

Chloride: An Opportunity to Increase Profitability

Great Plains researchers have clearly shown that attention to the essential nutrient chloride can help crops withstand moisture stress, boost yields and improve profitability. Low cost investment in chloride has returned \$2-\$5 per dollar invested, sometimes much more. Chloride (Cl) applications on Corn and Grain Sorghum may provide the highest economic returns.

Chloride in Plants

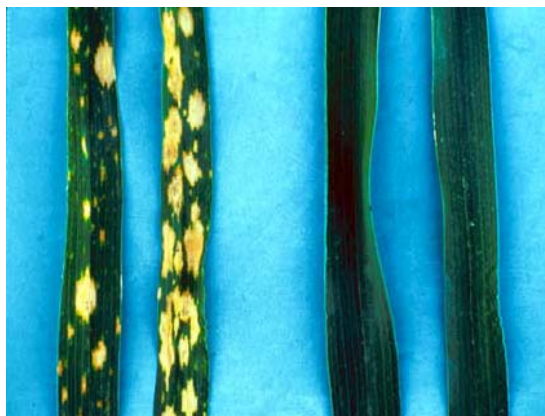
Research started with Wheat

Starting in the 1950's University of California and then South Dakota State University researchers have established: Plants with plenty of Cl are better able to withstand moisture stress. This is particularly important with the moisture shortages affecting crop production in the Great Plains.

In the late 1970s, Oregon State and North Dakota State University researchers determined that wheat plants supplied with adequate amounts of Cl had better resistance to fungal root diseases. In that research, suppression of fungal diseases was accompanied by substantial and profitable yield increases.



Proper Chloride levels suppress fungal diseases



Chloride deficiency can cause "leaf spot"

In the 1980s and 90s, work in southwestern Saskatchewan, Montana and later Kansas determined that a common phenomenon termed "leaf spot" in some varieties of wheat was in fact a Cl deficiency symptom. Chloride fertilization corrected the problem, eliminated the leaf spot symptoms, advanced maturity and profitably increased yields.

Readily Available Sources of Chloride

Readily available sources of Chloride include:

- **Ammonium chloride (AmCl) solution** mixes well with nitrogen and sulfur solutions, even if there is some phosphorus (P) in the system, and provides needed N.
- **Calcium chloride (CaCl₂) and Magnesium chloride (MgCl₂) solutions** are difficult to use if there is any trace of P in the solution or tanks.
- **Potassium chloride (KCl)** is a solid and usually spread in that form. Also, much of the Great Plains has sufficient natural supplies of K, another good reason for proper soil testing.

All have proven effective at suppressing fungal disease and profitably improving yields.

Effects of Cl Fertilization on Wheat Rust Infection, Yield and Returns

Chloride Source	Application Rate	Yield (Bu/Acre)	Net Return / Acre
None	0	35	--
AmCl	40	42	\$9
KCl	40	42	\$9
MgCl ₂	40	41	\$6

Wheat @ \$3.00 / Bu Chloride @ \$0.30 / lbs.

Research: Texas A&M University

Extensive Kansas research (22 site-years) has shown application of 20 lb of Cl costing somewhere in the vicinity of \$5/A has conservatively returned \$15/A or \$10/A net back over the cost of the Cl. Some Kansas returns have run as high as \$115/A for \$5 invested in Cl when wheat yields were very high.

Average Winter Wheat Yield Response and Return from Chloride (22 Site-years)	
Chloride /Acre	20 Lbs.
Chloride Cost /Acre	\$6
Yield without Chloride	45 Bu/Acre
Yield with Chloride	50 Bu/Acre
Improvement	5 Bu/Acre
Value @ \$3.00 / Bu	\$15
Net Return	\$9 / Acre

Research: Kansas State University



Note the difference in head size with a Chloride topdress application. Chloride is a mobile nutrient that can migrate out of the root zone in a preplant application.

But, the real penalty comes from no Chloride!

Corn and Grain Sorghum

More recent Kansas State University research indicates that Corn and Grain Sorghum have actually had greater response than wheat when Cl was applied at essentially the same rate. Net returns from Cl have averaged \$26/acre or over \$5 profit for each dollar invested. Cl also lowers the incidence of fungal stalk diseases in both of these crops.

Chloride applications either immediately prior to planting (broadcast or banded), banded beside the row at planting or in an early sidedress application with N have been effective. Remember, Cl is very mobile in the soil and fall applications may have been moved down out of the root zone with fall and winter precipitation. Soil analyses will show these effects.

Chloride Builds Yields and Profits for Corn and Grain Sorghum

Crop	Chloride Soil Test Level	# Sites	Increase (Bu/Acre)	Net Return (\$/Acre)
Sorghum	Low	7	13 Bu	\$33
Sorghum	Medium	1	12 Bu	\$30
Corn	Low	2	14 Bu	\$36
Corn	Medium	1	6 Bu	\$12

**Corn and Sorghum @ \$3 / Bu Chloride @ \$0.30 / Lbs.
Research: Kansas State University**

Determining Chloride Needs

Kansas State recommends a 2-foot sample for soil testing, the same one that can be used for soil nitrate-N determinations. K-State generally sees:

- 30 lb of Chloride/Acre or less yields high response
- Between 30 and 60 lb Chloride/Acre delivers moderate response
- Greater than 60 lb Chloride/Acre offers low probability of response

The Bottom Line

Quoting Kansas State researchers, “Chloride fertilization is such a clear-cut requirement that there is no more need to research the subject.” Returns are excellent and predictability by soil testing is good.

By Dr. Larry Murphy
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For further information on Chloride, refer to www.evansenterprisesllc.net or call Evans Enterprises, LLC at 913-533-2214.