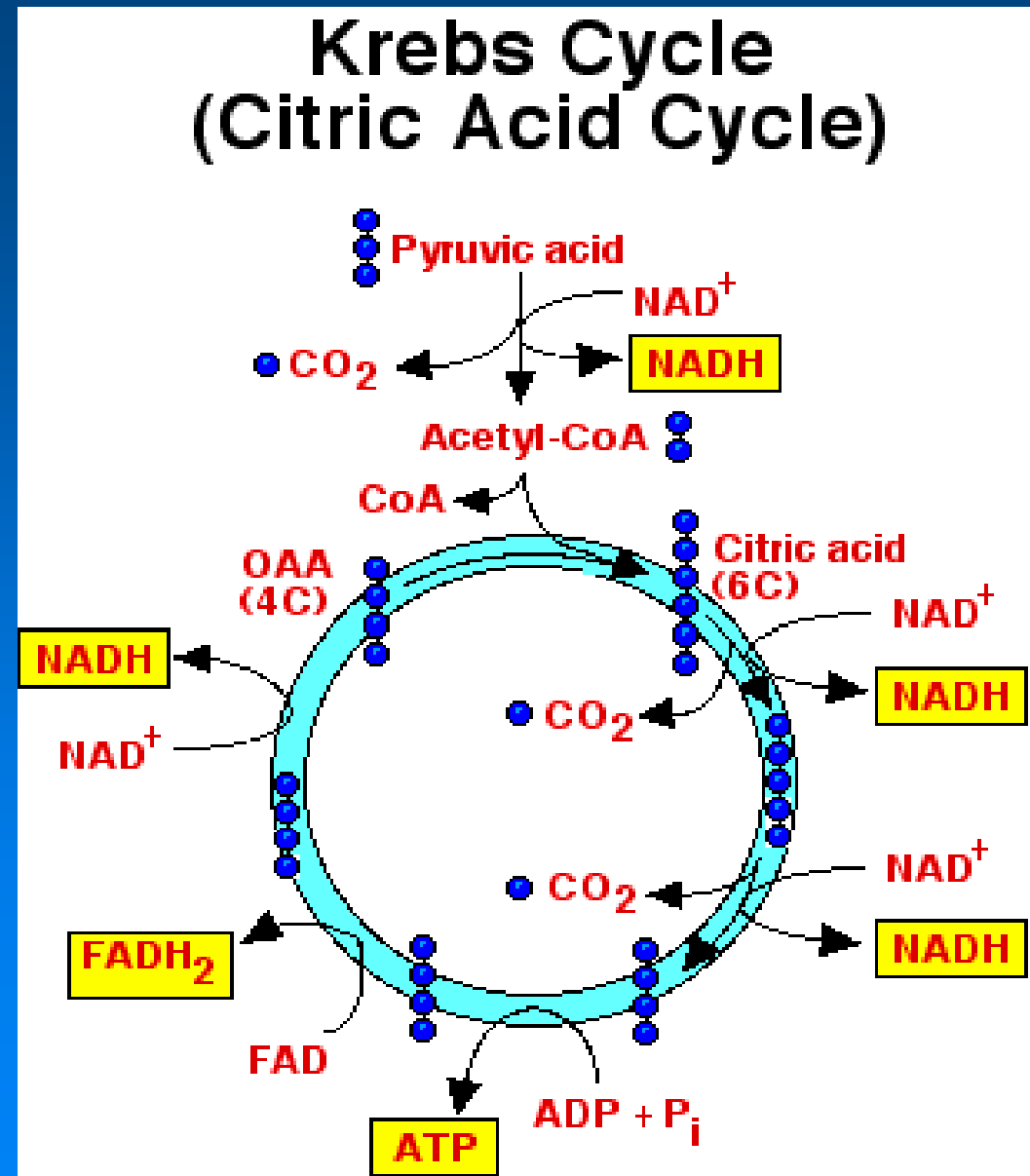
8.0% of DNA is [PHOSPHORUS]:

**cell division,
amino acids
and protein
synthesis all
need new [P]
each season**

PHOSPHORUS, A KEY FACTOR !

