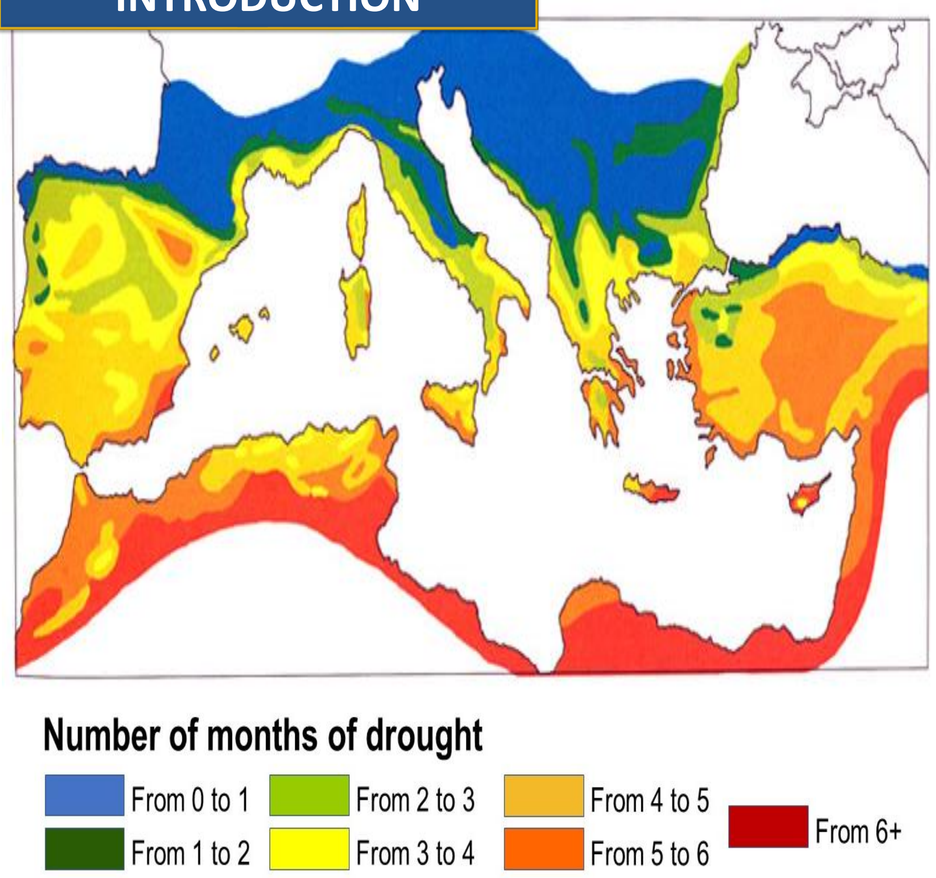
XXIV Convegno Nazionale di Agrometeorologia
Cagliari 15 –17 giugno 2022

Use of mulching film in arboriculture: effects of temperature and water soil content on peach (*Prunus persica* (L.) Batsch) fruit growth continuously monitored

Maria Roberta Bruno[1], Onofrio Cappelluti[1], Gabriele De Carolis[1], Teresa Mongelli[1], Gianfranco Rana[1], Rossana Monica Ferrara[1], Anna Francesca Modugno[1], Pasquale Campi[1]

[1] Research Centre for Agriculture and Environment, CREA-Council for Agricultural Research and Economics, Bari, 70125, Italy
* mariaroberta.bruno@crea.gov.it

INTRODUCTION



Source: Filippi, O. (2008). The Dry Gardening Handbook. *Thames and Hundson Ltd., France*, 208.

