



Controlled Release Fertilizers

Multicote[®] Controlled Release Fertilizers

Continuous
plant nutrition
over months

Enhanced
Nutrient Use Efficiency

Labor saving



The benefits of Controlled Release Nutrition

The benefits of controlled release nutrition

- 🌿 **Optimal Plant Development** - Nutrients are precisely supplied in accordance with specific plant needs



Multicote®: optimal nutrition throughout the growth season

Granular soluble fertilizer: hazardous excess at the beginning followed by deficiency towards the end of the growth season

The benefits of controlled release nutrition

Single Application per Season

- Labor saving
- Reduced application costs
- Fewer tractor operations = less soil compaction



The benefits of controlled release nutrition

Minimized Losses through leaching, volatilization or fixation in the soil

- Availability of nutrients throughout the growth cycle is ensured
- Optimized use of fertilizers without wastage
- No surplus fertilization is required – reduced application rates
- Ecologically superior (no soil, ground-water or air pollution)

The benefits of controlled release nutrition

Fertilization totally independent of irrigation

- No need for sophisticated dosing and injection systems
- In rainy season – no need for technical irrigations
- No fertilizer losses where irrigation is applied in excess to prevent salinity build-up



The advantages with the use of Haifa CRF

- ✦ Provides nutrients to plants according to their needs
- ✦ Allows to reduce the dose of conventional application
- ✦ Save labor
- ✦ Applied independently of the irrigation system
- ✦ Minimizes the environmental impact of fertilization

Multicote™ is recommended...



On light soils

where nutrients are easily leached

Multicote™ is recommended...



As base fertilizers for rainy season crops.
Rainfall accelerates nutrient leaching....

Multicote™ is recommended...



.... when the mud makes side-dressing application troublesome.

Multicote™ is recommended...



Where nitrogen application rates are limited by local regulations,
so high efficiency of nutrient use is desired

Multicote™ is recommended...



For crops with a shallow root system

Multicote™ is recommended...

when there is no technical irrigation system



Multicote™ is recommended...



When the field is remote and difficult to access

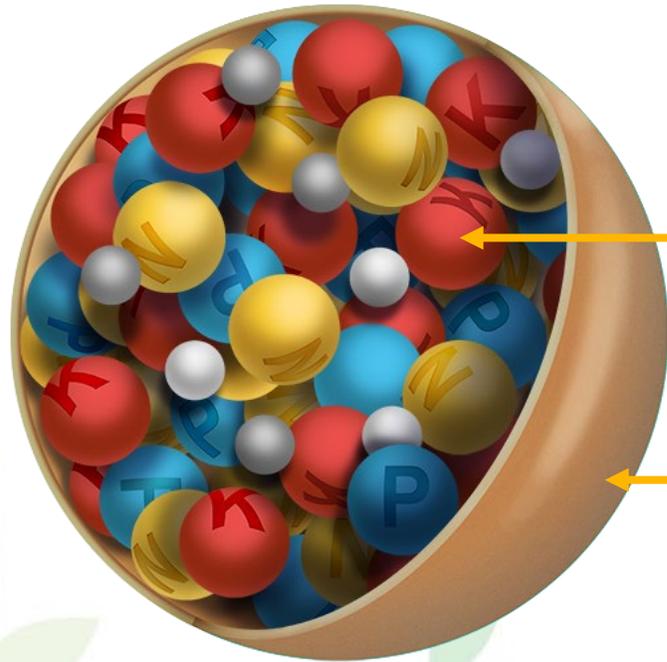
Multicote™ is recommended...



To prevent "Ant Theft"

