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Interactions Between Tomato Scion and Rootstock Varieties Regarding Growth and Development under Different Water Supply Levels

FIRDES CETIN, ANDREAS FRICKE, HARTMUT STÜTZEL

Leibniz Universität Hannover, Institute of Biological Systems Production, Germany

Abstract

In tomato production water deficit is a major limiting factor for plant growth, since it decreases photosynthesis by reducing leaf area and stomata conductivity. Grafting vegetables onto compatible rootstocks offers different advantages such as (i) resistance to soil pathogens, (ii) yield improvement under low soil temperatures and (iii) greater tolerance to drought and salt stresses.

In this study, different tomato scion (S) varieties were grafted with different rootstocks (R) varieties. As control treatments the S and R varieties were grafted on themselves. Two greenhouse experiments were carried out using 53 L containers. To screen the interactions and morphological plant characteristics, the tomato S varieties of Dirk (Enza), Pannovy (S&G), and Treasury (Seminis) were grafted onto R varieties of Vigomax (RZ), Brigeor (Enza), and Maxifort (De Ruitter) and examined under well watered (WW) conditions in the first experiment. The pre-selected varieties (S: Pannovy, Treasury; R: Brigeor, Maxifort) which showed highly significant interactions in the screening experiment, were tested in WW and drought stressed (DS) conditions in the second experiment. Early fruit fresh weight, leaf area, shoot and root dry weight, root length (in two soil layers) were measured while the water use efficiency (WUE) referring fruit fresh weight and total plant dry weight were calculated in the final harvests of both experiments.

After grafting, significant positive interactions between S and R varieties were found in the screening experiment and the best performance in total plant dry weight and leaf area was shown with Dirk-Brigeor, whereas opposite results were shown with Treasury-Vigomax combinations. In the second experiment, total root length and dry weight were significantly higher under DS than under WW and higher root length was produced in deeper layer with self-grafted R varieties. Graft combinations with Maxifort were characterised by higher root mass, particularly under DS compared to the control treatments. Treasury-Maxifort showed higher root/shoot ratios under both WW and DS. WUE referring to early fruit fresh weight and total plant dry weight was higher under WW. Under DS, both WUE referring to total plant dry weight and early fruit fresh weight was higher with Treasury-Brigeor compared to the control treatments.

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