

POLYMER PREPARATION HOLDS ENVIRONMENTALLY FRIENDLY

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Water plays a very important role in plant life, accounting for 70-90% of the cell weight. Water contained in plant cells to maintain physiological and biochemical activities takes place every day. Water is seen as an important building ingredient, a specific solvent for biochemical reactions and also an important raw material in some reactions: Water provides electrons and protons to remove CO₂. In order to create organic products in photosynthesis, water is directly involved in the oxidation of respiratory materials to release energy, water participates in the hydrolysis of starch, proteins ... The soil dissolves all minerals taken from the soil, photosynthesis products, vitamins, enzymes ... and transports to all cells, tissues and organs in the body. It can be said that water has the function of circulating, distributing and regulating in the plant body to ensure an intimate, harmonious relationship between the organs in the body as a unified whole. In addition, water is also a factor that regulates the temperature of the crop, especially when the air temperature is high, thanks to the evaporation process, which reduces the temperature on the leaf surface, which facilitates photosynthesis and activities. Other life is favorable ... Water demand of crops varies with each stage of growth and development. When the water demand is not met, the water balance in the tree is disrupted, affecting physiological activities such as photosynthesis, respiration, transport, accumulation of organic matter and reduced productivity and quality of agricultural products. For soil, water is also a factor of air and air conditioning, when water shortages and droughts occur, the mechanical-chemical properties of the soil such as tightness, cohesiveness, cohesiveness, expansion - contraction, the solubility of nutrients ... changes, thus directly affecting the crop.

Moisturizing polymers are polymer materials that can expand in water without being dissolved. The polymers have the ability to absorb water, physiological saline or physiological solutions ... with the amount ranging from 10 to 100 even up to 1000 times the weight of the polymer.

The hypertonicity or hydrophilicity of polymers is determined by polar functional groups such as: -OH, -COOH, -CONH₂, -SO₃H ... distributed on the links of the polymer. In the process of expansion of the polymer, two processes are involved: Solvent penetration into the pores of the polymer and the expansion of the polymer circuit leads to plasticization and increases the volume of the polymer. Actually, it is due to the action of ionic force, Vander Waals force, hydrogen bonding, osmotic pressure ...

Moisturizing polymers are widely used in many fields: sweat absorbent pads, water-retaining materials, waterproofing additives, the construction industry, the cosmetics industry, food, packaging, pharmaceutical and medical industries. ... and a particularly important application direction is being concerned as humectants and provide trace elements for plants.

The use of humectants is a scientific and technical progress that has been applied in many countries around the world since the 80s. The effectiveness of this measure has been confirmed in the US, Canada, China ... with improving desert areas, greening bare hills in the US, fertilizing coffee fields in

Brazil, sugar beets in Germany ... resulting in increased crop yields, reduced plant mortality, reduced Take care of plants, save time and water.

In Vietnam, the Institute of Economic and Irrigation Science has conducted research on the use of moisturizing materials on some crops in the Central Highlands and the Northwest, which has achieved good results, increasing productivity and quality of agricultural products. . Because polymers retain moisture in addition to moisturizing, providing water and moisture suitable for growing plants, polymers also have the ability to store fertilizers and micronutrients - indispensable nutrients for the birth process. plant growth and development.

Based on that, the research project of the institute T2016-05-09VB "Study the effect of drought on the growth and accumulation of proline in green vegetables (*Brassica juncea* L. Czern)" has been successfully created by the research team. polymer moisturizing materials from agricultural by-products, is a cheap and biodegradable source of raw materials, so the production of moisturizing polymers from agricultural by-products is of both environmental and economic value. International.