Multicote™ technology

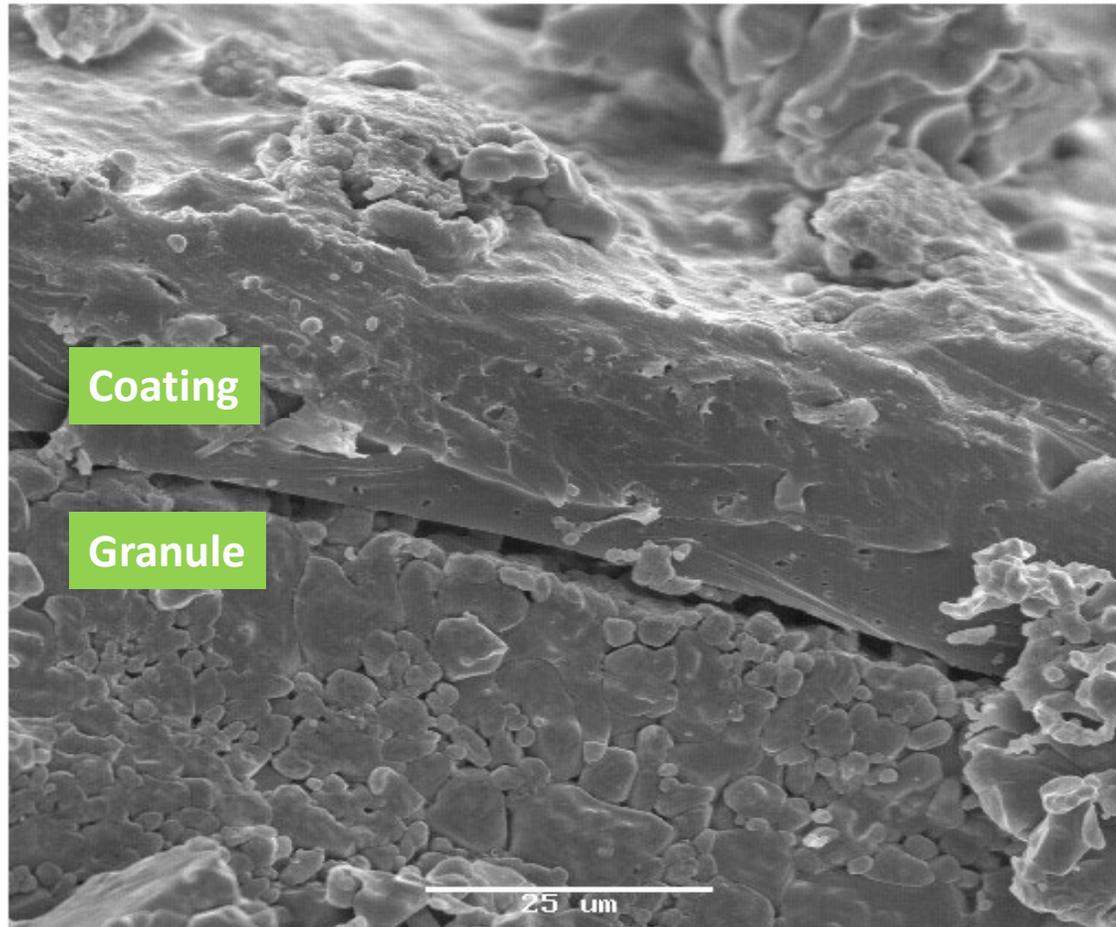
Multicote™ technology



Core:
Soluble nutrients

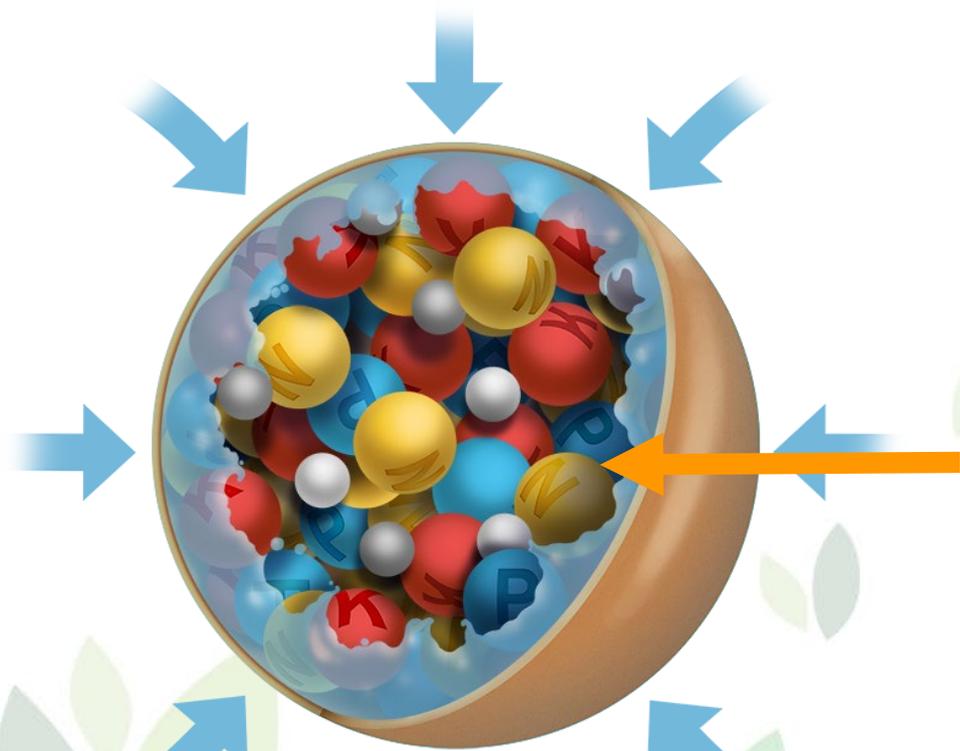
Shell:
Polymer coating

Multicote™ technology



Scanning Electron Microscope image of coated NPK granule

Multicote™ technology



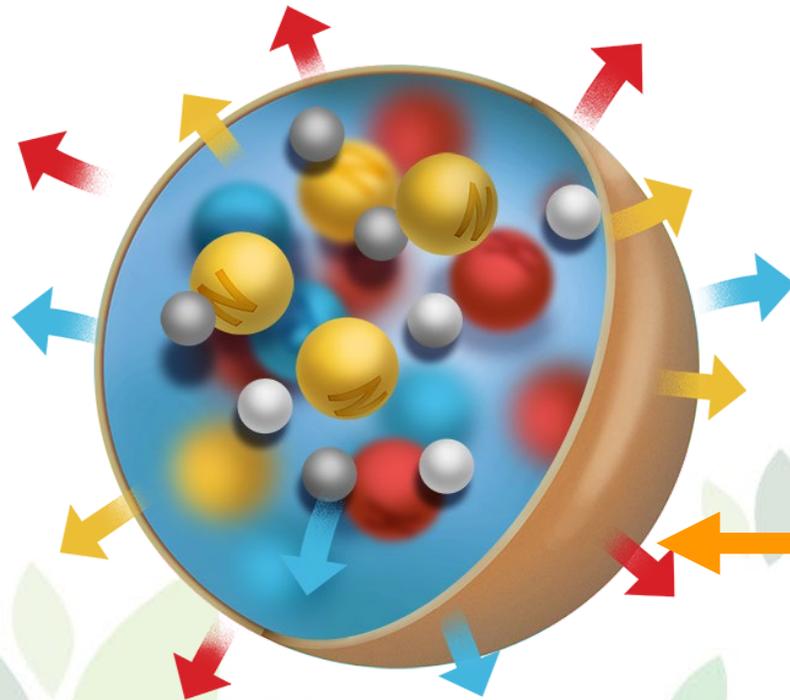