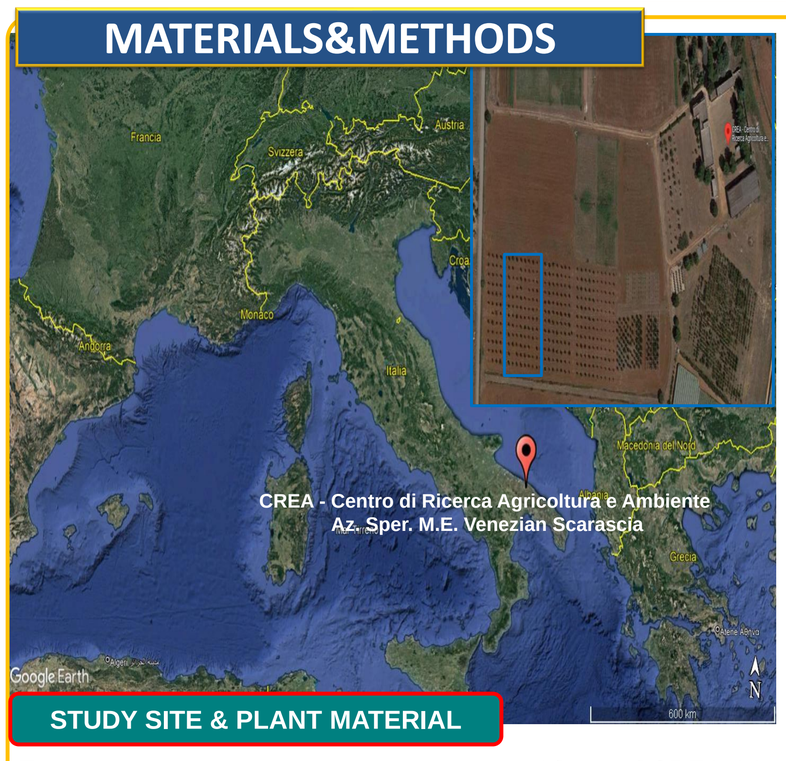
Mediterranean climate increasingly subjected to extreme weather events, with frequent and longer drought conditions and variable precipitation regimes, has strong impact on the efficient use of water for cultivations.

In peach orchards, mulching reduces soil evapotranspiration and improves fruit yields.

Soil temperature and moisture, which greatly affecting the soil environment, must be continuously monitored when mulching films are used.

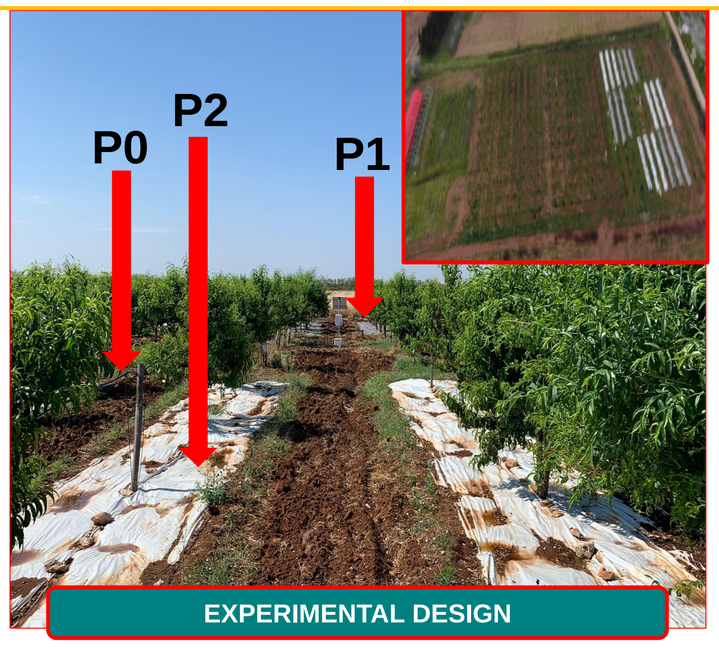
The objective of this study is to examine how the use of mulching films with two different colorations (C/902 Black White, C/820 Black Silver) **affects the peach development, focusing attention on soil temperature and moisture impacts on the variation of fruit diameter** during the last phase of fruit growth **(III phenological stage-ripening)**

MATERIALS&METHODS



STUDY SITE & PLANT MATERIAL

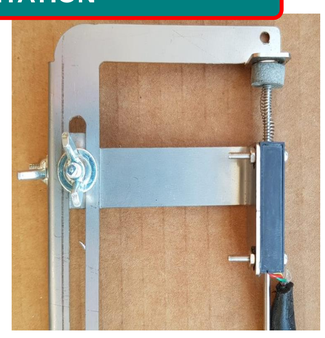
The study was carried out at the experimental farm of CREA-AA located in Rutigliano (lat.: 40_590 N, long.: 17 010 E, alt.: 147 m asl), on 5-year-old peach trees (*Prunus Persicae* L.), cv Calred, grafted on GF 677 with a 5m x 5m planting.



