
The beautiful crystal-clear droplets that you see on a turfgrass leaf in the early morning is not "Dew". They are droplets of exudated liquid being pumped out of the grass plant. Exudate is pumped out of the grass blades through its hydathodes. The hydathodes are located along the edges of the leaves.

Exudate is easy to see with the aid of a simple magnifying glass. You will see the precise location of each exudated droplet along the edges of both sides of the leaf, and a large droplet at the tip of the leaf, if it has been cut off. This liquid is crystal clear. It looks like a fine piece of jewelry.

Each droplet hides potency in its beauty. This liquid is not harmless water of condensation that we call dew. Dew is moisture from the air that condenses on a cold surface. Dew and exudate are completely different in composition. Dew is water of condensation and exudate is plant sap which is pumped out of the plant through the hydathodes. Dew can sometimes be found as a whiteish coating on the leaf surface. Exudate is found primarily along the edges of the leaf.

Dew is inert, because it is pure water of condensation. Exudate, on the other hand, contains all of the elements that are present in the plant sap, such as nitrogen, phosphorous, potash, calcium, magnesium and trace elements. With these salts, we can also find sugars, such as glutamine.

"Dew is Not Dew". When the grass is covered with millions of droplets in the early morning hours, what we have been calling "Dew" is actually exudated liquid.

The presence of salts of the elements contained in the plant sap can be demonstrated in a number of ways. With a clean glass or paper cup you can scoop up the exudate and pour it into a clean container. A clean sponge will also do.

The concentration of solids contained in the exudate will depend upon the fertility of the soil, and how much is available to the plant.

Allow the water to evaporate. You may have to fill the dish a number of times, each time allowing the water to evaporate. When all of the water is gone, crystals of the salts present in the exudate will form, and can be observed closely with a low power magnifying glass.

If you pour a small amount of exudate on a piece of window glass, the salts will etch marks on the surface. Fill a glass with exudate from a well fertilized green and pour it on one spot of grass, and you will get a severe chemical burn.

Try pouring a small amount of exudate in the palm of your hand and allow it to dry. Feel how sticky it is.

Pour some pure exudate in a petri dish or small clean saucer. In order to gather pure, uncontaminated exudate, use a glass tube or clean soda straw. Touch the end of the tube to the exudated droplet and it will be drawn into the tube by capillary action. After gathering a number of droplets in this manner, blow the liquid into your clean container and store in a warm place. Observe the fungi that germinate and grow pure exudate. Since fungi have no chlorophyll, they can only grow in a medium that has an abundant supply of ready made food. Exudated liquid is a perfect food for any fungal spores. These simple basic experiments demonstrate how exudate and turfgrass management practices can have a profound affect upon the health and growth of the turf.

We look at Dr. Mike Brittons research and his graphic illustrations of how fungal spores germinate slowly in water, while spores germinated in water with sugar added grew more rapidly. When he added glutamine to a solution, spores germinated quickly and the mycellium from these spores grew many times faster. He found that glutamine is one of the ingredients in exudated liquid.

The presence of glutamine is known to every golfer, because his hands get sticky when he plays while the so called "Dew" is on the turf. The presence of glutamine also accounts for the fact that clippings accumulate on the mowers.

(con't. on page 5)

(con't. from page 4)

Syringing the turf when exudate is present in the early morning will quickly wash this material back into the soil., Clean water dries more rapidly than exudate, therefore less clippings adhere to the mowers. It is interesting to note that over forty years ago, Dr. Fred Grau, after making a survey of member clubs, found that greenkeepers (as they were called then) that practiced early morning watering had far less disease than those who didn't. Today we know that it was not the time of watering, but that the washing off of the exudate minimized the incidence of disease. Golf course superintendents have always been a very important part of turfgrass research. In practicing their science and art, they found many ways to combat problems that seemed to have no answers.

This liquid, first found and reported in Egypt in 1893 was referred to as guttated water, Guttated water and exudated water are one and the same, and can be found reported either way in the literature.

Dr. Wilson also made another interesting discovery. he found that all grasses do not exudate at the same rate. He classified each of the turfgrasses in the following order: the Bentgrasses, Bermudagrasses, and Poa Annua were prolific pumpers of exudated fluid. The Bluegrasses were medium pumpers (except Poa Annua). We can also include St. Augustine grasses as medium pumpers. The Fescue grasses, Zoysia grasses and the Rye grasses were the low pumpers.

When we lose grass for some unknown reason, we need to find the answers. When 18 greens are lost overnight, we need to take a hard look at our management practices and an even harder look at research. We need research that gives us answers to problems and not just cures.

Starting with the management of the soil, we concentrate on the need to relieve compaction so that air, and nutrients can move into the root zone. What about exudated liquid? An open porous soil allows the exudate to be diluted and washed down into the soil to be recycled. aerification. therefore is essential to minimize or

We know that we can rely on some research, some theory, and lots of green thumb hands on experience to keep grass alive during periods of stress.

We also desperately need more meaningful research to separate dew from exudate. As we get the answers. turfgrass management will become more biological and cultural than curative.

Copywrited by Tom Mascara, Credit to The Florida Green, Fall 1988.

MEMBERSHIP-MARCH 1989

Members Today-30 day waiting period up

Class D

Larry Coving, Colusa G&CC

Kevin Smith, Moffett Field GC

Paul Gillis, Summitpointe GC, Milpitas

Class F

Richard McAllister, Rancho Solano GC, Fairfield

Mike Eisele, Country Club Sales, Inc. Benicia

Charles Messimer, Braman Pipe & Supply

Bob Whittaker, Western Lawn Equipment Co.

Hal Bonnet, Sierra Chemical Company, Milpitas

Current 30 day waiting period

Class A

D.J. (Donald) Pakkala, Pebble Beach Co.

Class D

Daniel A. Giammona, Sharon Heights G&CC

Andrew McBride, Spanish Bay GC

Class F

Donald D. Radford, Asst. Director of Parks, City of South Lake Tahoe

Craig Stenehjem, R.V. Cloud Co. Campbell

CONGRATULATIONS TO PETER J. GALEA

Crystal Springs GC, Burlingame for becoming a Certified Golf Course Superintendent.

OUR HOST AND HIS COURSE FOR MARCH:

Our host superintendent, **Ray Sabbaattini**, has spent his life farming. In 1970, Ray was retained as the Golf Construction Supt. and supervised construction of a second 18 holes and stayed on as the Golf Course Supt. **Rick Key**, graduated from Chico State University in Biological Science. He worked on the original turkey ranch and has been with Ridgemark for 1 1/2 years.