After application in the soil:

Water penetration

Gradual dissolution of the nutrients

This stage takes 7-10 days, depending on the longevity

Multicote™ technology



Water penetration



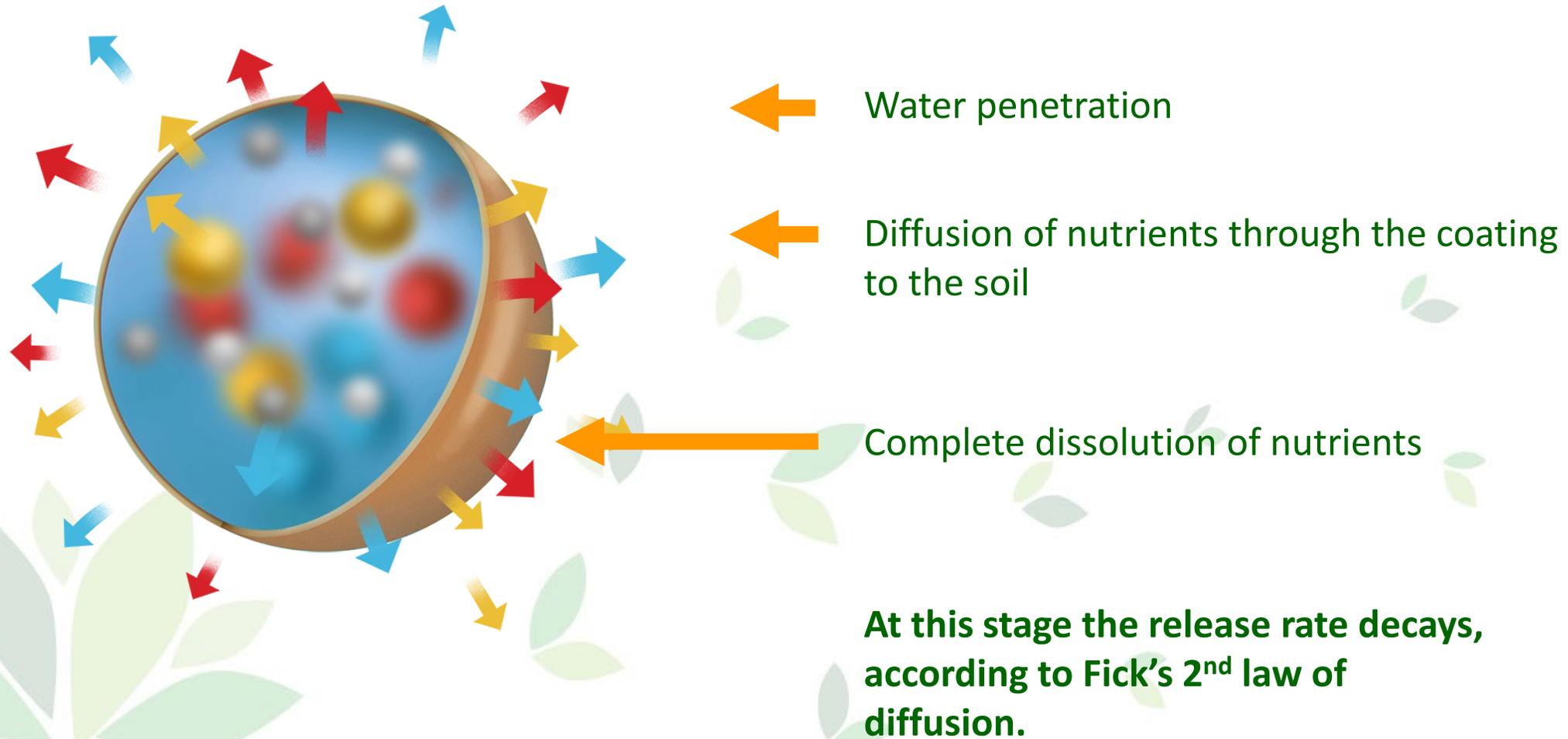
Diffusion of nutrients through the coating to the soil



