



PEI Analytical Laboratories
Soil Testing

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Supplemental Nutrient Applications for Potatoes

Introduction:

If it is established that nutrient deficiencies have occurred in a growing potato crop, it is often possible to successfully supplement the deficient nutrients, either by soil or foliar applications, and "save" the crop.

The success of this operation will depend on the nutrient(s) required and growth stage of the crop when the deficiency is confirmed. Supplemental nutrients, particularly micronutrients, should not be applied unless a deficiency is confirmed because unnecessary applications can result in adverse effects on the crop. **Plant tissue analysis is usually the best way to confirm such deficiencies.**

Soil Applications

If deficiencies occur with nitrogen, potassium, calcium, magnesium, or sulfur, it is best to apply nutrients to the soil as a broadcast or sidedress application. This is most practical early in the season before the rows have "closed in" when it is still possible to get through the field with a fertilizer spreader.

Dry granular fertilizers should never be applied to crops when the foliage is wet or even damp, because the granules will sometimes stick to the leaves and cause leaf damage. If at all possible, granular fertilizers should be incorporated into the soil with a cultivation operation.

Foliar Applications

Nutrients can be applied very effectively as foliar sprays. Only small quantities can be applied in any single treatment, otherwise "burning" of the foliage can take place. Foliar feeding is best used with secondary or micronutrients where plant requirements are relatively small. For major nutrients, such as nitrogen, it is often necessary to use several foliar applications in order to supply enough of that nutrient to significantly improve crop yield or quality.

Certain general principles should be followed when applying foliar nutrients.

- **Never exceed recommended application rates!** Severe foliar damage and crop loss can occur if too much material is applied in one treatment.
- Apply foliar nutrients in early morning or evening. Normally "safe" application rates can cause injury if applied during mid-day when the crop may be under stress. Absorption of nutrients into the foliage is also much more efficient in early morning and at night.
- Foliar nutrients can be applied with most insecticides or fungicides, provided a minimum water volume of 200 L/ha (20 gal/ac) is being used. **Compatibility of spray materials with foliar nutrients should be checked with a qualified pesticide product specialist.** When tank-mixing foliar nutrients with other spray materials, the foliar nutrient(s) should be the product first dissolved in the spray water before adding fungicides or insecticides. **A compatibility test should be carried out before tank-mixing any new combination of nutrients and pesticides.** To carry out such a compatibility test, place the water to be used in the sprayer in a small container and add the proper proportions of all of the products to be used in the tank, in the order they will be added to the tank. Agitate well. If the materials will not dissolve or not stay in suspension, or if a precipitate forms within the first hour after mixing, **apply the foliar nutrients separately.**

- Most of the foliar nutrient sources recommended in this bulletin are pure compounds (eg: magnesium sulfate, copper sulfate). A number of agricultural chemical companies sell prepared foliar application products containing one or more nutrients. These materials provide an excellent and convenient source of foliar nutrients. Care should be taken to ensure that the rate of application corresponds to the recommendation on your soil/tissue analysis report. If chelated nutrients are used in any of these commercial products, rates of nutrients required can be reduced. **Follow the label instructions on registered products.**

SPECIFIC NUTRIENT APPLICATIONS

Nitrogen

Soil Application

Any of the common nitrogen fertilizer materials can be used to supplement nitrogen for potatoes. If a nitrogen deficiency is obvious in the crop, a source containing nitrate-nitrogen (eg: ammonium nitrate or calcium nitrate) should be used. If urea is used, it should be incorporated into the soil on the day of application to prevent nitrogen loss due to ammonia volatilization. Normal application rates usually range around 40-60 kg/ha of actual nitrogen. Applications of typical sources to achieve these rates of nitrogen include:

Material	kg/ha	lb/acre
Ammonium nitrate	115-175	105-160
Urea	85-130	75-120
Ammonium sulfate	190-285	170-255
Calcium nitrate	265-400	240-360

Supplemental soil nitrogen can be applied any time a nitrogen deficiency is confirmed.

Foliar Application

Urea or nitrogen solutions are the only recommended nitrogen sources to use for foliar application. If urea is used, only a foliar or feed grade urea should be applied. It is particularly important that foliar nitrogen should not be applied during the heat of the day as crop damage is likely to occur. Normal application rates should be 2.5-5.0 kg/ha of actual nitrogen. This corresponds to 6-10 kg/ha (5-9 lb/ac) of urea or 8-16 l/ha (0.75-1.5 gal/ac) of nitrogen solution (28% N). Two to four applications, each one to two weeks apart, will be required to overcome a nitrogen deficiency problem. The first of these applications should go on at full bloom but can be applied earlier if a deficiency is confirmed prior to that stage of growth.