What Roles Does PHOSPHORUS Play In Plant Health and Yields?

Energy metabolism is based on recycling phosphate chemistries
ADP to ATP



ORGANIC SOURCES OF PHOSPHORUS :

**Mined Rock Phosphate:
(Apatite) low solubility**



Organic P Sources:

Manure and Composts

Bone Meal

Guano

**Other Balanced
Fertilizers?**

THE PLANT HEALTH ROLE OF POTASSIUM :

K is essential for many plant physiological reactions: protein synthesis, osmoregulation, enzyme activation and photosynthate translocation. Positive K balance must be maintained!

Organic K Sources:

**Mined Potassium Sulfate:
(K₂SO₄)**



Manure and Compost

Mined natural products (K₂SO₄, KCl)

Langbeinite (Potassium-magnesium sulfate)

Wood Ash, Hull Ash

Potassium carbonate (fungicide)

Citric acid chelates of K (0-0-25)

Seaweed Extract (KOH-based)

ORGANIC CHELATES: MICRONUTRIENT PRODUCTS

SOLUBLE SEAWEED EXTRACT POWDER

ACADIAN™ Powder is derived from fresh *Ascophyllum nodosum* seaweed harvested from the North Atlantic coastal waters of Nova Scotia, Canada. It is a natural storehouse of over 60 naturally occurring major and minor nutrients, carbohydrates, amino acids and naturally occurring plant growth promoting substances which enhance crop health, nutrition and quality.

PHYSICAL DATA

Appearance	Brownish-black crystals
Odor	Seaweed-like
Solubility in water	100% soluble
pH*	10 - 10.5

TYPICAL ANALYSIS

Maximum Moisture	6.5%		
Organic Matter	45 - 55%		
Ash (Minerals)	45 - 55%		
Total Nitrogen (N)	1.0 - 2.0%	Calcium (Ca)	0.1 - 0.2%
Available Phosphoric Acid (P ₂ O ₅)	1.0 - 2.0%	Sodium (Na)	3.0 - 5.0%
Soluble Potash (K ₂ O)	16.0 - 20.0%	Boron (B)	75 - 150 ppm
Sulphur (S)	1.0 - 2.0%	Iron (Fe)	75 - 250 ppm
Magnesium (Mg)	0.2 - 0.5%	Manganese (Mn)	8 - 12 ppm
		Copper (Cu)	1 - 10 ppm
		Zinc (Zn)	25 - 75 ppm

Carbohydrates: Alginic Acid, Mannitol, Laminarin

Naturally Occurring Growth Promoters: Cytokinins, Auxins, Gibberellins

AMINO ACIDS (average g of amino-acid/100 g of protein)

Alanine	3.81	Leucine	4.84
Arginine	0.22	Lysine	1.33
Aspartic Acid	5.44	Methionine	1.39
Cystine	trace	Phenylalanine	2.82
Glutamic Acid	7.69	Proline	4.42
Glycine	3.16	Serine	0.14
Histidine	0.42	Threonine	1.27
Isoleucine	1.94	Trypsine	1.80
		Valine	3.46

Why Do Seaweed Extract Powders Work?

Chelation Micronutrients Cool Sugars (SAR) Amino Acids

1-1-17 analysis

FUTURE CULTURAL PRACTICES FOR ORGANIC AGRICULTURE

(OFAC), is developing “Organic Fertilizer Use Guidelines” to inform and assist growers in the safe and effective use of NOP allowed fertilizer inputs. OFAC believes that proper handling and application of organic fertilizers are key components of the NOP and these suggested guidelines, coupled with the NOP product certification programs will help insure food safety and organic integrity for organic produce.

