The Use of AZSCHED to Schedule Irrigations on Wheat

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Abstract

AZSCHED irrigation software was used to schedule irrigation on Aldura wheat on the Safford Agricultural Center with very good results. Irrigations were scheduled at 40%, 50% and 60% calculated soil water depletion throughout the critical part of the growing season. The plots being irrigated at 40% depletion yielded the most and had the highest water use efficiency and showed the least plant stress. Comparing data with previous experiments, it was noted that increased inputs of higher seeding rate and higher nitrogen rate also increased the water use efficiency.

Introduction

Our irrigation studies in the past have lead to the development of AZSCHED, an irrigation scheduling software which utilizes AZMET data and heat unit based crop coefficients to model a crop and predict its water use (1,2). This study was designed to explore the capabilities of AZSCHED for wheat, varying the percent water depletion at which irrigations are scheduled. We have used infrared thermometry successfully to predict irrigations and also to follow the stress of plants. In this study, infrared thermometry will be used to follow the stress of plants as they go throughout the growing season.

Methods and Materials

AZSCHED was set up to use AZMET data generated at the Safford Agricultural Center and using Safford historical data as the default file and for projecting irrigation schedules into the future. An irrigation efficiency of 85% was selected and the soil parameters and other cultural practices as listed below.

Crop History

Cultivar: Aldura wheat
Elevation: 2950 feet above sea level
Soil type: Pima clay loam
Available Water: 2.3" in the top feet
1.8" in the second foot
1.0" in the third foot
1.0" in the fourth foot
Planting date: 10 December 1990, watered up on the 20th
Planting rate: 225 pounds of seed per acre
Fertilizer: 200 lbs/ac urea pre-plant
300 lbs/ac 16-20-0 at planting
75 lbs/ac side dressed on 26 February
75 lbs/ac side dressed on 15 March
Herbicide: 1.5 pints/ac 2,4-D on 19 March
Insecticide: None
Rainfall: 3.23 inches

Harvest date: 13 June
Number of replicates: 3

Results and Discussion

This years yields are the best we have had in several years, but only part of that is attributable to the irrigation scheduling. We followed our own recommendations (3) and increased the seeding rate and also increased the nitrogen fertilization to be in line with the recommendations of Doerge, et.al.(4). The results are shown in Table 1. As one would expect the scheduling method that watered the plant in the manner to alleviate stress, yielded the most. Figure 1 shows the stress index of the three treatments throughout the critical parts of the growing season. Table 1 also shows the average stress index value during that same period of time. Figure 2 shows the calculated water depletion from the soil profile from 80 to 160 days after planting, and the average calculated depletion is listed in Table 1 for each treatment. Because of logistics every plot was not irrigated exactly on the day that AZSCHED called for an irrigation, much as in a real farm situation, but still it was effective. The plots scheduled to be irrigated when they reached 40% calculated depletion had a lower average depletion than the other treatments and also lower average plant stress. The amount of water used by the three treatments was not greatly different but the yields were significantly different. This shows the power of the software in indicating the times when water should be added to increase the efficiency of production.

The water use efficiency was much higher than seen in previous years of the study. This was because the yields were higher and the water use about the same. The AZSCHED program worked well in predicting water use, but the increased inputs of seed and fertilizer aided in the efficient use of water by the crop.

Acknowledgements

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References

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Table 1. Yield and Other Agronomic and Engineering Variables on Wheat Irrigated Using AZSCHED Software, Safford Agricultural Center, 1991.

Treatment	Yield (lbs/ac)	Percent Moisture	Bushel Wt (lbs)	Plant Ht (inches)	Irrigation (inches)	Efficiency (lbs/ac in)	Leaching (inches)	Average Strs Indx	Average Depletion
40% Depletion	5731 a	9.7 a	59.0 a	29.3 a	35.7	160.5	7.6	1.94	26.2
50% Depletion	5301 ab	10.2 a	60.3 a	29.7 a	34.6	153.2	6.2	2.10	32.3
60% Depletion	5009 b	10.0 a	61.0 a	29.7 a	35.0	143.1	7.2	2.67	37.2
Average	5347	9.97	60.1	29.6	35.1	152.3	7.0	2.24	31.9
LSD (05)	648.7	1.18	3.02	2.73					

Numbers within a column followed by the same letter are not significantly different at the 5% level of confidence using Duncan's Multiple range test.

