Wetting Agent Tends to Slow Wilt, According to Meusel's Studies

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(Second of Two Articles)

In part 1 of this article (April, p 38) we discussed the soil physics involved wherein improvement in the infiltration, transport (drainage), uniformity, and availability of moisture in soils treated with a soil wetting agent were shown.

Now, let's go into the recent work done at Yale University by Harry Meusel, the course supt. there. His work studies the effects that soil wetting agents, watering practices, and fertilizing have on the wilting, appearance, internal cell structures, and stomatal openings of poa annua.

The first slide from his work shows the pots from one of the replicas. You will note the difference in color and growth.

(This article is condensed from a speech Moore made at Purdue University. Slides shown with the speech aren't available. Ed)

The next slide is a closeup showing more compact growth and slightly better color where a wetting agent was used. Minus "W" means no wetting agent, the "1" refers to infrequent watering (once a week) and the "N-1" refers to one pound of added nitrogen per month. A top view in this slide shows even more clearly the good tight turf and darker color in the wetting agent treated soils. Incidentally, these tests were conducted using a mixture of sand and vermiculite in an effort to avoid introducing added variables from a soil.

These treatments were allowed to naturally wilt. In the next slide (not available) we see the order of wilting part way through the test. General conclusions from this work showed that frequent watering (six times a week), representative of a rainy period, increases wilting. Fertilization at this time aggravates the situation. The use of soil wetting agents gave a very significant increase in resistance to wilting. We'll see more of this in a minute. This slide is merely a closeup to show the completeness of wilting when it occurs on poa. You may wonder at the length of the grass. The grass was clipped during the test at ½ inch twice weekly for 12 weeks, and then allowed to grow for 8 days, or until wilting.

The wilting characteristics of the grasses was also checked in a wilting chamber where effects of light, humidity, temperature and air movement were studied. This slide again shows the completeness of wilting. The order of wilting in the wilting chamber agreed with the results of those that were allowed to die naturally:

(Poorest) 1. Frequent watering & fertilizer.
2. Frequent watering.
3. Frequent watering, fertilizer, and wetting agent.
4. Infrequent watering and fertilizer.
5. Infrequent watering.
6. Frequent watering and wetting agent.
7. Infrequent watering, fertilizer and wetting agent.
(Best) 8. Infrequent watering and wetting agent.

It is evident again that frequent watering, or a rainy period, increases the susceptibility to wilt and that fertilizer tends to aggravate the situation. The soil wetting agent, on the other hand, has the effect of slowing wilt under all conditions.

From each set of pots, blades were picked at random (before the wilting test) for leaf impressions and cross sectional studies. By studying the cell structure of the blades under the microscope, it becomes evident as to why the plants reacted as they did. We will now look at a series of these cross sectional slides, figures (1) A, B & C, and figures (2) A, B & C described by the captions below them.

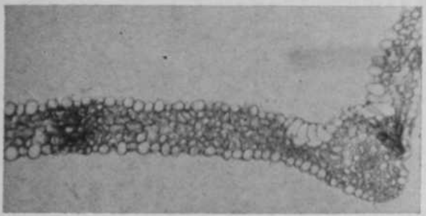

Fig. 1A — Infrequent watering, no fertilizer. (1 per cent air space — 8 days wilting).

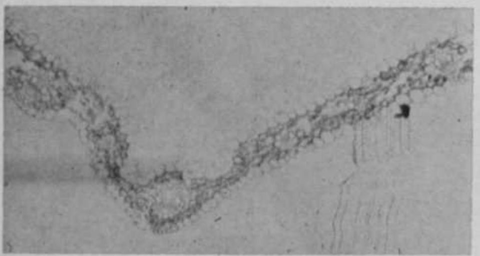

Fig. 1B — Frequent watering, no fertilizer. (15-20 per cent air space — 6 days wilting).

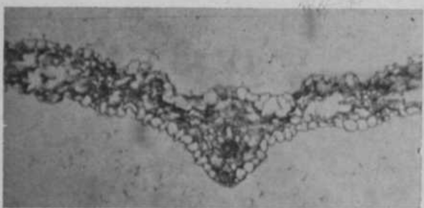

Fig. 1C — Frequent watering, added fertilizer. (50-70 per cent air space — 5 days wilting).

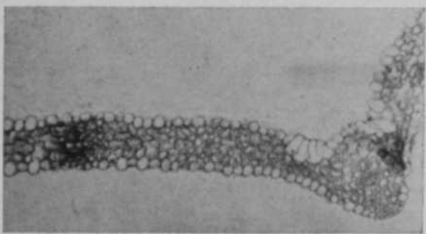

Fig. 2A — Infrequent watering, no fertilizer. (1 per cent air space — 17 days wilting).

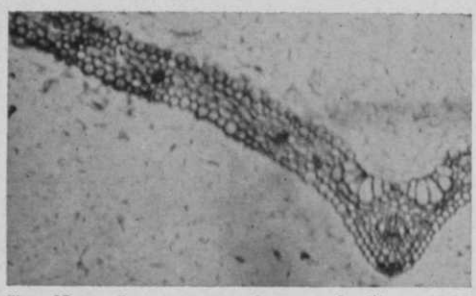

Fig. 2B — Frequent watering, no fertilizer. (5-10 per cent air space — 11 days wilting).