Further dissolution of nutrients

Step 3

Multicote™ technology



Multicote™ technology



Fick's 2nd law of diffusion:

$$\frac{dC}{dt} = D \frac{d^2C}{dX^2}$$

C = concentration

t = time

D = diffusion coefficient

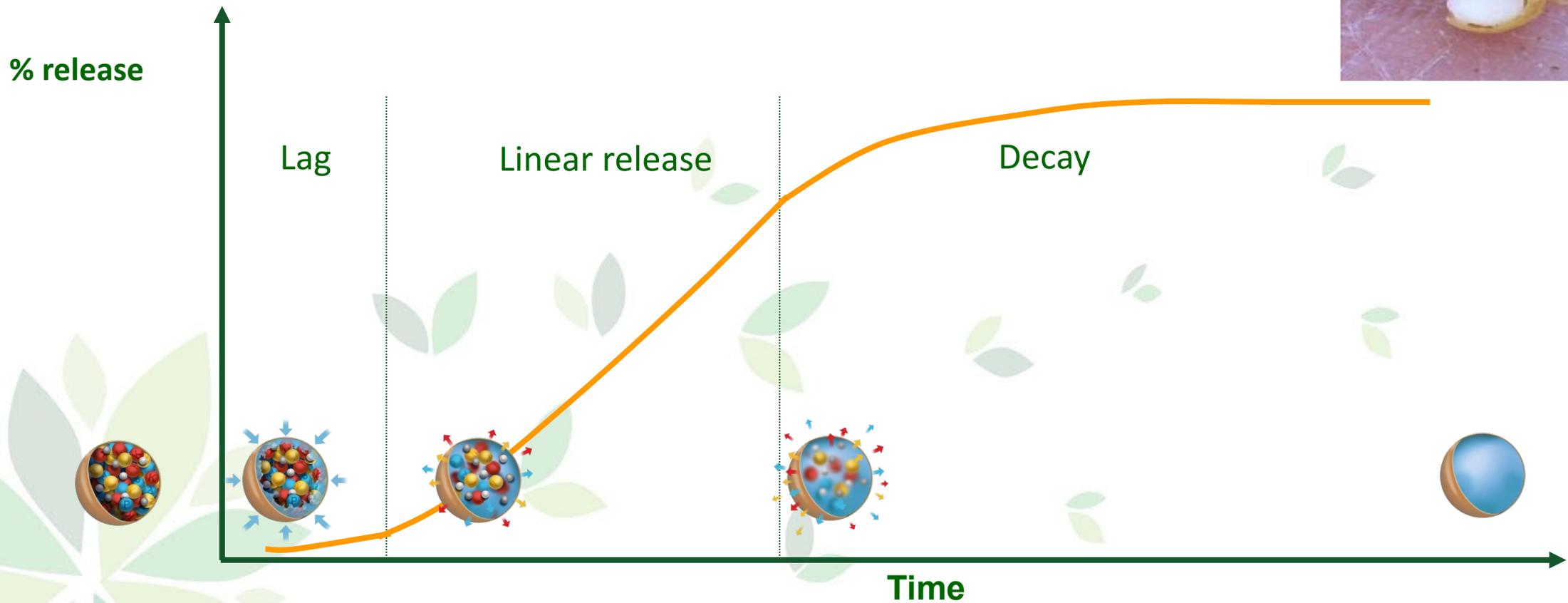
Multicote™ technology



After the release is complete, the coating will degrade gradually, leaving no residues in the soil.

