

The Effects of Mulch on Soil Temperatures for Field Growing Conditions[®]

Ian S. Tolley

Tolleys Nurseries Pty Ltd, Renmark, South Australia 5341

THE ORIGINAL CHART

Figure 1 was photographed by Ian Tolley at the University of Florida, Lake Alfred Research Station, U.S.A., during his Churchill Fellowship in 1966.

It was an old record stuck high up on an office wall, and current researchers, at that time, were unable to provide the author's name.

Other Data Sources

- At this time I am unaware of any current trial evidence of this nature.
- The unknown researcher used commonly available cotton trash (mulch).

Relevance of the Charts

- I thought this information was particularly important to tree crop production in hot, dry climates.
- Technology to accurately convert the information (distorted by a parallax error) was not available at that time.
- Thirty-nine years later, I still felt the information was useful to enhance support for mulching, as a permanent tool towards sustainable soil management.

The Converted Charts

- Each chart has five integrated, scaled segments.
- For clarity three charts, each of five graphs have been produced to include the following: U.S.A. (Northern Hemisphere) summer months (in Fahrenheit and in Centigrade) for June, July, August, September, and October (Figs. 2 and 3). Conversion to Australian (Southern Hemisphere) summer equivalents (in Celsius) for December, January, February, March, and April (Fig. 4).

Each chart in the figures demonstrates the following:

The top chart shows:

- Summer maximum / mean air temperatures at the time of trial.

The other four charts are constructed to:

- Show data for different soil depths.
- Show temperatures for three soil surface conditions.
- Black plastic sheeting (top line).
- Bare soil (centre line).
- Mulch – cotton [gin] trash (bottom line).

Sources of Mulch

- Import mulch materials to field.
- Permanent cover crops that can be mulched in situ.

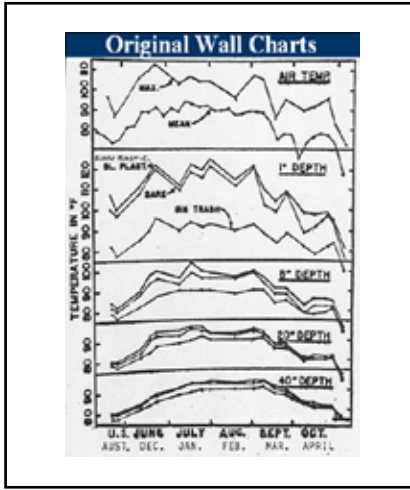


Figure 1. Original graph of effects of mulch on soil temperatures for field growing conditions.

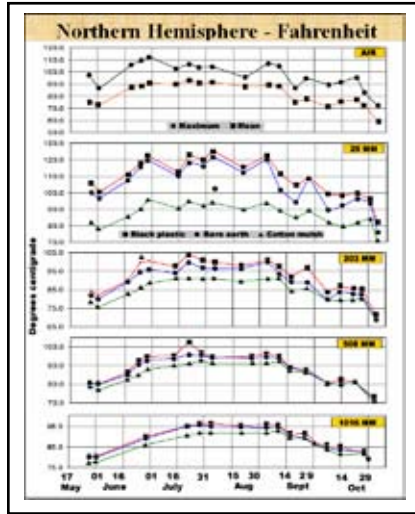


Figure 2. U.S.A. (Northern Hemisphere) summer months (in Fahrenheit) for June, July, August, September, and October.

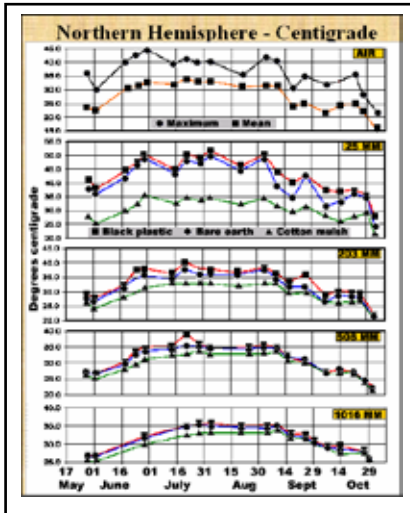


Figure 3. U.S.A. (Northern Hemisphere) summer months (in Centigrade) for June, July, August, September, and October.

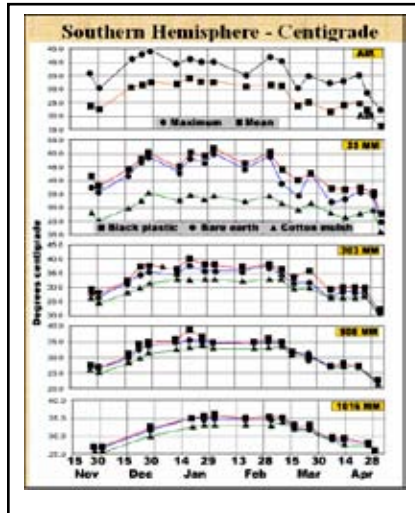


Figure 4. Conversion to Australian (Southern Hemisphere) summer equivalents (in Celsius) for December, January, February, March, and April.

Permanent Mulch

Mulch can also be regularly thrown under the tree crop canopy by offset slashers, for benefits of

- Further soil protection.
- Enhancement of carbon /nitrogen ratios.
- Improved shallow root growth and fertilizer uptake.
- Reduction of insect pressure on tree crop.

Soil temperatures at a depth of 25 mm.

Results: As much as a 15 °C reduction under mulch.

Requirement: Optimum root-zone soil temperatures should be between 20 °C and 27 °C.

The Individual Charts for Northern Hemisphere (Centigrade)

CHART 1: Maximum / mean air temperatures

CHART 2: Soil temperatures at 25 mm depth.

CHART 3: Soil temperatures at 203 mm depth.

CHART 4: Soil temperatures at 508 mm depth.

CHART 5: Soil temperatures at 1016 mm depth.