Phosphorus

Soil Application

Application of a dry granular phosphorus material to an established potato crop is **not recommended** due to its lack of mobility within the soil, and reduced plant availability caused by reactions with other stable ions within the soil that form stable compounds (i.e. iron and aluminium).

Foliar Application

Single source, water soluble phosphorus materials are not readily available. Therefore, a water soluble mixed fertilizer with high phosphorus content must be used. Typical examples of such products include 9-45-15 and 10-52-10. Normal application rates should be 1.5-2 kg/ha of actual phosphate. This corresponds to approximately 3-4 kg/ha (2.7-3.6 lb/ac) of either of the products mentioned above. Two applications, two weeks apart, are required beginning early August.

Potassium

Soil Application

Any common potassium (potash) source can be used to supplement potassium on potatoes. Sulfate of potash or Sulph-O-Mag are preferred if high specific gravity is required in the potato crop. Normal application rates should be 40-60 kg/ha of actual potassium. Applications of typical potash sources to achieve this include:

Material	kg/ha	lb/ac
Muriate of potash	65-100	60-90
Sulfate of potash	80-120	70-110
Sulph-O-Mag	180-275	160-250

Supplemental soil potassium should be applied anytime potassium deficiency is confirmed.

Foliar Application

Foliar applications of potash are not recommended.

Calcium

Soil Application

Calcium nitrate and calcium chloride are suitable water soluble sources of calcium for soil application. Limestone and gypsum are not recommended because of their limited solubility and availability to the crop within season. Application rates of 20-40 kg/ha of actual calcium should overcome most deficiencies. This is equivalent to 100-200 kg/ha (90-180 lb/ac) of calcium nitrate or 60-120 kg/ha (55-110 lb/ac) of anhydrous calcium chloride. Supplemental soil calcium can be applied any time a deficiency is confirmed.

Foliar Application

Calcium chloride and calcium nitrate can also be used as sources of foliar calcium. The source should be checked for purity to ensure that it does not contain insoluble impurities which will plug the sprayer nozzles. Normal application rates should be 0.5-1 kg/ha of actual calcium. This corresponds to 1.5-3 kg/ha (1.4-2.8 lb/ac) of calcium nitrate. Two to four applications, two weeks apart, should overcome confirmed deficiencies, with the first application occurring at full bloom.

Magnesium

Soil Application

Sulph-O-Mag is the most suitable water soluble source of magnesium for soil application. Although dolomitic limestone is a good source of magnesium, it has limited solubility and may not become available to the crop fast enough to overcome deficiency problems. Application rates of 10-20 kg/ha of actual magnesium should overcome most deficiencies. This is equivalent to 90-180 kg/ha (80-160 lb/ac) of Sulph-O-Mag. Supplemental soil magnesium can be applied any time a magnesium deficiency is confirmed.

Foliar Application

Magnesium sulfate (i.e. epsom salt) is a very effective source of magnesium. Normal application rates should be 0.4- 0.8 kg/ha of actual magnesium. This corresponds to 3.5-7 kg/ha (3.0-6.0 lb/ac) of magnesium sulfate.

Two foliar applications, one at full bloom and one 2-3 weeks later, should overcome most deficiencies.

Boron

Soil Application

Typically, soil application of boron within potatoes demonstrating a boron deficiency is not recommended. To avoid boron deficiencies, the addition of 0.2 lb of boron within the fertilizer mix at planting is a common fertility practice.

Foliar Application

Solubor[®] is an excellent source of foliar boron. The application rate should be 0.2 kg/ha of actual boron. This corresponds to 1 kg/ha (0.9 lb/ac) of Solubor[®]. Three applications are recommended with the first in mid to late July, the second in mid-August and the third in late August to early September.

Copper

Soil Application

Soil application of calcium for a potato calcium deficiency is not recommended.

Foliar Application

Copper sulfate (i.e. bluestone) is a suitable source of water soluble copper. The application rate should be 0.25 kg/ha of actual copper. This corresponds to 1 kg/ha (0.9 lb/ac) of copper sulfate. Two applications are recommended; the first application in mid to late July, and the second application four weeks following the initial application. As with most micronutrients, it is critical to adhere to the proper application rate. Higher rates than that recommended above can seriously arrest the growth of the crop.

Zinc

Soil Application

Soil application of zinc for a potato zinc deficiency is not recommended.

Foliar Application

Zinc sulfate is a suitable source of water soluble zinc for foliar application. The application rate should be 2 kg/ha of actual zinc. This corresponds to 8.5 kg/ha (7.8 lb/ac) of zinc sulfate. A single application during the period between mid-July and mid-August is recommended. If the fungicide used for regular blight sprays contains zinc, this by itself should overcome any zinc deficiencies. Check with your chemical dealer if in doubt about the zinc content of your fungicide.

For further information on nutrient management contact a Nutrient Management specialist from the PEI Department of Agriculture at (902) 316-1600.

(Revised April 2014)