

# Forms of Nitrogen Fertilizer

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- Nitrogen is required for vegetative growth of plants
- When deficient
  - Plants become stunted
  - Older leaves appear yellow and lack chlorophyll



## Facts about Nitrogen fertilizer

- Nearly 80% of air is nitrogen
- Each acre of land contains ~75 million pounds of N; not a single pound is useful to plants unless N is fixed into nitrate or ammonium forms
- Lightning and some bacteria can fix atmospheric N; however industrial fixation (Haber-Bosch process) is the main source of nitrogen fertilizer to crops
- About 1000-7000 lb/acre of nitrogen fertilizer is applied in ornamental industry

## Nitrogen fertilizer is applied to crops in different forms

Common forms of nitrogen fertilizer are:

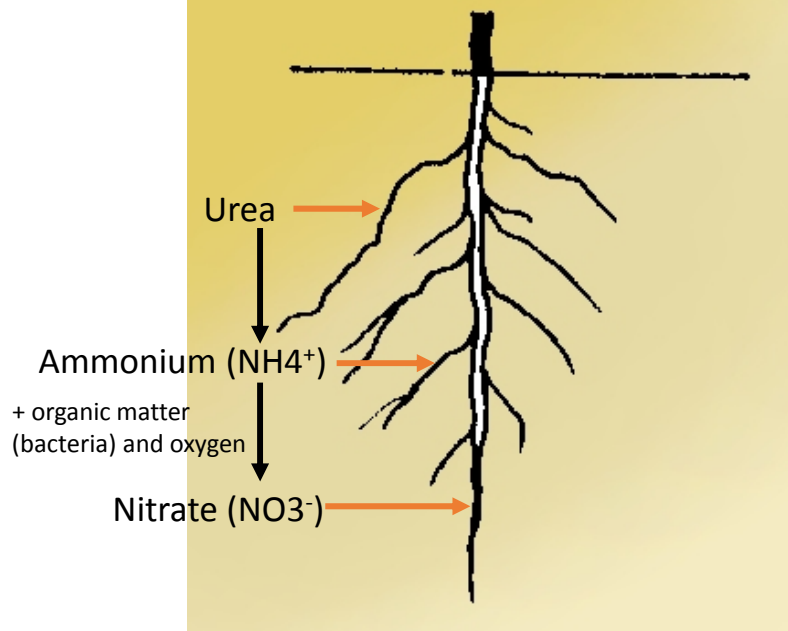
- Urea
- Ammonium
- Nitrate

### GUARANTEED ANALYSIS 20-10-20

Total nitrogen (N) .....	20%
8.0% ammoniacal nitrogen	
12.0% nitrate nitrogen	
Available phosphate (P <sub>2</sub> O <sub>5</sub> ) .....	10%
Soluble potash (K <sub>2</sub> O) .....	20%
Magnesium (Mg) .....	0.15%
0.15% water soluble magnesium (Mg)	
Boron (B) .....	0.0125%
Copper (Cu) .....	0.0125%
0.0125% chelated copper (Cu)	
Iron (Fe) .....	0.05%
0.05% chelated iron (Fe)	
Manganese (Mn) .....	0.025%
0.025% chelated manganese (Mn)	
Molybdenum (Mo) .....	0.005%
Zinc (Zn) .....	0.025%
0.025% chelated zinc (Zn)	

**Derived from:** Ammonium Nitrate, Potassium Nitrate, Potassium Phosphate, Magnesium Sulfate, Boric Acid, Copper EDTA, Iron EDTA, Manganese EDTA, Ammonium Molybdate, Zinc EDTA

