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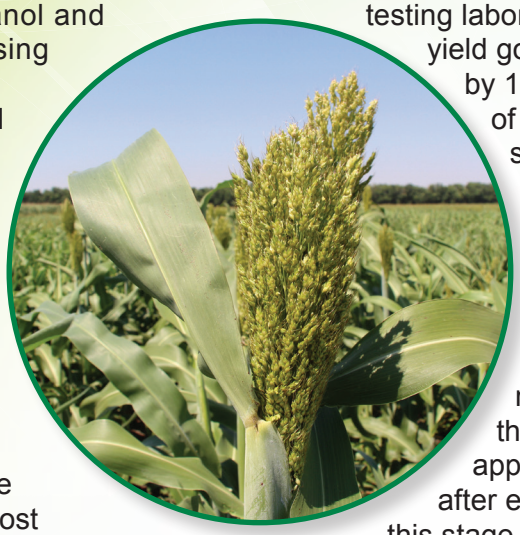
GRAIN SORGHUM FERTILIZATION

The Great Plains produces the majority of grain sorghum in the U.S. Kansas is generally the number one state for production followed by Texas. In 2016 Kansas produced 56% of U.S. grain sorghum, and Kansas and Texas combined produced 80%. Most is used in animal feed, but some goes to ethanol and a small but increasing amount goes into the consumer food market.



Grain sorghum is considered an exceptionally efficient crop. With a large fibrous root system, it is fit for production across a wide range of environments. Most in the Great Plains is grown under dryland conditions. It is often considered a rather low input crop when it comes to fertilizer, especially compared to corn. Therefore, and all too often, lesser attention is given grain sorghum nutrition. The fact remains though that it is a major crop in the Great Plains, and complete and balanced fertility is necessary to realize yield potential.

Although crop nutrient removal estimates vary from source to source, and the real numbers may vary considerably depending on specific field conditions, sorghum (grain only) removes about 66 lb N, 39 lb P_2O_5, and 27 lb K_2O per 100 bushels (5,600 lb) produced (*IPNI*)

Nitrogen is the nutrient that most frequently limits sorghum production. Recommendations for N fertilizer will vary based on factors such as yield potential, soil texture, and cropping sequence. The published recommendation equation from the Kansas State University (KSU) soil testing laboratory is based on yield goal (bu/A) multiplied by 1.6, with other sources of N and adjustments subtracted from the product of that multiplication. Grain sorghum begins a period of rapid growth, biomass accumulation and nutrient uptake at the five-leaf stage, approximately 3 weeks after emergence. Between this stage and booting about 70% of N will be taken up. Nitrogen fertilizer timing should account for this rapid growth period.

Phosphorus fertilizer has the potential to significantly improve grain sorghum yield and N fertilizer use efficiency, as has been demonstrated in an ongoing long-term irrigated study in western Kansas that was initiated in 1961. Over a recent 10-year period (2007-2016) the addition of N (80 lb/A) has on average increased grain yield by 42 bu/A, or 57%, over the zero-fertilizer control, while the addition of N plus P (40 lb P_2O_5/A) increased yield by 69 bu/A, or 93% (*IPNI Research Database*). Other work published in *Better Crops* from north central Kansas has shown that a combination of N and

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P in a starter can have a marked effect on both yield and hastening maturity, even at relatively high soil test levels.

Soil testing should be used to help generally guide both P and K fertilization. While soils over much of the Great Plains are responsive to P input, the likelihood of response to K fertilizer is greatest in the eastern reaches of the region, where sandy soils and low soil K levels are more common.

Grain sorghum may also be responsive to other nutrients. Work in Kansas has shown that in 19 of 23 study sites grain sorghum was responsive to chloride (Cl^-) fertilizer (*Better Crops*). Soil critical levels and fertilizer guidelines for Cl^- have been well established. Zinc and iron may also need to be addressed, particularly in high pH, calcareous conditions in the west.

Close-up examples of N, P, and K deficiency symptoms (left to right) on sorghum leaves. (Sharma and Kumar/IPNI Images).

DEFICIENCY SYMPTONS ON SORGHUM LEAVES

Close-up examples of Zn and Fe deficiency symptoms (left to right) on sorghum leaves. (Sharma and Kumar/IPNI Images).

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