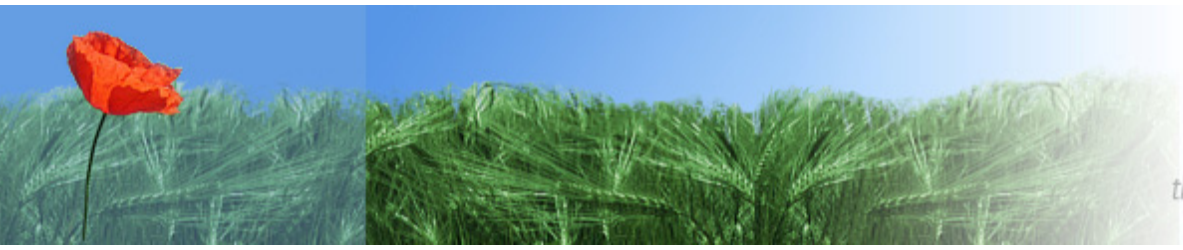


AQUAGRAIN
the organic super absorbent

... and AQUAGRAIN takes care of the rest!

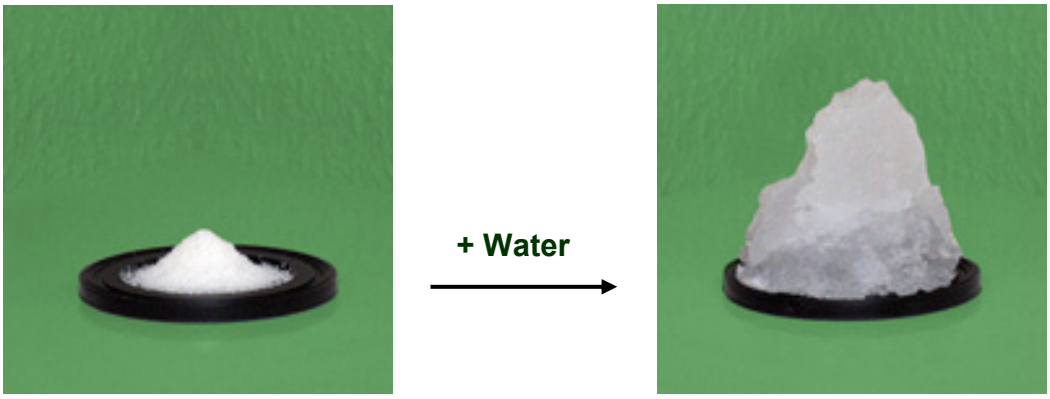
God created the three elements: **earth**, **wind** and **fire**.
However, it's not only **earth**, **wind** and **fire**, that makes the world go around
There is also **soil**, **air** and **water** - so, what's left for to do us?
Take care about the soil, **AQUAGRAIN** takes care about the rest!

Every biologist can tell you that, what a plant needs for the origin of the life-process, photosynthesis, is **light**, **soil**, **air** and **water**. Also every biologist can tell you that a plant gets the essential part of air and water through its roots.
So what is there to take care about?

- The sun provides the light
- You take care of the soil

And **AQUAGRAIN** takes care of the rest

What is **AQUAGRAIN**?



AQUAGRAIN is

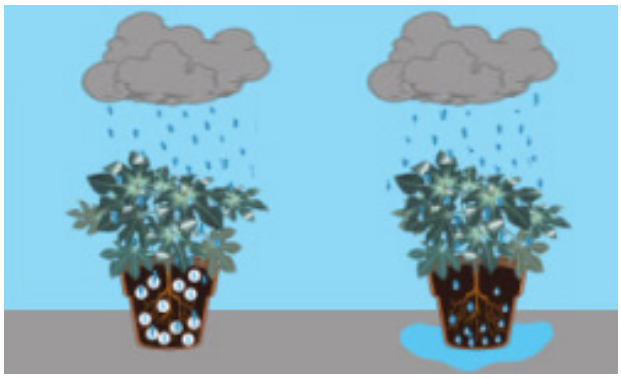
- a polyelectrolyte based plant growth enhancer
- biologically harmless
- non toxic
- does not contain any toxicological relevant substances
- effective up to 5 years after application

The effectiveness of **AQUAGRAIN** in soil is based on its polyelectrolyte structure, which enables it to absorb up to 1000 times its own volume in water. This process is reversible and in the vicinity of plants, it can give this water up to the plant, when needed. This material acts as a water reservoir for the plant and takes the plant through dry periods.
AQUAGRAIN can collect and store rain and irrigation water. This water is normally lost due to gravity and/or run off due to the soils poor water retention properties. Furthermore through **AQUAGRAIN**'s increase in volume it loosens the soil and enhances the aeration leading to improved air supply to the plant. These effects together result in a huge benefit for the plant, without the use of any conventional fertiliser, simply by using the growth enhancing properties of this material.

