

# Aminosol<sup>®</sup> - kasutus ja mõju

Henning Jaworski  
Lebosol Dünger GmbH  
06.12.2017 Olustvere





## Aminosol<sup>®</sup>: sisaldus

- ✿ Lahus, kus sisalduv mahelämmastik on saadud ensümaatilisel hüdrolüüsitud taimsetest ja loomsetest valkudest
- ✿ Sisaldab enam kui 20 erinevat aminohapet  
s.h.alaniin, arginiin, asparagiin / asparaganiinhape, tsüsteiin, glutamiinhape, glütseiin, histidiin, hüdroksüproliin, hüdroksülüsiin, isoleutsiin, leutsiin, lüsiin, metioniin, fenüülalaniin, seriin, treoniin, trüptofaan, türosiin, valiin, proliin  
56 - 58 % amiinohappeid ja peptiide = 9 % orgaaniline side N (110,7 g/l)
- ✿ Koostises mineraalid ja mikroelemendid
- ✿ Registreeritud maheviljeluses kasutamiseks

# Agricultural Biostimulants: What do we know from the Lab to the Field?

Plant biostimulant, or agronomic biostimulant, include diverse substances and microorganisms that enhance plant growth. As the name suggests, biostimulants stimulate growth-like factors (but water also stimulates growth and is not considered a fertilizer). Just how do such work, what are biostimulants? The Florence Congress is a unique opportunity to address with world-class researchers the many remaining questions.

Some of these questions could simply be completely changed the way we grow crops in the future: the definition and concept of plant biostimulants is still evolving, which is partly a reflection of the diversity of inputs that can be considered to be biostimulants. So let's have a deeper look at some categories of substances that we recommend to have biostimulants properties: humic substances, Protein hydrolyzates, Seaweed extracts, Chitosan, Amino acids, Phytochemicals, Flavonoids, and Plant growth promoting rhizobacteria (PGPR).

## HUMIC SUBSTANCES: UNCALLED THE BLACK GOLD OF AGRICULTURE

Humic substances are formed by chemical and biological transformation of organic residues and are the major pool of organic carbon at the earth's surface. Humic substances are heterogeneous non-molecular organic and inorganic compounds, with high molecular weight and low water solubility. Humic acids (humic compounds) and fulvic acids (humic compounds) are the main components of humic substances. Humic acids are soluble in water, while fulvic acids are soluble in water and are stable in alkaline solutions.

Humic substances are formed by the decomposition of organic residues and are the major pool of organic carbon at the earth's surface. Humic substances are heterogeneous non-molecular organic and inorganic compounds, with high molecular weight and low water solubility. Humic acids (humic compounds) and fulvic acids (humic compounds) are the main components of humic substances. Humic acids are soluble in water, while fulvic acids are soluble in water and are stable in alkaline solutions.



Figure 1 Effect of humic acid application on plant growth in alkaline calcareous soil and neutral soil.

The addition of water-soluble humic substances to soil can increase the availability of nitrogen, phosphorus, and potassium. Humic substances can also improve soil structure and water retention. Humic substances are formed by the decomposition of organic residues and are the major pool of organic carbon at the earth's surface. Humic substances are heterogeneous non-molecular organic and inorganic compounds, with high molecular weight and low water solubility. Humic acids (humic compounds) and fulvic acids (humic compounds) are the main components of humic substances. Humic acids are soluble in water, while fulvic acids are soluble in water and are stable in alkaline solutions.

Humic substances are formed by the decomposition of organic residues and are the major pool of organic carbon at the earth's surface. Humic substances are heterogeneous non-molecular organic and inorganic compounds, with high molecular weight and low water solubility. Humic acids (humic compounds) and fulvic acids (humic compounds) are the main components of humic substances. Humic acids are soluble in water, while fulvic acids are soluble in water and are stable in alkaline solutions.

Humic substances are formed by the decomposition of organic residues and are the major pool of organic carbon at the earth's surface. Humic substances are heterogeneous non-molecular organic and inorganic compounds, with high molecular weight and low water solubility. Humic acids (humic compounds) and fulvic acids (humic compounds) are the main components of humic substances. Humic acids are soluble in water, while fulvic acids are soluble in water and are stable in alkaline solutions.

Humic substances are formed by the decomposition of organic residues and are the major pool of organic carbon at the earth's surface. Humic substances are heterogeneous non-molecular organic and inorganic compounds, with high molecular weight and low water solubility. Humic acids (humic compounds) and fulvic acids (humic compounds) are the main components of humic substances. Humic acids are soluble in water, while fulvic acids are soluble in water and are stable in alkaline solutions.



Figure 2 Effect of foliar spray of protein hydrolyzate on chlorophyll content (SPAD index) of lettuce leaves.

Humic substances are formed by the decomposition of organic residues and are the major pool of organic carbon at the earth's surface. Humic substances are heterogeneous non-molecular organic and inorganic compounds, with high molecular weight and low water solubility. Humic acids (humic compounds) and fulvic acids (humic compounds) are the main components of humic substances. Humic acids are soluble in water, while fulvic acids are soluble in water and are stable in alkaline solutions.

Humic substances are formed by the decomposition of organic residues and are the major pool of organic carbon at the earth's surface. Humic substances are heterogeneous non-molecular organic and inorganic compounds, with high molecular weight and low water solubility. Humic acids (humic compounds) and fulvic acids (humic compounds) are the main components of humic substances. Humic acids are soluble in water, while fulvic acids are soluble in water and are stable in alkaline solutions.

Humic substances are formed by the decomposition of organic residues and are the major pool of organic carbon at the earth's surface. Humic substances are heterogeneous non-molecular organic and inorganic compounds, with high molecular weight and low water solubility. Humic acids (humic compounds) and fulvic acids (humic compounds) are the main components of humic substances. Humic acids are soluble in water, while fulvic acids are soluble in water and are stable in alkaline solutions.



Figure 3 Effect of applying protein hydrolyzate on lettuce growth.

Humic substances are formed by the decomposition of organic residues and are the major pool of organic carbon at the earth's surface. Humic substances are heterogeneous non-molecular organic and inorganic compounds, with high molecular weight and low water solubility. Humic acids (humic compounds) and fulvic acids (humic compounds) are the main components of humic substances. Humic acids are soluble in water, while fulvic acids are soluble in water and are stable in alkaline solutions.



## Aminosol<sup>®</sup>: ülesanne

- ✿ Vähendab pindpinevust
  - Märgaja
  - Kleepaine
- ✿ Toiteelemendid: mikrode ja aminohapete kaudu
- ✿ Fütohormonaalne mõju
- ✿ Mõjutab – puhverdab pritsimislahuse pH-d
- ✿ Spetsiifiline lõhn



## Aminosol®: pindpinevuse vähendamine

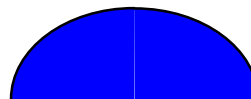
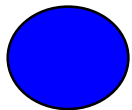
- ✿ Madal pindpinevus aitab kaasa väga heade mürkamisomaduste saavutamisele lehtedel.
- ✿ Mõju tulemusena on:
  - Tagatud ühtlane levik lehe pinnal
  - Parem kontakt lehepinnaga
  - Paranenud efekt
  - Pritsimislahuse kiirem aurustumine ja seega suurenenud vihmakindlus



