

WATERSTORE

FOR

SUCCESSFUL & PRODUCTIVE

PLANTING



HYDREX

UNI-SAFE
PLUS

ÖKO-TEC

GEOFIX
BIO - REMEDIATION

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Water

In Africa's harsh climate, water is particularly important for successful growth of any plant, whether ornamental, agricultural or for other purposes such as rehabilitation, stabilization etc.



In many cases, much of the water which falls on the soils either as natural rainfall or irrigation water is not available for plant growth due to poor soils, high evaporation rates, steep slopes etc. This results either in sub-optimal growth of the plant if additional irrigation is not possible, or an increase in water used for increased irrigation cycles.

With this challenge in mind, Hydrex developed a product designed to overcome these problems:

WATERSTORE

WATERSTORE is a unique water retention product, which is able to store water and water soluble fertilizers in the soil until they are needed for plant uptake.

The water or water/ fertilizer mix is stored in the **WATERSTORE** granules and is released into the soil by a process of osmosis when the soils dry out, ensuring an uninterrupted supply of water and nutrients to the root system of the plant.

**By mixing
a small percentage of
WATERSTORE with the soil, the
watering cycles can be reduced by up
to 50 %**



THE PRODUCT

WATERSTORE is a cross linked potassium ammonium poly-acryl co-polymer. Added special additives increases the gel stability and also dramatically increases the long term effectiveness of the product in the ground.

The special formulation of acryl-acid and potassium salts gives the product an unsurpassed water holding capacity.

WATERSTORE is inert and non toxic; it is therefore environmental friendly (and reduces water use too!).

The granules of **WATERSTORE** have an effective life span of 3 to 5 years in the soil.

WATERSTORE has an advantage over competitive products, as it can recharge itself with water very quickly, even after a long period of total dryness. The granulates are still able to reach 80 % of their total absorption capacity even after 150 to 180 complete cycles (from being totally dry to fully recharged with water).

Adding **WATERSTORE** to the soil has no effect on the pH of the soil.



NON TOXIC AND COMPLETELY INERT.



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The Soil



WATERSTORE has several positive effects on the soil into which it is added, these include:

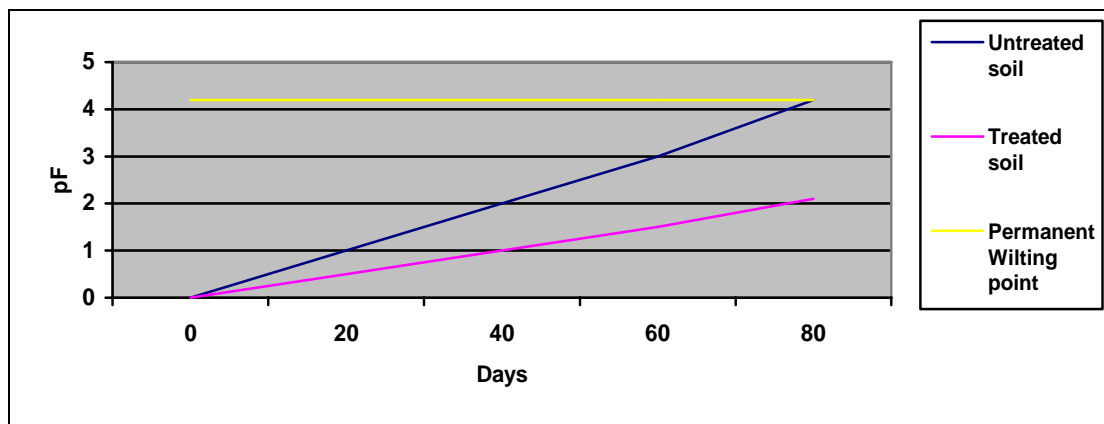
- Increased porosity and aeration characteristics as the product swells and contracts
- Reduction in erosion potential (up to 44%) as the product particles behave like colloids in the soil
- Reduction in soil compaction due to the active nature of the product (cycles of expansion and shrinkage)
- Increase in water penetration into the soil due to increased permeability (reduced runoff, increased infiltration)
- Significant increase in water storage capacity of the soil
- Increase in capacity to retain fertilisers applied to the soil

It can be seen that soil characteristics are significantly improved as a result of the addition of **WATERSTORE**, making them more productive and suitable for optimal plant growth.