Multicote™ technology

Typical release curve:



Multicote™ technology

Release rate, longevity & temperature

🌱 The rate of nutrient release from Multicote increases with temperature:

$$\frac{dC}{dt} = D \frac{d^2 C}{dX^2}$$

C = concentration,
T = time
D = diffusion coefficient

$$D = D_0 e^{-\frac{Q}{RT}}$$

Q = activation energy
R = gas constant
T = temperature

- 🌱 Note: plant uptake rates also increase with temperature
- 🌱 The longevity decreases as release rate increases

Multicote™ technology

The rate of nutrient release from Multicote™ increases with temperature, and the longevity is decreased accordingly.

temperature	Release rate	longevity
		
		

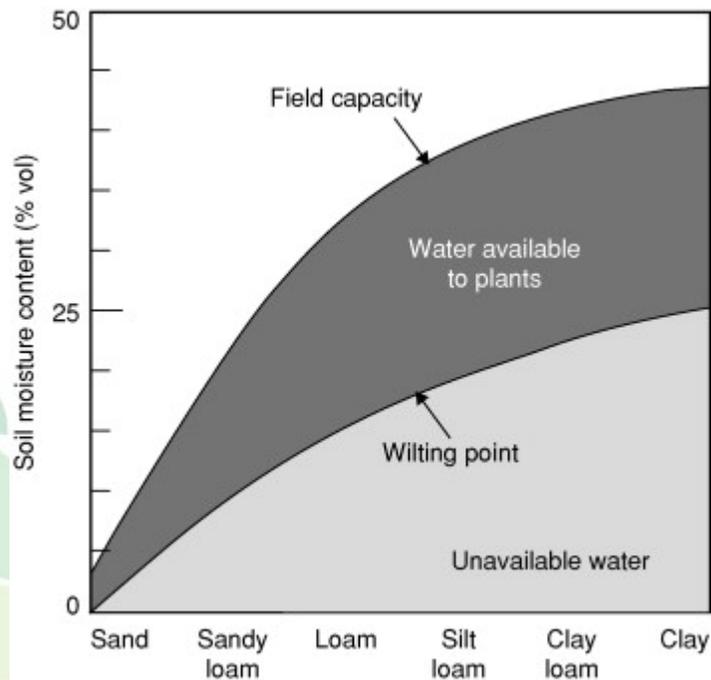
longevity and temperature

	15°C (60°F)	21°C (70°F)	30°C (86°F)
Multicote™ 2	3 months	2 months	-
Multicote™ 4	6 months	4 months	2 months
Multicote™ 6	7-8 months	6 months	3-4 months
Multicote™ 8	9-10 months	8 months	5-6 months
Multicote™ 12	15-16 months	12 months	7-8 months
Multicote™ 16	20-22 months	16-18 months	9-10 months

The declared longevity refers to release at **21°C**

Multicote™ technology

- 🌱 To allow continuous release, the granules must be in a humid environment
- 🌱 Multicote™ granules must be incorporated in the soil
- 🌱 Effective release occurs when soil moisture is 40% over the wilting point

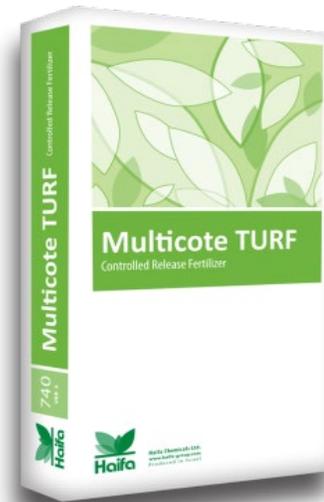
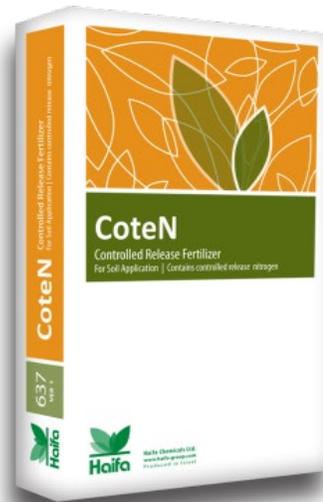
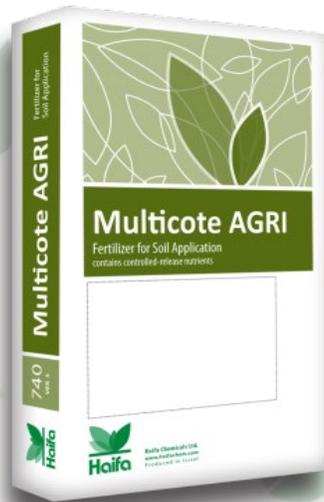
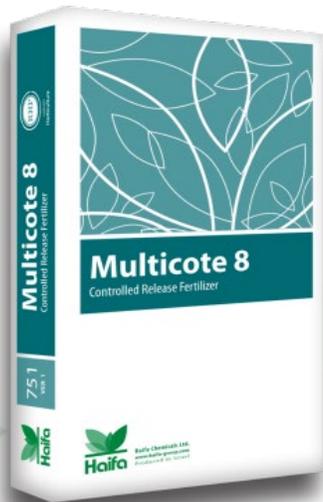


