Yield Response of Confection Sunflower to Delaying the Onset of Irrigation

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In recent years, confection sunflower (those grown for consumption instead of oil) has become an increasingly important crop to Wyoming farmers, especially those in the Bighorn Basin. Therefore, sunflower acreage in the region has been on the rise. In response to this increasing interest, the Powell Research and Extension Center (PREC) has been conducting studies on its agronomic management practices, especially in regards to irrigation. Past studies have shown sunflower to be moderately tolerant to water stress and may be a good candidate for limited-irrigation strategies; however, information on when irrigation can be limited without compromising yield is still lacking. Identifying an irrigation strategy that significantly reduces water use but maintains yield could contribute to water savings for Wyoming and other states.

Objectives
The objectives of the study were to 1) determine the effects of delaying irrigation on sunflower seed yield and quality and 2) develop a water-management strategy that could reduce the number of irrigations without compromising yield.

Materials and Methods
The experiment was conducted on a clayey-loam soil during the 2014 growing season at PREC. The confectionary sunflower hybrid 9579 (SunOpta Inc.) was planted May 26 at 19,000 seeds per acre using 22-inch row spacing under a furrow-irrigated system. Irrigation treatments were: full irrigation for the whole growing season (FI), starting irrigation at R1 stage when miniature floral head appears (R1), starting irrigation at R4 stage when floral head begins to open (R4), and rain-fed (RF). All treatments received an initial establishment irrigation to ensure plant stand. The RF sunflower trial received approximately 3.5 inches of precipitation during the 2014 growing season, which is about 60% of the historical average. Data were collected on total yield and large seed yield (seeds left after screening on a 20/64-inch, round-hole sieve). Yield component data were also collected but are not reported here.

Results and Discussion
Delaying irrigation until R1 and R4 stages of plant growth averaged 254 and 525 lb/ac less total yield and 244 and 672 lb/ac less large seed yield as compared to full irrigation (Figure 1). Our results indicate that irrigation can be minimized in confection sunflower production during the vegetative growth stage since the reduction in total yield as well as large seed yield from R1 treatment was only 7% as compared to full irrigation. In R4 treatment, the reduction in total yield and large seed yield was 15 and 20%, respectively, as compared to full irrigation. This suggests that large seed yield is more influenced by delaying the on-set of irrigation after the crop enters into reproductive stage; however,

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producers are cautioned to avoid R4 irrigation management until more is known about the economics of this practice. An economic analysis of these practices is ongoing.

Our results suggest that the RF treatment is not viable, but it is noteworthy to mention briefly its dramatic effects. The total yield from RF treatment was 67, 65, and 61% less as compared to FI, R1, and R4 treatments, respectively, and the reduction in large seed yield was even more pronounced (Figure 1). Large-seed yield was reduced by more than 90% in RF as compared to other irrigation treatments, indicating a marked reduction in seed quality.

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