## Aminosol®: kleepaine

Kleepaineta

Suurendab pindaktiivse aine kontsentratsiooni



Lehepind

Väike kontaktala

- piirab omastatavust
- voolab lihtsalt maha

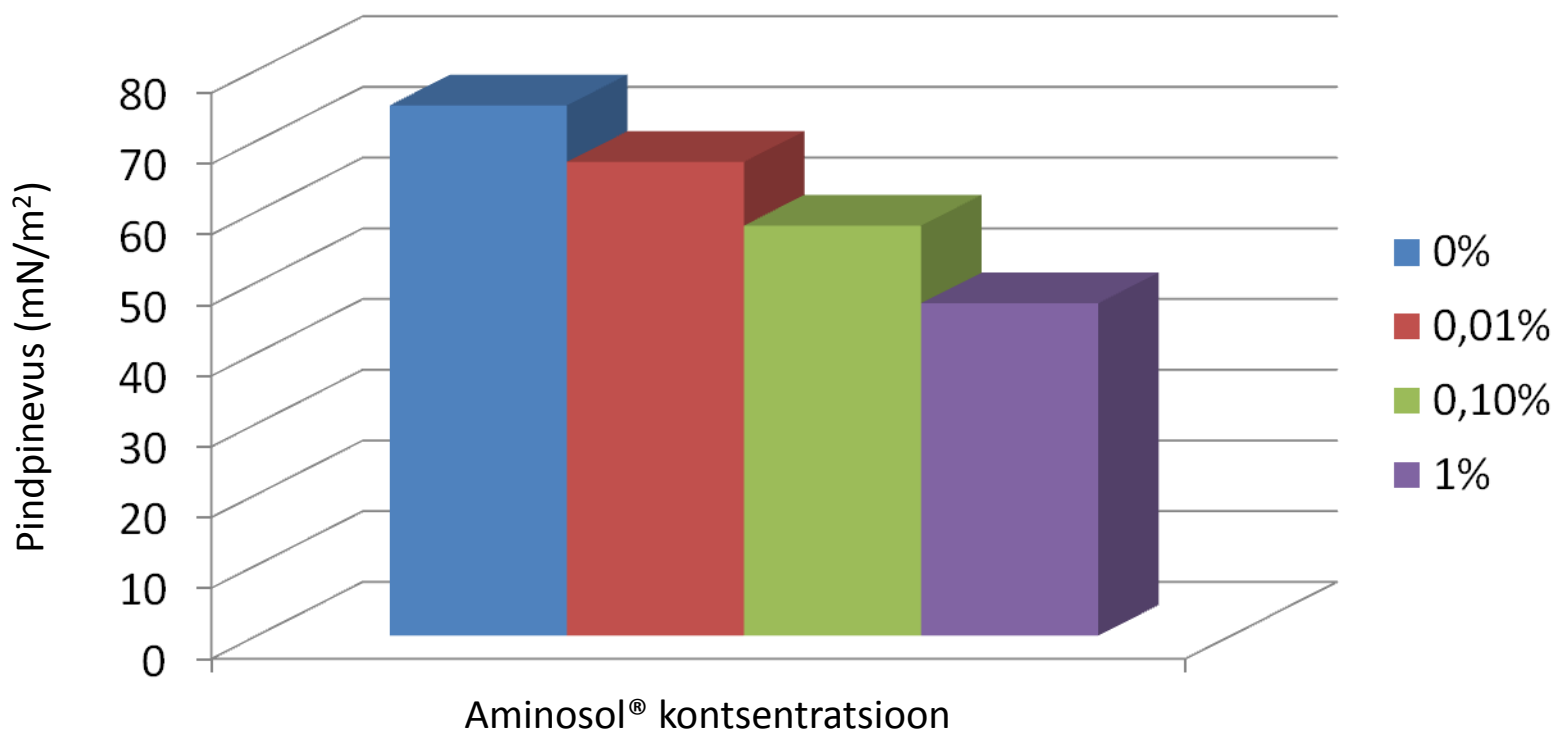
Laiem kontaktala

- suurendab omastatavust
- pidurdab maha valgumist
- parandab kleepumist



# Aminosol<sup>®</sup>: pindpinevuse vähendamine

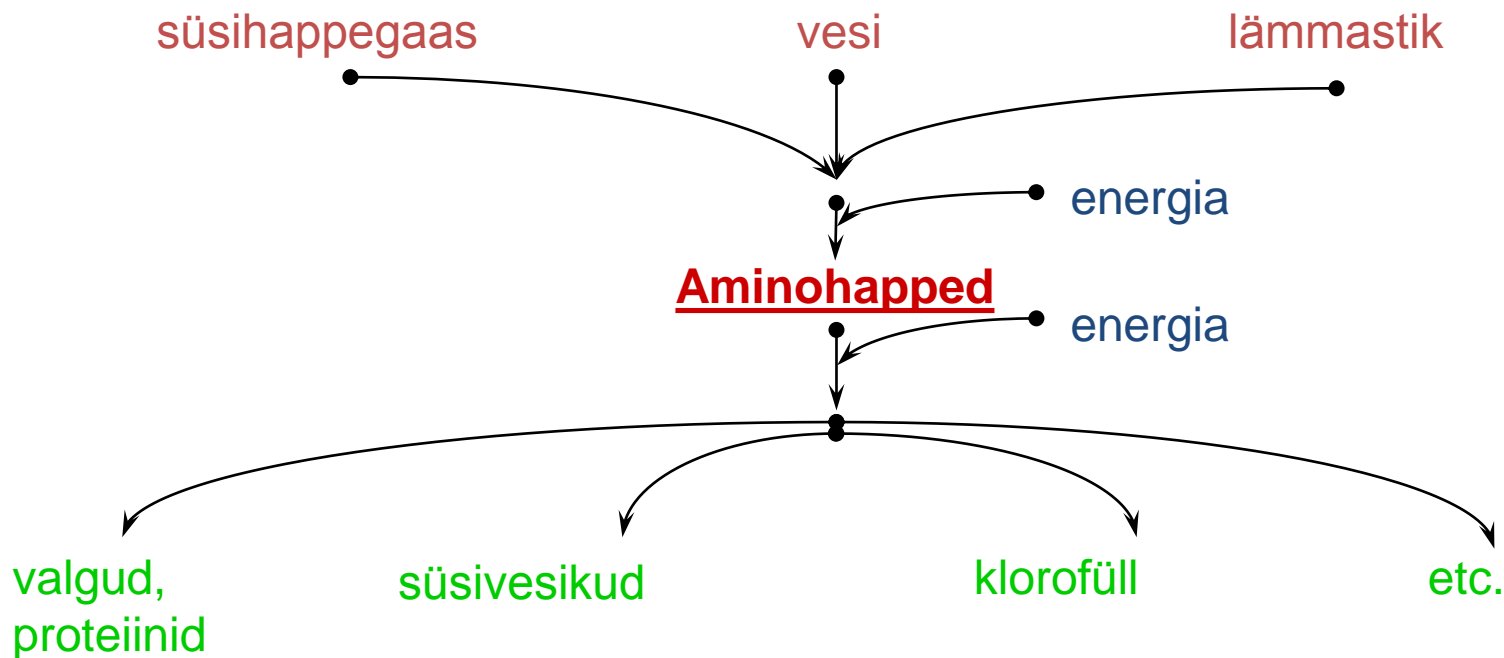
## Vee pindpinevuse vähenemine Aminosol<sup>®</sup>'i lisamisel





# Aminosol<sup>®</sup>: aminohapped

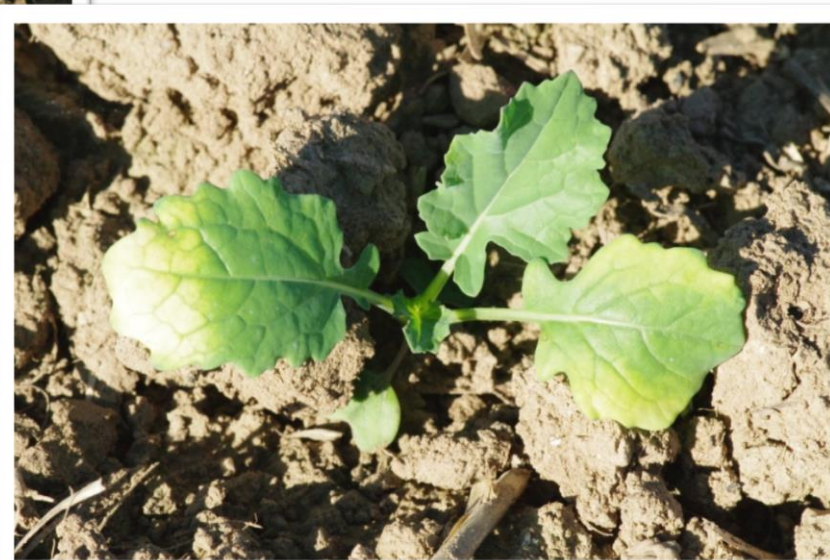
- ✿ Aminohapped omastatakse lehe kaudu
- ✿ Aminohapped on taimedele kõige otsesemaks ja kiiremaks energiaallikaks
- ✿ Aminohapete omastamine tugevdab taime ja kaitseb teda stressi vastu







# Aminosol<sup>®</sup>: näited taimede stressist





# Aminosol<sup>®</sup>: stressi vähendamine

✿ Aminohapete kohene kasutamine

✿ Ajastus:

- Istutamisel
- Herbitsiidide ja kasvuregulaatorite kasutamisel
- Halbade ilmastikutingimuste esinemisel, jne.



liigniiskus



külm



põud

Kasutussoovitus stressi leevendamiseks: 2 - 3 l/ha **Aminosol<sup>®</sup>**



## Aminosol<sup>®</sup>: fütohormonaalne mõju

- ✿ Fütohormoonid juhivad taime arengut
- ✿ Fütohormoonid on tootmisprotsessi käigus saadud aminohapetest ja Aminosol<sup>®</sup>'is täiesti olemas
  - Indool-3-lädikhape (IAA) on tuleb trüptofaanist
  - Fenüülädikhape on pärit fenüülalaniinist
- ✿ Aminosol<sup>®</sup> sisaldab fütohormoone ja aminohappeid (samuti teisi IAA tüüpi asendamatuid aminohappeid)



## Aminosol®: auksiinide mõju

- ✿ Raku kasv
- ✿ Vaskulaarse koe diferentseerimine
- ✿ Assimilatsiooni edendamine
- ✿ Juurekava moodustamine ja arendamine
- ✿ Lehtede ja viljade langetamise pidurdamine (stressi mõju vähendamine)
- ✿ Mõju viljapuudele- põõsastele:
  - Suurendab vilju ja nende kaalu
  - Viljade ühtlikust



