

Protocol on how to safe water & fertilizers in horticulture

Bulb Ornamentals

1. Reduction of nutrient input

1.1 By the use of tools

- Which sensors?

Non-destructive optical sensors that detect indicators of nutrient stress such as an early decrease in the chlorophyll content and increase in secondary stress metabolites, e.g. Greenseeker (fast, cheap and easy to use). These sensors can give a good indication of the presence of stress if slight color differences become visible. If there is nothing visually noticeable, it is recommended to combine the sensors with isotope analyzes or other destructive laboratory analyzes.

- How to use non-destructive optical sensors?

- Perform scattered measurements every 1-2 weeks, e.g. by holding the Greenseeker on a constant distance above the crop. Remind yourself that the pigment content doesn't change immediately when a plant experiences stress.
- Compare indices of plants in nutrient stress with plants in optimal conditions to verify whether there is a shift in the pigment composition (less chlorophyll and more secondary metabolites) due to the presence of stress.

➔ On the Bio4safe project page (<https://bio4safe.eu/sensors>), you can find information leaflets about different non-destructive optical sensors and how best to use them.

1.2 By combining tools and biostimulants

Non-destructive optical sensors can be used in combination with biostimulants, which can influence the nutrient use efficiency of plants. You can find the most suitable biostimulant for your situation in our online Bio4safe database.

- How to use Bio4safe-database?

- Surf to <https://bio4safe.eu/>
- Click on the button '**Crop group**' and select '**Bulb ornamentals**'
- If you want, you can further filter your search result for the desired effect. (E.g. 'Increased nitrogen 'N' use efficiency'; 'Increased phosphorous 'P' use efficiency'...)
- Click on one of the listed products you are interested in.



Case study: Tulip (*Tulipa* 'World's Favourite')

When large amounts of nutrients are present in the soil, fertilizer application can be reduced. A good and structured sampling with analysis of the soil is therefore very important to keep a finger on the pulse.

In general, a reduction of **10-25% in N-fertilization is possible** in the cultivation of tulips. This depends on the type of soil (clay or sand). The fertilizer content on clay soils is higher than on sandy soils. Tulips are a biennial crop and are vegetatively propagated every year. This means that differences in fertilizers levels in the second and subsequent growing years should be increased. The use of moisture sensors can save the water amount.

During 3 trial years in the Bio4safe project, the nitrogen application in the cultivation of tulip 'World's Favourite' was reduced by **50 % (80 kg N/ha post-emergence instead of 160 kg/ha pre-emergence (clay soil) or pre- and post-emergence (sandy soils))**. There was **no significant difference in total bulb weight**, number of **bulbs > 12 cm**, number of **bulbs 11-12 cm** and number of **bulbs 10-11 cm** compared to the control grown at optimal nitrogen concentrations (160 kg/ha) in a **clay soil**. Also no significant differences in total bulb weight , number of bulbs > 12 cm , number of bulbs 11-12 cm and number of bulbs 10-11 cm compared to the control grown at optimal nitrogen concentrations (160 kg/ha) in a **sandy soil**. The tested biostimulants didn't have an additional value compared to the optimal control.