

ENHANCING NITROGEN FERTILIZER EFFICIENCY IN GRAIN SORGHUM TO BOOST YIELDS AND REDUCE NITROGEN LOSS

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ABSTRACT

Effective nitrogen (N) management is essential for optimizing plant growth, increasing yield, and reducing environmental impacts, such as nitrogen runoff. Grain sorghum, a staple crop in Kansas, can greatly benefit from precise nitrogen application strategies. This study aimed to identify the optimal nitrogen application rate and best management practices to prevent over-application, minimize nitrogen losses, and avoid deficiencies.

Research was conducted on rain-fed fields across six sites in North-East and West Kansas from 2021 to 2024. The objectives were to (1) determine nitrogen response in grain sorghum using broadcast-applied urea at rates of 0, 30, 60, 90, 120, 150, and 180 lb/ac, and (2) evaluate yield response to a fixed nitrogen rate of 60 lb/ac under various nitrogen management strategies. These strategies included different nitrogen sources (urea, UAN), timings (at planting, growth stage 6), placements (broadcast, coulter, streamed, subsurface), and additives (ESN, NBPT, Super U).

Nitrogen fertilization significantly increased yield at Site 1, where a rate of 98 lb/ac produced a yield of 128.62 bu/ac. Similarly, at Site 5, a rate of 110 lb/ac resulted in a yield of 80.27 bu/ac. In contrast, other sites showed no yield response to nitrogen fertilization. Specific nitrogen management practices demonstrated trends toward increased efficiency over the standard of broadcast urea applied at planting; however, these differences were not statistically significant at Sites 1 or 5.