Molybdenum Ranges in Soils and Tissue

FACT SHEET

Molybdenum is required by plants in very small amounts for proper plant growth, less than any other micronutrient except for nickel. Most soils contain sufficient amounts of total molybdenum; however plant availability is closely related to soil pH, texture, and weathering. Changes in molybdenum concentration most greatly affect vegetable crops, such as cabbage and cauliflower, and leguminous plants.

The element molybdenum is required for both nitrogen fixation and nitrogen reduction. The enzyme nitrogen's (containing two molybdenum atoms per molecule) is required for leguminous plants to fix nitrogen. Therefore the functions of molybdenum are very closely related to nitrogen metabolism, and the molybdenum requirement strongly depends on the mode of nitrogen supply. For this reason, plants that are deficient in molybdenum often show the same symptoms as plants that are nitrogen deficient. Some molybdenum deficiency symptoms include:

Yellow-green color and lack of vigor in clover
Nitrogen deficiency symptoms (older leaves become yellow first)
Interveinal chlorosis (yellow mottling between plant veins
Rolling, curling, withering , and crinkling of plant leaves
Vegetable crops show irregular leaf formation known as whiptail

Molybdenum is mobile within the plant, deficiencies will first be seen in older parts of the plant.

The soluble soil form of molybdenum is the molybdate (MoO_4^{2-}) anion, whose availability is increased 10-fold for each unit increase in soil pH. In the soil, Mo is strongly absorbed by Fe and Al oxides whose formation is pH dependent. Movement to the root is by mass flow and diffusion equally, although mass flow supplies most of the Mo when the soil Mo levels are high. Nitrate nitrogen (NO_3^-) enhances the uptake of Mo as apposed to ammonium. Phosphorus and magnesium also enhance Mo uptake, while sulfate (SO_4) will reduce uptake.

Soil Test Ranges

Ranges found 0.5-40ppm
Extreme ranges 0.1—80 ppm
Optimum ranges 1 to 2 ppm for most crops
Some crops ranges require 2 to 5 ppm

Tissue levels Ranges

Deficient	0.03-0.15 ppm
Sufficient	0.1-2.0 ppm
Toxic	> 100
Toxic to ruminants	>5

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Molybdenum Ranges for Field Crops

Crop	Stage	critical	Adequate	high
Alfalfa	Pre-bloom	1.0-5.0	1.0-5.0	
Apples		0.05-0.1	>0.1	
Barley	FS 5-8		.1-.3	
	Mid to late til	.05-.09	.1-.5	.6-.7
	FS 10		.3-.5	
	heading		.11-.18	
	Grain		1.2-1.9	
Canola	Veg early		0.5-1.0	
	Pre-flower		.28-.55	
	Early flower		0.4-1.0	
	Rosset to pod		.25-.60	
Corn			.1-.3	
Red clover			.5-1.0	
White clover			.15-.25	
Faba Bean			..4-5.5	
Field Bean			.4-1.0	
Field Pea			.4-1.0	
Flax			.3-1.0	
Linola			.3-1.0	
Linseed			.3-1.0	
Lupin			.3-5.0	
Oat	Heading		.2-.3	
Onions			.15-.30	
Radish			.3-.55	
Rye			.2-2.0	
Soybeans	Prior to pod		1.0-5.0	
Sunflower			.28-.75	
Wheat	FS5-8		.1-.3	
	FS 10+		.09-0.18	

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Molybdenum Ranges for Vegetable Crops

Crop	Stage	Critical	Adequate	High
Arugala			5.7-5.9	
Boston Lettuce	Prior to heading		.29-.58	
Broccoli	heading		.3-.5	
Brussel sprouts	mature		.25-1.0	
Cabbage	2-3 mths		.4-.7	
Common Cabbage	2-6mks old		.3-1.0	
Common Cabbage	mature		.3-1.0	
Cauliflower	At heading		0.5-0.8	
Celery			.3-1.0	
Celery Mustard			1.5-6.4	
Chinese Spinach			>.12	
Chinese Kale			1.0-2.3	
Chinese Cabbage			2.8-5.6	
Cucumber	Small fruit to harvest		.8-4.0	
Cucumber seedless			.8-5.0	
Cucumber	Flower to small fruit		.8-3.3	
French Bean			>.12	
Green House tomato			2.9-5.8	
Head Lettuce	heading		.1-.4	
Kale			.1-.15	
Mustard greens			1.37-5	
Potato			.1-1.5	
Pumpkin			>.5	
Rhubarb			>.12	
Romaine lettuce			.3-.6	
Spinach			>.5	
Spinach mustard			1.0-3.2	
Squash			>.5	
Sweet corn			.9-10	
Tomato Field	Mid bloom		>.68	
Turnip			>2.48	