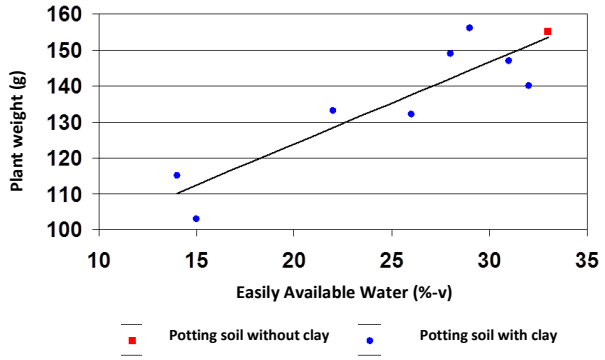
Effects of clay in potting soil

What does clay do in a potting soil mixture and which clay product is most suitable in order to achieve the desired effect in a certain culture situation? The effects of clay further illustrated.

More compact crop

Clay in a potting soil causes the crop to remain more compact. This is because clay can lower the availability of water and phosphate (P). Slowing down the growth can be enforced by using a potting soil with a low EAW level (Easily Available Water) and combining it with dry growing. Clay materials in potting soils have an effect on the availability of water. The EAW is the amount of water that a plant can easily absorb from the potting soil. The dosage of a number of clay products influences the availability of water to the crop. The finer the clay products, the more the decrease of the EAW. Coarse clay materials have a decreasing effect on the EAW when applied in high dosages.* As the EAW is lower and the plants thus need to appeal to more scarcely available water, the growth of the plants is slowed down and they become more compact and sturdier. In order to use the EAW as a tool for managing the crop development, the crop needs to be grown dry; the root ball is kept at a lower moisture level.

** There is a difference in clay materials. Fresh clay still contains water. Dry clay granules therefore give more effect, because it effectively contains more clay mineral.*



Effect of EAW during a dry growing situation (example Impatiens).

By adding clay to a potting soil mixture the availability of phosphate for the plant decreases. In combination with no extra phosphate fertilization, the growth of the crop may decrease. Therefore, a low phosphate fertilization in potting soils may be used as a tool for the desired growth inhibition. This works for all kinds of clay.

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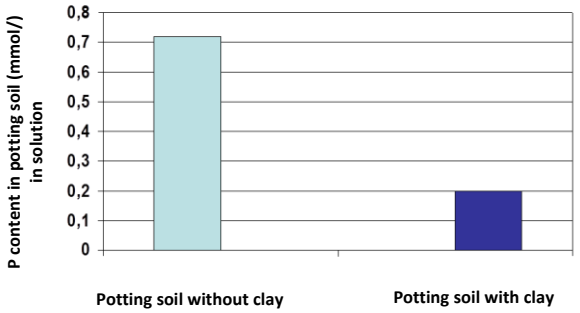


Decreasing phosphate (P) in potting soil because of clay.

Improving the water uptake

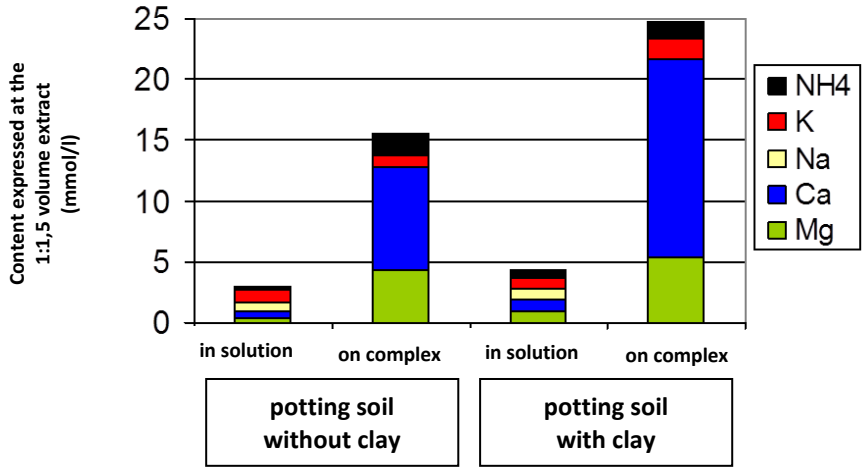
Clay attracts water and in this way it has a positive effect on the water uptake of potting soil mixtures. For example in a peat mixture without clay, the water uptake of potting soil is only 5 percent after half an hour. This is because peat can have difficulty taking up water under dry circumstances. The addition of fine clay leads to a better water uptake than coarse clay granules. This is because fine clay spreads more easily throughout the mixture and influences the finer pores in the potting soil as well. Coarse clay fractions influence the water uptake of a mixture in higher dosages. So the fraction distribution of the clay used is of importance. For cultures under dry circumstances the potting soils with clay ensure a better internal water transport. This is important for a constant water supply to the roots of the crop. Potting soil mixtures with clay can more easily be made wet again when they have become dry or in case of the first wetting after planting cuttings or plugging.

