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Geocomposite with Superabsorbent as an Element Improving Water Availability for Plants on Slopes

A. Pawlowski, K. Lejcus, D. Garlikowski, and H. Orzeszyna

(pawlowski@iis.ar.wroc.pl) Institute of Environmental Engineering, Wroclaw. University of Environmental and Life Sciences, pl. Grunwaldzki 24, 50-363 Wroclaw, Poland tel.:+48/71/32 05 543 tel/fax: +48/71/3205579

Daniel Garlikowski
Krzysztof Lejcuś (klejcus@iis.ar.wroc.pl)
Henryk Orzeszyna
Andrzej Pawłowski (pawlowski@iis.ar.wroc.pl)
Institute of Environmental Engineering, Wroclaw. University of Environmental and Life Sciences, pl. Grunwaldzki 24, 50-363 Wroclaw, Poland tel.:+48/71/32 05 543 tel/fax: +48/71/3205579

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Water availability for plants on a slope is usually worse, then on a plane surface. Exposure on sun radiation makes these conditions even more difficult. The key problem is how to supply plants with water. Frequently watering is good but expensive solution. To avoid often repeating of such action and/or to use as much as possible water from precipitation, it has to be retained in soil. One of the ways to increase soil water retention is superabsorbents (SAP), called often hydrogel addition to the soil. They can absorb 300 – 1000 times more water, then theirs own weight. This water can be later taken by roots system. Addition to the soil small amount of dry superabsorbent, which, after absorbing water, forms gel can affect stability of the slope top layer, diminishing soil strength parameters. Part of the strength lose can be recompensed by reinforcing action of better developed roots system, which, according to the tests are increasing soil shear strength. However because it is a living system still rest some uncertainty about its functioning over many vegetation seasons. From engineering point of view, these strength parameters are very difficult for precise calculation, control and determination of long term behaviour.
Important factor of superabsorbent influence on soil shear parameters is its dosage and, as a result, final volume and properties after water absorption. If the volume of superabsorbent is not greater then available pore volume of soil, this influence is not decisive. By bigger dosage, when volume of superabsorbent with retained water is much greater then pore space volume. The soil form a suspension in hydrogel and in laboratory condition one can observe sedimentation of soil fraction at the early stage of saturation. After longer time gel's density is already high enough to support grains of soils and stop sedimentation process. By highly permeable soils, which are sometimes used in embankment construction, eg. for buttress, gel, just after saturation, could infiltrate deeper, where water retained by superabsorbent would be much more difficult to reach by plants root system.
To avoid disadvantages, listed above, of using superabsorbents in slope cover layer of soil, a special gecomposite has been developed. In basic form it consists of dry superabsorbent paticles placed between 2 layers of geotextiles. The non woven geotextile is extensible enough to let the superabsorbent swell, when it absorbs high amounts of water. Geotextile separates superabsorbent from surrounding soil and does not allow changing its properties by gel penetrating pore space. It is not a barrier for roots to access the water retained in the geocomposite. Roots, as tests have proven, form dense system connected with geocomposite. Positive influence on roots system's shear resistance, when geocomposite has been placed in soil layer, had been observed.
There are many different possibilities of geocomposite arrangement on slopes to be protected by plants cover. It can be placed horizontally in parallel lines, it can form a grid like pattern or can be used at defined point to

support water supply of bushes. Possibilities of gecomposite usage are not limited to bioengineering. It can be used in many sectors of agriculture, where precisely placed “water reservoir” is better, then uncontrolled mixing of superabsorbent with the soil. If necessary it can be removed, which is not possible, if superabsorbent particles are applied directly to the soil. So using the geocomposite one can fully profit from its advantages avoiding at the same time its negative influence on soil properties.