FUTURE CULTURAL PRACTICES FOR ORGANIC AGRICULTURE

- 1. Dry Materials (definition and general characteristics, product overview)**
 - a. Materials defined (manures, compost, animal proteins, plant proteins)**
 - b. Allowed Products**
 - A. Purchase, Receiving and Storage**
 - B. Field application**
 - C. Precautions for use**
- 2. Liquid Materials (definition, features, overview)**
 - a. Material defined (protein hydrolysates, fish emulsions, water extract teas, etc...)**

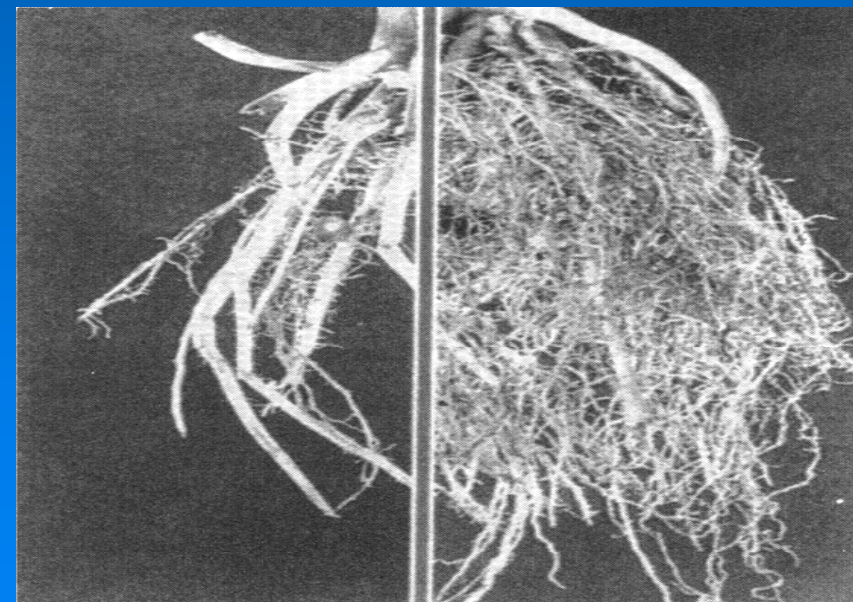
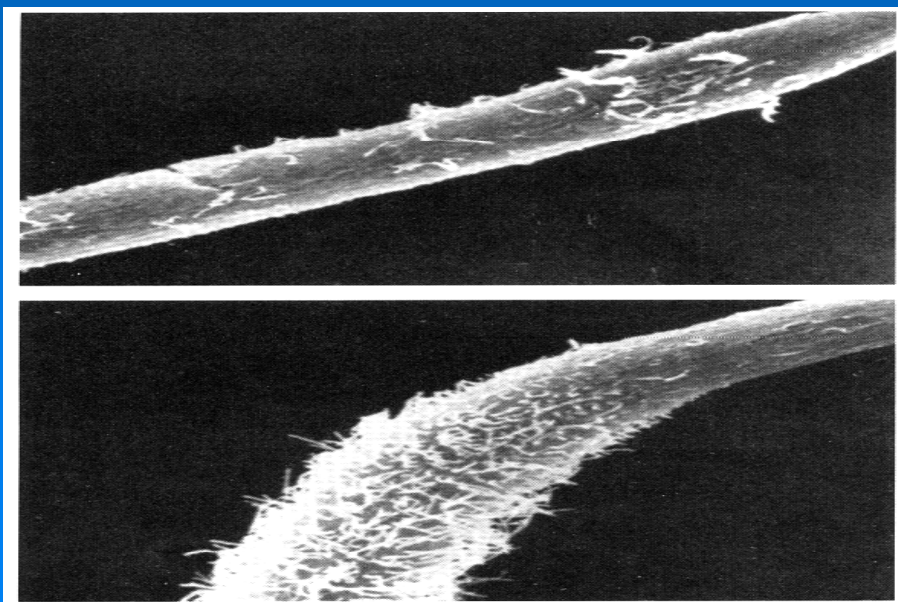


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CHEMICAL SPECIALTIES



“Let’s Grow More Organically Together!”



Thank You !
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