Grain Sorghum Response to Irrigation in Virginia

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Grain sorghum [Sorghum bicolor (L.) Moench] production has gained interest among growers in Virginia. Farmers often include sorghum in the corn (Zea mays L.)–wheat (Triticum aestivum L.)–soybean [Glycine max (L.) Merr.] double-cropping system when corn planting is delayed or to break the pest and disease cycle in wheat–soybean crop rotation (Thomason et al., 2017). Similar to corn, some growers have irrigated sorghum. Previous reports indicate that effectiveness of irrigation to sorghum depends on soil water status and weather conditions (Jahanzad et al., 2013; Afshar et al., 2014). Both economic return (Maman et al., 2003) and loss (Trooien, 1999) have been reported when sorghum was irrigated. Our objectives were to address two producers’ questions: (i) which hybrid to choose under irrigation and dryland farming in Virginia, and (ii) whether it is economical to irrigate sorghum in Virginia.

Field studies were conducted at Sussex County (State sandy loam: fine-loamy, mixed, semiactive, thermic Typic Hapludults) in 2013 and in Dinwiddie County (Emporia sandy loam: fine-loamy, siliceous, subactive, thermic Typic Hapludults) in 2016. The amount of precipitation in the study is reported in Table 1. Experiments in both years were planted in a split-plot design with irrigation as the main plot (irrigated vs. rainfed) and hybrid as the subplot. Five hybrids were observed both years: Dekalb DKS 5101, Dekalb DKS 5400, Dyna-Gro 765B, Pioneer 83P17, and Pioneer 84P80. At both locations, hybrids were planted with a four-row plot planter on 36-inch rows at a seeding rate of 87,200 plants/acre. Information about planting, nitrogen application, irrigation, and harvest is reported in Table 2. To find a break-even point at which irrigation would be economically feasible, a cost analysis was run. Sorghum prices were calculated based on the USDA National Agricultural Summary Statistics price for grain sorghum in March 2017. This price was US$3.60/bu. The irrigation price used was $25/inch/acre/application, which is the price that the Virginia Sorghum Official Variety Testing program pays for an irrigated trial. The following equation was used to calculate whether irrigation was economical or not:

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\text{Net return} = (\text{yield} \times \text{sorghum price}) - \text{irrigation cost}.
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For this analysis, the price of sorghum was increased in increments of 10% until the final price per acre of irrigated sorghum was higher than that of rainfed plots. In addition, we decreased the price of irrigation in increments of 10% until the price per acre of irrigated trials broke even with the price of rainfed sorghum. Finally, the irrigation price was dropped simultaneously...