# Aminosol®: auksiinide mõju

## ✿ Õuna-ja pirnipuud

- Parem viljade suurus ja värvus
- Väiksem vastuvõtlikus haigustele
- Väiksem viljade langetus
- Suurem saak
- Istutusjärgselt parem juurestiku areng

## ✿ Luuviljalised viljapuud

- Õiealgmete areng
- Stabiilsem saak
- Istutusjärgselt parem juurestiku areng

## ✿ Marjakultuurid, puukoolid

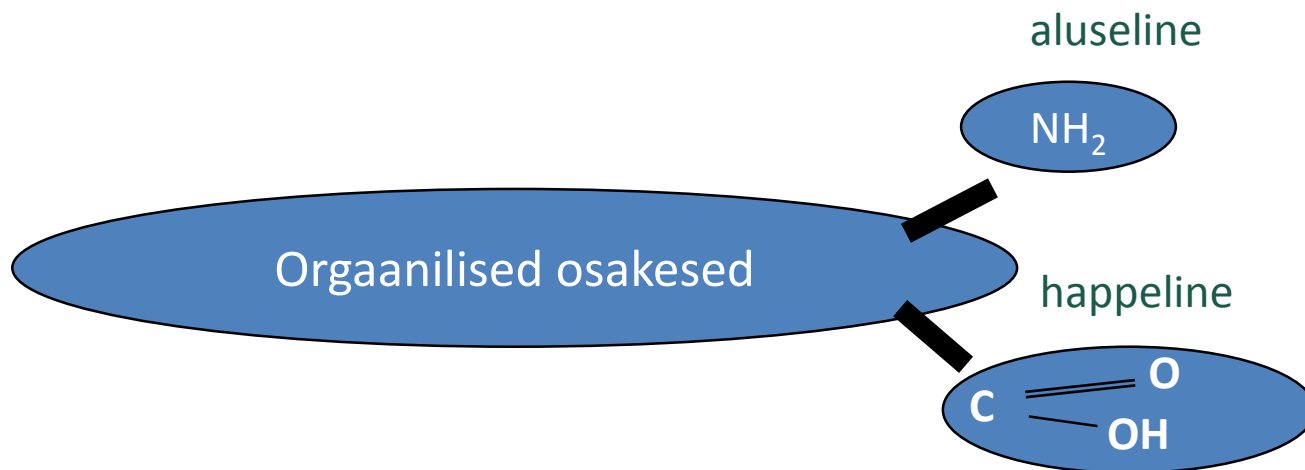
- Noortaimede juurestiku areng

## ✿ Köögiviljad

- Juurestiku, võrsete areng



# Aminosol<sup>®</sup>: pH puhverdamine-reguleerimine

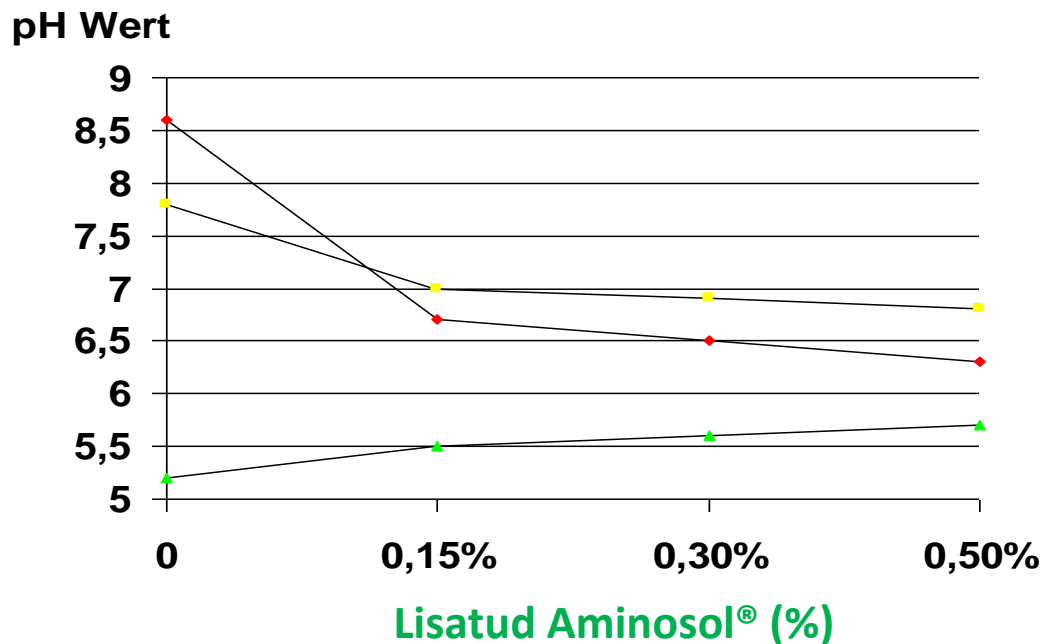


Aluselised ja happelised osakeste grupid neutraliseerivad vastavalt  $\text{H}^+$  ja  $\text{OH}^-$  ioone. Tulemuseks on stabiilse pH kujunemine pritsi paagisegus.



# Aminosol®: pH reguleerimine

Aminosol®'i mõju pH-le  
erineva veekvaliteedi korral



Soovituslik kasutusnorm pH reguleerimiseks on: 0,5% **Aminosol®**



## Aminosol<sup>®</sup>: lõhna mõju

- ✿ Intensiivselt lõhnavad (haisevad) osakesed pärinevad tootmistsüklist, kus osad aminohapped lagunevad orgaanilisteks amiinideks (erinev päritolu)
- ✿ Ulukid on selle lõhna suhtes üsna tundlikud
- ✿ Pritsimine Aminosol<sup>®</sup>'iga aitab ulukeid tõhusalt peletada







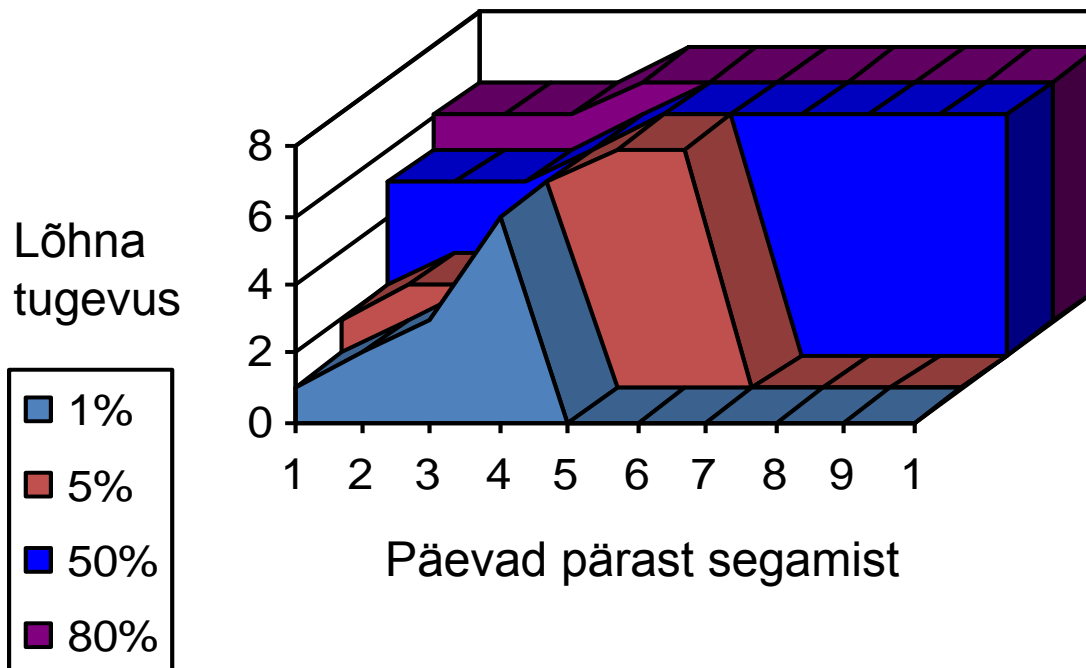
# Aminosol®: näited ulukite kahjustustest





## Aminosol<sup>®</sup>: lõhna tugevdamine

- Valmista paagisegu arvestusega 2 l/ha Aminosol<sup>®</sup> + 2 l vett ja jäta 2-3 päevaks seisma. Lisa vajalikud lisandid- pritsimisvahendid ja kasuta.