The Multicote™ Range

The Multicote™ range

The Multicote™ range provides solutions for different market segments:

- ✦ **Multicote™** for nurseries and ornamentals
- ✦ **Multicote™ Agri / Multigro™** for agriculture
- ✦ **CoteN™** for arable crops
- ✦ **Multicote™ Turf / Multigreen™** for professional turf & domestic lawns



Multicote™

for nurseries and ornamentals

🌿 100 % coated elements



certified for
Horticulture



Multicote™ products

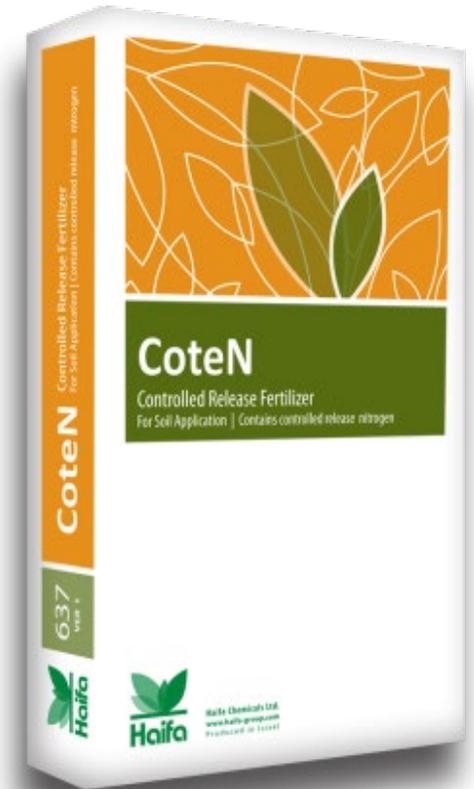
products	Recommended applications
Multicote 2	Compost production, gardening
Multicote 4	Pot-plants and hanging baskets, bedding plants, garden applications
Multicote 6	Pot-plants, hanging baskets
Multicote 8	Trees, shrubs, pot-plants and container grown nursery stock
Multicote 12	Trees, shrubs, pot-plants and container grown nursery stock
Multicote 16	Container grown nursery stock in tropical and sub-tropical regions

Release longevities

	15°C (60°F)	21°C (70°F)	30°C (86°F)
Multicote 2	3 months	2 months	-
Multicote 4	6 months	4 months	2 months
Multicote 6	7-8 months	6 months	3-4 months
Multicote 8	9-10 months	8 months	5-6 months
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Multicote 16	20-22 months	16-18 months	9-10 months

CoteN™

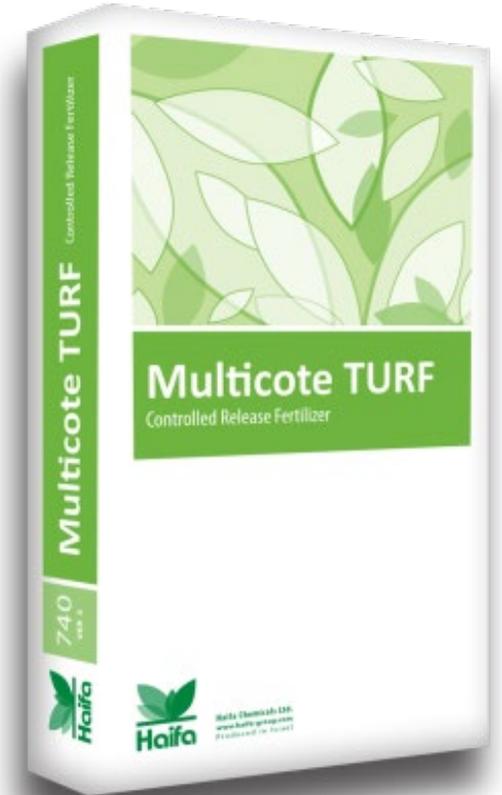
- ✦ Coated urea for open field crops (2 and 4 months longevity).
- ✦ Can be mixed with conventional sources of N, P, K (CoteN™ Mix)



Multicote™ Turf / Multigreen

for professional turf & domestic lawns

- ✦ Year-round nutritional programs for turf of all types and all uses
- ✦ Formulas with different N:K ratios
- ✦ Takes care of the changing nutritional needs of the turf plant
- ✦ Products contain potassium nitrate
- ✦ Supports seasonal growth processes