THE WILTING POINT

After heavy rains or irrigation, the pores of the soil are totally saturated with water. This water is available to the plant through the suction power of the root system. When soils are wet, the water is readily available to the plant, but after a while, the amount of water close to the root system decreases and the plant has to find water from surrounding soil areas by capillary action. The subsequent delivery of water to the roots continues until there is insufficient water to sustain the capillary action and the plant reaches its wilting point.

Through the use of **WATERSTORE**, the point when the plant reaches its permanent wilting point is drastically delayed, as can be seen by the graph below.



Tests have proven that soil treated with only 3g/kg **WATERSTORE** has 3 times more water available to plants after 40 days than untreated soil.

The tests demonstrate that plants reached their permanent wilting point (pF4.2) after 80 days in untreated soil, whilst plants in treated soil had only reached pF values of 2.1 (half way to their permanent wilting point) after the same time period.

The tests clearly show that by adding **WATERSTORE** to the soil, the plant has more water available and for a longer period of time. This means that watering cycles can be reduced without subjecting the plant to stresses caused by lack of water, a common growth limiter in Africa.

Reducing Costs

Higher productivity



To increase profits, input costs must be kept low and productivity must increase.



One of the great input costs for growers or farmers is irrigation and the use of fertilizer products.



Irrigation consumes energy and needs manpower. Both are becoming more and more expensive and quality fertilizer is not getting cheaper.



Through the use of **WATERSTORE**, watering cycles can be reduced by up to 50%, which means irrigation costs are reduced, less manpower needed and at the same time, added fertilizer is used more efficiently, therefore higher productivity.



By using **WATERSTORE** tests have shown that the biomass production per 1 litre of water was increased by 30 to 40 %. Survival rate of young plants maximises.

The input cost of **WATERSTORE** is low. 20 Kg per Hectare or 3g for a growing tree is all that is needed to enjoy a greater success.



Agriculture

WATERSTORE promotes quality and yield of agricultural crops.

Under dry climatic conditions crop yields are limited by poor stand establishment and low plant density.



This is especially true in sandy soils, since the loss of water and nutrients through deep percolation below the root zone is a frequently occurring problem.

Management of soil water movement by applying **WATERSTORE** leads to significant improvement in the soil matrix as well as soil water potential.

The subsequent swelling of the gel particles results in a linear decrease in the drainage pores and a linear increase in the water-holding pores in the treated soil.

The ability of **WATERSTORE** to absorb water increases the soil moisture potential and, thus, restricts water loss by evaporation and deep-water percolation.

Increasing soil moisture content to a certain limit is known to promote seed germination, seedling population, plant growth and development, nutrient uptake and crop yield.

Application	
<u>Broadcast application</u>	<u>Furrow application</u>
<ul style="list-style-type: none"> Scatter the WATERSTORE by or with a fertilizer spreader before sowing or planting. 	<ul style="list-style-type: none"> Place the dry granules together with Fertilizer in the seed/plant furrow (dosing device: Gandy-box)
<ul style="list-style-type: none"> Plough up the soil 	<ul style="list-style-type: none"> Dosage rate: 20kg per hectare
<ul style="list-style-type: none"> Working-in depth: 15cm 	
<ul style="list-style-type: none"> Dosage rate: +/- 40kg's depending on soil condition 	

Horticulture



Horticultural substrates with **WATERSTORE** extend the market life of container plants. Most bedding plants are grown in containers that make them very susceptible to water stress. The problem is compounded by retail marketplace conditions where watering frequency is often a function of managerial convenience rather than plant demand.

WATERSTORE is commercially used as an amendment to modify the water status of growth media.

Beneficial effects of **WATERSTORE** are; increased water-holding capacity, improved aeration and drainage, better root development, extended shelf-life of container grown plants, reduced watering requirements, improved leaf growth and flowering. Avoidance of water stress and protection against possible plant injury is of significant

value to growers and retailers.

