



# Chlorosis: Troublemaker On Velvet Bent Greens

By O. J. NOER

Every now and then velvet bent turf on putting greens behaves badly. It happens on the localized spots of this grass on greens of mixed German bent, and occurs on the pure strains of Piper, Kernwood, etc. It was bad on the velvet bent plots at the Arlington garden in Washington, D. C., but was never a serious problem at the Rhode Island station.

Greenkeepers have been gravely concerned about this behavior of velvet bent and rightly so because it does not have the recuperative powers of other bent grasses. Velvet bent is unable to stage a quick comeback. Clover, poa annua, etc., take possession following severe injury to it.

Velvet bent greens have been torn up and discarded at several New England clubs. The program to change all greens to velvet was abandoned because of being plagued with this baffling trouble continuously. Yet velvet bent has behaved in a normal manner at other clubs.

The summer of 1947 was a bad one for velvet bent in New England. Difficulties started in the spring, but real trouble occurred in July following a heavy rain that ended a month or more of drought. Rain stopped by mid-afternoon and was followed by intense heat and extreme humidity. The velvet bent became chlorotic. It turned a sickly yellow color. The leaves and stems became soft and limp so they bruised easily. Grass that did not recover normal color promptly, soon withered and died. The green, or the damaged area, looked exactly like it had been scalded.

There seems to be some relationship between chlorosis and soil moisture. Overwatering and heavy rains especially when followed by decidedly cooler weather appear to aggravate chlorosis. It is accentuated by the recent previous use of readily available phosphate (super phosphate), or heavy liming, especially with hydrate.

## Causes of Chlorosis Vary

Disease of undetermined origin, either bacterial or fungicidal in nature, has been

generally accepted as the cause. A physiological disorder such as a temporary nutritional deficiency in something other than the usual basic elements (nitrogen, phosphoric acid and potash) would seem like a more likely cause. Lack of iron produces the same kind of chlorosis in other plants. Magnesium is another element associated with leaf color. A deficiency of trace elements such as manganese, copper, zinc, boron, etc., would be another possibility. All were tried on test strips by several greenkeepers with indifferent results.

Arthur Anderson at Braeburn in Newton, Mass. had more than his share of trouble in years past. The patches of velvet in the old seeded German mixed greens kept turning yellow. Some would recover but others would die. He tried spray applications of ferric and of ferrous sulfate alone, and in combination with compounds containing magnesium, and the various trace elements. Iron compounds were the only ones that seemed to do any good. Ferrous sulfate, commonly called copperas, was the best. Benefits were of short duration and sometimes were disappointing with respect to color even with rates of 4 to 5 pounds per 1,000 sq. ft. He tried light rates of 1 to 2 pounds per green of approximately 5,000 sq. ft. with just enough water to cover the green. This procedure left the iron on the leaves and gave far better results.

William Mitchell tried the same procedure on some velvet bent greens in Western Massachusetts. From 1 to 1½ pounds of copperas was sprayed on each green with 20 to 25 gallons of water. Burlap bags were used to cover an odd spot on several greens and provide untreated checks. The sprayed grass started to turn green within less than 24 hours and leaf blades became firmer. Shortly thereafter grass became normal in sharp contrast to the sickly yellow chlorotic velvet bent in the untreated checks.

1. William Mitchell points to spot on chlorotic velvet bent green which was covered with a burlap bag before spraying with iron sulphate. This part stayed yellow but the iron sulphate restored normal color to rest of green. Picture taken 24 hours after spraying. 2. Close-up of chlorotic spot where velvet bent has withered and then the area resembles scald. 3. Velvet bent along edge of green is sickly yellow in color and about to wither and die. 4. Bad case of chlorosis on velvet bent green in Conn. Surface soil has high content of peat. Large areas on this green were repaired by sodding.