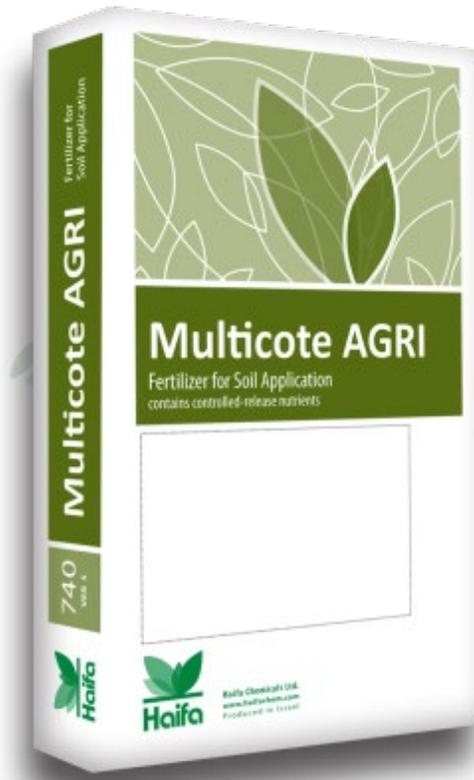
The Multicote™ Turf range

Product	N:K ratio*	Action
Booster	2:1	Dormancy breaker Initiates intensive leaf growth
Feeder	1:1	For balanced root and shoot growth. Helps maintaining turf quality and durability during seasons of intensive use.
Keeper	1:2 or 1:3	High-potassium fertilizer supports autumn growth and builds carbohydrate storage. Promotes drought & frost resistance
Multi-K® Turf / Multiverdo	1:3	Quickly available potassium fertilizer; “Quick action for tough periods”.

Multicote™ Agri / Mmultigro™

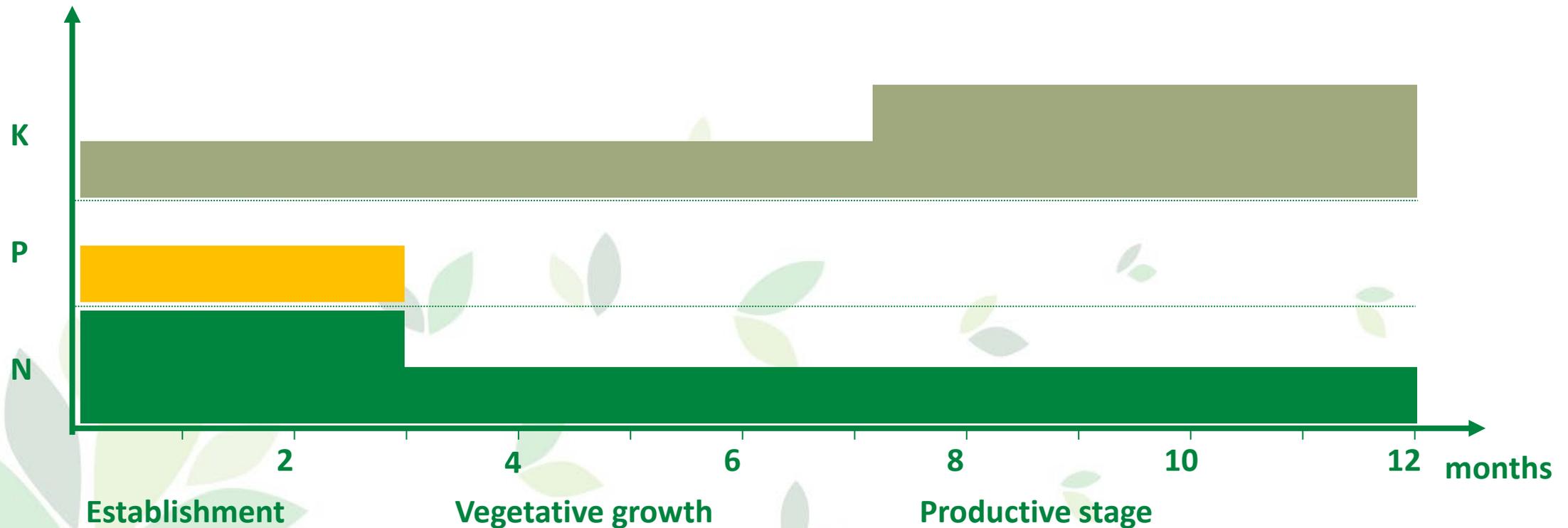
for agriculture (open field vegetables, orchards, vineyards, forestry)

- ✦ Combine coated N, P, K and non-coated nutrients
- ✦ Wide variety of nutritional compositions
- ✦ Release longevities of 2, 3, 4, 6, 8 and 12 months



Multicote™ Agri “Stages”

🌱 NPK ratio changes during the growth season, according to growth requirements.



