PRO AGRO LECTORIUM

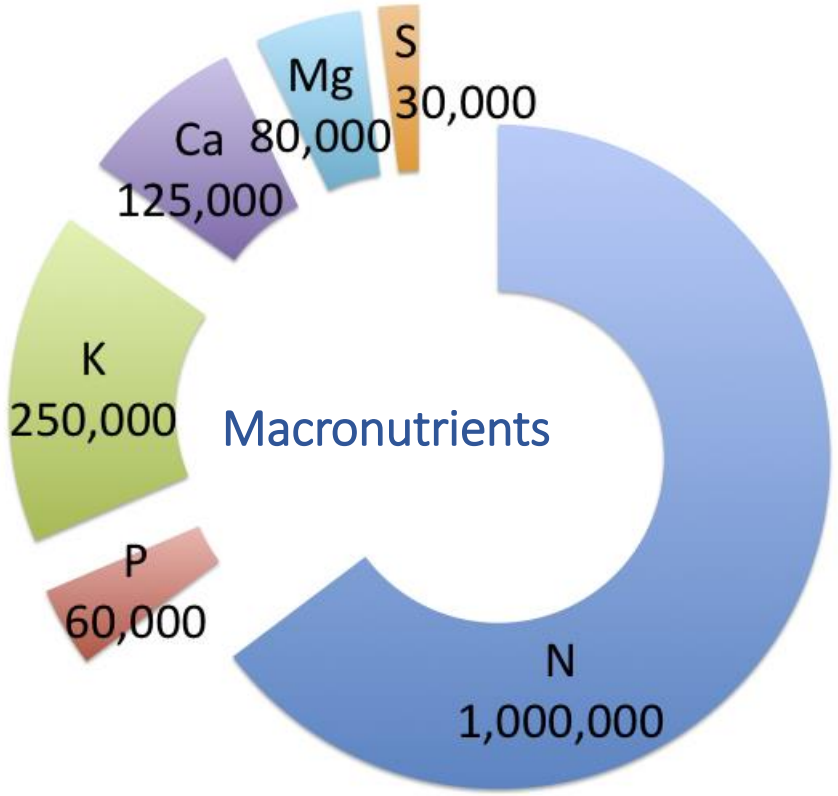
Nitrogen deficiency symptoms in plants

Vladimir Nosov

PhD (Soil Science), Competence Centre Head, Apatit, PhosAgro Group

vvnosov@phosagro.ru

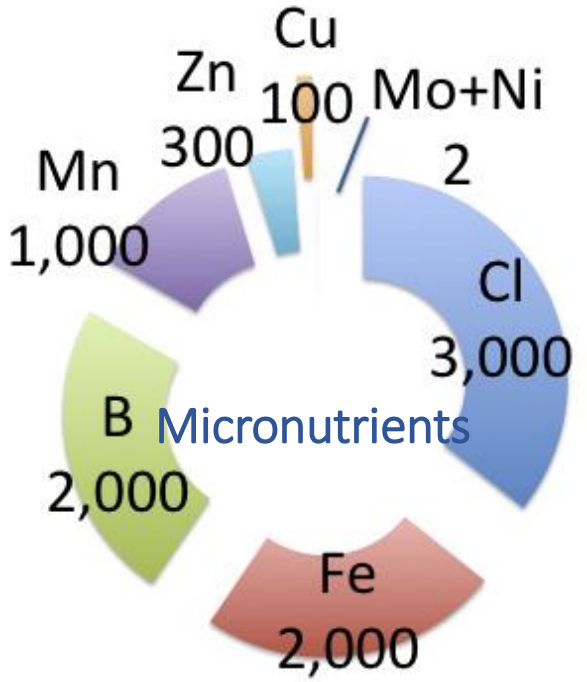
Relative content of macro- and micronutrients in plants



Plants need 17 nutrients for mineral nutrition.

14 of them come from the soil.

