PRO AGRO LECTORIUM

Potassium deficiency symptoms in plants

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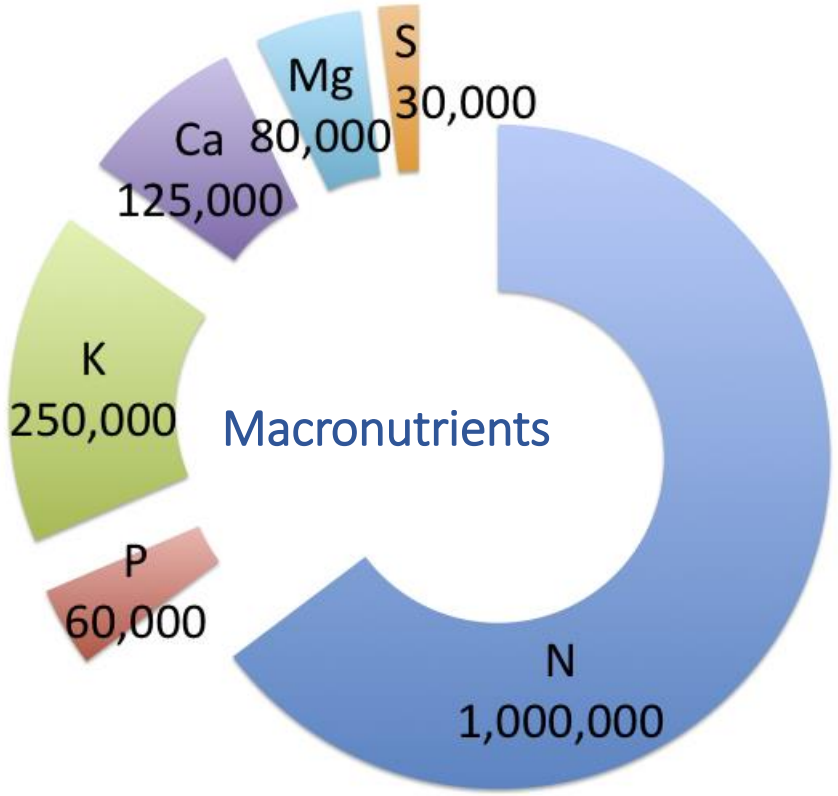
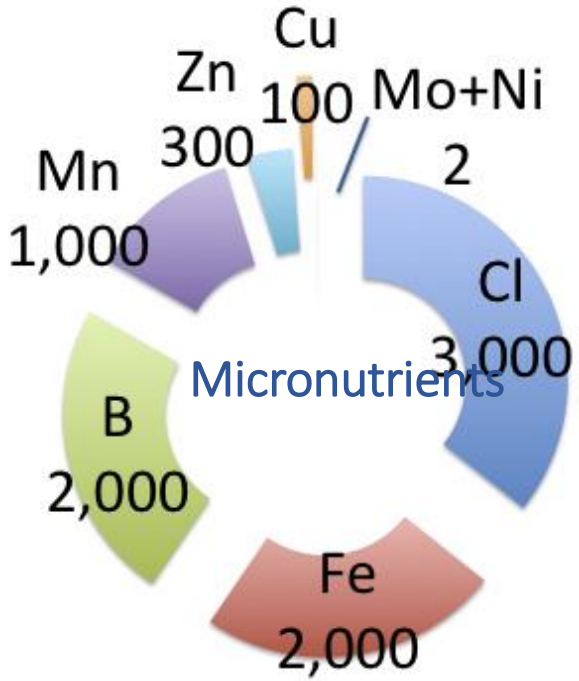
Relative content of macro- and micronutrients in plants



Plants need 17 nutrients for mineral nutrition.

14 of them come from the soil.

