CAMERON CHEMICALS INC.

Cameron Chemicals, Inc.

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Manganese Sources

Research Questions

Which is the best manganese source, a sulfate, an oxysulfate? Does the quality and placement of Manganese materials make a difference?

Research Objectives

Does the source of Manganese affect the yield? Does the application of manganese on crops with adequate manganese levels produce yield responses?

Previous Investigations

Previous studies have indicated that the uptake of Manganese Mn++ through the roots is by three mechanisms, mass flow (soluble) 5%, root interception 15% and diffusion 80%. On crops which express a manganese deficiency, the preferred method of treatment is the application of a foliar manganese product. While this type of application may help correct the visual deficiency and salvage the crop , the maximum yield potential has been reduced. Other research has indicated that the banded application of a granular manganese source with an acid forming starter fertilizer would correct a manganese deficiency. Suggested rates for soil applied manganese varies with soil types and the extractable Mn concentrations.

Study Description

This study examines an application of manganese on soybeans for producing higher yields versus no treatment. Two manganese formulations were evaluated over a four year period, in replicated plots from 1995 to 1998 at Arise Research & Discovery, Inc. in Martinsville, Illinois. This test was designed to study a one hundred percent water soluble form of manganese versus a homogenous manganese oxysulfate source. The plots were replicated using a randomized complete block with a latin square configuration. The objective of this experiment is to examine the crop response to two forms of manganese products on soils which are considered high in manganese content. Both manganese oxysulfate and manganese sulfate were applied in a broadcast application.

Study Results

Data collected to date indicates that the application of manganese has produced significant yield increases over untreated plots. The untreated plots averaged 37.77 bushel per acre, the manganese sulfate plots averaged 40.76 bushel per acre and the manganese oxysulfate plots averaged 43.58 bushel per acre.

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Manganese Sources

Continued

Soil Plant Nutrient Interactions

The soil, plant interaction with plant nutrients is complicated. Soils consist of solid, liquid and gaseous states. The chemical and physical composition of soils and plant nutrients is diverse and in a constant state of dynamic change due to biological, chemical and gravitational influences. Micronutrients are very diverse and active due to the metallic state of each element. The positive charged micronutrients are taken up by the plant in only the elemental state. Manganese is taken up as the Mn++ form and generally Manganese is unavailable with pH's of 6.5 or higher, even if the soil test indicates high Manganese levels. The soil environment will always move towards equilibrium with elements constantly moving from unavailable to available form. Studies on the uptake of manganese in soybeans have shown that a banded soil application can correct Manganese deficiency. The pla nt's newly formed root hairs must directly intercept with the manganese source regardless of the form found in the soil.

Discussion

The application of manganese, regardless of the chemical form, produced consistent increases in yield over untreated plots. The application of the manganese consistently outyielded the untreated plots by an average of six bushel per acre. The manganese oxysulfate application out yielded the untreated by 5.81 bushel per acre. Economic analysis gives significant advantages to the oxysulfate formulation.

Conclusions

While the preferred method of application for manganese should be banded in the row, many farmers are applying most nutrients broadcast. The application of broadcast manganese treatments can produce a yield response. Manganese oxysulfate provides sufficient availability of manganese for immediate plant uptake with extended manganese availability throughout the growing season. Manganese applications, in either form, offer an economical and viable return on investments.

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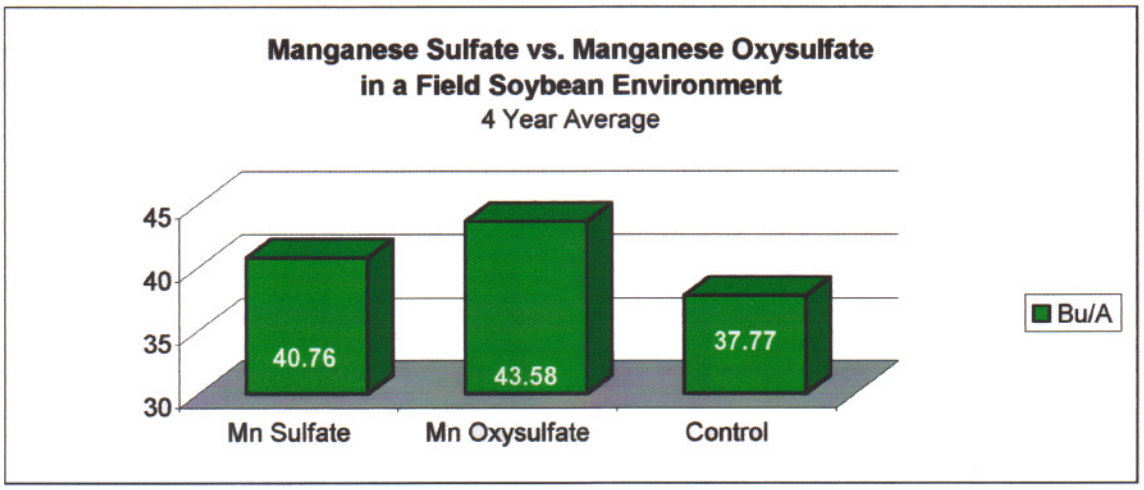
Soybean Study Plot Data

Treatment	Form	Rate	Unit	Plot	1995	1996	1997	1998	Average
Mn Sulfate	28	30	LB/A	101	46	41.5	40.7	39.2	41.85
Phosphorus	1152	150	LB/A	201	43	40.8	41.3	36.3	40.35
Potassium	60	150	LB/A	301	39	36.9	47	31.4	38.58
				401	42	42.5			42.25
				Average	42.5	40.4	43	35.6	40.76
Mn Oxysulfate	28	30	LB/A	102	47	48.6	44.3	41.2	45.28
Phosphorus	1152	150	LB/A	202	44	45.4	43.3	37.3	42.5
Potassium	60	150	LB/A	302	41	43.8	46	30.4	40.3
				402	43	49.5			46.25
				Average	43.8	46.8	44.5	36.3	43.58
Control				103	36	40.5	38.6	36.2	37.83
Phosphorus	1152	150	LB/A	203	35	36.5	39	34.3	36.2
Potassium	60	150	LB/A	303	43	39.3	40.5	29.3	38.03
				403	37	41			39
				Average	37.8	39.3	39.4	33.3	37.77



Source: Arise Research & Discovery