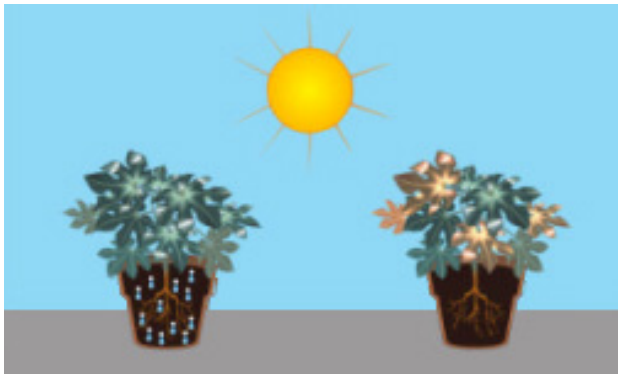
AQUAGRAIN – The polyacrylamid free superabsorber

How does AQUAGRAIN work?

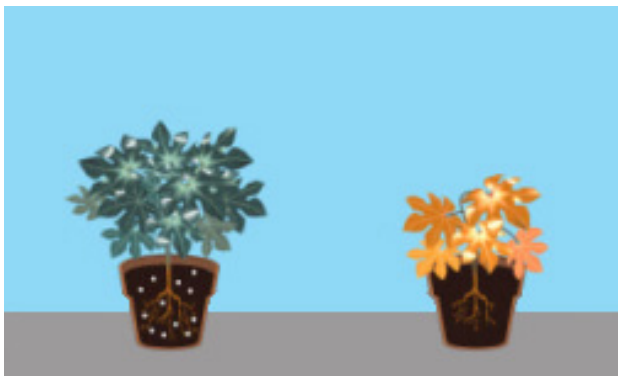
If we compare two plants – one with **AQUAGRAIN** in the soil and one without.



When water falls on the plant, be it as rain or from a watering can. The plant pot without **AQUAGRAIN** can only store so much water. The plant pot with **AQUAGRAIN** can store the excess for later.



So later, when the sun comes out and the temperature rises. The plant without **AQUAGRAIN** starts to lose water and dry out. The plant pot containing **AQUAGRAIN** can now release the stored water to the plant to help it live through these dry spells.



The large amount of water that can be stored by **AQUAGRAIN** ensures that the plants can survive these dry spells for longer, without the need for extra watering. All in all **AQUAGRAIN** reduces your watering requirement and increases the survival rate of your plants.

What is the effect of AQUAGRAIN on plants?

- the plants can take up water easier, as well as nutrients
- the plants produce more organic building blocks and, therefore, show increased growth
- the plants are stronger and are therefore less susceptible to disease
- due to the improved aeration, the micro flora and bacterial content of the soil is enhanced, which is beneficial for the growth of the plants
- the plants are more robust against stresses such as transplantation or dry periods
- the plants show prolonged shelf life and higher survival rates
- agricultural crops show increased yields

Proposed Application Areas

Commercial Horticulture

AQUAGRAIN Superabsorbent Polymers can enhance the water storage capability of soils and other cultivation substrates. This reduces the watering frequency, water consumption and the power and labour costs that are invested into these functions.

Sod Turf and Landscaping

AQUAGRAIN Superabsorbent Polymers can help during the growth cycle of grasses and sod, particularly during the germination phase. Were quicker growth, reduction of transportation stress and root establishment are all key success parameters which establish the seedlings. The collection and the storage of rain and irrigation water can reduce labour and water costs, as well as providing relief for difficult growing areas.

Application Data

Application rates for **AQUAGRAIN Superabsorbent Polymers** will vary with soil conditions, water quality and moisture conditions. Please refer to the next page for information with regards to suggested application rates and recommendations on useage.

How to use AQUAGRAIN

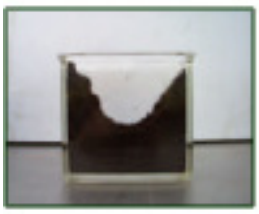
The best method for the transplanting of plants is to create a hole in the soil, which is about 20-30% deeper than usual. The extra removed soil is mixed with **AQUAGRAIN** at a concentration of about 2-3g per liter soil, treated with water and placed on the bottom of the hole about 15-20cm below the surface. A thin layer of earth is then applied to cover the **AQUAGRAIN**. The plant is placed in the hole and the hole is filled with the remainder of the removed soil.
The plant is ready to grow.
An easier method of incorporation is to spread out the **AQUAGRAIN** on the surface of the soil and dig it into the soil. Both methods lead to better germination and growth of the plants. The first method makes the most advantage of the polymers properties.

What should you be aware of when using this application?

- Don’t fill your container totally. Due to the increase in volume of the polymer, the soil will spread out by about

10-15% - keep that space free.

