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# Investigation into Water–Yield Relationships in Some Drought-Resistant Cotton Varieties Cultivated in Aydın Province

**Bayram Ali CEYLAN, Oguzhan MANTAR, Yusuf UGURLU, Safiye Pinar TUNALI***
**Aydin Adnan Menderes University, Biosystems Engineering Department**
***Corresponding Author: pinar.gulmez@adu.edu.tr**

## INTRODUCTION & AIM

Cotton is an essential raw material in Turkey for many fields, from the textile to the oil and feed industries. It was determined that the yield of cotton when grown under irrigated conditions is 3-4 times higher than when grown under non-irrigated conditions (Doorenbos and Kassam, 1979; Tüzel and Ul, 2003). Since it is known that existing agricultural areas cannot be increased, other resources such as irrigation, fertilization, pesticide use, use of good seeds, and energy use must be used optimally to increase agricultural production. The fact that we have entered a severe dry period throughout the country has increased the importance of operating techniques that will save more irrigation water (Büyüktaş and Baştuğ, 2007). This study evaluated some drought-resistant cotton varieties grown in our region under field conditions regarding water-yield relations. The study also investigated the effects of different irrigation water levels on cotton yield in the Aydın region.

## METHOD

This study evaluated drought-resistant cotton varieties grown in field conditions regarding water–yield relationships. It also aimed to investigate the effects of different irrigation water levels on the yield of cotton plants in the Aydın region. The research was conducted in field conditions at the Aydın Adnan Menderes University, Faculty of Agriculture, Research and Application Farm in 2022. Two drought-resistant seed varieties (Sahra, Özaltın-404) produced in the region were used as research material. The experiment was set up according to the randomized block design, with three replications and two factors. The first factor in the study is the cotton variety, and the second is the irrigation level. The gravimetric method approach, a soil-based monitoring technique, was used in irrigation programming. In the study, two different types of cotton with two different irrigation levels were applied with three replications. Thus, the experiment consisted of a total of 12 plots. In the study, irrigation was composed of two different irrigation water levels in which 50% (limited irrigation) and 100% (full irrigation) of the amount of irrigation water required to increase the existing moisture at a 90 cm soil depth to the field capacity was applied. In addition, the May 455 cotton variety, which is intensively grown in the region, was used as a control. In the study, irrigation water was applied to each plot by the drip irrigation method. When the harvest time came, the plants in the middle two rows were harvested by hand and weighed, and yields with plots were obtained. Thus, the relationship between irrigation water and plant yields in drought-resistant cultivars was determined.

## RESULTS & DISCUSSION

Table 1. Total amounts of irrigation water applied to different parcels in the experiment (mm)

| | Amount of Irrigation Water Applied During the Trial (mm) | | | | |
|---|---|---|---|---|---|
| Irrigation Date | May-455 (%100) | Sahra (%100) | Sahra (%50) | Özaltın-404 (%100) | Özaltın-404 (%50) |
| 05/31/22 | 129.61 | 129.61 | 129.61 | 129.61 | 129.61 |
| 07/28/22 | 262.32 | 234.14 | 117.07 | 230.53 | 115.26 |
| 08/09/22 | 161.24 | 200.21 | 100.11 | 226.94 | 113.47 |
| 09/01/22 | 200.31 | 224.19 | 112.10 | 228.36 | 114.18 |
| 09/14/22 | 186.65 | 220.42 | 110.21 | 221.23 | 110.62 |
| TOTAL | 940.13 | 1008.57 | 569.10 | 1036.67 | 583.14 |

Since the amount of irrigation water planned to be given during the trial was given at longer intervals than planned due to a malfunction in the pump unit in the trial area, the amount of water given in each irrigation was more than other drip irrigation applications in the region. In addition, the seasonal water consumption of May-455, a non-drought-resistant cotton variety planted for control purposes, was lower than that of other drought-resistant cotton varieties.

Table 2. Cotton yields and yield reduction rates for research subjects

| Cotton Veriety | Yield (kg/da) | Relative Yield (%) | Relative Yield Reduction (%) | Seasonal Irrigation Water Amount (mm) |
|---|---|---|---|---|
| May-455 (%100) | 377.81 | 89.53 | 10.47 | 940.13 |
| Sahra (%100) | 300.07 | 71.11 | 28.89 | 1008.57 |
| Sahra (%50) | 393.89 | 93.34 | 6.66 | 569.10 |
| Ozaltın-404 (%100) | 377.94 | 89.56 | 10.44 | 1036.67 |
| Ozaltin-404 (%50) | 422.00 | 100.00 | - | 583.14 |

When Table 2 is examined, the highest yield value was obtained from the Ozaltın-404 cotton variety, to which 50% irrigation water was applied. Under normal conditions, the highest yield value is expected to be achieved when the amount of water the plant needs is fully met. However, since the cotton varieties used here are drought-resistant varieties, these results are possible. The yield value obtained in the May-455 parcels, a cotton variety that is not drought resistant, was below expectations due to the failure to implement the irrigation program as intended due to a malfunction in the irrigation unit during the experiment. In addition, due to late irrigation, the moisture deficit in the soil was more significant than it should have been, and therefore, the amount of water given to all parcels was higher than the target. In interviews with cotton producers in the region, it was learned that approximately 700 - 800 mm of irrigation was done in the 2022 season.

## CONCLUSION

In light of the findings obtained from the study, it can be seen that drought-resistant cotton varieties can be recommended, especially in conditions where water resources are limited. To obtain more accurate results, carrying out the irrigation program using plant-based monitoring techniques is beneficial.

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## FUTURE WORK / REFERENCES

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