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Yield of Eggplant Submitted to Different Water Tensions on Soil

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Introduction

The annual Brazilian production of vegetables reaches about 12.5 million tons with growth projections mainly of those with phytotherapic properties (Cardoso, 2005). In this context, eggplant (*Solanum melongena L.*) stands out for having produced 30700 tons in 1996. The Southeast participated with 88.79% of production, particularly the states of São Paulo (60.74%), Rio de Janeiro (12.43%) and Minas Gerais (14.32%). Eggplant is currently grown in approximately 1,500 ha in the country with increasing demand due to medicinal properties such as reducing cholesterol level and for being a good source of minerals and vitamins (Bernardi, 1968). Appropriate irrigation management aims to maximize water use efficiency, minimize energy consumption and maintain favourable conditions of soil humidity and plant health. (Marouelli et al. 1996). Criteria for scheduling irrigation can be based on the matric potential of soil water, but few studies have been done to evaluate the optimal time to perform irrigation in eggplants. Thus, this study aimed to evaluate the effects of different soil water tensions applied at two growth stages on the productive behaviour of eggplant, Napoli cultivar, in a greenhouse in Southern Minas Gerais.

Material and Methods

Two experiments were conducted in a greenhouse at the University of Lavras, state of Minas Gerais, April to October 2008. The experimental design used in both experiments was completely randomized with 5 levels of soil water tension (15, 30, 45, 60 and 80 kPa) and 6 replicates. Plants were irrigated by drip system, and irrigation management was carried out based on readings from tensiometers installed at 12.5 cm depth in the experimental units 20 kPa and 40 kPa. At tensions 80 kPa to 120 kPa we used Watermark®. Based on tension reading, we calculated the corresponding humidity values using the water retention curve. Using these humidity values plus that one corresponding to field capacity and also considering the volume of soil in the pots, we calculated the replacement volume. Treatments began in experiment 1 on the first phenological stage (post-transplant/bud opening) 10 days after seedling transplanting up to the time when 50 % flowers were open. Then treatments were discontinued and all experimental units were irrigated when tension reached 15 kPa up to the end of the cycle. Treatment differentiation in experiment 2 concerning the second phenological stage (fruit formation / harvesting) was held by the end of treatments in experiment 1 up to the end of the cycle. Then we evaluated yield per plant. Data were subjected to analysis of variance and effect of treatments was studied by regression analysis. Effect of water deficit on yield was quantified by the relationship between relative yield decrease and relative evapotranspiration deficit (Ky).

Results and Discussion

The point of highest total yield was obtained with tension 15 kPa, equivalent to an average yield of 1.72 $kg.plant^{-1}$ (Figure 1). Marouelli et al. (2002) found greater vegetative growth, total yield and average bulb mass of garlic with tensions 15 to 19 kPa and recommend performing irrigation under high frequency. Marouelli & Silva (2006) concluded that matric tension 10 kPa maximized yield in tomatoes for processing during fruiting stage.

Figure 2 shows yield decrease due to water deficit applied during post-transplanting/ bud opening stage (experiment 1). A linear regression equation passing through the origin was adjusted as proposed by Stewart & Hagan (1973). The slope of the equation, which represents the response factor Ky, was 0.27. Doorenbos & Kassan (1994) highlight that when water deficit occurs in the early stage of development, yield decrease is usually proportionally smaller than the applied water deficit (ky <1).

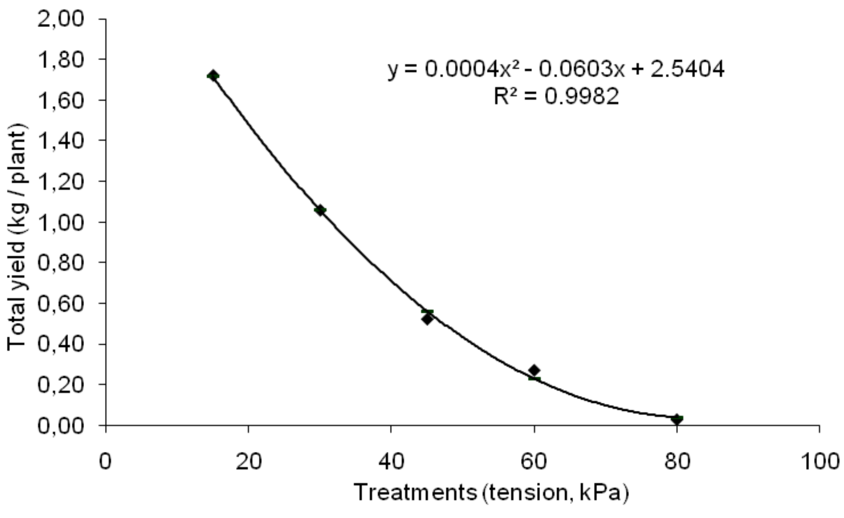

Figure 1. Effect of different soil water tensions in total yield (kg / plant) at the stage of fruit formation / harvest. UFLA Lavras / MG 2008