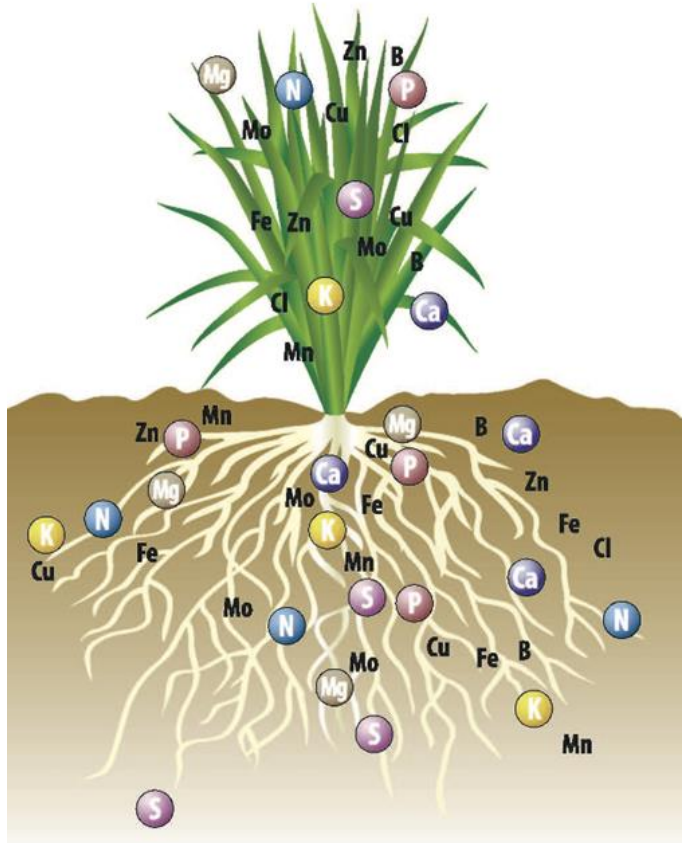
Nitrogen (N) is a key macronutrient.



IPNI, 2018.

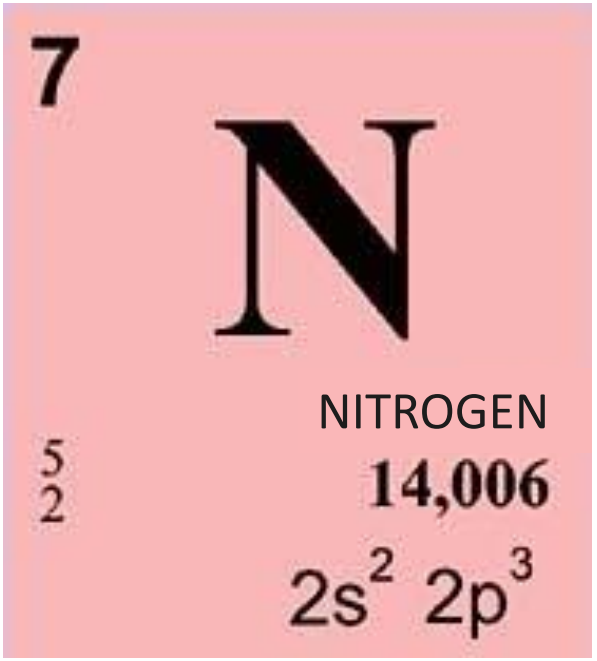
Basic principles of mineral plant nutrition

- Nutrients need to be available in an easy-to-absorb form, especially during peak consumption periods, no matter what source (organic or mineral) they come from.
- Nutrients must be dissolved to be absorbed by roots because insoluble compounds cannot be directly used by plants.
- Focusing on just one nutrient is never enough. If plant growth and development is limited by the lack of a nutrient, the other nutrients cannot be used effectively either.
- It is important to correct adverse soil properties that hinder plant nutrient uptake, such as acidity, over-compaction, or salinity.



