Response of Stomatal Anatomy of Tomato to Sub-Optimal Water and Nitrogen Supply in Different Growing Environments

Kaushalya D.G.A., Bandaranayake P.[1], Dewapriya I.G.N.S.[1], Weerakkody W.A.P., Beneragama C.K. and De Costa W.A.J.M.[*]
Department of Crop Science,
Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka

Tomato (*Solanum lycopersicum* L.), which belongs to the family Solanaceae, is a widely grown and consumed vegetable in Sri Lanka. Stomatal anatomy is an important leaf characteristic for exchange of carbon dioxide and water vapour between plant leaves and its environment. Stomata can impact the leaf function, with changes in density and size affecting potential water loss, CO_2 uptake, and leaf temperature. The objective of this study was to determine the interactive effects of water deficits**,** and sub-optimal **water and** nitrogen supply on the stomatal anatomy of tomato (variety Thilina) in different growing environments. Experiments were carried out in the temperature-controlled greenhouse, Uncontrolled greenhouse, and open field environment at the Agricultural Biotechnology Center in Meewathura from September to November 2022. Treatments were laid out in Randomized Complete Block Designs (RCBD) with five blocks in three different environments separately. Three leaflets of the fifth leaf from the top of each of the five plants in each treatment were collected. A stomatal impression was taken and the slide was prepared, and images were taken using a light microscope mounted with a digital camera. Anatomical measurement was made with these images using Image J software. Stomatal density, epidermal cell density, stomatal index, stomatal size, and potential conductance index were taken as anatomical measurements. Abaxial and adaxial stomatal density, adaxial stomatal index, adaxial stomatal size, and adaxial potential conductance index were not significantly different among different water or nutrient regimes ($p>0.05$). Sub-optimal water and nitrogen supply significantly affected epidermal cell density, abaxial stomatal size, abaxial stomatal index, and abaxial potential conductance index ($p<0.05$). However, these differences were not consistent across the three growing environments. It is concluded that stomatal anatomy of tomato has a limited sensitivity to variation in water and nitrogen supply while being under strong genetic control.

Keywords: Nutrient stress, Stomatal anatomy, Tomato, Water stress

[1]Agricultural Biotechnology Center, Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka
[*]janendrad@gmail.com