## Aminosol®: kokkuvõte

- ✓ Väetamiseks
- ✓ Parandab taimekaitsevahendite ja teiste toodete omastatavust (märgajana, kleepainena)
- ✓ pH reguleerimiseks
- ✓ Ei kahjusta vahakihti (liigub hüdro- ja lipofiilsel teel)
- ✓ Stressi vastane mõju
- ✓ Mõjub hästi taimekaitse vahendite osas tundlikele kultuuridele (peedid) ja agressiivse taimekaitse-leheväetise paagisegude leevendajana (kaltsiumkloriid, kasvuregulaatorid)
- ✓ Parandab vihmakindlust
- ✓ Ei mõjuta taimede väljanägemist (ilutaimed)
- ✓ Aminosol® ei mõju korrodeerivalt!



# Kuidas teooria AMINOSOL<sup>®</sup>'ist rakendub praktikas?



Valik katsete tulemusi erinevate kultuuridega enam kui 150 katse hulgast



# Aminosol<sup>®</sup>: eksperimendi tulemused

Suurem saak ja suhkruisaldus peedil: Aminosol<sup>®</sup> koos herbitsiididega

*Austria 1999*

<p>Distance between rows 45 cm, 6 rows of each 100 m were tested</p> <p>Engelhart Karl Weidling 5 3125 Statzendorf Tel.: 02786/2272</p>	<p>Lisatud Aminosol<sup>®</sup>i</p>  <p>Yield surplus ca. 15 %</p>	<p>Ilma Aminosol<sup>®</sup></p> 
<p>Saak katsealalt</p>	<p><b>1780 kg</b></p>	<p><b>1560 kg</b></p>
<p>Hektarisaak (kg/ha)</p>	<p><b>65929 kg</b></p>	<p><b>57780 kg</b></p>
<p>Suhkru sisaldus (%)</p>	<p><b>18,42</b></p>	<p><b>18,02</b></p>



# Aminosol®: eksperimendi tulemused

## Parem herbitsiidide taluvus suhkrupediil tänu Aminosol®'i kasutamisele

SLVA Oppenheim, Standort Wintersheim 2000 – Rheinland-Pfalz

**Sort:** Tatjana

**Külviaeg:** 12/03/2000

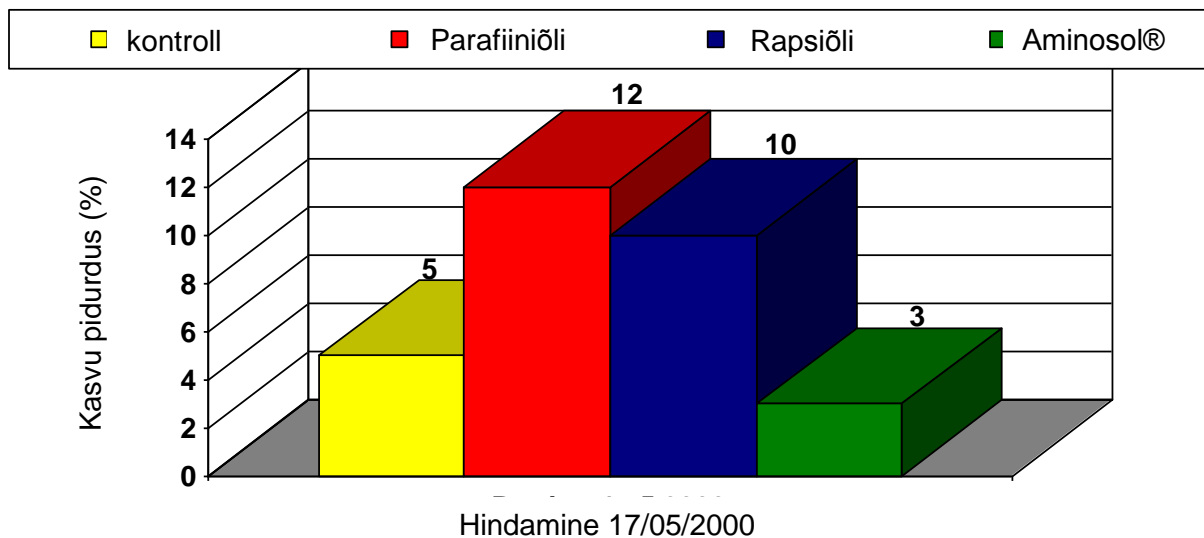
**Tärkamine:** 06/04/2000

**N-väetusfoon :** 93 kg/ha N

**Hindamine:** visuaalne hindamine kasvuajal

### Pritsimistööd:

- |               |  |  |
|---------------|--|--|
| 1. Kontroll – | 1. NAK 14/04/2000                          | 1 l/ha Betanal Progress + 1 l/ha Rebell      |
|               | 2. NAK 26/04/2000                          | 1 l/ha Betanal Progress + 1 kg/ha Goltix WG  |
|               | 3. NAK 04/05/2000                          | 1 l/ha Betanal Progress + 2 kg/ha Goltix WG  |
| 2. as 1 plus: | 1. NAK + 0.5 l/ha Paraffin oil (Oleo FC)   | 2/3. NAK + Paraffin oil (Oleo FC)            |
| 3. as 1 plus: | 1. NAK + 1 l/ha Rape seed oil (Rako-Binol) | 2/3. NAK + 2 l/ha Rape seed oil (Rako-Binol) |
| 4. as 1 plus: | 1. NAK + 1 l/ha Aminosol®                  | 2/3. NAK + 2 l/ha Aminosol®                  |



### Tulemused:

Suurim kasvupidurdus avaldus parafiiniõli pritsimise katseosas, Aminosol® soodustas kasvu võrreldes kontrollvariandiga.



# Aminosol®: eksperimendi tulemused

## Parem herbitsiidide taluvus ja efektiivsus suhkrupeedil tänu Aminosol®'i kasutamisele

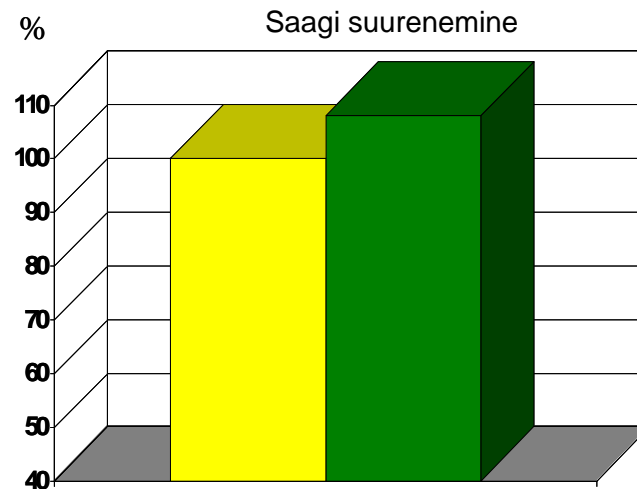
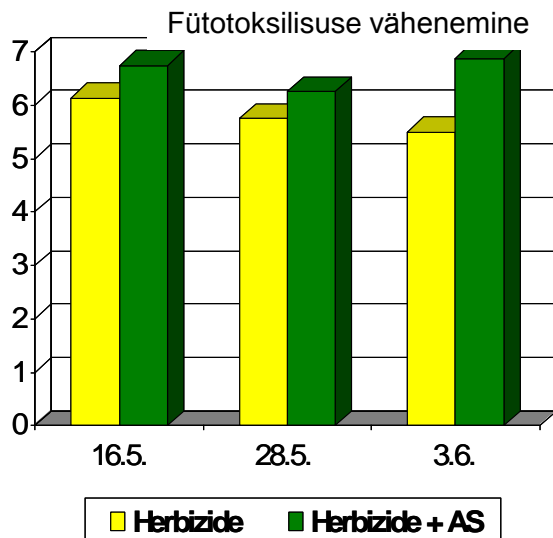
*Innoventis, Niederlande 2003*

### Pritsimised:

- 0.75 l/ha Betanal Progress + 0.75 kg/ha Goltix + 14 g/ha Safari
- 0.75 l/ha Betanal Progress + 0.75 kg/ha Goltix + 14 g/ha Safari + 1 l/ha Aminosol®