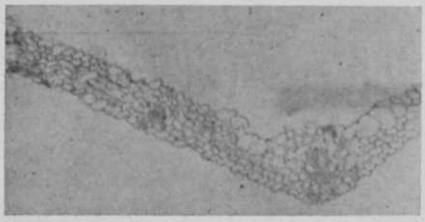

Fig. 2C — Frequent watering, added fertilizer. (20-30 per cent air space — 7 days wilting).

The infrequently watered grass, with no added fertilizer (Fig. 2), but with a wetting agent in the soil gave the same good looking compact cross section, with very little intercellular air space (1 per cent). Though the cellular structures were the same, the soil wetting agent increased the time before wilting by 100 per cent. This is due to the low tension and more available (lower energies) water that were discussed in Part 1.

The next four slides show these same points again but at a higher magnification. The captions describe the effects.

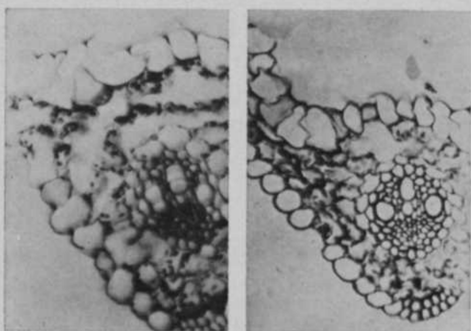

Fig. 3A (left) — No wetting agent. Note large air space, thin cell walls, cell damage by tearing and very little cutin layer. 3B (right) With wetting agent. Note less air space, thicker cell walls, no cell damage and good cutin layer (heavy black layer on the outside.)

Water is lost from the mesophyll cells into the intercellular air space (hence the desire to keep this at a minimum) and then leaves the blade of grass through a mouth-like opening called the stomata. Leaf impressions of the grass blade show these areas clearly, figure 4A and 4B. Note the size of the epidermal cells with respect to the stomata, from frequently watered grass.

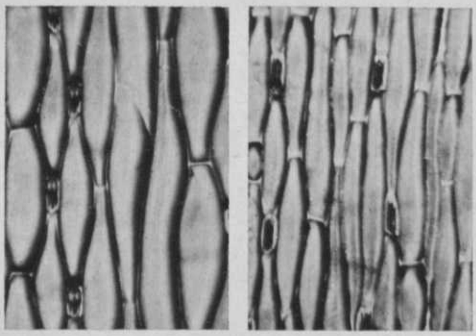

Fig. 4 Epidermal layer impressions. A left) — Frequently watered. Note large epidermal cells (two cells per stomate.) B (right) — Infrequently watered. Note small epidermal cells (four cells per stomate.)

In figure 4B we see the impression of infrequently watered grass. Note that the stomata are the same size, but here the epidermal cells are more compact — actually twice as many per stomata. The wetting agent tended slightly to further increase the number of epidermal cells per stomata (a move in the direction of decreasing wilt). A chemical control of the stomatal opening was found and in 4B you see the results on an un-irrigated fairway. (Time: end of July, after 25 days of no rain.) The poa has gone out, the bluegrass is going dormant, the fescue has stopped growing. The treated half still had to be mowed and showed little signs of thinning.

By the use of soil wetting agents we can effectively handle water. Through a conscientious program, deeply rooted turf (figure 5 is pure poa in late July) that is uniform and pleasing can be grown in the face of bad weather and inexperienced help. So, we stress these points:

1) Soil wetting agents lower the tensions of water and permit a more rapid and more uniform infiltration, transport, and drainage (Part 1).

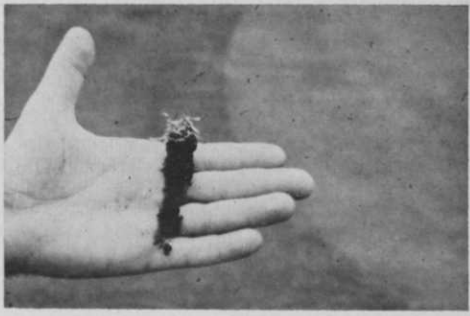

Fig. 5. Roots in pure poa annua turf from collar area of green (Time — July 18, 1963). Soil treated with wetting agents. Stomatal openings controlled chemically.

2) Soil wetting agents lower the soil moisture tension and, thereby increase the availability of water and nutrients (Part 1).

3) Lower tensions decrease the frequency of watering. Less frequent watering improves the *wilt* resistance of grasses.

4) Soil wetting agents decrease the intercellular air space in grass, and, thereby, improve the wilt resistance of the grass.

Purdue Offers 4-Year Course in Landscape Horticulture

Starting in the fall of 1964, Purdue University will offer a course in landscape horticulture. The curriculum will cover four years, according to Leslie Hafen, professor of horticulture.

Landscape horticulture is defined as the art and science of land planning and involves the arrangement of homes, subdivisions, parks, recreation centers, highways, public buildings, etc. It is rated a $13 billion business.

The Purdue course will provide instruction in architecture, sociology, city planning, art and design and engineering. Employment opportunities for trained landscape personnel are said to be excellent. Starting salaries for graduates range from $5,000 to $7,000.

Information about the new curriculum can be obtained by writing to the Office of Admissions at Purdue, which is located in West Lafayette, Ind.