

Measuring the effect of biostimulants used in seed treatment on the early root development of tomato and oilseed rape crops

Audrey Dupont, Marie-Hélène Wagner, Sylvie Ducournau
GEVES, Station Nationale d'Essais de Semences, 25 rue G. Morel, 49071 Beaucouzé - FRANCE

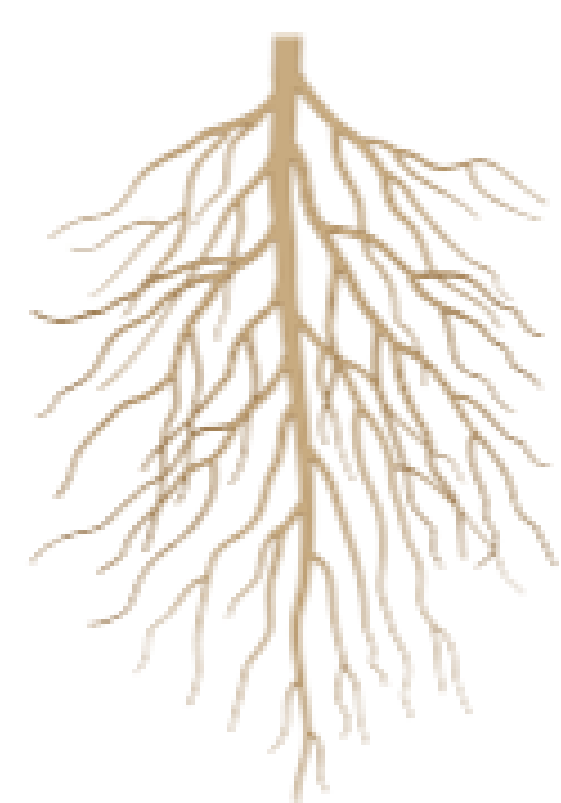
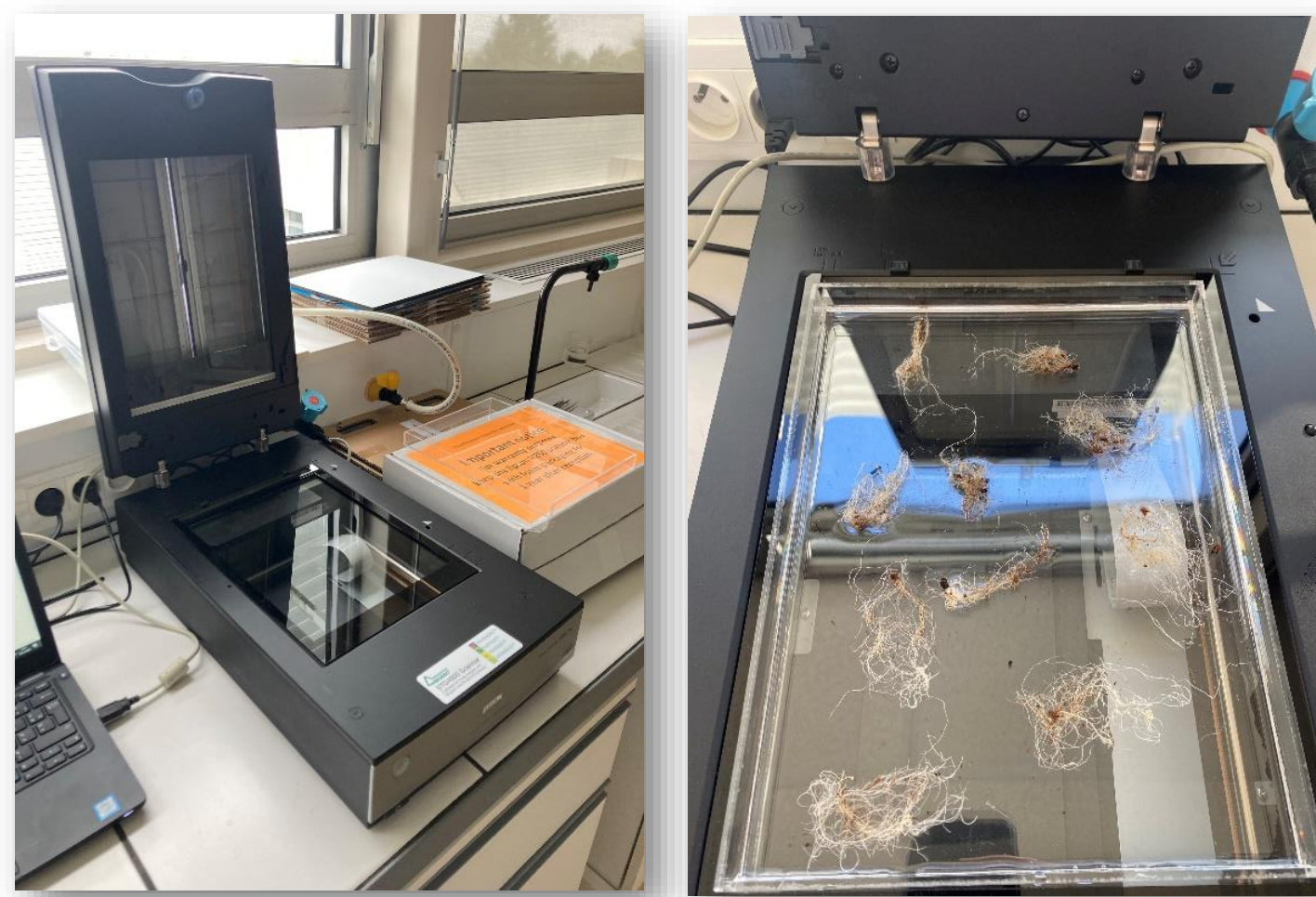
INTRODUCTION