EXPERIMENTAL DESIGN

The trial was performed on the control fruits **(P0)** and, on two treatments where two 100 µm thickness mulch covers were present: mulch cover C/902 Black White (**P1**, PolyEur Srl., Benevento, Italy) and mulch cover C/820 Black Silver (**P2**, PolyEur Srl., Benevento, Italy). A total of 108 plants were involved in the trial, divided into randomized blocks, in three replicates.

INSTRUMENTATION



Only the last phase of fruit growth before harvesting (from 5 August to 7 September 2021) was continuously monitored by a system of custom-built fruit gauges diameter developed by Winet, Srl. (Cesena, Italy) able to acquire changes in fruit growth every 15 minutes

Soil water content (SWC) and temperature (T_{soil}) in P0, P1 and P2 were monitored using 9 probes Sentek Drill & Drop Probe, 60cm, (Sentek Sensor Technologies, Stepney, South Australia, Australia)

RESULTS

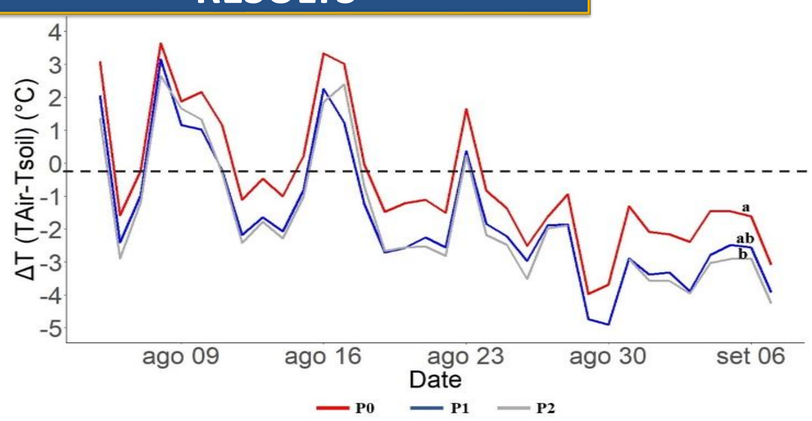


Fig.1 Difference between air temperature and soil temperature (ΔT), P0 (control-in red), P1 (Black White-in blue), P2 (Black Silver-in gray). Different letters (a–c) indicate a significant difference (p- value <0.001).

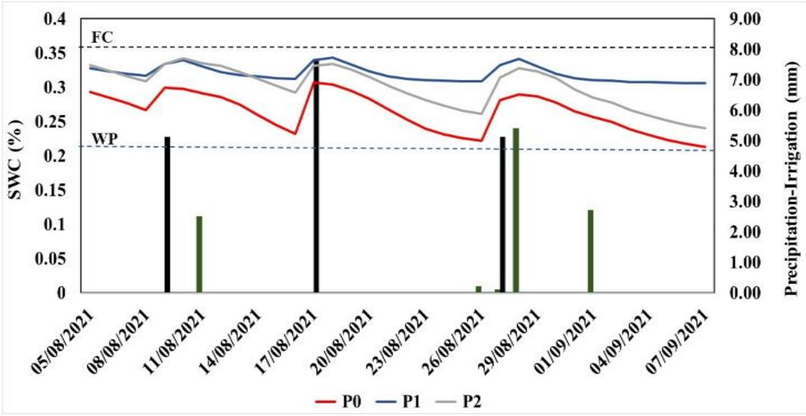


Fig.2 Soil water content (SWC) in the three treatments, P0 (control-in red), P1 (Black White-in blue), P2 (Black Silver-in gray) and water supply, irrigation (black bars), precipitation (green bars). Field capacity (FC), wilting point (WP).

