

Boron Deficiency Symptoms

- Plants initially may not exhibit obvious symptoms of nutrient deficiencies other than a slower growth rate, which may be due to other factors.
- When moderate or severe nutrient deficiencies occur, most crops exhibit visible symptoms which are typical for deficiencies of a particular nutrient.
- Knowledge of boron-deficiency symptoms can help in diagnosing deficiencies.
- Symptoms should be confirmed with results of soil tests and plant analyses, and appropriate corrective action taken.

Visible boron (B) deficiency symptoms for many crops are listed below. Such symptoms become clearly visible when the deficiency is acute. At this point growth and yield may be severely limited. For crops not listed, general B deficiency symptoms include chlorosis, necrosis, and deformations on young leaves and at growing points.

Boron sufficiency ranges in upper mature leaves before flowering or fruiting are provided for many crops. Plant tissue samples with B levels in these ranges are not likely to exhibit visual symptoms. However, tissue levels in this range may not be adequate for maximum yield and quality.

Diagnoses from visible symptoms should be confirmed with results of soil tests and plant tissue analyses.

| Vegetable Crops | Visible Symptoms | Boron Sufficiency Range (ppm) |
|-----------------|--|-------------------------------|
| Beet (Red) | External spotting, cracking and canker. | 30 - 80 |
| Broccoli | Hollow stems, internal discoloration, brown curds. | 25 - 50 |
| Cabbage | Hollow stem, watery areas, heads hollow, plants stunted. | 25 - 40 |
| Carrot | Reddening of leaves and root splitting. | 32 - 200 |
| Cauliflower | Leaves curled, hollow stem, curds dwarfed, brown. | 25 - 50 |
| Celery | Stem cracked and striped brown, heart blackened. | 25 - 50 |
| Lettuce | Stunted growth, discoloration of leaves, brittle. | 27 - 43 |
| Radish | Pale roots, brittle stems, watery flesh and flecked coloration. | 20 - 195 |
| Rutabaga | Roots are tough, fibrous and bitter. Upon cutting, they have soft, watery areas, often called "brown-heart." | 38 - 140 |
| Sweet Corn | Short, bent cobs, barren ears, blank stalks, poor kernel development, elongated, watery or transparent stripes later becoming white on newly formed leaves, dead growing points. | 10 - 25 |
| Tomato | Thickened leaves, brittle leaves, fruit fails to set. | 30 - 100 |
| Turnip | Hollow center or brown heart, watery areas. | 25 - 50 |

| Fruit and Nut Crops | Visible Symptoms | Boron Sufficiency Range (ppm) |
|----------------------------|--|--------------------------------------|
| Almond | Flowers fall and nuts abort or are gummy. | 80 - 150 |
| Apple | Pitting, skin discolored, cracking and corking. | 25 - 50 |
| Apricot | Twigs die back and fruit fails to set. | 20 - 70 |
| Citrus | Thickened ring, gum pockets near axis, discolored patches. | 30 - 100 |
| Grape | "Hen & Chick" symptom, dead main shoots. | 30 - 50 |
| Pear | Blossom blast, pitting, internal corking and bark cankers. | 30 - 50 |
| Pistachio | Fruit set decreases, and blanks and non-split nuts increase. | 150 - 190 |
| Strawberry | Pale chlorotic skin of fruit, cracking and dieback. | 25 - 50 |
| Walnut | Dieback from shoot tips, leaf fall. | 40 - 400 |

| Field Crops | Visible Symptoms | Boron Sufficiency Range (ppm) |
|------------------------|--|--------------------------------------|
| Alfalfa | Death of terminal bud, rosetting, yellow top, little flowering and poor pod set. | 30 - 80 |
| Canola | Leaves distorted. Blank or partially filled seed heads. | 15 - 50 |
| Clover | Poor stands, growth and color. Reduced flowering and seed set. Leaves cupped and shriveled, and become brittle. | 20 - 45 |
| Corn (Field and Sweet) | Short, bent cobs, barren ears, blank stalks, poor kernel development, elongated, watery or transparent stripes later becoming white on newly formed leaves, dead growing points. | 10 - 25 |
| Cotton | Shedding of squares and young bolls, ruptures at base of squares, dark fluid exuding from ruptures, internal discoloration at base of boll, half-opened bolls, green leaves until frost. | 30 - 80 |
| Dry Bean | Interveinal chlorosis of leaves. Bushy appearance. | 15 - 50 |
| Peanut | Dark, hollow area in center of nut, called "hollow heart." | 25 - 50 |
| Potatoes | Plants have a bushy appearance. Leaves thicken and margins curl upward. | 20 - 50 |
| Sorghum | Leaves are narrow and have a gray appearance with watery, transparent stripes. Seed heads are not filled. | 7 - 35 |
| Soybean | Yellow leaves, chlorotic between veins, downward curling of leaf tips, crinkling of leaves, dieback of tips, no flowering, roots stunted. | 20 - 60 |
| Sugar Beet | Yellowing or drying of leaves, cracking of leaf midrib, brown discoloration of internal tissue, rotting of crown. | 30 - 50 |
| Sunflower | Leaves appear wilted. Abnormal head fall due to weak peduncles. | 30 - 100 |
| Tobacco | Leaf puckering and deformed buds. | 20 - 100 |
| Wheat | Distorted heads and chlorosis of leaves. | 10 - 20 |

For more information:

Call US Borax at
1 (800) 699 9005

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