

Zinc and Copper Crop Toxicity and Removal

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Both zinc and copper in soils can become chelated with organic matter to help reduce the toxicity. However, plants can tolerate 2 times more zinc than copper in the soil. It is estimated that copper becomes toxic to seed germination, shoot vigor and root growth when soil levels start to approach 100 ppm. Zinc does not become toxic until soil levels become greater than 200 ppm. Additionally, high levels of soil phosphorus reduce the availability of zinc by precipitating the zinc in the soil or at the root-soil interface. Phosphorus has not been reported to have the same effect on soil copper.

Besides plants being able to tolerate higher levels of soil zinc, plants remove between 2 to 10 times more zinc than copper in the soil. The table below is the calculated crop removal of Hoof-Zink and copper sulfate (CuSO₄) for corn grain, corn silage, soybeans, alfalfa hay and grass hay. The calculated zinc and copper removal was based on estimated yields (average and high) for the various crops and the tabular values (dry matter, zinc and copper; NRC, 2001) for these harvested crops. Depending on the type of crops harvested and yield, between 0.2 and 1.6 lb of Hoof-Zink per acre can be removed each year. This is 2 to 8 times greater than the removal of copper sulfate.

Crop	Dry Matter (%)	Zinc (ppm)	Copper (ppm)	Yield	Zinc removal (lb/ac)	Copper removal (lb/ac)	Hoof-Zink removal (lb/ac)	CuSO ₄ removal (lb/ac)
Corn grain	88	27	3	150 bu/ac	0.20	0.02	0.71	0.09
				200 bu/ac	0.27	0.03	0.95	0.12
Corn silage	35	23	6	15 tons/ac	0.24	0.06	0.86	0.25
				18 tons/ac	0.29	0.08	1.04	0.30
Soybeans	90	49	13	20 bu/ac	0.05	0.01	0.19	0.06
				60 bu/ac	0.16	0.04	0.57	0.17
Alfalfa hay	88	24	9	4 tons/ac	0.17	0.06	0.60	0.25
				8 tons/ac	0.34	0.13	1.21	0.50
Grass hay	88	31	9	4 tons/ac	0.22	0.06	0.78	0.25
				8 ton/ac	0.44	0.13	1.56	0.50

Sources:

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