**Ajad:** 01/05, 08/05, 15/5 and 26/5/2003

**Hindamine:** visuaalne fütotoksilisuse hindamine 16/05, 28/05 ja 04/06/13  
saagi ja suhkruisalduse määramine





# Aminosol®: eksperimendi tulemused

## Parem herbitsiidi mõju suhkrupeedil tänu Aminosol® kasutamisele

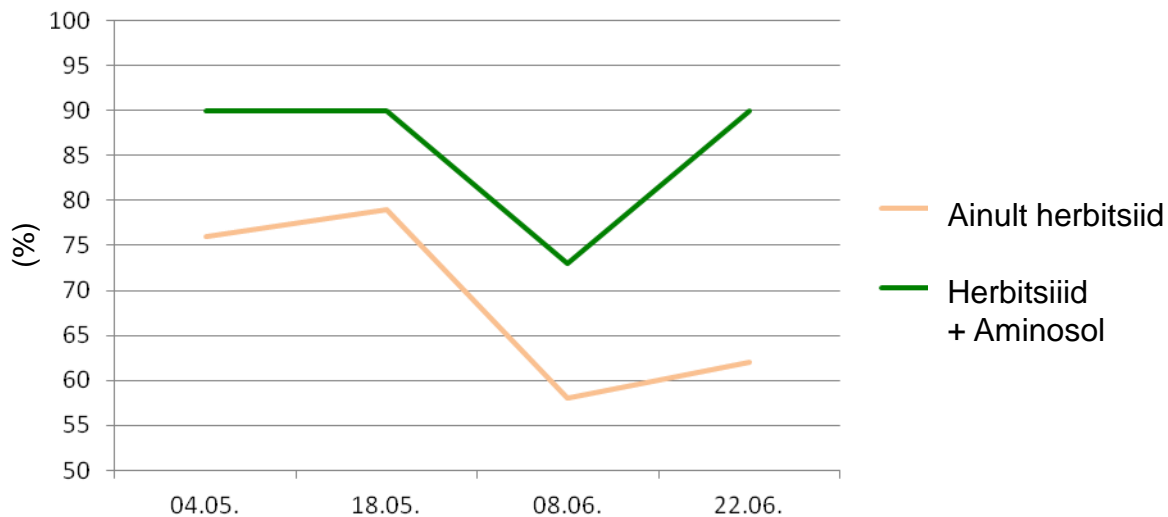
ARGE Nord, Standort Braunschweig – Niedersachsen 2007

### Pritsimised

1. Kontroll– 1 l/ha Powertwin Plus + 1 l/ha Goltix 700 SC
2. 1 l/ha Powertwin Plus + 1 l/ha Goltix 700 SC + **2 l/ha Aminosol®**

Ajad: 23/04, 05/05, 18/05/2007

### Herbitsiidi mõju hindamine







# Aminosol®: eksperimendi tulemused

## Taliodra elujõu suurendamine – lisasaak tänu taimiku tugevdamisele

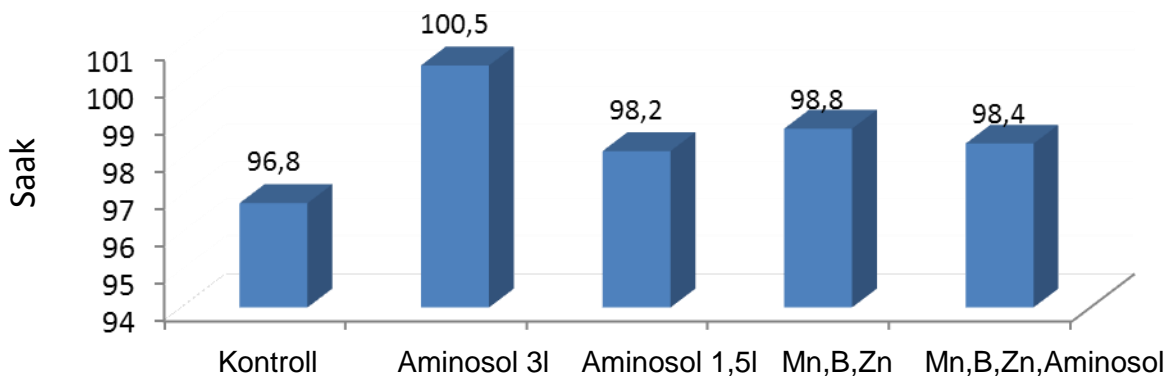
ABIB, Dietingen – Baden Württemberg 2009

**Mullastik:** saviliiv (sandy loam)

**Sort:** Annisette

**Pritsimisaeg:** 15/04/2011

Töötlemised	Tooted	Kasutusnorm (l/ha)
1	Kontroll	-
2	Aminosol®	3
3	Aminosol®	1.5
4	Lebosol®- Mangan <sup>500</sup> SC+ Lebosol®-Bor + Lebosol®- Zink <sup>700</sup> SC	0.6 + 0.5 + 0.3
5	Lebosol®- Mangan <sup>500</sup> SC+ Lebosol®-Bor + Lebosol®- Zink <sup>700</sup> SC + Aminosol®	0.6 + 0.5 + 0.3 +1.5



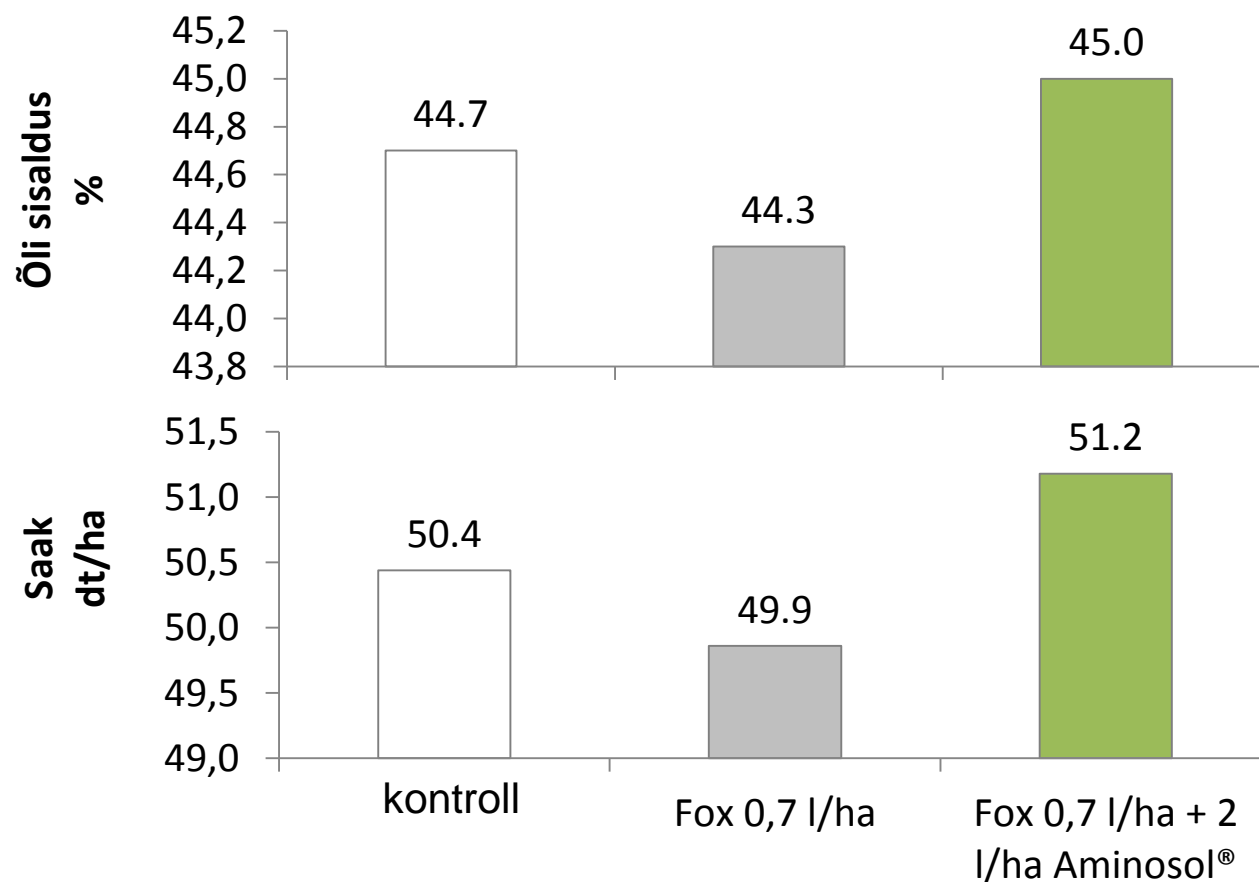
### Tulemused:

Juhul kui omastatavate toitainete määr taime juures ei ole teada, on elujõu suurendamine Aminosol® kasutades kasulik, kui väetamine erinevate lisaväetistega.