Biostimulants can be used to enhance metabolic efficiency and thus improve germination or promote plant growth in different crop species. The effectiveness of biostimulants often depends on biostimulant type, concentration, and plant species but also on the plant stage when the application is done. In this study we investigated the effects of one to three commercial biostimulant solutions applied as seed treatment.

Studying root length using the Winrhizo imaging tool is particularly useful for investigating the effect of biostimulants on development of the seedling and its different organs.

In order to identify an early stage in the young plant that would allow us to see the effect of biostimulant solutions on growth, various samples were taken between 4 and 21 days. This enabled us to define a stage at which the effects were visible and significant.

WINRHIZO TOOL TO ASSESS ROOT DEVELOPMENT



Winrhizo is a device with image analysis software for scanning and measuring roots.

- ❑ **Set-up:** Deposit the root or roots in the tank, which has been filled with water beforehand. Possibility to obtain an average value or measurements plant by plant.
- ❑ **Measurement:** Root length, root volume, root diameter class, root air surface ...
- ❑ **Data:** The data is collected in a txt* file and then transferred to an Excel file before the results are analysed.

OILSEED RAPE RESPONSE TO BIOSTIMULATION



➤ **Selection of the optimal dose of biostimulant solution applicable in seed treatment**

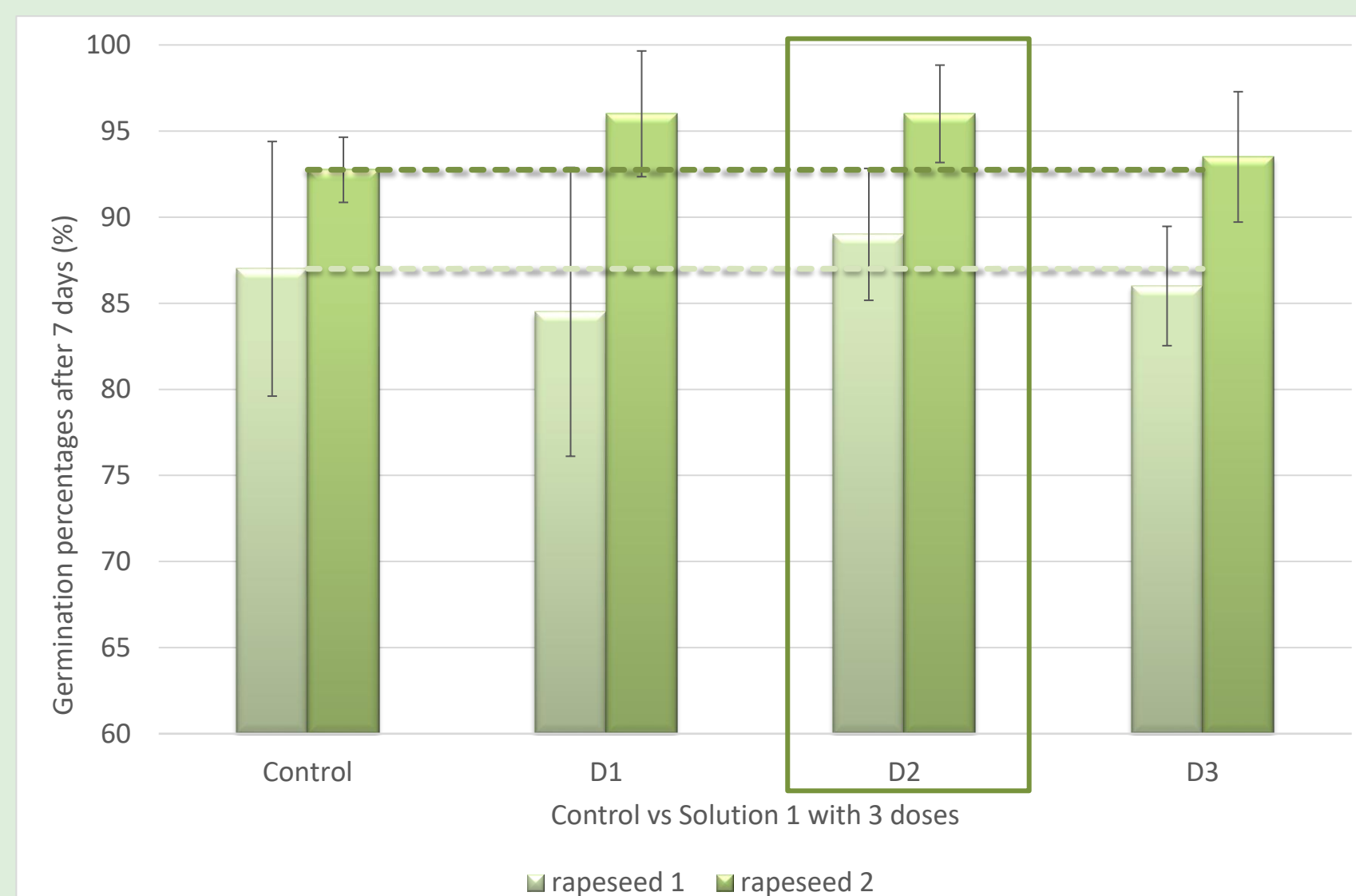


Figure 1 : Comparison of germination obtained using three doses of a biostimulant solution on two lots of rape seed.

Selecting the right dose is essential for optimizing the effects of biostimulants on seedling development. **Dose 2** is the only one to improve germination percentages in both lots tested.

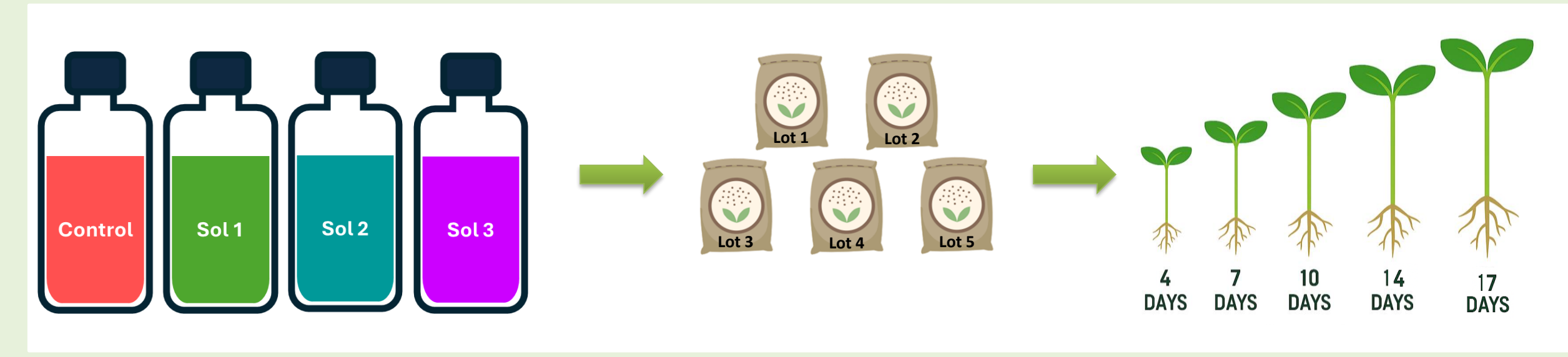
➤ **Root system at different development stages**

Figure 2 : Evolution of root system length at different stages of development for two rapeseed lots.