4 corner model of coating percentage

Model developed by Haifa with LandLab (Dr. Altissimo)

Based on the soil type and the water regimen you can find the recommendations for % of coated material in the blend

	Sand > 70% (Sand, loamy sand)	50% < sand < 70% Medium sandy	Silt > 40% Silt, silty loam, silty clay	Clay > 60% Clay loam, clay
(rain) + irrigation does not exceed the crop demand	50-0-25	25-0-25	25-0-0	25-0-0
(rain) + irrigation can exceed the crop demand; rarely heavy rain	50-25-50	50-0-25	50-0-25	25-0-0
heavy events and rain often exceeding the crop demand	75-35-75	75-25-50	50-0-50	50-0-25
rain is constantly exceeding the crop demand, with heavy events; no irrigation	75-50-75	75-35-75	75-25-50	50-0-50

Slow release fertilizer VS. Controlled release fertilizer

Multicote™ Controlled release fertilizer		Sulfur Coated Fertilizer (Slow Release Fertilizer)
Polymer	Type of coating 	Sulfur + polymer sealing
Diffusion at a predetermined rate	Release mechanism 	Cover disassembly
Soil temperature	Factors affecting the release ratio 	<ul style="list-style-type: none"> • Soil temperature • Microbial activity • Soil humidity • pH • % of MO

Slow release fertilizer VS. Controlled release fertilizer

Multicote™ Controlled release fertilizer		Sulfur Coated Fertilizer (Slow Release Fertilizer)
In the laboratory using "Water Model"	Quality control 	It is not possible to predict the duration of the release in the laboratory. Quality control only examines the composition and thickness of the coating
Contains 100% essential nutrients for the plant	<u>Nutritional Value for the Plant</u> 	Lower nutrient content; It contains sulfur at a dose greater than the plant needs

Raw material range for possible mixtures

Fertilizer	Longevity (21°C)							
	UC*	2	3	4	6	8	12	16
MAP								
MAP mini								
KNO ₃ prills								
KNO ₃ mini								
UREA granular								
UREA prills mini & regular								
Kieserite								
Boron								
NPK 15-7-15 +2MgO+ ME (2-1-2)								
NPK 14-14-14 (1-1-1)								
NPK 12-12-15+2MgO+ME								

Coated Boron(Borax 12%)

- 4 to 12 months of longevity
- Ensures an adequate supply of B
- a MUST on heavily washed floors and B deficient
- Ideal for forest trees, fruit trees and vegetables



2 months	14-12-24+0.3B+ME 14-18-20+0.3B+ME	8 months	10-29-14+1B 11-22-9+4MgOc+B 12-24-12+2.5MgO+0.2B 20-3-13+1MgO+0.6B+ME 8-36-4+2B
4 months	10-45-0+1B 11-6-35+ME+B 14-12-24+0.3B+ME 14-19-20+0.3B+ME 9-43-0+1B	12 months	10-11-16+2.5MgO+1.2Fe+1B 22-3.5-14+1.8+0.5+0.6B+ME 9-32-7+ME+B 9-36-7+B
6 months	10-0-28+4MgO+ME+B 11-19-10+3.5MgO+ME+B 9-27-12+ME+B		

New! Multicote™ Calcium

- ✦ Analysis: 14-0-0+28CaO
- ✦ Longevity: 4m, 8m
- ✦ Multicote Agri formulae for crops sensitive to Ca deficiency

Multicote(12)	19-10-10+2MgO+2CaO (100-100-100)
Multicote Agri(4)	14-13-13+2CaO(100-100-100)
Multicote Agri(6)	17-5-10+4Ca (100-100-100)
Multicote Agri(6)	22-8-13+5Ca (100-100-100)
Multicote Agri(8)	17-5-24+4CaO+ME(80-0-80)
Multicote Agri(8)	14-6-20+2MgO+4CaO+ME(100-100-100)
Multigreen Mini	11-5-26+5CaO+ME
Multigreen Mini	21-5-11+2MgO+5CaO+ME



Tomato



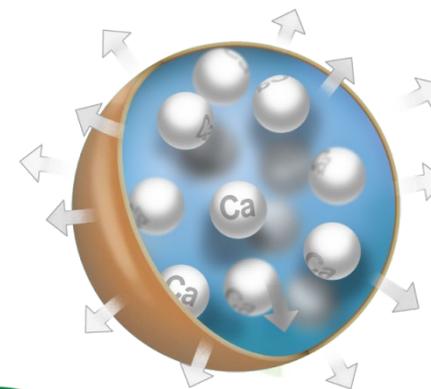
Pepper



Strawberry



Citrus



New products

Calcium Nitrate 14-0-0+28CaO

4 to 8 months longevity

Zinc Sulfate 0-0-0+29Zn

4 to 8 months longevity

SOP 0-0-45+17S

2, 4 and 8 months longevity



Summary

- ✦ Controlled-release products for ornamentals, agriculture and turf
- ✦ Based on polymer-coating technology
- ✦ Provide efficient nutrition
 - For optimal growth
 - For minimized losses
- ✦ Require single application per season
- ✦ Products address specific requirements of the crop

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Thank You

Join our community
www.haifa-group.com/community