# Aminosol® leevendab herbitsiidi Fox tekitatavat stressi talirapsil

BioTechFarm GmbH, Üplingen – Sachsen/Anhalt, 2014



**+ 42 €/ha**  
(Rapsi hind  
310 €/t)

Fox –  
480 g/ l Bifenox



# Aminosol®: maisil

## Saagi suurendamine maisil. Pritsimine Aminosol®'iga pärast rahe kahjustust

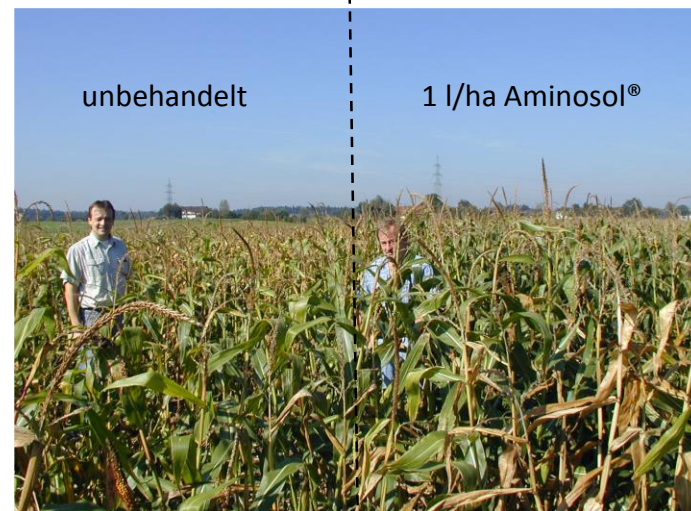
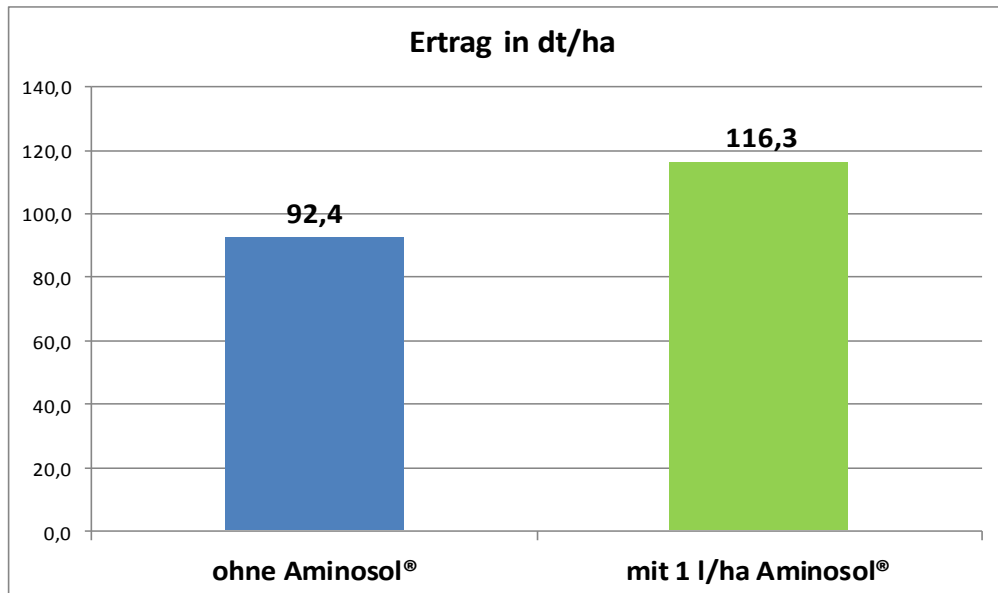
Austria 2000

**Sort:** Clarica

**Rahe:** 29.05.2000 4-6 lehe faasis

### variandid

1. kontroll
2. 1 l/ha Aminosol® (5. Juni 2000 – 7 päeva pärast rahet)



### Tulemus:

Aminosol®'iga pritsimine → saagi suurenemine 25.8 % võrreldes pritsimata kontroll alaga.



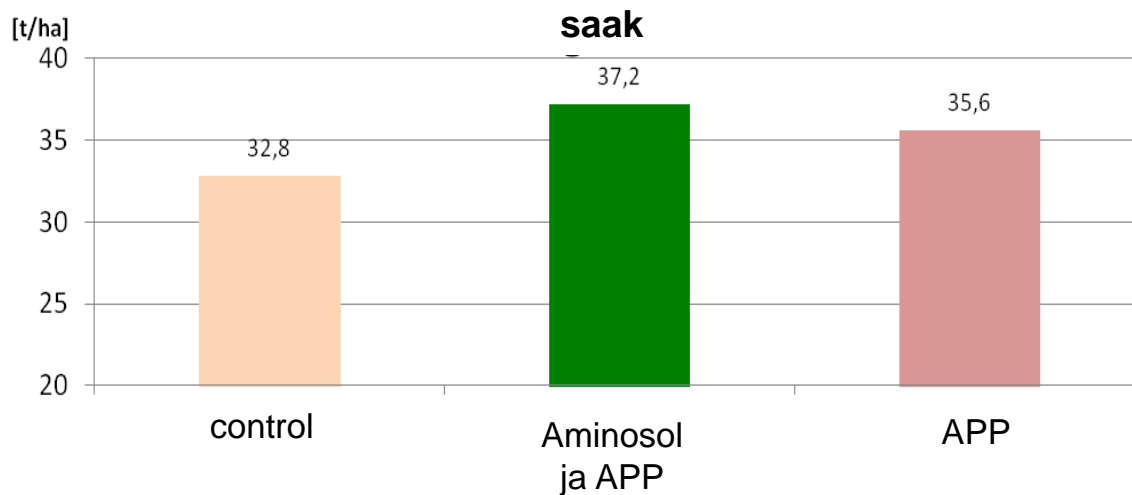
# Aminosol<sup>®</sup>: eksperimendi tulemused

## Aminosol<sup>®</sup> porrulaugul

### Saagilisa tänu noorte taimede Aminosol<sup>®</sup>'iga pritsimisele (Ammonium polyphosphate - APP)

*Proefstation voor de Groenteteelt, Belgien, 2006*

	Toode	Kasutusnorm	Kasvufaas
<b>kontroll</b>	Pritsimata	-	-
<b>1</b>	Aminosol <sup>®</sup>	4 l/ha	Istutuseelne taimede pritsimine
	APP	100 l/ha	Mulla istutusjärgne töötlemine
<b>2</b>	APP	100 l/ha	Mulla istutusjärgne töötlemine





# Aminosol<sup>®</sup>: eksperimendi tulemused

## Saagilisa peasalatil tänu Aminosol<sup>®</sup>'i kasutamisele

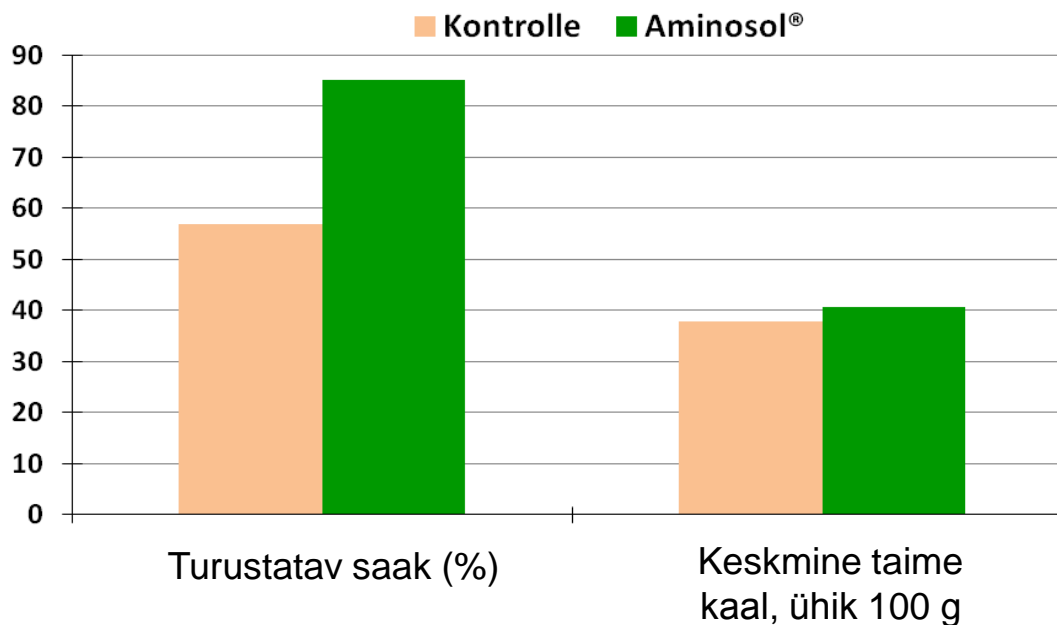
LVG Auweiler-Friesdorf 1997

	Kasutusnorm	Pritsimise aeg
kontroll	-	-
Aminosol <sup>®</sup>	0.2 % 0.3 %	Noorte taimede istutusjärgne pritsimine ja mulla kaudu töötlemine (10 l/aari kohta)

