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Comparative evaluation of the yield characteristics of *Sideritis raeseri* under different irrigation levels

Georgiou C.[1] and Angelaki A.[1]

Department of Agriculture, Crop Production and Rural Environment, University of Thessaly, Volos Greece

INTRODUCTION & AIM

Sideritis raeseri (Greek mountain tea) grows naturally at high altitudes (over 1000m). The plant is native and endemic, as it grows exclusively in Greece. Native plants are declining due to wildfires, uncontrolled grazing, harvesting, and climate change, while increased market demands lead to the need for cultivation, which in turn leads to sustainable utilization and protection of the plant. Usually, studies focus on genetics, nutrients, and essential oils; thus, there is a significant gap in water use efficiency. The present study aims to investigate the effect of irrigation levels on growth characteristics, yield, and irrigation water use efficiency (IWUE), when cultivating Greek tea in plains, where environmental conditions differ from its natural habitat.

METHOD

An experimental design consisting of four treatments (0%ET, 50%ET, 75%ET, 100%ET), three replications, 60 plants/plot, was configured at the University of Thessaly farm (70m altitude), resulting a total of 720 plants. Water needs were based on Penman-Monteith method, while considering factors as emitters/plant, distance between plants and rows, irrigation timing, dose, and duration were determined.

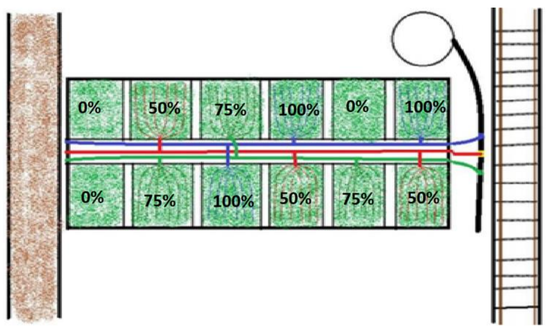


Figure 1. Experimental design, experimental field, biomass weighting and plant drying

RESULTS & DISCUSSION

The statistical analysis showed significant differences between the 0%ET and all other treatments regarding plant height, fresh and dry biomass (Fig. 1, 2, 3), indicating that irrigation is essential at low altitudes. The 75%ET treatment showed the highest IWUE; particularly, 75%ET and 100%ET treatments showed the best growth and yield characteristics with no statistically significant differences between them. However, the correlation of dry biomass with the total water applied indicated that the 75%ET treatment was superior in terms of IWUE (Table 1).

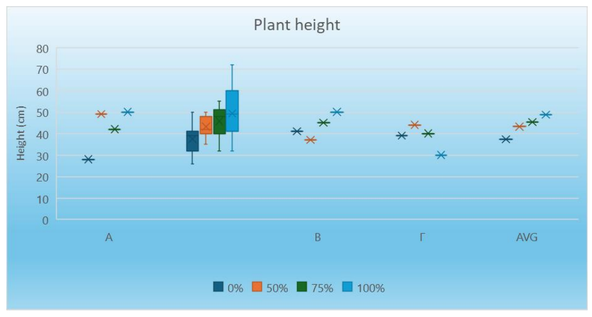
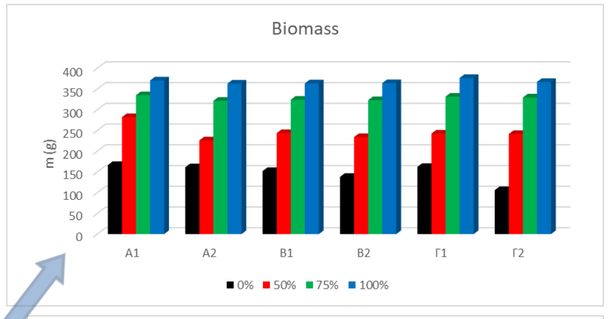
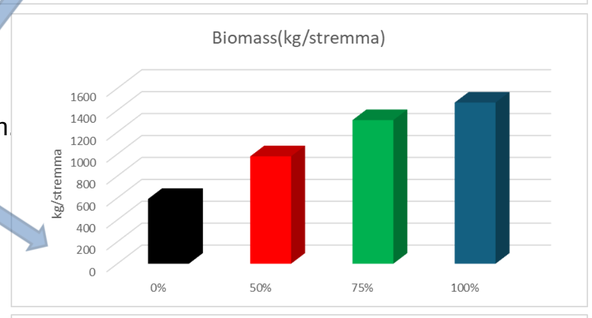