- **Fine (powder) clay** already has an effect on the water uptake in a low dosage (20-50 kg).
- **Coarse clay** has an effect on the water uptake in higher dosages.
- **Fraction in between** fine and coarse clay are somewhere in between.

Buffering of nutritional elements

Clay in a potting soil mixture also leads to a larger buffering of nutritional elements in the soil moisture (cations such as potassium (K), calcium (Ca), magnesium (Mg) and ammonium (NH_4)). This larger buffer capacity decreases the chance of acute nutritional deficiencies for the crop. This applies to potted plants in the greenhouse, but also for container plants in outdoor cultures. Outside an undesired rinsing of nutritional elements caused by excessive rain is limited thanks to the larger buffering. The size of the extra buffer is determined by the size of the CEC (Cation Exchange Capacity; the exchange complex of the positively charged cations and negatively charged anions) of the clay and the amount of clay in the potting soil. The largest buffering is achieved by adding a high dosage of clay with a high CEC to a potting

soil. However, also of importance is the occupation of the complex. When this contains undesired elements like sodium or other elements creating an unbalance in the substrate, this can lead to problems.



Effect of the exchange complex.

Durability of plants in retail phase

In the potted plants culture, clay also seems to have a favourable effect on the durability and quality of plants in the retail phase. Plants can sustain their quality longer in the trade channel because of an extra buffer storage of the nutritional elements K, Ca, Mg, NH_4. The stronger moisture binding of a potting soil that contains clay contributes to the durability of the plants.

Making the pot heavier

Adding clay also increases the weight of the root ball. 100 kg clay per m^3 potting soil has 100 grams more weight per litre of root ball. For an average moisture level this means an increase in weight of 10 to 20 percent.

Other effects

Adding clay can have more effects in the root environment. For example clay can be a source of certain elements, like silicon. It can also have a buffering effect on certain toxins. For animal nutrients certain clay minerals are added to bind mycotoxins. These aspects are still in research.

Switching to new potting soil

The desired effect that the grower wants to realise, is defining for the choice of the clay product and its dosage in the potting soil mixture. It makes sense to first analyse the specifications of the current mixture before switching to a new potting soil mixture. It is

especially important to measure the EAW level. In order to gain insight into the properties of the new mixture, it is advised to analyse it beforehand and frequently to keep an eye on the nutritional balance and if necessary adjust the fertilization of the culture.

Desired effect	Choice of clay
Decrease of water availability (EAW)*	- the finer the clay, the more easily it spreads throughout the mixture and the more effect
Decrease phosphate availability*	-all kinds of clay
Improvement of water uptake	-fine clay in low dosage or -coarse clay product in high dosage
Buffering of nutritional elements	-clay with a high CEC capacity and the right occupation (elements) in high dosage
Durability of plants in retail phase	-CEC capacity and occupation (elements)
Making the pot heavier	-all kinds of clay

* *Effect is enforced when combined with a dry growing situation.*

Finally

So clay can be a tool in controlling growth. However, this depends in particular on the mineralogical compositions and fraction of the clay used and how the culture is grown and the experience of the grower. There are many different qualities of clay on the market, all with their specific characteristics. Please contact the suppliers of clay products and growing media for advice on achieving the desired effect.