## Dynamics of N forms in the substrate

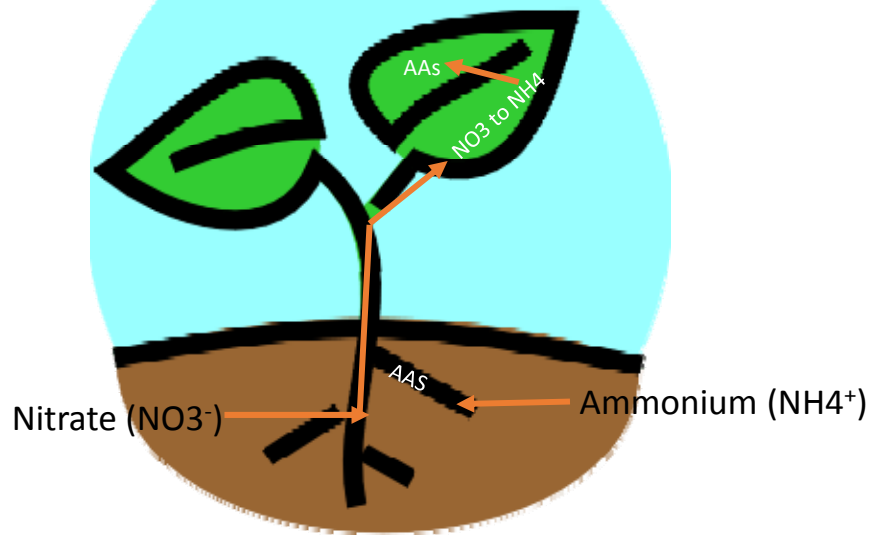


## Hydroponic lettuce mix

Why only nitrate form?

<b>GUARANTEED ANALYSIS</b>	<b>5-11-26</b>
Total nitrogen (N) .....	.5%
5.0% nitrate nitrogen	
Available phosphate ( $\text{P}_2\text{O}_5$ ) .....	11%
Soluble potash ( $\text{K}_2\text{O}$ ) .....	26%
Magnesium (Mg) .....	6.0%
6.0% water soluble magnesium (Mg)	
Sulfur (S) .....	8.0%
8.0% combined sulfur (S)	
Boron (B) .....	0.05%
Copper (Cu) .....	0.015%
0.015% chelated copper (Cu)	
Iron (Fe) .....	0.3%
0.3% chelated iron (Fe)	
Manganese (Mn) .....	0.05%
0.05% chelated manganese (Mn)	
Molybdenum (Mo) .....	0.01%
Zinc (Zn) .....	0.015%
0.015% chelated zinc (Zn)	

## Dynamics of N forms inside the plant



## Ammonium toxicity

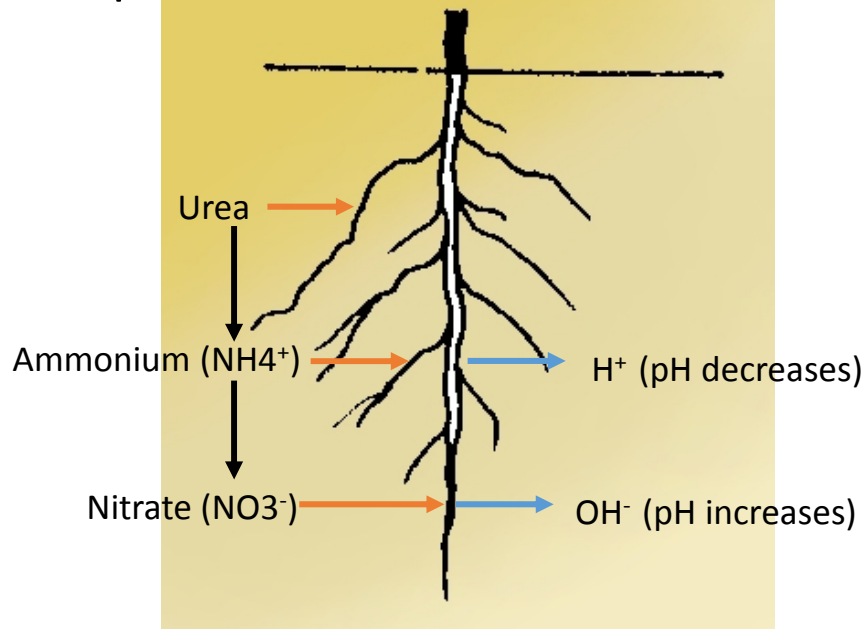
Ammonium can accumulate in the substrates under certain conditions when bacterial activity is low:

