The effects of soil-bedding methods, water quantity, and water quality on the performance and yield of sweet pepper plants

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Sweet pepper is the largest and most successful agricultural sector in the Arava valley yet, it faces problems of availability of fertile soils and water restricts its farther expansion. Innovative soil-bedding methods are, therefore, sought, to which the irrigation regime should be re-adjusted. The objective of the present study was to test the response of sweet pepper yield to different soil-bedding methods at differential irrigation quantity at two levels of water quality.
Three methods of soil-bedding were tested. For the first method, 'nutrition duct' (ND), 40 cm wide, 20 cm deep ducts were dug in the 'Hamada' soil at 1.6 meter intervals. Tuff (0-8, Tuff Merom Golan Company) was laid inside the ducts at a uniform volume of 50 liter/m^3. The second soil-bedding method tested was the restricted root zone (RRZ) system, in which a thin layer of coarse Tuff that covered the bottom of the duct was coated with a thick technical cloth sheet (Agripal, Palrig) on top of which an equal volume of Tuff 0-8 was added. The third was the traditional method of sand-coating (40 cm sand layer on top of the Hamada soil). The experiment took place at Yair Station in the Arava. Sweet pepper seedlings (var. 7187) were planted (24/08/05) in a net-house (50 Mesh), distributed between the three soil-bedding treatments. The differential water quantities began 24 days after planting. The water quantities were adjusted once a week at four different levels according to refund indices of 0.5, 1, 1.5, and 2 of the current evaporation as recorded by a maximum lysimeter. At the end of the season, the water quantities accumulated to 350, 684, 962, and 1350 mm. The experiment structure was duplicated in order to allow two salinity levels of the water: 2.5 and 0.7 dS/m.

The sand coating method produced the lowest fruit yield at all conditions. When desalinated water (0.7 dS/m) was used, the difference in yield between the sand and the RRZ method reached 20%. The RRZ method did well in the desalinated water, but was inferior to the nutrition duct when saline water (2.5 dS/m) water was used. This inferiority may be attributed to higher salinity in the RRZ rhizosphere. The yield response curve to the desalinated water saturated already at the second level of 684 mm per season at all three methods, whereas in the saline water yields increased along with the increment of water quantity throughout the range. A small advantage of the RRZ over the ND method is explained by a better water retention (25% increase) that was found at the three higher water quantity levels. In conclusion, net-house sweet pepper yields in the Arava valley can be increased by 20% using the RRZ method with 700 mm high quality water. However, when this water quality is unavailable, equal results can be obtained with at least 1400 mm of saline water (2.5 dS/m). These conclusions will be reassessed in the next seasons.