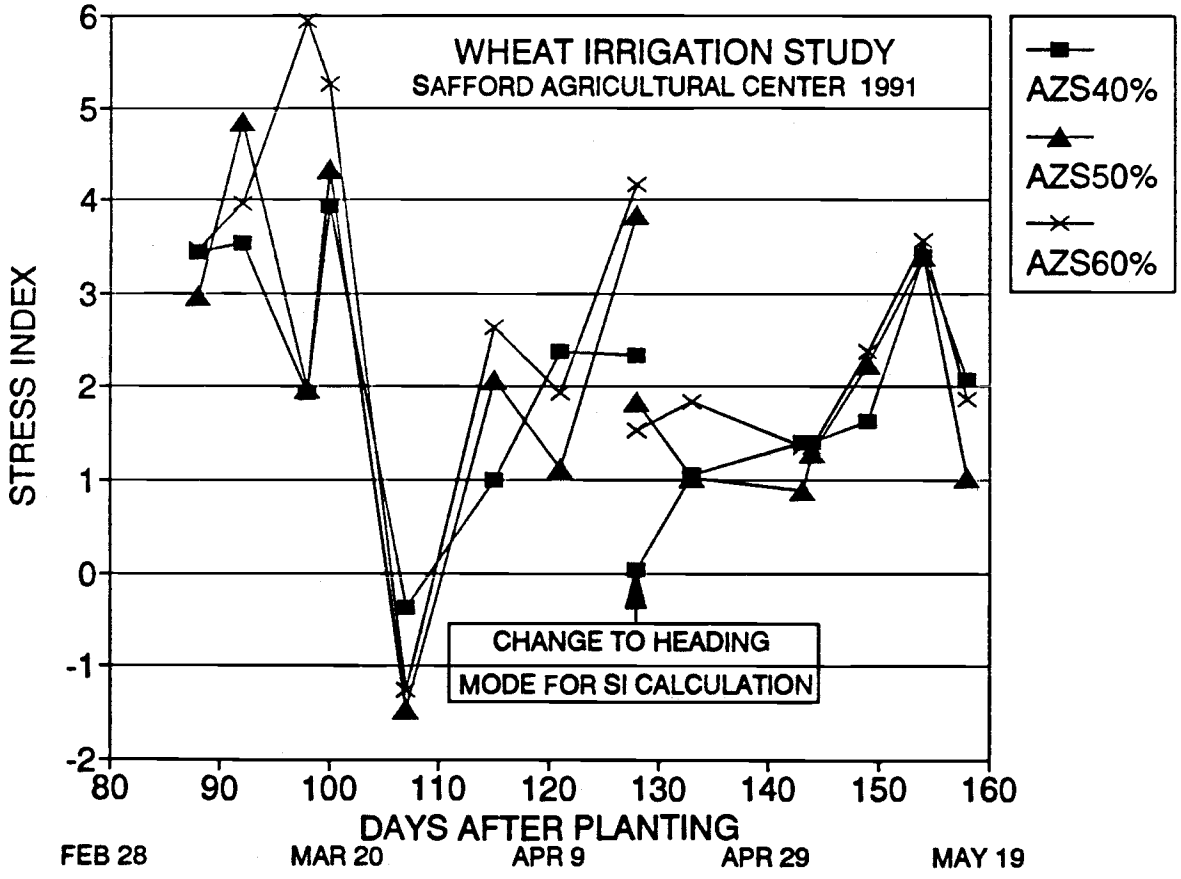

Figure 1. Stress indices on Aldura wheat where irrigations were scheduled by AZSCHED software on Safford Agricultural Center, 1991.

