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Soybeans Tolerant of Iron Chlorosis

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Chlorotic soybeans with reduced yields due to a shortage of available iron are an increasing problem in Kansas. As the soybean acreage expands in the central and western portions of the state, the iron deficient areas that often are associated with highly calcareous soils are becoming more apparent. In severe cases of iron deficiency, other crop choices should be considered rather than soybeans. Where soybeans are grown, however, partial solutions to this expanding crop problem are possible.

Yield losses due to iron deficiency often can be minimized in soybeans by:

(1) Growing varieties with genetic tolerance to iron chlorosis.
(2) Making field applications of livestock manure.
(3) Making foliar applications of iron-containing materials.

Among these three alternatives, using varieties tolerant of iron deficient soils is the most generally desirable. Livestock manure applications to a field are often effective, but drawbacks include accessibility to manure, high transportation costs, and the frequent presence of weed seed. Foliar iron applications often are not very effective with soybeans and the materials also tend to be expensive, difficult to maintain in suspension, and abrasive to application equipment.

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Procedure

Approximately 80 soybean varieties plus 200 experimental lines have been studied during 1981-84 in field plots at the Garden City Experiment Station and nearby counties for their response to soils with limited available iron. Iron chlorosis ratings for entries were taken so that advancements can be made in the development of future Kansas variety releases having greater tolerance of iron deficiencies.

Plant response was estimated visually for each plot with ratings to the nearest 0.5 score between 1 (excellent) and 5 (poor), depending upon the degree of plant yellowing. Ratings then were averaged from three plots for each entry.

Sites used for testing were selected by their tendencies for uniform moderate iron deficiency symptoms as observed with previous soybean or sorghum cropping. Soil types varied but soils of the six sites contained approximately 3 to 5 ppm iron (DPTA test).

Results

The reactions of some public and private varieties are given in Table 1. Results shown include primarily data from locations in Finney County and Meade County during 1982. These data cover released varieties available to the public and of interest to producers.

The first eight varieties listed in Table 1 rank significantly better than other entries in tolerance to limited available iron. The very poorest tolerance was shown by the variety Harcor.

Conclusions

Although there are no soybean varieties available with complete tolerance to iron chlorosis, some show moderate levels of tolerance. Moderate tolerance allows improved soybean production in all but the most severe problem areas. Thus, variety selection is often the most practical solution to chlorosis caused by iron deficiency.

Table 1. Soybean variety evaluation for iron chlorosis tolerance.

		Iron Chlorosis Rating*		
Brand	*Entry*	*1982 Finney County*	*1982 Meade County*	*Average*
—	Douglas	2.0	1.9	2.0
—	Calland	2.0	2.3	2.2
Dekalb	CX350	2.0	(2.6)**	2.3
Ring Around	Mitchell 450	2.0	2.7	2.4
—	DeSoto	2.0	2.8	2.4
—	Sparks	(2.5)**	2.5	2.5
Migro	HP4800	2.3	2.7	2.5
Asgrow	A3659	2.3	2.6	2.5
—	Amsoy 71	2.3	3.2	2.8
Wilson	3130	3.0	3.0	3.0
Dekalb	CX321	3.0	3.0	3.0
Dekalb	CX380	2.7	3.3	3.0
Wilson	3340	3.0	2.9	3.0
Wilson	3860	2.7	3.3	3.0
—	Crawford	2.7	3.2	3.0
—	Williams	3.0	3.2	3.1
Wilson	3550	3.0	3.2	3.1
—	Union	2.7	3.7	3.2
—	Williams 82	3.0	3.4	3.2
Asgrow	A3860	2.7	3.8	3.3
—	Pella	3.0	3.8	3.4
—	Cumberland	3.0	3.7	3.4
Migro	HP3700	3.0	4.0	3.5
—	Williams 79	3.3	3.8	3.5
—	Nebsoy	3.7	3.4	3.6
—	Sprite	3.3	4.2	3.8
—	Harcor	4.0	4.7	4.4
	Test Averages	2.8	3.2	3.0
	L.S.D. (.05)	0.5	0.8	0.5

*Based on 1 = excellent to 5 = poor.
**Ratings from 1983 tests.

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