**Sort:** Skipper

**Istutamine:** autumn 1996

140 kg N/ha





# Aminosol®: eksperimendi tulemused

## Juurselleri saagilisa tänu Aminosol®'i kasutamisele

LVG Auweiler-Friesdorf 1998

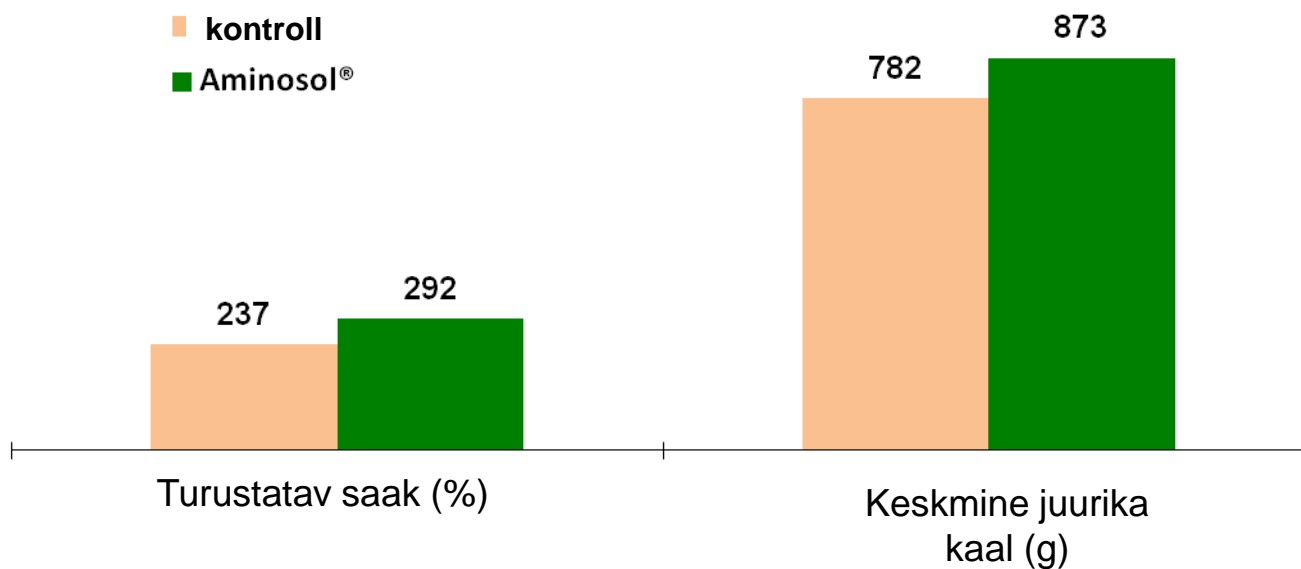
	Kasutusnorm	Pritsimine/ töötlemine
control	-	-
Aminosol®	0.2 % 0.3 %	Noorte taimede istutusjärgne pritsimine ja mullakaudne töötlemine (10 l/aari kohta)

**Sort:** Monarch

**Külviaeg:** 16/4/98

**Istutamine:** 24/6/98 (50 cm x 50 cm)

**Saagikoristus:** 3/11/98



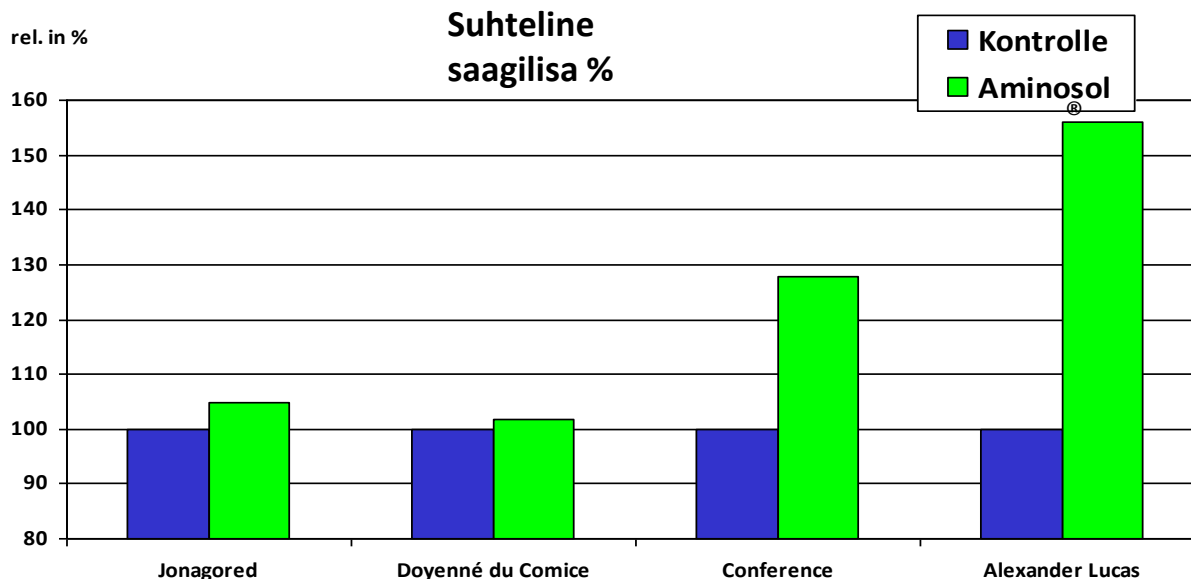


# Aminosol®: eksperimendi tulemused

## Aminosol®'iga pritsimise mõju viljapuudel (õuna- ja pirnipuud) enne õitsemist

ACS Steenbergen Niederlande 1999

2 pritsimist õitsemiseelselt, Aminosol® kasutusnorm 7,0 või 6,5 l/ha, veekogus 1 000 l



### Tulemus:

Aminosol® aitas kaasa viljade moodustumisele ja valmimisele. Saak oli märgatavalt suurem.

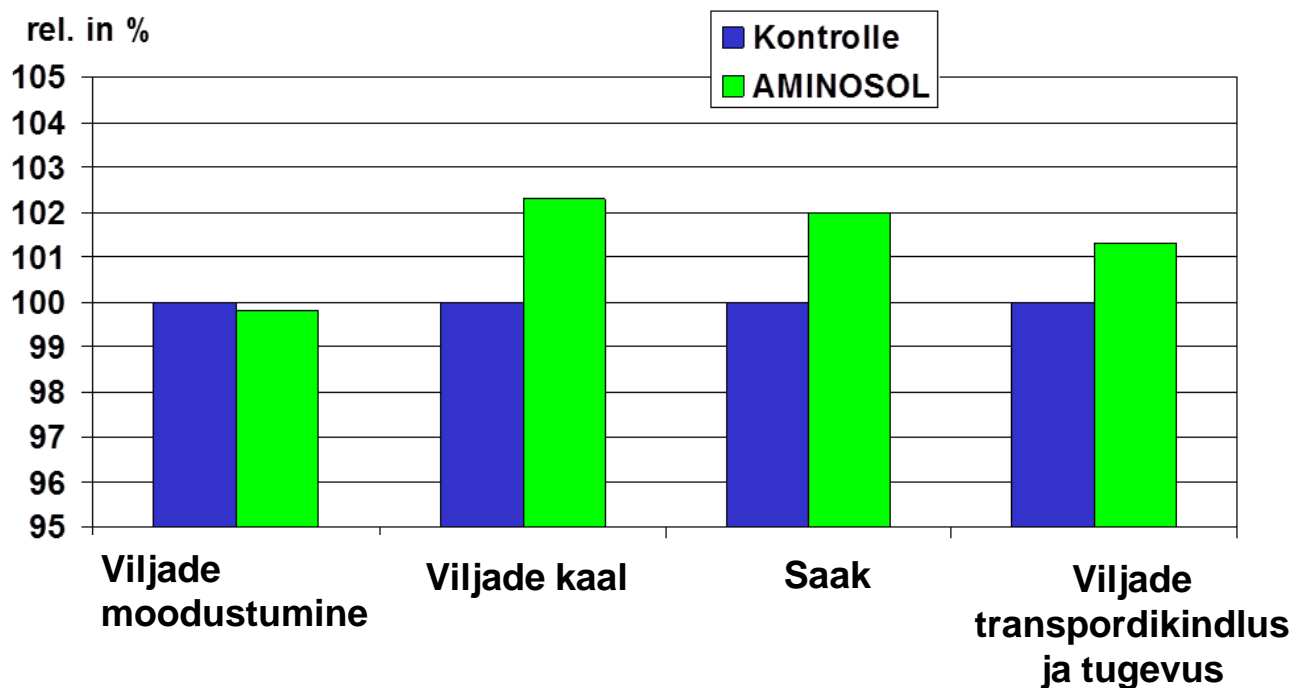


# Aminosol<sup>®</sup>: eksperimendi tulemused

## Aminosol<sup>®</sup> - õitsemiseelse kasutamise mõju õunasordil 'Jonagold'

*ACS Steenbergen Niederlande 1999-2000*

2 õitsemiseelset pritsimist Aminosol<sup>®</sup>iga, kasutusnorm 6,5-7,0 l/ha, veekogus 1 000 l







# Aminosol®: eksperimendi tulemused

## Kirsi viljade moodustumise suurendamine

Nat. Proeftuin voor grootfruit. St. Truiden, Belgien 1999

### Pritsimised

1. kontroll
2. Aminosol® 5 l/ha
3. Aminosol® 5 l/ha

ei tehtud

1. pärast õitsemist
2. 1 nädal pärast õitsemist
1. õitsemise alguses
2. pärast õitsemist