Figure 2. Average height for every treatment (cm).

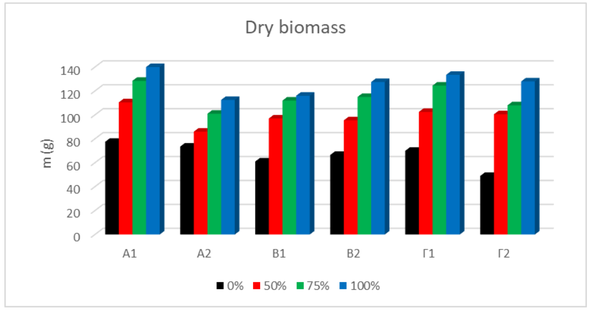


(a)

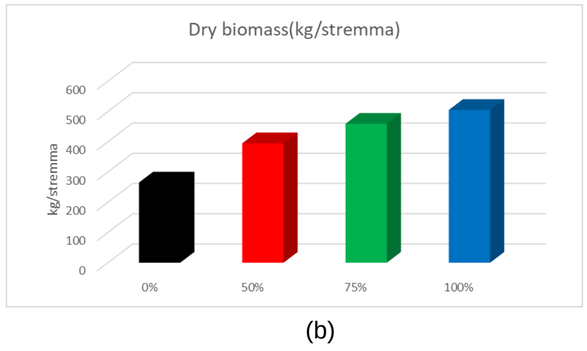


(b)

Figure 3. (a) Biomass (g) in every treatment and replication (b)Total biomass for every treatment (kg/stremma)



(a)



(b)

Figure 3. (a) Dry biomass (g) in every treatment and replication. (b)Total dry biomass for every treatment (kg/stremma)

Table 1. Irrigation Water Use Efficiency (IWUE)

Irrigation Water Use Efficiency (IWUE)		
	75% ET	**100% ET**
Water used (mm)	145,47	193,96
Dry Biomass (kg/stremma)	459	505
IWUE (kg/stremma mm)	**3,16**	**2,60**

It appears that irrigation improves Greek tea yield (Kigalu et al 2008, Carr, 2010), while the application of deficit irrigation to aromatic plants, such as Greek tea, can lead to increased production, with simultaneous water savings compared to full irrigation (Chrysargyris et al 2019, Wang et al 2022). Water stress at levels tolerable to the plant can lead to rational use of water resources and sustainable yield and production (Abdelkhalik et al 2020, Angelaki & Golia 2024).

CONCLUSION

The two treatments with the best growth and production characteristics were 75%ET and 100%ET, as they did not show statistically significant differences, in terms of plant height and total green and dry biomass of the Greek tea produced. However, the correlation of dry biomass production with the total water applied in each treatment showed that the 75% treatment was superior in terms of irrigation water use efficiency.

Given its demand, Greek mountain tea can be an alternative crop at low altitudes for farmers, under the condition of irrigation. High yield can be achieved by applying 75%ET, as the plant's water stress is tolerable, and significant water savings (25%) can be achieved simultaneously. The approach enhances the direction of sustainable water use and contributes to the long-term protection of the plant.

FUTURE WORK / REFERENCES

The experiment should be replicated over multiple growing seasons and under varying climatic conditions, with the aim of evaluating the stability and consistency of both yield and quality parameters, under deficit irrigation regimes.

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