Experimental site for the meteorological parameters measurements in protected cultivation of a tomato cultivar

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Introduction

Light is a limiting factor of paramount importance for plants since, in addition to providing the energy for photosynthesis, it modulates the growth and development in response to environmental conditions. when operating in protected cultivation the spectral distribution of solar radiation undergo a modification that depends on the type of cover used (Krizek, 2004). UV-B radiation is considered as a stress factor, which is able to affect the characteristics of plant growth and to trigger a variety of physiological responses that lead to an accumulation of secondary metabolites increasing the plant resistance (Fedina *et al.,* 2009).

Currently, accurate measurements in protected cultivation are unavailable, neither are known the measurement uncertainties of environmental parameters that can be resolved in percentage uncertainties on the variability of the product (Sanna *et al.,* 2013).

A new experimental site was settled in the research area of Turin, in order to assess the quality of the Saint Pierre tomato cultivar growth in protected cultivation. different aspects are currently under evaluation: (i) internal microclimate and solar radiation measurement of the spectral distribution, using calibrated and traceable instrumentation, within the different cultivation environments; (ii) monitoring of the optical and radiometric properties of the films used as covering material; (iii) identification of the physiological processes of crops in response to the type of plastic film adopted and microclimate by phenological and physiological analysis, and morphological observations.

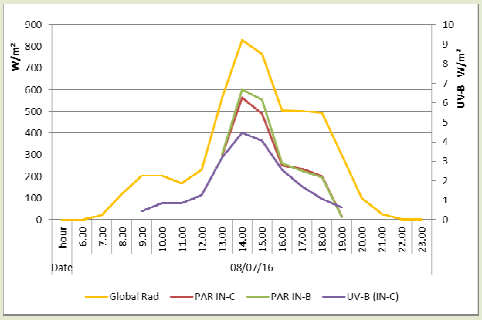
		UV-B Inside-A	UV-B Inside-B	UV-B Out	PAR Inside-A	PAR Inside-B	Global Radiation	Air T	Air RH
		[mW/cm²]	[mW/cm²]	[mW/cm²]	[W/m²]	[W/m²]	[W/m²]	[°C]	[%]
		Day	Day	Day	Day	Day	Day	Day	Day
05/06/16	0:00	0	0.1	0.1	0	161	479.3	16.3	77
06/06/16	0:00	0	0.1	0	152	223	1191.3	14.5	78
07/06/16	0:00	0.1	0	0.1	113	235	1221.6	16.6	69
08/06/16	0:00	0.2	0.2	0.1	0	189	1171	14.4	71
		15 min	15 min	15 min	15 min	15 min	15 min	15 min	15 min
08/06/16	12:15	200	0	100	170	109	454	16.4	59
08/06/16	12:30	200	100	200	171	118	450	16.3	60
08/06/16	12:45	200	200	200	253	220	503.6	16.2	55

Meteorological parameters evaluated during the both monitoring and tomato harvest periods

Experimental work

The following instruments were installed:
- #2 high-tunnels (IN-C and IN-B) with different covering material having opposite filtering properties with respect to UV-B solar radiation.
- #2 automatic weather stations including sensors for the detection of: air temperature (T) in the range between -10 °C and 45 °C and relative humidity (RH) between 10 %rh and 98 %rh (UV-B and PAR), and soil moisture between 1% and 90%;
- #1 AWS outside the tunnels (called OUT), including sensors for the detection of: T, RH, Rad in the spectral range from 290 nm to 2800 nm (Global and UV-B) wind speed and precipitation.

The instruments used follow calibration procedures defined *ad hoc*.

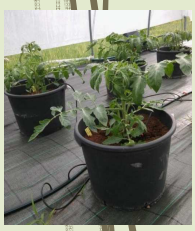


Global radiation in OUT, UV-B in IN-C and PAR in IN-B and IN-C, during a typical day of the tomatoes growing season

Preliminary results

The absence of UV-B radiation in IN-B affects PAR, growth and LAI but might influence the susceptibility of plants to mite infections. The presence of UV-B radiation, on the other hand, affects T and RH. In IN-C were recorded higher values even though the calibrated data are lower than the non-calibrated ones.

Other expected results are: the agricultural product productivity assessment as a function of the meteorological measurement uncertainty within the protected cultivation; assessment of the different degradations of the covering materials with reliable instruments; assessment of the crop quality through chemical characterization of the *health promoting compounds.*



Morphological characters:
Growth, anthesis, fruit set, weight, diameter, pulp hardness, color, LAI (in collaboration with University of Milan)

Phytochemical analysis:
titratable acidity (citric acid) and pH, total flavonoids and polyphenols (Folin-Ciocalteu method)

References

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