

Chloride Fertilization Increases Yields of Corn and Grain Sorghum

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Research across Kansas and the Great Plains has shown wheat responds consistently to Cl fertilization, particularly when soil Cl levels are less than 20 lb/A (0 to 24-inch depth). Chloride sensitive cultivars often show 5 to 15 bu/A yield responses when Cl is applied. These results have prompted the question: What about Cl needs on corn and grain sorghum?

To address this question, studies were conducted at several sites in Kansas during 1998 and 1999 to evaluate Cl rates and sources on corn and grain sorghum. Chloride rates (0, 20, 40 lb/A) and sources, including potassium chloride (KCl), calcium chloride (CaCl₂), and sodium chloride (NaCl), were evaluated during the course of this work. All Cl treatments were surface broadcast at planting time.

Nitrogen (N) and other needed nutrients

were balanced on all treatments. Plant samples (leaf opposite and above primary ear on corn and flag leaf on grain sorghum) were taken at tassel (VT)/boot stage (Stage 5) for nutrient analyses. Plants were rated for disease and stalk rot, but levels were extremely

low at all sites. Grain yields were determined (corn corrected to 15 percent moisture and grain sorghum to 13 percent moisture). All soil Cl values were determined from samples taken from surface to a depth of 24 inches.

The effect of Cl fertilization on corn is shown in

Tables 1 and 2. Corn grain yields were not significantly affected by Cl fertilization in 1998. However, soil tests at both research sites were above 20 lb Cl/A. In 1999, corn grain yields were significantly increased, with both sites below 20 lb Cl/A soil test. The average corn response to Cl in 1999 was 6 bu/A.

Two years of data from Kansas research indicate that corn and grain sorghum are likely to show economic yield response to chloride (Cl) if soil test levels at the 0 to 24-inch depth are less than 20 to 25 lb/A.

TABLE 1. Effects of Cl fertilization on corn, 1998.

Cl rate, lb/A	Cl source	Osage Co.		Riley Co.	
		Yield, bu/A	Tassel Cl, %	Yield, bu/A	Tassel Cl, %
0	—	133	0.29	107	0.12
20	NaCl	133	0.38	114	0.30
40	NaCl	137	0.37	112	0.39
20	KCl	133	0.36	108	0.28
40	KCl	133	0.36	116	0.37
LSD (0.10)		NS	NS	NS	0.06
Soil test Cl (0-24 in.), lb/A		40		24	

TABLE 2. Effects of Cl fertilization on corn, 1999.

Cl rate, lb/A	Cl source	Brown Co.		Marion Co.	
		Yield, bu/A	Tassel Cl, %	Yield, bu/A	Tassel Cl, %
0	—	123	0.16	94	0.15
20	KCl	124	0.29	106	0.18
40	KCl	129	0.40	107	0.55
20	NaCl	119	0.29	104	0.42
40	NaCl	134	0.46	108	0.59
20	CaCl ₂	120	0.21	101	0.23
40	CaCl ₂	127	0.32	96	0.32
LSD (0.10)		10	0.11	7	0.13
Soil test Cl (0-24 in.), lb/A		19		14	

TABLE 3. Effects of Cl fertilization on grain sorghum, 1998.

Cl rate, lb/A	Cl source	Marion Co.									
		Site A		Site B		Site C		Osage Co.		Riley Co.	
		Yield, bu/A	Boot Cl, %	Yield, bu/A	Boot Cl, %	Yield, bu/A	Boot Cl, %	Yield, bu/A	Boot Cl, %	Yield, bu/A	Boot Cl, %
0	—	62	0.10	63	0.06	87	0.09	125	0.17	101	0.06
20	NaCl	70	0.32	74	0.30	112	0.25	121	0.25	106	0.19
40	NaCl	76	0.48	69	0.47	109	0.33	130	0.29	112	0.23
20	KCl	70	0.29	69	0.26	107	0.15	129	0.23	114	0.18
40	KCl	76	0.42	72	0.38	103	0.26	122	0.29	118	0.21
LSD (0.10)		8	0.07	7	0.06	15	0.07	NS	0.07	11	0.04
Soil test Cl (0-24 in.), lb/A		16		9		20		52		12	



Also, tassel-stage leaf Cl concentrations were significantly increased at all sites. Chloride sources performed similarly, except that CaCl₂ resulted in somewhat lower leaf Cl concentrations than either KCl or NaCl, but still much higher than the check treatments.

Grain sorghum yields were significantly increased by Cl fertilization at eight of nine sites over the two years (Tables 3 and 4). The lone non-responsive site had a soil Cl level of 52 lb/A and had a history of annual application of KCl. Other sites had much lower soil Cl, mostly below 20 lb Cl/A. The average response among these eight sites was 11 bu/A. Boot stage leaf Cl concentrations were significantly increased at all sites. The larger yield responses were noted at sites with the lowest

check treatment leaf Cl levels. In most cases, application of 20 lb Cl/A was enough to achieve response. All Cl sources evaluated performed similarly.

Summary

Results to date suggest that if Cl soil test levels are low (less than 20 to 25 lb/A, 0- to 24-inch depth), corn and grain sorghum are likely to respond economically to Cl fertilization. The responses noted seem to be a nutrient response to Cl as disease pressure was very low the two years of this work. Application of 20 lb Cl/A appears sufficient in most cases, and all Cl sources evaluated performed similarly. **BC**

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TABLE 4. Effects of Cl fertilization on grain sorghum, 1999.

Cl rate, lb/A	Cl source	Brown Co.		Marion Co.		Stafford Co.		Osage Co.	
		Yield, bu/A	Boot Cl, %	Yield, bu/A	Boot Cl, %	Yield, bu/A	Boot Cl, %	Yield, bu/A	Boot Cl, %
0	—	93	0.15	98	0.13	132	0.04	96	0.18
20	KCl	98	0.28	109	0.36	142	0.31	98	0.20
40	KCl	108	0.49	111	0.51	144	0.28	104	0.22
20	NaCl	96	0.40	106	0.36	146	0.25	109	0.23
40	NaCl	104	0.55	107	0.47	139	0.48	115	0.26
20	CaCl ₂	102	0.30	109	0.38	144	0.21	96	0.23
40	CaCl ₂	95	0.44	105	0.49	141	0.33	105	0.23
LSD (0.10)		12	0.13	7	0.06	11	0.09	9	0.04
Soil test Cl (0-24 in.), lb/A		17		12		21		31	