

Dosing equipment, in particular of hydrogel, for planting forest stands, arranged as a superstructure on a furrow tree planter

The device helps to fight drought in planting forest stands. It is designed for very fast and efficient line planting of seedlings of not only forest trees, but also banana trees, coffee trees etc. in areas affected by water scarcity. It utilizes the classic principle of the creasing machine, adding to each seedling a set amount of a mixture based on a hydrophilic polymer (hydrogel). It demonstrably increases the taking of seedlings and at the same time significantly reduces water consumption for irrigation. The device is designed to be operated without major skill requirements, so it is also very suitable for the developing world. Planting efficiency is up to 1,000 seedlings per hour, which significantly exceeds the possibilities of manual planting.

Hydrophilic polymers

Hydrophilic polymers are chemical substances based on a crosslinked organic polymer of potassium carbonate. These substances are able to absorb 100 to 400 times their own weight. Moisture in the hydrogel is readily available to the plant. The water binding in the hydrogel is relatively strong, so there is minimal evaporation. Using its osmotic system, the plant can take the maximum amount of water supplied. The hydrogel is able to absorb water not only from irrigation or rainfall, but also from dew or fog. This ability is very pronounced in arid and semiarid areas, where an extreme change in temperature between night and day brings short but intense dew.

The hydrogel remains in the soil for five to nine years (depending on the manufacturer and type of gel), which is long enough to ensure tree establishment.

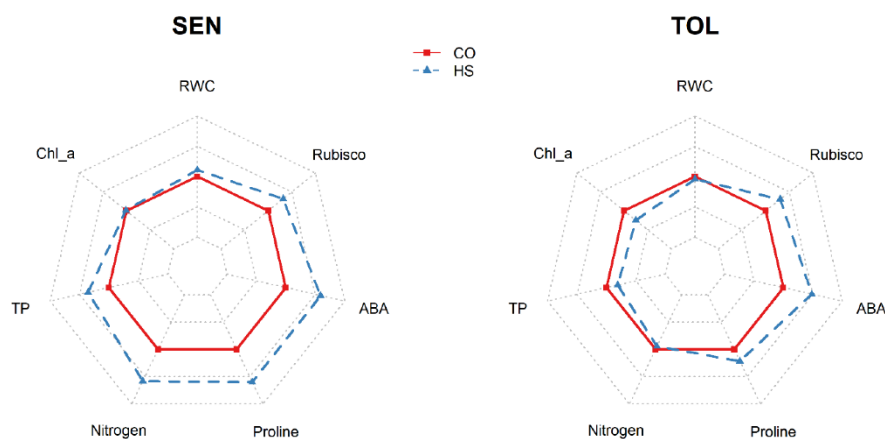


Figure 1

Our research shows that the hydrogel has a positive effect on the taking of seedlings, especially with trees intolerant to drought (Fig. 1.) The hydrogel also reduces the demands on irrigation and mortality of seedlings. The results of six year's research on a total of twenty tree species in semiarid areas are summarized in the article at the link: <https://www.mdpi.com/1999-4907/11/2/211/htm>

We are currently working on further research in the field of protecting tree seedlings in forest stands and in facilities with controlled humidity (Fig. 2). The results so far show that the hydrogel has a very positive effect, significantly reducing stress on seedlings, while simultaneously increasing their growth performance. The research is ongoing. Under the guidance of Associate Professor Tomášková, physiological measurements are performed at FFWS in order to determine the response of plants to the hydrogel at the highest scientific level (assessment of the degree of stress hormones excretion etc).



Figure 2

Equipment for seedlings with the addition of hydrogel

The equipment developed at FFWS is used for semi-automatic line planting of forest trees and crops, such as banana, coffee, and cocoa. The machine is based on the principle of a furrow tree planter (Fig. 3). Seedling is done manually. The pedal operator controls the start of the dosing device (Fig. 4). Dose



Figure 3



Figure 4

metering and subsequent application takes place in automatic mode. The device is carried on common machinery, such as a standard wheeled tractor (Fig. 5). The great advantage of the device is its high efficiency (in ideal conditions up to 8000 seedlings per shift) and minimal demands on the operator. The machinery operator must meet the standard conditions for operating the device; the requirements for the planters are minimal. The device is therefore very suitable for developing countries. However, service and calibration of the unit must be performed by qualified personnel.



Figure 5

Suitability of equipment deployment

The equipment is suitable for the restoration and establishment of stands in all areas with a lack of precipitation, including developing countries. It is especially suitable for flat and slightly sloping terrain without major obstacles.

The device was granted a patent, a utility model, and an industrial design for a special coulter (Fig. 6). The prototype of the machine is now fully operational in the renewal and establishment of stands throughout the Czech Republic.

Work is currently underway on the development of a second generation of the machine with fully automatic operation.

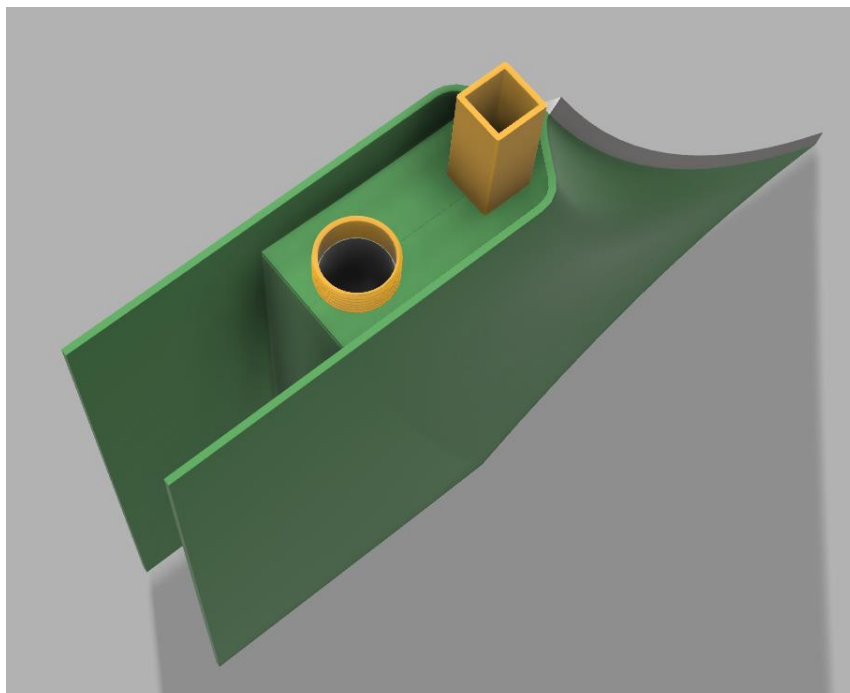


Figure 6