Role of nitrogen in plant development

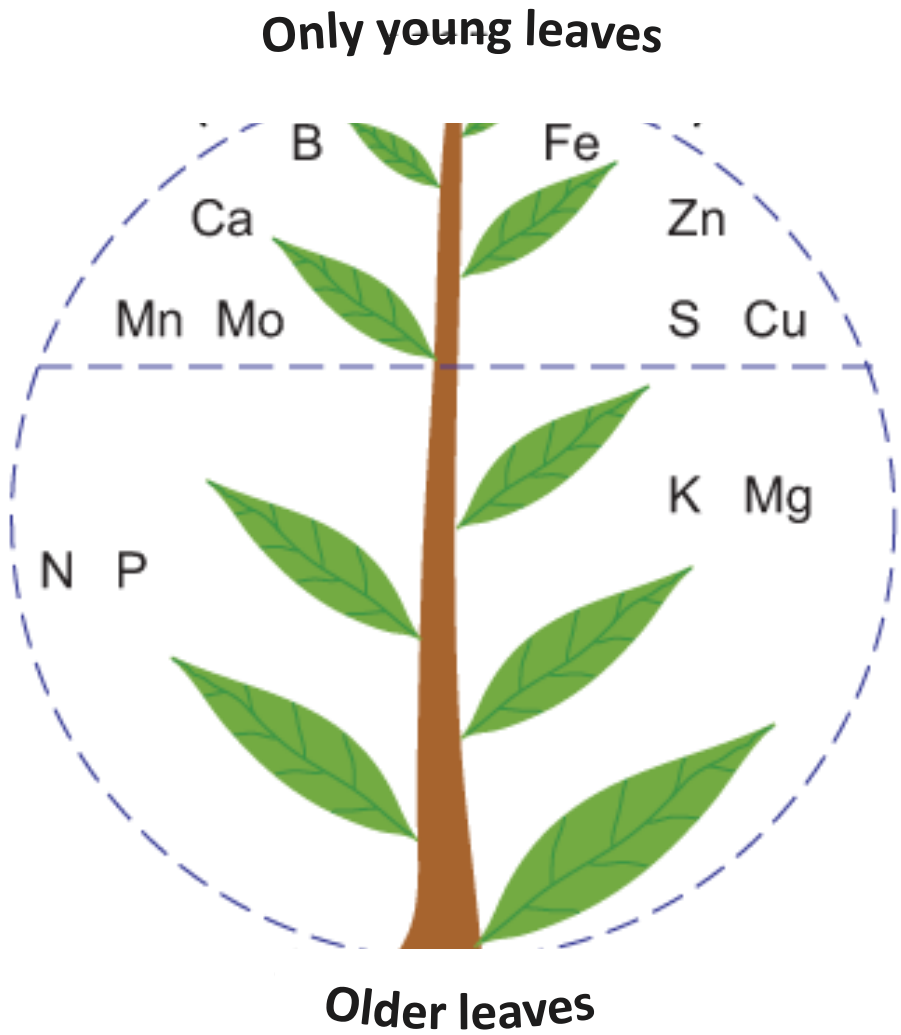
- Nitrogen is part of plant proteins. Thus, the nutritional value of plant products we consume depends to a large extent on the nitrogen supply of crops.
- Plants require this element in larger quantities than other essential nutrients except for potassium-loving crops, which have potassium in the first place.



https://megabook.ru

Typical nitrogen deficiency symptoms in plants

- With a sufficient supply of nitrogen, leaves have a dark-green colour due to a high content of chlorophyll.
- Nitrogen is a mobile element in plant tissue and as a result deficiencies develop **in older leaves first – they become light green or yellow**. As nitrogen starvation intensifies, these symptoms also spread to younger leaves.
- Other signs of nitrogen deficiency include inhibited plant growth, thinning of stems, poor tillering in grain crops, low protein content in seeds and vegetative parts of plants, and reduced foliage.
- Nitrogen-deficient plants ripen prematurely and produce low yields of poor quality.