Application	
APPLIED AS DRY GRANULES	APPLIED AS PRE-WETTED GEL
<ul style="list-style-type: none"> Mix the dry WATERSTORE homogenously with the growing media. 	<ul style="list-style-type: none"> Pre hydrate WATERSTORE and mix it homogenously with the growing media: Put 100 litres of water into a drum, add 1kg of WATERSTORE, stir the solution for 30 min and let it settle for 15 min.
<ul style="list-style-type: none"> The first irrigation must be very intensive to saturate the polymer granules with water. 	<ul style="list-style-type: none"> The water reservoir is already activated. Irrigation can be reduced immediately. No changes in soil volume.
<ul style="list-style-type: none"> The soil volume will increase due to expansion of WATERSTORE. 	<ul style="list-style-type: none"> Pre-hydration of WATERSTORE can also be carried out in a fertilizer solution.
	<ul style="list-style-type: none"> Dosage rate: 2 - 3 kg per cubic meter.

Landscaping



Intensive Landscaping with WATERSTORE

Landscape maintenance is very costly. Cost data show that one third of the total project costs are dedicated to plant maintenance, including replanting in case of plant losses, labour expended on watering and water itself.

By using WATERSTORE maintenance costs are significantly reduced. Due to the increased water-holding capacity of root zones, especially those high in sand, WATERSTORE promotes better establishment and survival of landscape plants, assisting in buffering the irregularity of seasonal rainfall.

APPLICATION
<ul style="list-style-type: none">Mix WATERSTORE into the backfill below and around the root ball and water thoroughly.
<ul style="list-style-type: none">Groundcovers/Planting Beds 100 g/m²
<ul style="list-style-type: none">Dig WATERSTORE into the soil to a depth of approx. 10-15cm depending on the expected root depth and water thoroughly.
<ul style="list-style-type: none">Large areas may be power rotovated.
<ul style="list-style-type: none">Turfgrass 50-100g/m².
<ul style="list-style-type: none">Apply WATERSTORE with a drop seeder and power rotovate to a depth of 10-15cm in two directions.
<ul style="list-style-type: none">Water immediately after sowing to saturate the polymer granules.

Forestry

Forestry plantations with **WATERSTORE** improve transplant survival.

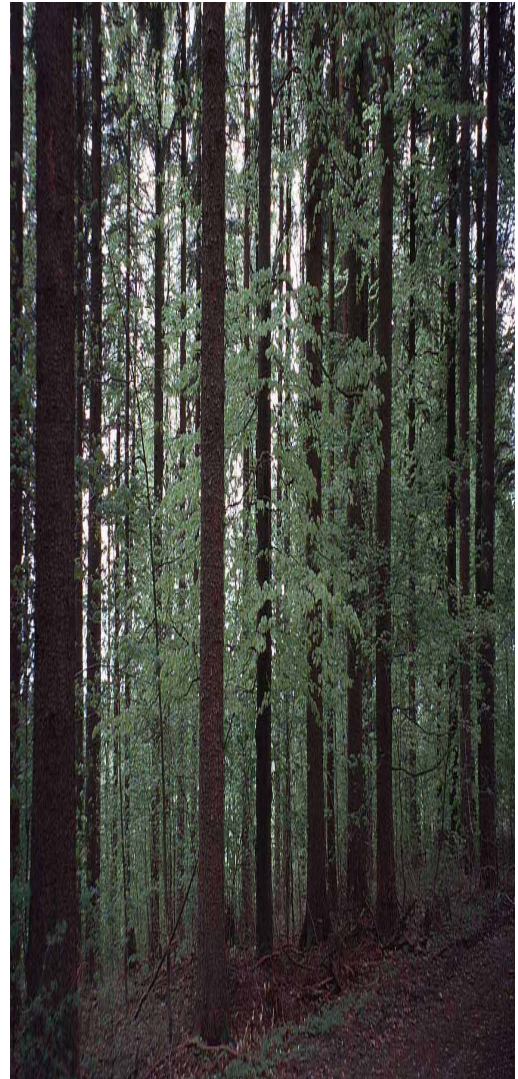
Insufficient water is considered one of the major factors limiting growth and survival during the establishment of commercially planted transplants.

WATERSTORE is used in forestry plantations to increase the survival of newly transplanted seedlings.

The water volumes used at planting are significantly reduced without negatively affecting current silvicultural standards.

By applying **WATERSTORE** the planting season can be extended to include the dry months, previously unattainable due to risk of unacceptably high mortality.

Planting costs are reduced by 25%.