- Low temperature
- Low pH
- Saturated conditions

Leaching and adding basic fertilizer can aid if toxicity is observed



## pH imbalances due to N forms



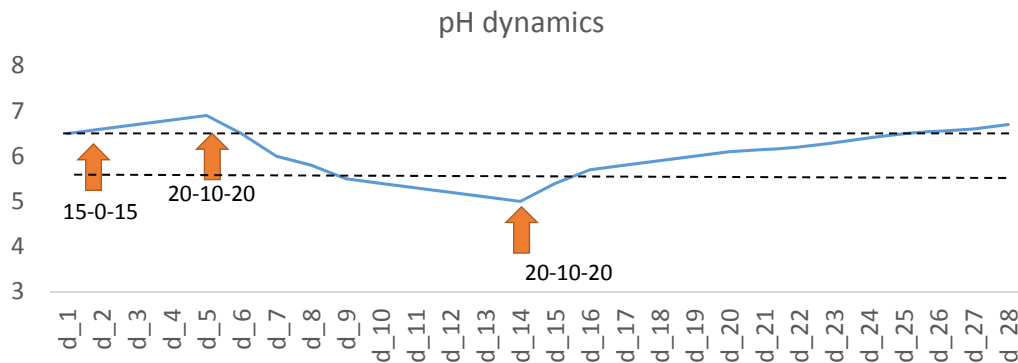
Fertilizer	$\text{NO}_3$	$\text{NH}_4^b$	Potential acidity <sup>c</sup> or basicity <sup>d</sup>
Ammonium sulfate	0	100	2200 a
Urea	0	100	1680 a
21-7-7 acid	0	100	1539 a
21-7-7 acid	0	100	1518 a
Diammonium phosphate	0	100	1400 a
Ammonium nitrate	51	49	1220 a
Monoammonium phosphate	0	100	1120 a
18-9-18	47.7	53.3	708 a
20-20-20	27.5	72.5	532 a
21-5-20	62.3	37.7	407 a
20-10-20	59.5	40.5	404 a
20-10-20	60	40	401 a
21-5-20	60	40	390 a
17-5-17	70.6	29.4	106 a
20-0-20	54	46	0
15-0-20	76.7	23.3	38 b
15-5-15	80	20	69 b
15-5-15	78.7	21.3	131 b
15-0-14	82.7	17.3	165 b
15-0-15	86.7	13.3	221 b
15-0-15	80.8	18.8	319 b
Calcium nitrate	100	0	400 b
Potassium nitrate	100	0	520 b
Sodium nitrate	100	0	580 b

Acidic

Neutral

Basic


## Adjusting substrate pH using nitrogen form in the fertilizer



## Plugs vs finished plants: which form to use?

**Peters Professional**

SKU# E99720\*



Classic low-phosphate ratio proven by Florida researches for tropical foliage and hanging baskets. Excellent choice for interiorscapes.


- B (Base) formulation can be used alone or rotated with a C (Customizing) component
- Effective for all Water Types
- Contains a complete range of essential micronutrients

\* Available in Canada SKU # E99723

GUARANTEED ANALYSIS		24-8-16
Total nitrogen (N)	.....	24%
7.1% ammoniacal nitrogen		
8.7% nitrate nitrogen		
8.2% urea nitrogen		
Available phosphate (P <sub>2</sub> O <sub>5</sub> )	.....	8%
Soluble potash (K <sub>2</sub> O)	.....	16%
Magnesium (Mg)	.....	2.0%
0.35% water soluble magnesium (Mg)		
Sulfur (S)	.....	2.0%

**Peters Professional**

SKU# E99340



Ideal for plugs, liners, bedding plants and vegetable transplants with high nitrate and low phosphate levels to encourage healthy, compact growth.

- B (Base) formulation for constant, balanced nutrition
- Most effective with Water Types 1 and 2
- Contains calcium and magnesium
- For growers who prefer to add their own micronutrient package

GUARANTEED ANALYSIS		13-2-13
Total nitrogen (N)	.....	13%
0.4% ammoniacal nitrogen		
12.6% nitrate nitrogen		
Available phosphate (P <sub>2</sub> O <sub>5</sub> )	.....	2%
Soluble potash (K <sub>2</sub> O)	.....	13%
Calcium (Ca)	.....	6.0%
Magnesium (Mg)	.....	3.0%
3.0% water soluble magnesium (Mg)		

## Is nitrate form better?

### Plus:

- Nitrates are readily available to plants, not fixed by substrate
- Does not compete with uptake of positively charged ions like K, Ca, Mg
- Increases stress tolerance

### Minus:

- Nitrates are safe to store inside plants
- Requires light energy to convert to amino acids
- Micronutrient deficiencies due to pH imbalance

## Is ammonium form better?

### Plus:

- Ammonium is directly incorporated into amino acids
- Results in large foliage and lush plant growth
- Not easily leached as nitrates

### Minus:

- Can compete with uptake of positively charged ions (blossom end rot)
- Excess ammonium can cause phytotoxicity