Nitrogen deficiency symptoms in wheat

IPNI Crop Nutrient Deficiency Image Collection, 2019

Nitrogen deficiency symptoms in maize

IPNI Crop Nutrient Deficiency Image Collection, 2019

Nitrogen deficiency symptoms in sunflower

IPNI Crop Nutrient Deficiency Image Collection, 2019

Nitrogen deficiency symptoms in rapeseed

IPNI Crop Nutrient Deficiency Image Collection, 2019

Nitrogen deficiency symptoms in flax

IPNI Crop Nutrient Deficiency Image Collection, 2019

Nitrogen deficiency symptoms in potato

IPNI Crop Nutrient Deficiency Image Collection, 2019

Nitrogen deficiency symptoms in cacao

Leaf N was estimated as 0.54%, which is much below the optimum of 1–2%.

The chlorophyll index (SPAD) value was also found to be very low (24) in N deficient leaves, while the healthy ones showed SPAD values >40.

IPNI Crop Nutrient Deficiency Image Collection, 2019

Nitrogen deficiency symptoms in coffee

During fruit development and through harvest, berries draw more N and K from the leaves than other nutrients.

The leaves on the fruiting lateral (branch) shows signs of N (yellowing) and K (tip browning) deficiencies.

IPNI Crop Nutrient Deficiency Image Collection, 2019

Nitrogen deficiency symptoms in coconut palm

IPNI Crop Nutrient Deficiency Image Collection, 2019

Range of sufficient macronutrient content in plants

Crop	Growth phase	Part of the plant	N	P	K
			(% (absolute dry matter)		
Maize	Seedlings (< 10 cm)	Whole plant	**4.00–5.00**	0.40–0.60	3.00–4.00
	Vegetative	Uppermost fully expanded leaf	**3.00–4.00**	0.30–0.50	2.00–3.00
	Tassel emergence	Ear leaf	**2.80–4.00**	0.25–0.50	1.80–3.00
Soybeans	Germination	Uppermost fully expanded trifoliolate leaf	**3.50–5.50**	0.30–0.60	1.07–2.50
	Flowering	Uppermost fully expanded trifoliolate leaf	**3.25–5.00**	0.30–0.60	1.50–2.25
Wheat, barley, rye and oats	Seedlings (before stem elongation)	Whole plant	**4.00–5.00**	0.20–0.50	2.50–5.00
	Flowering	Flag leaf	**4.00–5.00**	0.20–0.50	2.00–4.00
Sorghum grain	Seedlings (< 30 cm)	Whole plant	**3.90–5.00**	0.20–0.50	2.00–4.00
	Vegetative	Uppermost fully expanded leaf	**3.00–4.00**	0.20–0.40	2.00–4.00
	Flowering	Flag leaf	**2.50–4.00**	0.20–0.35	1.40–4.00
Alfalfa	Number of flowers on 10% of stems ≥1	Upper parts – 10–15 cm (leaves and stems)	**3.00–5.00**	0.25–0.70	2.00–3.50
Red feather clover	Before flowering	Upper parts – 10–15 cm (leaves and stems)	**3.00–4.50**	0.20–0.60	2.20–3.00
Cock's-foot	Five weeks after cutting or renewed vegetative development in spring	Whole plant	**2.50–3.50**	0.25–0.35	2.50–3.50
Sugar beet	Middle of the vegetative phase	Central fully expanded leaf	**3.01–4.50**	0.26–0.50	2.01–6.00
Vegetables	–	Uppermost fully expanded leaves	**2.50–4.00**	0.25–0.80	2.00–9.00
Potatoes	Middle of the vegetative phase	Petioles of the uppermost fully expanded leaf	**2.50–4.00**	0.18–0.22	6.00–9.00

PRO AGRO
LECTORIUM

Thank you!