THIELAVIOPSIS A GROWER'S PERSPECTIVE

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Hansen Ranches is a 16,000 acre family farm that operates in the Tulare Lake Basin of Kings County in California. Our soil is primarily loamy to clay loam, with very good water holding capacity. The crops that we grow on a rotational basis are cotton, seed alfalfa, safflower, alfalfa hay, wheat, corn, and vegetable seed.

We first became aware of the thielaviopsis in the early 80's when we noticed that some of our cotton fields would germinate, emerge, then just sit and not grow for two to three weeks. Initially the cotton looked healthy but soon after emergence the plant took on a dull color, as if it was stressing for water. The roots turned a black color on the outside. If weather was warm the plant usually outgrew the stunted dull look and began to grow "normally" the rest of the year. Unfortunately the "normal" plant was now two to four weeks behind the healthy fields, and we were forced to try and help the plant catch up. Because of the stressed appearance we thought watering the plants early would help them grow quicker. In some cases this only stunned the small plants and set them back further. We tried stressing the plants after a first irrigation hoping it would fruit earlier, once again with limited success. When Pix first appeared we tried various timings and rates, 1/4 pint up to full rates, again with limited success. We tried planting our crop in favorable weather and high soil temperatures hoping the plant would grow through the disease. While this showed promise, any kind of a cold spell hampered the plants. We worked closely with the University of California Extension personnel putting in various seed treatment plots to see if some certain seed treatment or combination of treatments would work against the disease, but no luck. Our only success with the disease early on was to treat it as a late planted crop and manage it as such.

For us a late field required extra attention. It was already two to three weeks behind schedule. A plant that late could not tolerate any insect pressure. This usually forced us to spray earlier and more often to protect young squares. Also we would decide at some point to stop the plant growth by applying Pix at the maximum rate. Our last irrigation was usually late causing the field to be picked later in the season. This would open us up to early rains and fog lowering the quality of our crop. Even with the extra work and chemicals, fields that in the past were making 2.5 to 2.75 bales were now making 1.6 to 2 bales.

By 1986, as more of our fields had declining yields, it became apparent that some new direction was needed to insure we stayed in the cotton business. Our neighbors, J.G. Boswell, had been recently pre irrigating their safflower field in late August and early September by pounding water in larger blocks a quarter section or more, and then draining them 30 days later. This practice was also carried on into November. Because safflower used all the available moisture in the soil to great depths, this flooding effectively recharged the soil profile for the next year's crop. What they were beginning to notice was that the fields that had been flooded early showed significant yield increase over late flooded fields or normal pre-irrigated fields. Also, it was noted that the best cotton ground happened to be where the Tulare Lake had flooded during the '82-'83 flood and had remained into the '85 season.

With this in mind, we decided to take one of our worst fields and flood it during the summer. We harvested the safflower crop that was on it and did our normal cultural work to make the ground ready for the 1987 crop. At the same time we put up large two way borders that were approximately 3 to 4 feet high and 15-20 feet wide at the base. We then pumped on the water as fast as we could to fill up the field. Once the field was full, we would have to pump extra water on occasionally to replenish water lost to evaporation. At the end of 30 days, the excess water was drained off to be used on other fields, and the flooded field was then left to sit until spring when ground preparations were underway for cotton planting.

In 87 we were rewarded with a crop that was approximately three quarters of a bale larger than the last cotton crop on that field. The plants had a very healthy look to them and grew rapidly during the early part of the season. Based on this success we planned a long range goal of flooding all our fields following an alfalfa seed, hay or safflower crop. Fields that had been tested by the University for Thielaviopsis and found to have 450 to 800 propoguales per gram of soil suddenly had those numbers reduced to 5 to 10 propoguales per-gram. Fields that remained flooded under water 2 to 3 years, had no thielaviopsis. We have been rewarded with a yield increase of 4 tenths to one full bale of cotton over the past ten years.

Once we were able to control the disease we began to ask the question, "how does flooding the fields effect the organism?" At first it was thought that flooding during the heat of August and September helped to cook the disease and reduce its numbers. But we noticed that at the shallow ends of the fields our cotton still showed some effects of thielaviopsis while the deeper ends seem to be cured of the disease. It was then suggested that since the organism also needed oxygen to survive, possibly the deeper water starved the organism of all of its oxygen. In the end the conclusion was that water depth, heat and the length of time the water stayed on the field all contributed to the demise of the organism.

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We also noticed a decline the first year, of verticilium wilt, pythium and rhizactonia. While this appeared to be only a one year control, it did help in getting our plants off to a fast start. Also I feel by flooding fields for a prolonged time, water was able to penetrate deeply into the soil pores and help swell them open, allowing the plant more nutrients. Water was stored more efficiently in the soil, enabling the plant to draw water during hot spells in the summer. In some cases an irrigation was left off or we were able to finish our last irrigation earlier in the season.

Some problems cropped up over the course of our flooding program. Occasionally a border would give way, usually at night, draining 80 to 150 acre feet of water. After a temporary border was knocked down, cotton wouldn't grow on that 20 foot wide strip. In some cases this meant 10 to 20 acres of land out of production. Flooding started mid-September did not seem to produce as good a result as flooding in August and early September. One major problem in this program is the necessity of level fields. The borders could stand no more than 20" of water in the deepest part, against their sides. Our fields have a foot to foot and a half full in a mile in the direction we irrigate, with zero to a foot of side full in a mile. This allows us to take a full section and border it up to flood 1/4 to 1/2 of the field at a time.

In conclusion, flooding helps us control a serious threat to cotton production.