From day 17 onwards, the control and biostimulant treatments differed significantly (p value = 0.004**), with an average difference on root total length of 60 cm, and at 21 days (p value = 0.002**), with an average difference of 91 cm in favour of the biostimulant treatment.

TOMATO ROOT GROWTH



➤ **Root system at different development stages**

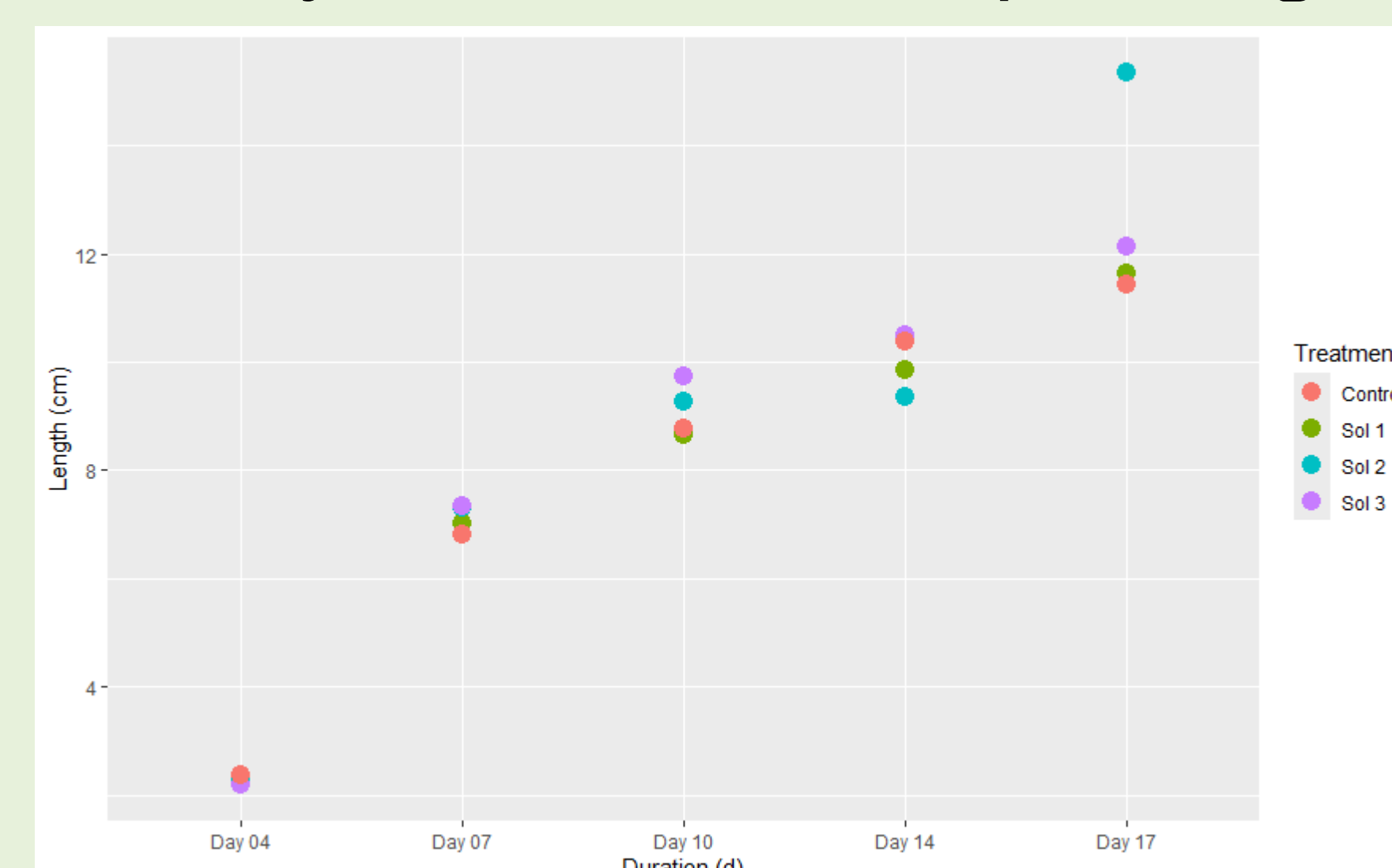


Figure 3 : Evolution of mean root system length at different stages of development for five tomato varieties treated with three biostimulant solutions.