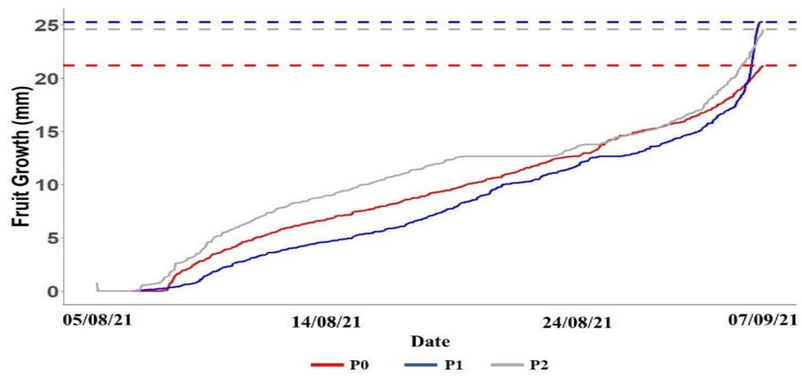


Fig.3 Fruit growth in the three treatments, P0 (control-in red), P1 (Black White-in blue), P2 (Black Silver-in gray), measured with continuous fruit diameter gauges.

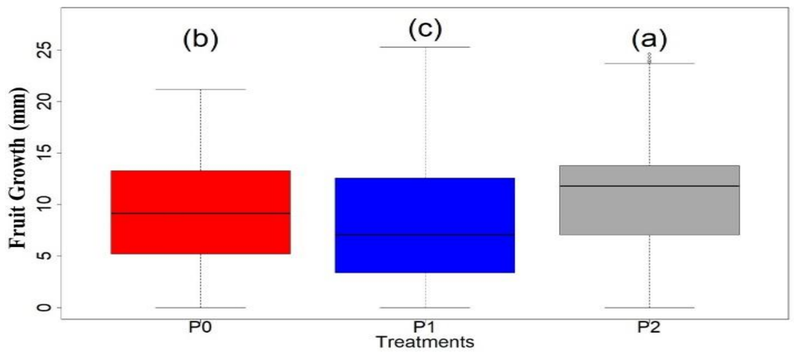


Fig.4 Boxplot with fruit growth ranges in the three treatments, from 05/08/21 to 07/09/21, measured with continuous fruit diameter gauges. Different letters (a–c) indicate a significant difference (p value <0.001)

In the **Fig.1**, the control P0 shows higher values than the mulch treatments (P1, P2), ΔT daily trends were almost superimposable in P1 and P2; even thought, the ANOVA showed a minimally significant differences between these treatments, while **a significant difference was present between P0 and P2 . It seems clear that both plastic films are able to retain and diffuse the shortwave radiation more than bare soil.**

Mean SWC under film mulching is greater than the SWC of P0 (see **Fig. 2**), with the P1 treatment more stable than the P2. The effect of irrigation (black bars) and precipitation (green bars) is clearly showed by the increasing in SWC soon after each water supply. **Mulching films retain more water by an average of about +4% than soils without mulch.**

Fig. 3 reports the growths measured by fruit gauges on peach fruits in the different treatments. **Treatments P1 and P2 showed larger fruits than P0 by +16.14% and +16.07%, respectively.**

Fig. 4, indicated that **the greatest dispersion range was measured in P1, in which the maximum growth value of 25 mm was recorded in the period between 05/08/21 and 07/09/21.**

CONCLUSIONS

In the last phase of peach fruit growth (III Phenological Phase), **the use of black/white and black/silver mulching films resulted in an increase in fruit growth**, correlated with higher soil temperature and water content. Although the reference period is quite short, through the continuous measurement of fruits with fruit gauges diameter, the positive effects of mulching films on fruits were measured quickly and accurately, showing daily the fruit growth during the whole period considered.

For futher information please contact: PhD M.R. Bruno