Application	
APPLIED AS DRY GRANULES	APPLIED AS PRE-WETTED GEL
<ul style="list-style-type: none"> Mix WATERSTORE 50 throughout the planting hole. 	<ul style="list-style-type: none"> Fill 200 litres of water into a drum.
<ul style="list-style-type: none"> Plant in the usual way. Irrigate directly after planting to saturate the polymer granules with water. 	<ul style="list-style-type: none"> Add 1 kg WATERSTORE. Allow to swell for 30 minutes.
<ul style="list-style-type: none"> Dosage Rate: 3 - 4g per seedling 	<ul style="list-style-type: none"> Mix the gel solution throughout the planting hole. Plant in the usual way.
	<ul style="list-style-type: none"> Dosage Rate: 400 - 600 ml per seedling.

Land Reclamation



Root dipping improves establishment of bare root transplants on dry and harsh sites

Surface mine reclamation by planting trees and shrubs is a common practice.

However, mine soils frequently possess chemical or physical limitations which adversely affect water relations.

On such sites, moisture retention is low and root desiccation can be a major problem for newly planted seedlings.

As a bare-root transplant dip, **WATERSTORE** draws and retains water in close proximity to the roots. Gel particles cover the roots supplying enough moisture to prevent dehydration of the exposed roots. Plant survival and growth are improved due to the faster development of fine root hairs after planting.

Root dipping is an inexpensive but effective operation for bare root planting on harsh and dry sites.

Using **WATERSTORE** as root protection gel is extremely efficient. 100 l dipping solution or 1 kg of **WATERSTORE** is enough for approx. 800 ornamental shrubs or 1000 forest tree seedlings.

Application
<ul style="list-style-type: none">• 100 g of WATERSTORE is stirred into 10 - 20 l water.
<ul style="list-style-type: none">• Make sure the polymer is slowly poured into the water and that the water is moving. Let the solution stand for at least 20 minutes.
<ul style="list-style-type: none">• Adjust the slurry to the thickness that best adheres to the roots. Dip or spray roots in the gel either singly or in bunches.
<ul style="list-style-type: none">• Plant out into the soil in the usual way.

Benefits

W A T E R S T O R E

- Presents the economical solution for efficient water management in soils.
- Reduces the frequency of irrigation.
- Minimises the water and nutrient losses through to seepage, evaporation and surface runoff. By increasing the water use efficiency more biomass is produced with less water. Labour and maintenance costs associated with irrigation are significantly reduced.
- Activates sustainable root growth.
- Based on optimized conditions for root growth, the use of **W A T E R S T O R E** results in faster development of seedlings, vigorous plant growth and increased crop yields - particularly under difficult growing conditions such as drought stress due to low soil moisture and poor soil fertility.
- It improves the survival during plant establishment.
- Due to a more uniform water supply **W A T E R S T O R E** grants an improved and faster germination and plant establishment.
- It allows for plant growth in extremely hot and dry climatic conditions.
- Increases the safety margin in plant production and plant quality.
- Creates optimum conditions for plant growth.
- It has a positive effect on the water and nutrient supply, as well as on the porosity and permeability of soils and potting mixes.
- It has a long-lasting effect.
- A particular feature of **W A T E R S T O R E** is its very quick rewetting ability whilst in the soil, even after completely drying out.
- It retains the ability of repeated water absorption and release over a long period of time.
- It is environmentally safe and compatible.



FREQUENTLY ASKED QUESTIONS

1. How does **W A T E R S T O R E** work in soils?

- Increases the utilizable water holding capacity of soils and potting mixes by decreasing the water and nutrient losses due to seepage, evaporation and surface runoff.
- Swells to gel particles and stores water, as well as the plant nutrients dissolved in the water. Thus acting as a reservoir of water and nutrients available to your plants on demand. Water and nutrients are taken up directly by the fine root hairs growing into the gel particles or they are slowly released to the surrounding soil.
- It supports the capillary flow of water into the root zone by releasing water with the surrounding soil due to the moisture gradient. Thus, the soil moisture potential is kept at the highest level for a longer period of time.