After selecting an optimal dose based on germination characteristics, evaluation of average root system length at different stages highlights a significant difference between the control and a biostimulant treatments from the 17th day onwards (p value = $2.46.10^{-5}$ ***). The solution 2 significantly increased the root system of tomato seedlings compared to the control as solutions 1 and 3 were similar to the control.

➤ **Lot effect analysis**

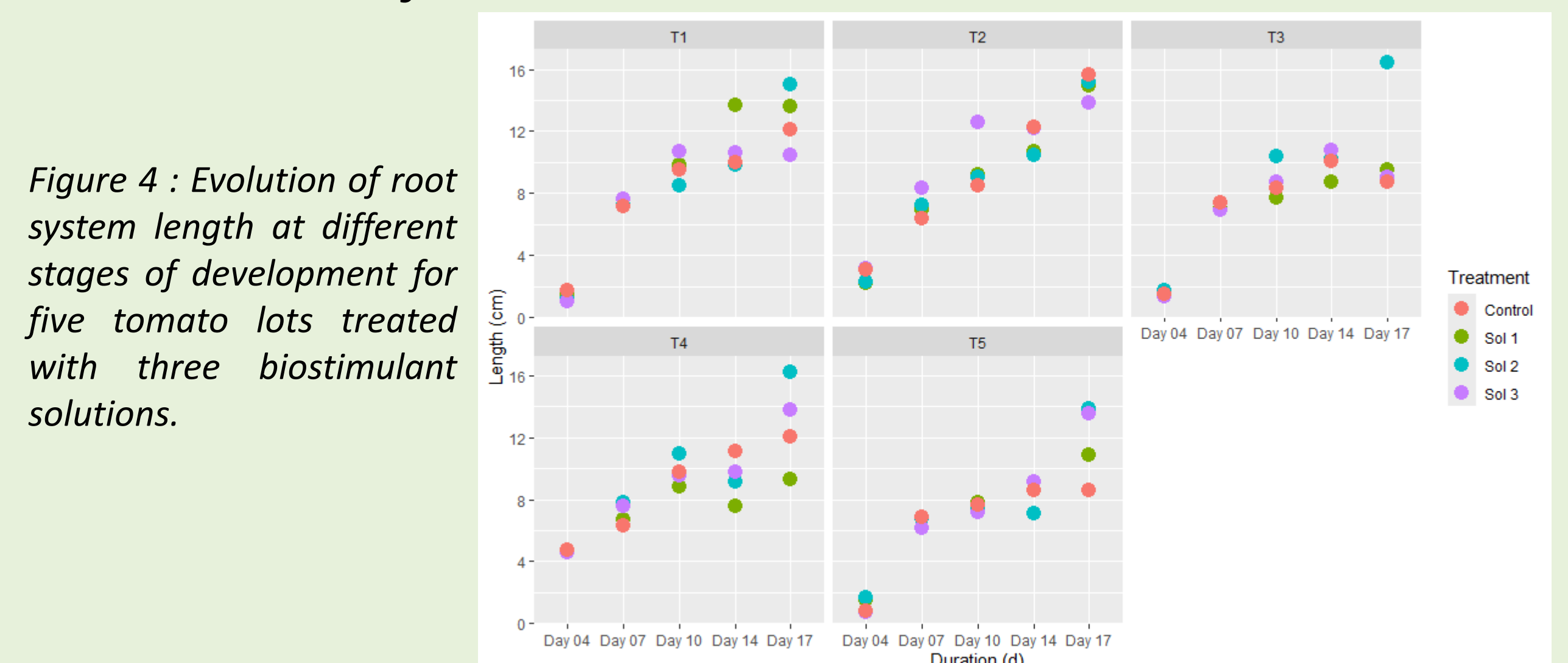


Figure 4 : Evolution of root system length at different stages of development for five tomato lots treated with three biostimulant solutions.

The lot effect is pronounced here (p value = 0.00125**) indeed, tomato 2 does not react with any of the biostimulant solutions, even after 17 days.

CONCLUSION

One solution increased the length of the rapeseed root system by an average of 28%, after 17 days of growth for the two tested lots. For tomato, it is also after 17 days that we can assess the impact of a biostimulant on root system development. Solution 2 increases the length of the root system of the five varieties tested by 34%. However, there is a significant lot effect, as one tomato lot (T2) does not benefit from the effects of any biostimulant.

Biostimulants could have a great impact in seedling root development when applied on seeds but should be specific to crop species and to seedling stage. Bearing in mind that genetics can also have an impact on the effect of the biostimulant.