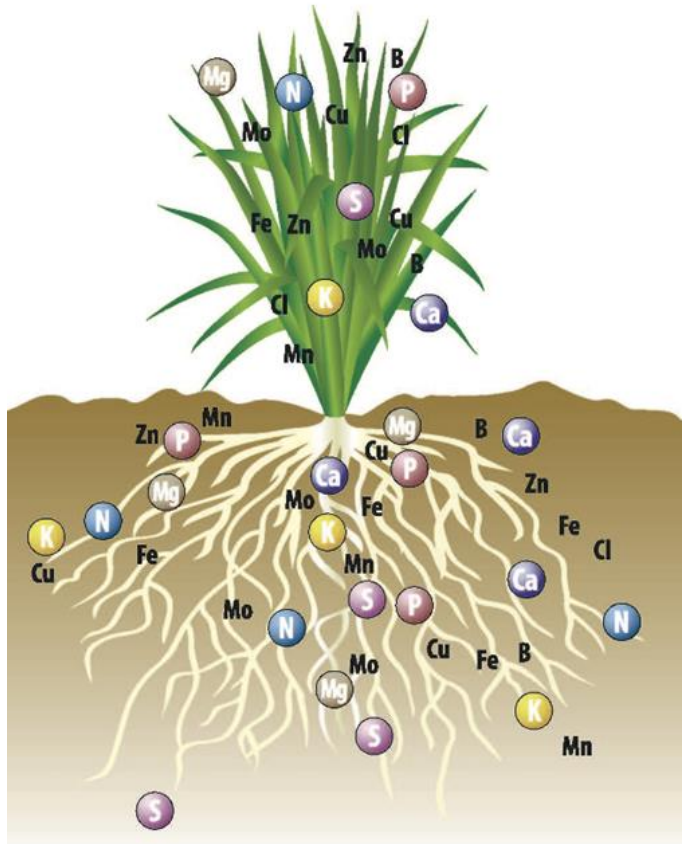
Potassium (K) is a key macronutrient.



IPNI, 2018

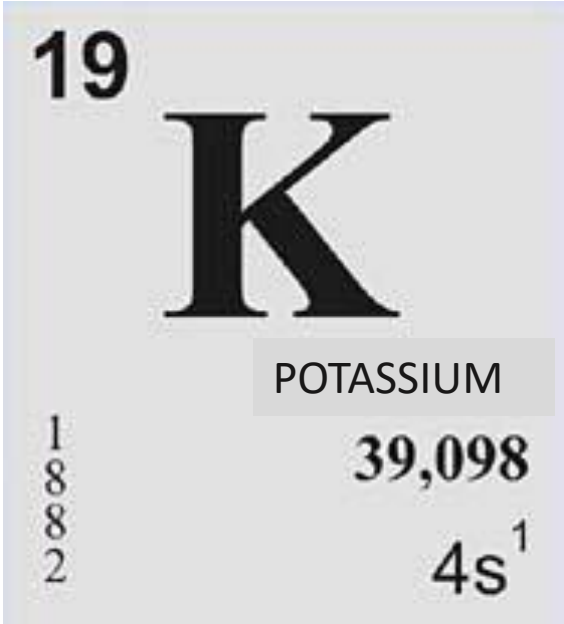
Basic principles of mineral plant nutrition

- 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 are 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 potassium in plant development