2. How much water does **W A T E R S T O R E** absorb?

- One kilogram is able to absorb up to 250 litres of demineralised water. Salts and ions in soil or irrigation water decrease the uptake of liquids under use conditions. All hydro gels are sensitive to salt solutions.
- In the soil salts and multi-valent cations like magnesium and calcium are absorbed by the hydro gels. Since the cations act as additional cross linking agents the polymer network becomes narrow. This results in a reduced absorption capacity. In soil, one kilogram of absorbent will take up and retain 150ml of water.
- The hydro gels achieve their maximum swelling capacity even against the natural pressure of soils, substrates and compost. Incorporated in soil at a depth of 20 cm one kilogram of **W A T E R S T O R E** still absorbs 100 litres of soil solution.



3. How does **W A T E R S T O R E** affect soil moisture?

- It stores water and with it dissolved plant nutrients. Water which normally drains away is now easily available for plants. Thus, the soil moisture content is increased.
- By applying 3g **W A T E R S T O R E** per litre of soil the amount of plant available water is increased by 30-50%. Thus, the time period until plants reach the permanent wilting point is doubled under normal growing conditions. Through the addition of **W A T E R S T O R E** the properties of a sandy soil, as regards water retention capacity and water availability, have changed to such an extent that they are now similar to those of a silt loamy soil.

4. Can **W A T E R S T O R E** cause water logging?

- Applied at the recommended dosage rates and homogeneously mixed with the soil **W A T E R S T O R E** does not lead to over watering. Due to the swelling and shrinking of the hydro gel stable soil aggregates are formed. This loose soil structure remains lasting. Water permeability and soil aeration is granted.
- Over watering is caused by standing water in the root zone. Standing water is the result of lack of drainage and soil compaction. **W A T E R S T O R E** increases the pore space volume thus, reducing soil compaction.
- When **W A T E R S T O R E** has reached its maximum absorbing capacity, no more water is retained beyond this quantity and the excess flows off. The remaining air stored in the soil ensures a very good aeration and oxygen supply to the topsoil.

5. How does WATERSTORE affect physical properties of soil, substrates and compost?

- Due to the swelling of the hydro gel during water uptake the soil volume changes, resulting in reduced soil compaction and increased soil pore volume. Thus, by loosening the soil roots grow best and most thickly.
- In a sandy soil treated with WATERSTORE compaction is reduced by 23, 4% compared to an untreated soil. The soil pore volume is increased by 40, 5% applying 3g WATERSTORE per litre of soil. At the same time water infiltration is greatly improved. If rainwater infiltrates the soil quickly, less water runs off. With a lower volume of running water, less soil can be transported. The erosion of soil material is reduced by 50%. To reduce erosion means to keep the fertile topsoil.

6. How long does WATERSTORE last in the soil?

- WATERSTORE retains the ability of repeated water absorption and release over a period of several years which makes them very cost effective for long term maintenance situations.
- As a water management tool WATERSTORE is therefore particularly suitable for plantations of trees and shrubs, for orchards, as well as for perennial crops (alfalfa, sugar cane).

7. Is WATERSTORE environmentally compatible? Is it safe?

- The use of WATERSTORE in landscaping, forestry and agriculture is environmentally safe.
- Yes, it is. In-depth ecotoxicological testing was performed in laboratories certified according to the rules of "Good Laboratory Practice GLP". No evidence for adverse effects of WATERSTORE to animals, plants, soil or ground water was obtained.
- WATERSTORE is approved as "inert ingredient" by the US Environmental Protection Agency EPA under 40 CFR section 180.1001(c).

8. Is WATERSTORE biodegradable?

- WATERSTORE is potentially biodegradable.
- WATERSTORE adapts itself to natural degradation mechanisms: Due to physical, mechanical and biological activities the polymer gets liquefy. Higher molecular soluble polymer parts are attached to soil components. Thus in the course of time, WATERSTORE forms part of the humus fraction of the soil, without having any negative or toxic effects on the soil and micro organisms. The low molecular soluble polymer parts are mineralized. Together with naturally occurring humic substances WATERSTORE enlarges the organic soil matter fraction. Degradation products are not toxic.

Waterstore

- Two granular sizes for the right application.
- High absorption and retention rate.
- More than 150 cycles of rehydration.
- Long lasting. Up to 5 years.
- Reduces water cycles up to 50 %
- Lowers soil density, increases aeration.
- Easy to apply.
- Totally environmentally friendly.
- Increases young plant survival and growth.
- Saves money, increases productivity.



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