### Istandused:

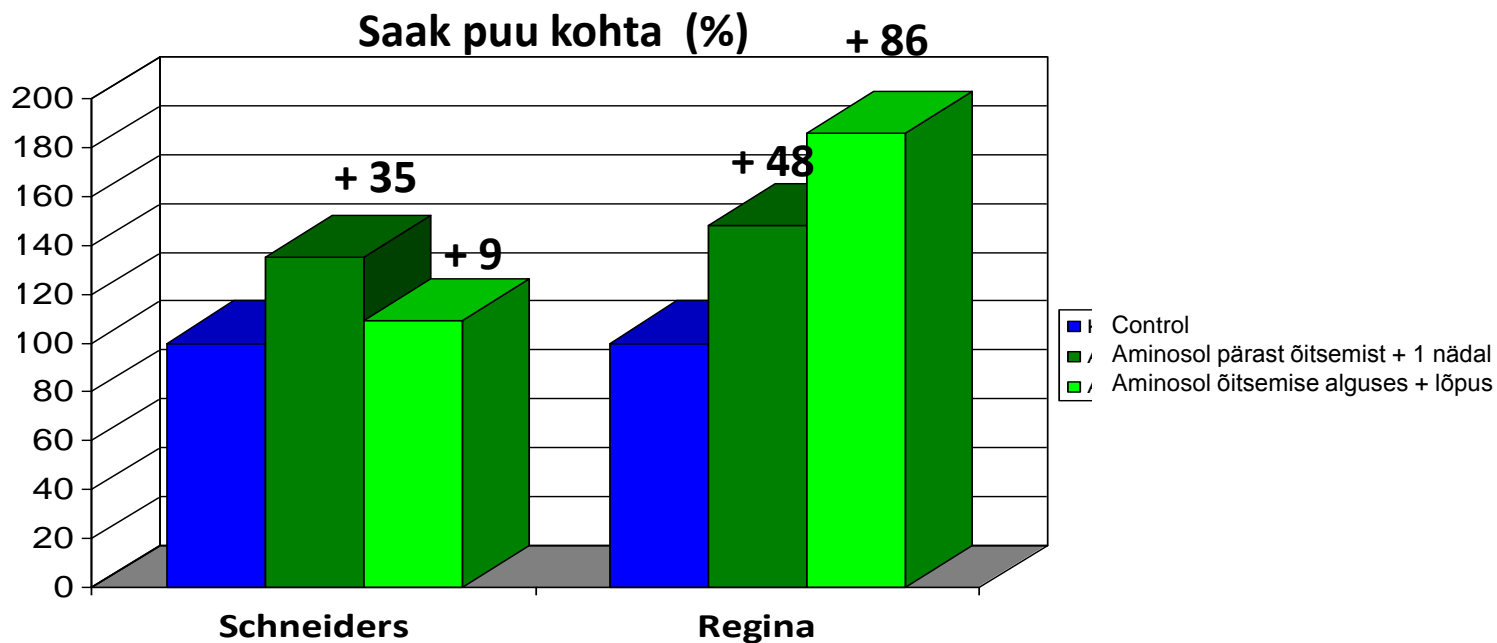
Schneiders 5. aasta

Regina 4. aasta



# Aminosol®: eksperimendi tulemused

**Kirsi viljade moodustumise suurendamine**  
Nat. Proeftuin voor grootfruit. St. Truiden, Belgien 1999





# Aminosol®: eksperimendi tulemused

## Aminosol® suurendab kaltsiumi efektiivsust ja vähendab selle fütotoksilisust

Versuchsanstalt Gorseem Belgien, 1998

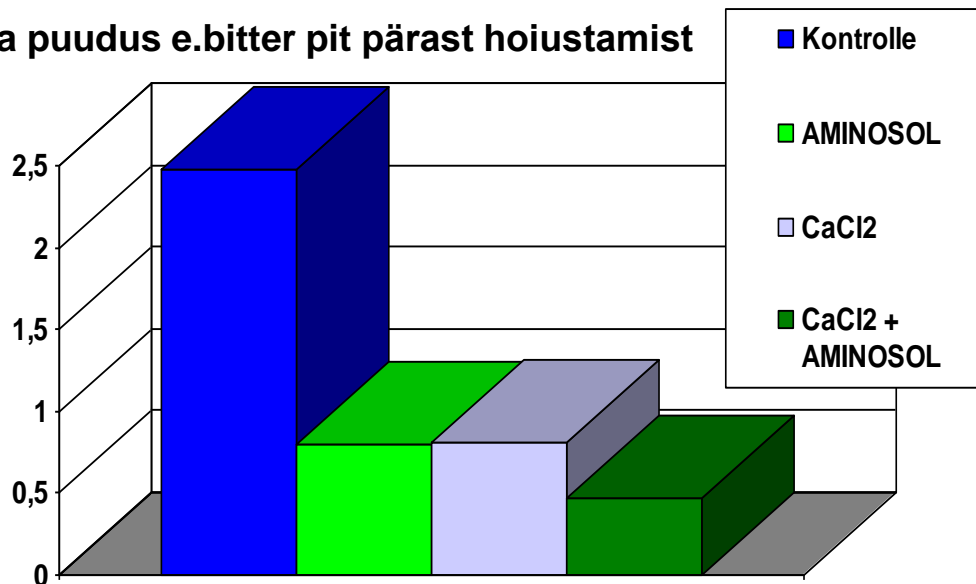
Jonagold on M 9, 9.aastane

Pritsimised:

Vee kogus: 300 l/ ha

1. control
2. Aminosol® (8 x 1 l)
4. CaCl<sub>2</sub> (8 x 5 l)
5. CaCl<sub>2</sub> (8 x 5 l) + Aminosol® (8 x 1 l)

Ca puudus e.bitter pit pärast hoistamist



### Tulemus:

Aminosol® parandas kvaliteeti lehekaudsel pritsimisel. Puudushaiguse esinemine vähenes Aminosol® kasutamisel.



# Aminosol®: eksperimendi tulemused

## Aminosol® suurendab kaltsiumi efektiivsust ja vähendab selle fütotoksilisust

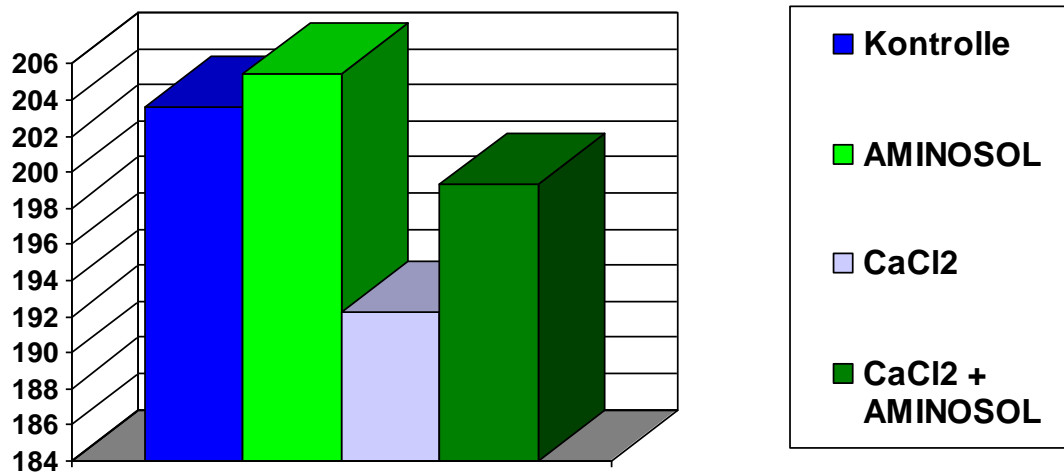
*Versuchsanstalt Gorseem Belgien, 1998*

Jonagold on M 9, 9. aasta  
Pritsimised:

Vee kogus : 300 l/ ha

1. control
2. Aminosol® (8 x 1 l)
4. CaCl<sub>2</sub> (8 x 5 l)
5. CaCl<sub>2</sub> (8 x 5 l) + Aminosol® (8 x 1 l)

### Keskmine viljade kaal, g





# Aminosol<sup>®</sup>: kasutamise soovitused

## ✿ Pritsimine

- Märgaja / kleepaine mõju: 150 - 300 ml / 100 l pritsimisvee kohta
- Auksiini mõju saavutamiseks viljadel: 5 - 7,5 l/ha
- Stressi vähendamiseks ja leheväetamisel : 2 - 3 l/ha
- pH-reguleerimiseks: 0,5 %

## ✿ Noortaimede istutuseelne töötlemine

- Istikuid hoida min. 15 min Aminosol<sup>®</sup>'i 1% lahuses

## ✿ Kastmine

- Taimede kastmine Aminosol<sup>®</sup>'i 1% lahusega

## ✿ Ulukite peletamine

- Sega 1 l Aminosol<sup>®</sup> 1 l veega ja lase seista 3 päeva, kasta peletuseks sobivad riidetükid lahusesse ja paigalda kultuuri kaitseks põllule

Lebosol 





**Thank you for your attention  
Lebosol® Dünger GmbH!**

**[www.lebosol.de](http://www.lebosol.de)**