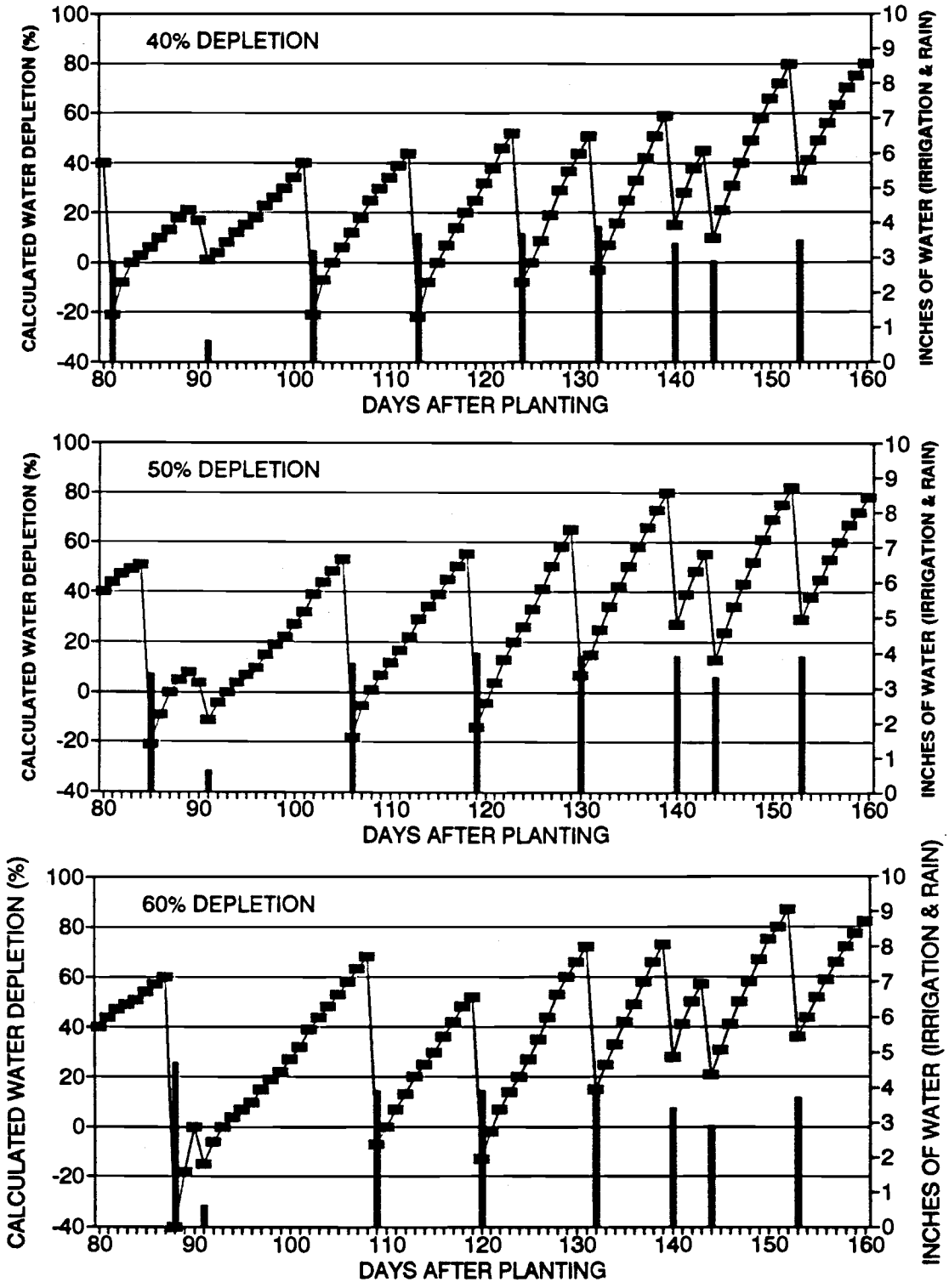

Figure 2. Calculated water depletion levels throughout the season for Aldura wheat grown at the Safford Agricultural Center under three irrigation scheduling regimes using AZSCHED software.