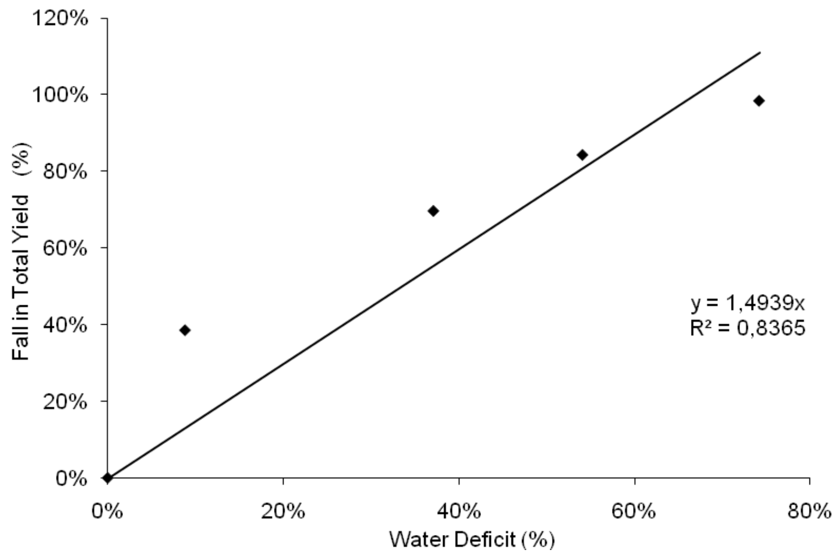

Figure 2. Yield decrease due to water deficit during post-transplanting/ bud opening in eggplant. UFLA Lavras / MG 2008

Figure 3 shows the relationship between water deficit and yield decrease in experiment 2, where treatments were applied at fruit production/harvest stage. The slope of the equation, response factor Ky, was 1.49, showing that relative yield decrease was higher than relative decrease in evapotranspiration, ky> 1 (Doorenbos & Kassan, 1994).

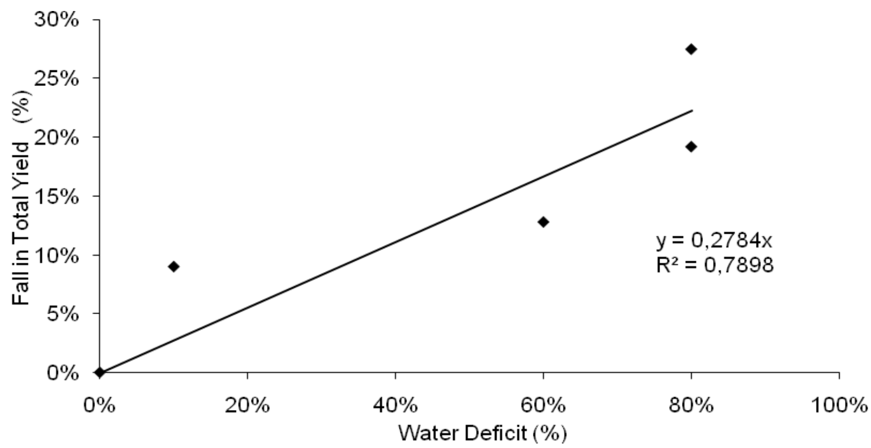

Figure 3. Yield decrease due to water deficit during fruit formation / harvesting in eggplant. UFLA Lavras / MG 2008

Therefore, response factor Ky was higher in experiment 2 thus showing higher sensitivity of eggplant to water deficit during fruit formation / harvesting. In experiments with eggplant grown under water deficit, Vieira (1994) found higher values of Ky during fruiting phase (including bud opening).

Conclusions

Eggplant was more sensitive to water deficit during fruit formation / harvesting phase, where yield, stem diameter and plant height showed growth inversely proportional to soil water tension. The highest yield and plant growth were found in treatments irrigated with tension 15 kPa.

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