PHYSIOLOGICAL AND CHEMICAL EFFECTS OF DIFFERENT WATER REGIMES ON CAPE GOOSEBERRY (*PHYSALIS PERUVIANA* L.) GROWN ORGANICALLY IN GREENHOUSES IN TURKEY

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INTRODUCTION

According to various climate models it has been foreseen that Turkey, having a mixed climate structure, will be drastically affected from climate change which may take place depending on global warming as of 2030’s. A majority of the country will come under the effects of hot, dry climate that will significantly affect water resources, ecological and economical processes, ecosystems and biodiversity and commercial agriculture. Physalis peruviana L (P. edulis Sims) commonly known as the Cape gooseberry is also known around the world by other common names (Morton, 1987). Although other Physalis species are in cultivation in various countries, P. peruviana is the most commonly grown species (Fischer et al., 2011). Cape gooseberry (Physalis peruviana L.) is a medical plant that is widely used in treatment of cancer, malaria, hepatitis, dermatitis and rheumatism (Wu et al., 2005). Its fruits have important place among diabetic and low calorie products (Ramadan and Moersel, 2007). Cultivation of Cape gooseberry that is widely performed in many countries started to increase in Turkey in recent years.

AIM

The aim of this study is to determine the physiological, morphological and chemical changes that may occur when this crop is produced under organic greenhouse growing condtions with various reduced water regimes.

MATERIAL AND METHODS

Plant material and experimental design

In this research a Cape gooseberry species named Gamerika01, which is most probably originated from a standard species and which is widely found in the market (Klinac, 1986), was used as a material.

Evaluation of data

The experiment was established as a factorial randomized block design with four replications and 5 different irrigation applications (100% irrigation (control), 75% irrigation, 50% irrigation, 25% irrigation and 0% irrigation) were used in each replication. In all the experiments; 20 parcels in total and 20 plants for each parcel were used.

Leaf water potential measurement (MPa): (Scholander et al., 1965)
Leaf relative water content (RWC) (%): (Sánchez et al. 2004)
Membrane damage index (%): (Fan and Blake. 1994)
Measurement of Leaf Temperature (∘C): (Erdem et al., 2010)
Determination of total chlorophyll content (SPAD): (Geravandi et al., 2011)
Determination of total phenolic compound (mg/100 g): (Chantiratikul et al., 2009)

RESULTS

Leaf water potential (MPa)

Table 2. Effect of different water deficiency levels on average midday (ψ_{md}) leaf water potentials in Cape gooseberry (MPa)

Water deficiency	The number of days after flowering (week)							
	3	6	9	12	15	18	21	24
% 0	-0,42	-0,87	-0,90	-1,60	-1,77	-2,30	-2,37	-2,45
% 25	-0,44	-0,80	-0,82	-1,50	-1,63	-2,03	-2,20	-2,23
% 50	-0,46	-0,77	-0,77	-1,33	-1,62	-1,80	-1,93	-1,95
% 75	-0,47	-0,57	-0,63	-0,69	-0,97	-1,09	-1,21	-1,34
% 100	-0,42	-0,55	-0,59	-0,63	-0,80	-0,96	-1,03	-1,08

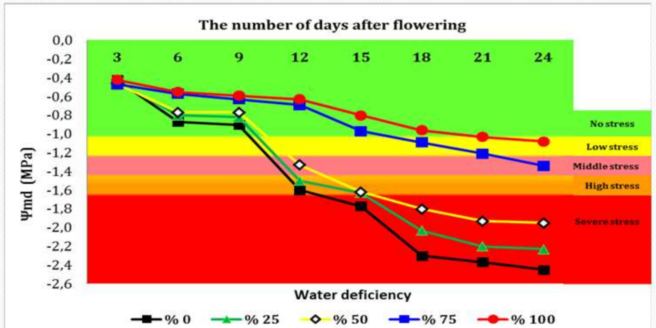

Figure 1. Effect of different water deficiency levels on average midday (ψ_{md}) leaf water potentials in Cape gooseberry (MPa).

Measurement of Leaf Temperature (°C)

Tablo 3. Effect of different water deficiency on midday leaf temperature (°C) of Cape gooseberry plant

	Water deficiency	The number of days after flowering (day)							
		3	6	9	12	15	18	21	24
Midday leaf temperature (°C)	% 0	30,6	30,6	30,3	28,5	30,4	30,1	29,9	26,7
	% 25	30,3	30,4	30,5	28,1	30,3	29,6	29,3	26,3
	% 50	29,9	30,1	28,9	27,6	29,9	28,9	29,0	25,9
	% 75	29,6	29,8	28,4	26,9	28,3	28,4	28,5	25,3
	% 100	29,1	29,3	28,2	26,5	28,7	27,9	28,2	24,8

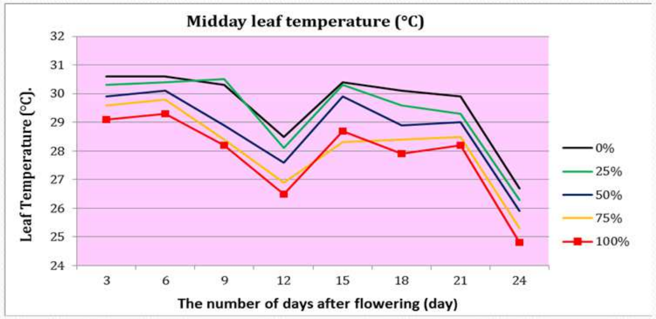

Figure 2. Effect of different water deficiency on midday leaf temperature (°C) of Cape gooseberry plant






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Leaf relative water content (%), Membrane damage index (%), Total chlorophyll content (SPAD), Total phenolic compound (mg/100 g)

Table 4. Effect of different water deficiency levels on average leaf relative water content (%). membrane damage index (%) total chlorophyll content (SPAD) and total phenolic compound (mg/100 g) of Cape gooseberry plant and LSD groups*

	100% (control)	0%	25%	50%	75%
Leaf relative water content (%)	79,22 a	40,79 d	48,79 d	53,20 c	69,48 b
Membrane damage index (%)	8,14 e	76,36 a	69,34 b	47,10 c	38,45 d
Total chlorophyll content (SPAD)	41,23 a	26,60 d	26,62 d	32,90 c	37,55 b
Total phenolic compound (mg/100 g)	285,77 a	148,50 d	160,29 d	197,55 c	250,66 b

*There is no difference in the level of 0.001 among averages that have the same letter.

CONCLUSION

Leaf water potential decreased due to decrease in irrigation in Cape gooseberry, from flowering period till harvest. When water stress occurred, only the control treatment and 75% irrigation from control were not affected by stress. The plants in the 0%, 25% and 50% treatments could not resist the stress.

The total chlorophyl and phenolic compounds in leaves and fruits decreased in reaction to the water deficit treatments, whilst membrane damage ratio and leaf surface temperatures increased.