# THE EFFECTS OF IRRIGATION WATER AS A FUNCTION OF THE DISTANCE BETWEEN IRRIGATION DRIPPERS IN A TOMATO FIELD.

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## Introduction

The growth and the yield of the tomato plant in southern hot-arid areas of Italy depend on the satisfaction of water needs. In these environments, high productivity depends on the optimization of irrigation water management, which should be based on the real crop evapotraspiration, a rational water-distribution technique (Favati et al., 2009), and the hydrological properties of the soil. The final objective should be that of maximizing the water use efficiency resource (WUE) (Howell, 2001). While it is commonly known that the drip-irrigation system is the most water-efficient irrigation method, this method has a high installation cost mainly due to the number of drippers needed. In order to provide a scientific contribution to the solution of this problem, we aimed to evaluate the effect of the distance between drippers on the marketable yield of tomatoes.

## Materials and Methods

The experiment was conducted between the years 2007-2008 at the "Sparacia" Experimental Farm (Cammarata – AG). The soil where the experiment was carried out is a Eutric Vertisol (WRB) with slight slope; the tomato plants were transplanted into double rows (50 cm between rows, 100 cm between pairs) with a density of 3 plants.$m^{-2}$. 4 dripper intervals were compared: 15, 30, 60 and 90 cm. Compensating pressure drippers were used with a nominal supply of 3.2 l $h^{-1}$ of water at 1 bar of pressure. Irrigation shifts occurred every four days during the first year, while during the second year the shifts occurred every 2 days, returning the ETr of the crop for each treatment calculated via the Blaney and Criddle method. The effects of the year and the drippers interval distances were evaluated by analysis of variance (ANOVA), using MINITAB 16, according to a split-plot experimental design with three replications, in terms of the yield response, subdivided in: marketable tomatoes (good berries) and non-marketable tomatoes (rotten berries); while in the last harvest the production of immature (green) berries was also verified.

## Results and Discussion

Analysis of the variance for the data obtained during the two years of the experiment showed the significant effects both for the main factors (year and distance between the drippers) as well as for the interaction between them. The more favorable climatic conditions of the first year determined higher yields reaching values of 103.1 t $ha^{-1}$ (90 cm) 12.5% higher than in the second year (90.2 t $ha^{-1}$).
In both years, the production of green and non-marketable was rather modest with values equal to 11.4 t $ha^{-1}$ the first year and 5.5 t $ha^{-1}$ the second year (60 cm).

The distance between the drippers had a directly proportional influence on the productive response of the crop. In both years, the highest yield was observed with the drippers at an interval of 90 cm while the lowest values were recorded with the drippers positioned at a distance of 15 cm. No significant difference emerged between the 60 cm and 90 cm treatments.
The fact that the highest yield was obtained with the drippers positioned at a greater distance could be due to the different efficiency of irrigation water induced by the distance between the drippers. By bringing them closer together, it is in fact possible that the quantity of water emitted in a unit of time exceeded the infiltration rate of the soil causing it to become waterlogged.
The interaction year X drippers distance showed significant effects only for green and non marketable yield.

*Table 1. Tomatoes yield (t ha$^{-1}$ ) in the two years for the thesis and for different kind of production.*

| | I Year | | | II Year | | |
|---|---|---|---|---|---|---|
| Spacing | Marketable | Green | Non-Marketable | Marketable | Green | Non-Marketable |
| 15 cm | 64,9 C | 2,3 B | 5,2 C | 59,2 C | 2,2 C | 0,9 B |
| 30 cm | 74,5 B | 2,9 A | 6,1 B | 67,4 B | 3,0 B | 1,5 A |
| 60 cm | 83,4 AB | 2,6 AB | 8,8 A | 77,0 A | 4,1 A | 1,8 A |
| 90 cm | 92,1 A | 1,8 C | 9,2 A | 85,8 A | 3,2 B | 1,2 B |

*Means values within each character and year followed by different letters are statistically different at 0.01 P level according to Duncan test.*

## Conclusions

The results show that the distance between the drippers must be determined according to the hydraulic characteristics of the soil. In soils with a clay matrix characterized by a low infiltration rate, it seems useful to position the drippers at a distance between 60 and 90 cm.

## References

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