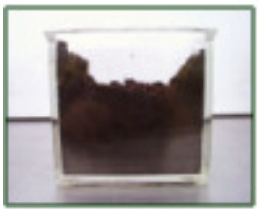
- This is also important for the second application method.



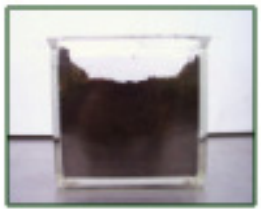
Prepare the hole for the plant, about 20-30% deeper than usual.

Mix the additional 20-30% soil with about 2-3g **AQUAGRAIN** per liter soil.

Thoroughly mix the two components.



Put the mixed material in the bottom of the hole and pour about half a pint of water into it.



Cover the prepared mixture with a thin layer of soil.

Place the plant into the hole, fill with the remaining soil and enjoy your plant!

Summary of Toxicological & Ecological Safety Data

The following toxicological and ecological data has been generated for the superabsorbent polymer **AQUAGRAIN.**

AQUAGRAIN Superabsorbent Polymers are crosslinked polymers of partially neutralised acrylic acid, with a counter ion of either potassium or sodium. In the dry form they are a powder of crystalline structure. Upon contact with water they expand and form a gel-like material. The polymers are essentially insoluble in water. The residual monomer and residual crosslinker content are low.

Toxicity Data

Various homopolyacrylate superabsorbent polymers have been tested in detail for possible health risks. The outcome is a very homogenous profile of toxicological endpoints.
Polyacrylic acid polymers and salts thereof behave in a similar manner. The material is adsorbed onto solids and, owing to the adoption of a cross-linked network configuration, is insoluble in water. Mobility in soil is low and typically less than 5% may leach out or become degassed.
Activated sludge plants are not noticeably inhibited and polyacrylic acid is eliminated by sorption. No negative effects on anaerobic treatment plants are known. No significant degradability has been recorded.

The material does not absorb onto membranes and does not show any bioaccumulation potential. It is probably harmless to aquatic organisms.
Critical evaluation of this comprehensive, and very consistent data, leads to certain generic conclusions, and the production of a general risk assessment based on the structure-activity relationships of analogue superabsorbent polyacrylates.

Toxicological Information

The following conclusions are derived from a very comprehensive and consistent database of toxicological measurements of superabsorbent polyacrylates.

The material:

- has an acute oral toxicity in rats above 2,000 $mg.kg^{-1}$ body weight
- has an acute dermal toxicity in rats above 2,000 $mg.kg^{-1}$ body weight
- is not irritating to the skin of rabbits and humans
- may exhibit slight irritating effects on the eye of rabbits, and these effects are due to mechanical processes
- is not considered to be irritating whilst in contact to either vaginal or penile mucous tissue
- is not a skin sensitizer
- has no mutagenic or genotoxic potential
- has no effects on reproduction and is not teratogenic
- is devoid of any systemic toxicity by various exposure routes

Ecotoxicological Information

Certain ecotoxicological tests have been performed, and we consider the results to be representative of superabsorbent polymers in general, and that they present no risk to the environment.

Testing for acute toxicity to the alga Desmodesmus subspicatus according to EC Directive 92/69/EEC and OECD 201 (1984) on a typical superabsorbent polymer gave an EC50 of > 100 $mg.L^{-1}$ for both biomass development and growth rate.

Testing for acute toxicity to the fish Brachydanio rerio according to EC Directive 92/69/EEC and OECD 203 (1992) on a typical superabsorbent polymer gave a nominal LC50 of > 100 $mg.L^{-1}$ up to 96 hours exposure.

Testing for acute toxicity to the plants Brassica napus, Avena sativa and Vicia sativa according to ISO 11269-2:1995(e) and OECD 208 (1984) on a typical superabsorbent polymer gave the following:

- Nominal EC_{50} after 11 days of > 1000 $mg.kg^{-1}$ for all organisms based on Emergence Rate (ER), Dry Matter (DM), Fresh Matter (FM) and Shoot Length (SL), all based on dry mass of the soil.
- NOEC/LOEC under the same conditions of >1000 for all organisms excepting Brassica napus (ER 62.5/125 $mg.kg^{-1}$) and Avena sativa (FM 250/500 $mg.kg^{-1}$).

Testing for acute effect on the swimming ability of the water flea Daphnia magna STRAUS according to OECD 202 (1984) on a typical superabsorbent polymer gave an EC50 of > 100 $mg.L^{-1}$ and this considered to be non-inhibitory.

Testing for acute lethal effect on the earthworm Eisenia foetida (Michaelson) according to OECD 207 (1984) on a typical superabsorbent polymer gave an LC50 of > 1000 $mg.kg^{-1}$. Negative impacts on worm biomass were detected, 9% at the control, 6% at the 125 mg and 8% at the 62.5 mg levels.