The scientific significance of technology is based on denaturing the spatial structure of cellulose networks. Cellulose is an organic compound with molecular formula $(C_6H_{10}O_5)_n$, is a type of polysaccharide with straight chain structure formed by hundreds to thousands of D-gluco monosaccharides bound together by bonds β (1 $\rightarrow$ 4). The cellulose circuits are closely linked by the hydrogen bond between the -H atoms of this circuit and the -OH groups of the adjacent circuit, which forms the strong structure of cellulose. Cellulose is the main constituent of the cell wall in green plants, about 33% of the composition of trees is cellulose, cellulose content in cotton is 90% and in wood is 40-50%

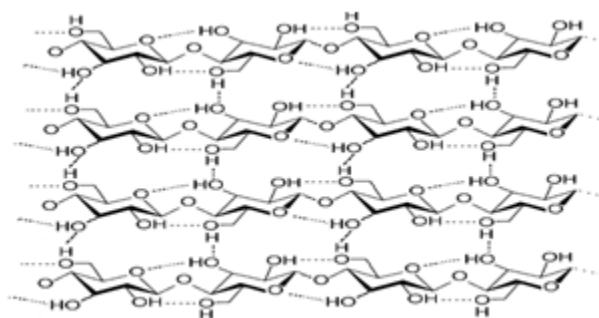


Figure 1: Structure of cellulose

Cellulose is odorless, tasteless, insoluble in water and organic solvents. Cellulose is biodegradable, which can be broken down into D-gluco monos when dealing with acids at high temperatures. Cellulose is an inexpensive, biodegradable, renewable, and the most common content in nature. Cellulose has been studied extensively for decades, applying to paper, paperboard, rayon, fuel, concrete additives, light bricks, bioenergy

Natural cellulose lacks some properties that synthetic polymers have. Changing the properties of cellulose by coupling reaction is one of the important steps to change the physical and chemical properties of cellulose. Many studies have conducted cellulose coupling reactions by different

techniques, mostly based on free radical coupling reactions by different chemical substances or by irradiation agents. The result is a change in the chain of cellulose circuits, forming flexible circuit structures, capable of absorbing and storing a large amount of water. In this study, we conducted the reaction: Synthesis of moisturizing polymers based on cellulosic coupling reaction with acrylic acid and initially tested on broccoli (*Brassica Juncea*)

The mechanism of expansion and absorption of water by polymers is explained by the fact that on the polymer chain, there are -COOH and -OH functional groups in the structure of acrylic acid and cellulose. The groups -COOH , -OH are hydrophilic, so when introduced into the water environment, there are hydrogenation interactions between functional groups on polymers and solvents. These effects reduce energy and increase the entropy of the system. Because of its hydrophilic nature, polymer chains tend to disperse without restriction in water, which also increases entropy. Thanks to the presence of the lattice that forms the 3D space network, the elastic force of the mesh prevents the polymer from expanding (dissolving). In the system, there exists a balance between the force of network elasticity and the trend of unknown circuit expansion. For ionic polymers, the neutralized circuits contain electrical charges and repulsive signs. The charge neutralization is maintained when the negative -COO- groups are balanced with positively charged Na^+ ions. When exposed to water, the hydrogenated Na^+ ions reduce their attraction to the -COO- group (due to the high dielectric constant of the water). This process allows Na^+ ions to move freely within the network to form an internal osmotic pressure of the gel. However, Na^+ ions are flexible but cannot be removed from the gel because they are still weakly attracted by the -COO groups along the main polymer chain and are likely trapped by a semi-permeable membrane. Therefore, the driving force of the swelling process is the difference in gel osmotic pressure inside and outside the gel.

The product obtained a high level of expansion, about 250 g / g polymers in distilled water, the product has good swelling level in both acid and base environment from $\text{pH} = 3$ to $\text{pH} = 11$, of which the best is about $\text{pH} = 6$. -10, the swelling level of the polymer is stable, so this expanded polymer can be used for acid and alkaline soils. Experimental results on broccoli showed that when adding 3% and 5% of this expanded polymer, the germination rate increased by 11.94-16.56%, height of plants increased 18.63-26, 27%, leaf area increased 56.62 to 62.53% compared to the control formula

Research results show that polymers help keep soil moist, create favorable conditions for plants to grow, and provide essential nutrients for plants to promote vegetative growth, contributing to productivity. . The use of the above materials has brought many preeminent features: both able to supply water to the tree and help the plant absorb well fertilizers, nutrients.

During the experiment, moisturizing polymer materials were added to the substrate, the results showed the significant effect of adding polymers of 3% polymer materials (CT2) and 5% polymer materials (CT3).), especially CT supplemented with 5% moisturizing polymer materials has the greatest advantages and the highest efficiency.