Copperas used in the same manner was equally effective on chlorotic greens in other parts of New England, notably Worcester and Fitchburg. Results were so striking that the greenkeepers intend to have copperas on hand at all times. It will become a regular supply item with them just like fungicide, fertilizer, etc.

The use of iron sulphate in this manner should be tested on any green where the grass becomes chlorotic (sickly yellow color), whether it is velvet bent or another kind of grass. A minimum amount of water should be used and the rate for the iron sulphate should not exceed 1 to 2 pounds per green. Otherwise scorching of the grass may occur.

At clubs where greens contain a high proportion of velvet bent another test should be made. In place of using ammonium sulphate alone, a mixture of 1 pound copperas to each 5 or 6 of ammonium sulphate should be tried. Such a mixture may overcome chlorosis most of the time, although it may still be necessary to spray grass foliage with a little iron sulfate now and then when weather is bad. Such a mixture is used regularly on greens in

Britain where velvet bent is common in greens.

Why velvet bent is unable temporarily to obtain the small amount of iron needed for growth is a problem for the future to solve. Chlorosis seems to be less common on porous sandy soil, and where water is used sparingly. Conversely it seems to be worse on heavy soils especially when they are continuously wet from overwatering or heavy rains. A high humus content of the soil from the excessive use of peat, or due to an accumulation at the surface of partially decayed leaves and stems is another contributing factor. Apparently these conditions immobilize the iron in the soil. It is precipitated as insoluble compounds or converted into ones the plant cannot use. Whether it is lack of aeration, or something else time alone will tell. One club in Connecticut had trouble of this kind until greens were turfed one or two times each spring and fall. Turf has been playable ever since and iron sulfate has never been applied. Besides the routine drilling in spring and fall any green is turfed promptly again at the first sign of yellow color.

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## Aerifier Makes Quick Work of Cultivating Fairways, Greens

The Green Valley CC, LaFayette Hill, Penn., has come to life on the site of a golf course that was unattended during the war years and permitted to grow up in weeds and grass. A real job awaited Charlie Wilfong, grnkr., when he undertook the reconditioning of the fairways and the rebuilding of the greens. Costs were held to a minimum by using the old fairways—some holes were lengthened, but in the main new construction was confined to the greens.

Opening the fairways to play was no small task. They began cutting with sickle bar mowers and gradually brought the height of cut down to the point where the fairways were in playable condition. 1946 found the fairways in good condition but they became infested with crabgrass and clover during 1947, posing a complete renovation job which Wilfong has devoted his time to during the fall in the hope that he can have first class turf established for the coming season.

Milarsenite was applied to get rid of the crabgrass and clover. The first nine fairways were cultivated with an aerifier set to maximum depth. Seeding followed with the use of an alfalfa drill cutting in the seed in two directions to a depth of about a half inch. The result was an excellent stand of grass which Wilfong believes will solve his crabgrass and clover problem for the approaching season.

After the apparent success with the first nine fairways, the remaining nine were

given the same treatment, including the tees. Fertilizer and seed were applied followed by a Scotch chain-harrow used to work down the soil brought up by the aerifier.

To continue in Wilfong's own words: "Where holes had been lengthened we had a special job to do. The approaches had previously been rough and needed considerable improvement. We wanted to work organic matter down into the existing soil and hit upon the idea of applying the organic matter to the surface and then passing the aerifier back and forth across the area many times. As the soil became loose the spoons worked down deeper until even the discs were in the ground. When we were finished the soil was well pulverized and the organic matter was thoroughly mixed to a depth of five inches. To my knowledge this is something new in soil tillage and may be worth consideration by others. The amazing thing about the whole job is the fact that it took only about an hour to do each approach whereas my experience leads me to believe that it would have taken a full day for each job with any other method.

"We have found the aerifier a time-saver in conditioning greens also. We equipped our aerifier with new half-inch diameter spoons and used them on a trial basis. It took only thirty-five minutes to aerify, mat, roll and mow one green that normally would take four men almost a day to do with hollow-tined forks.