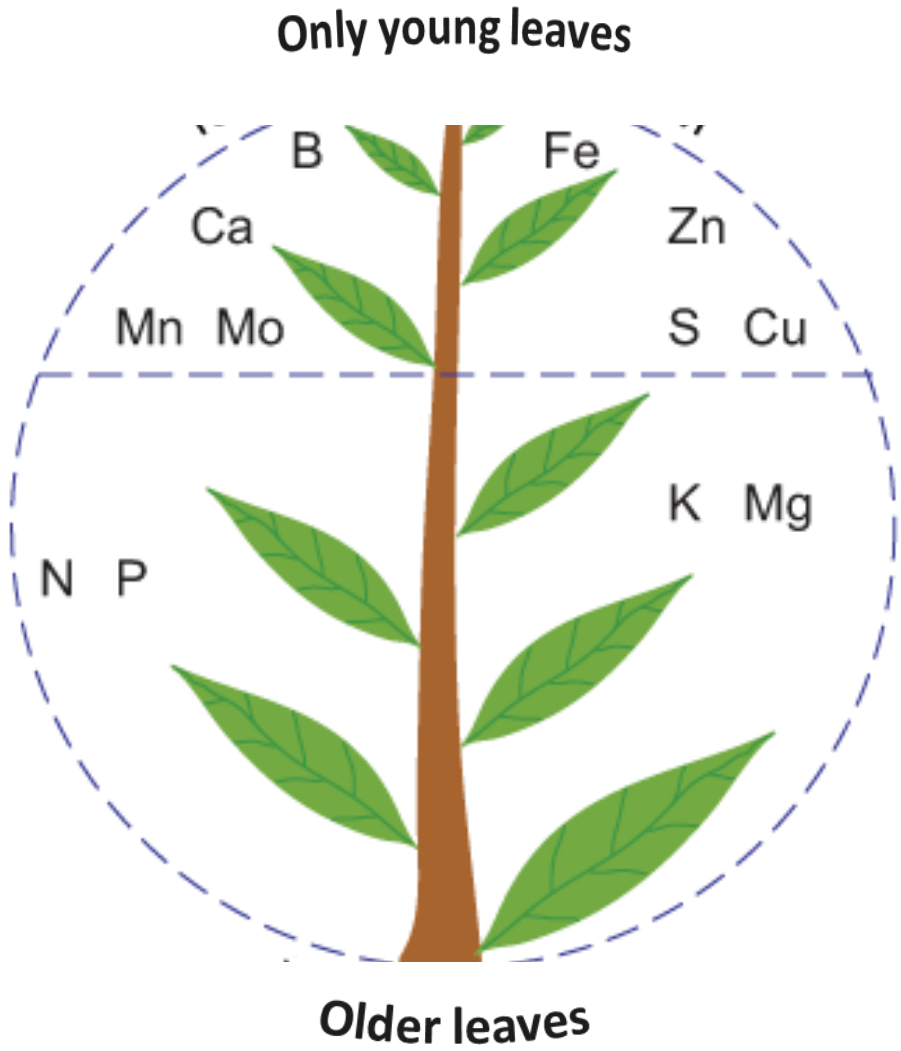
- Potassium is absorbed by plants in the ion form (K^+). It improves photosynthesis, accelerates the outflow of photosynthetic products and contributes to their accumulation, while also intensifying the activity of more than 60 enzymes and enzyme systems and enhancing the acid–alkaline balance.
- Potassium speeds up nitrogen absorption, boosts protein synthesis and lowers nitrate content. It also increases the content of essential amino acids and vitamins.
- Potassium intensifies the synthesis of cellulose and pectins thereby increasing the thickness of cell walls, improving tissue strength, and decreasing lodging. It also enhances resistance to diseases and pests.
- Potassium stimulates the formation of tubercles on the roots of legumes and intensifies nitrogen-fixing processes.
- Potassium slows down transpiration and improves the water-retaining capacity of leaves thereby increasing the plant's drought resistance. It enhances the plant's winter survival properties and cold resistance, while also improving the marketable condition and integrity of products.



https://megabook.ru

Typical potassium deficiency symptoms in plants

- **Tipburn (tip chlorosis and necrosis)** is a typical symptom of potassium deficiency. The nutrient displays increased mobility within the plant and easily migrates from older parts into newly growing ones. The first signs of potassium deficiency appear on the lower leaves, whereas the upper leaves remain green and look healthy.
- Moderate potassium deficiency may lead to latent potassium starvation, with plants showing no apparent symptoms.
- Plants suffering from potassium shortages grow slowly and develop a weak root system. The stems are also underdeveloped and tend to lodge, while the seeds and fruits are usually undersized, thin and puckered.
- In case of potassium deficiency, plants are more vulnerable to diseases and pests, turn more susceptible to droughts and produce low yields of poor quality.



Potassium deficiency symptoms in wheat

IPNI Crop Nutrient Deficiency Image Collection, 2019

Potassium deficiency symptoms in maize

IPNI Crop Nutrient Deficiency Image Collection, 2019

Potassium deficiency symptoms in rapeseed

IPNI Crop Nutrient Deficiency Image Collection, 2019

Potassium deficiency symptoms in soybean

IPNI Crop Nutrient Deficiency Image Collection, 2019

Potassium deficiency symptoms in alfalfa

IPNI Crop Nutrient Deficiency Image Collection, 2019

Potassium deficiency symptoms in apple

IPNI Crop Nutrient Deficiency Image Collection, 2019

Potassium deficiency symptoms in groundnut

The soils were deficient in the basic cations and had very low soil available K (61.3 kg/ha).

Total leaf K content in the deficient leaves was found only 0.6%.

IPNI Crop Nutrient Deficiency Image Collection, 2019

Potassium deficiency symptoms in grapewines

High soil Na causes K deficiency in plants.

Average K content in petioles of healthy vines was 1.49% compared to 0.33% in petioles of affected vines.

IPNI Crop Nutrient Deficiency Image Collection, 2019

Potassium deficiency symptoms in cacao

K content of affected leaf was 0.85% compared to healthy leaf of 1.65% K.

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

Schwab et al, 2007; Vitosh et al, 1994.

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Thank you!