Tiger 90CR:

Influence of Tiger 90 Sulphur on Potato Scab

Common scab of potatoes is decreased as soil pH is reduced

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"As early as 1897 Wheeler and Adams demonstrated that applications of elemental sulphur (S) to soil would control potato scab"[1]. It appears that the mechanism for control comes from the reduction in soil pH. Elemental sulphur products such as degradable Tiger 90CR can aid in reducing the infection levels of common scab caused by the *(Streptomyces scabies*) in prairie soils.

S. Scabies infects potato lenticels, the natural pores in tuber skin, during tuber initiation. The surface of the tuber is affected, and lesions appear as eruptions, deep pits, or superficial layers of corky tissue[2]. Disease incidence and severity generally rises as pH increases.

Mechanism of disease reduction

Studies indicate that the influence of disease suppression is due to a reduction of soil pH. This soil pH reduction occurs naturally as elemental sulphur (ES) is oxidized by soil micro-organisms. As sulphur oxidizes it passes through several phases including production of sulphuric acid which reduces soil pH.

Nitrogen fertilizers can also result in a decrease soil pH due to a release of hydrogen (H) ions as the ammonium is converted to nitrate or as ammonia is released. Caution must be taken when applying high levels of nitrogen in the tuber zone.

Note: When Ca is added to the soil as calcium carbonate ($CaCO_3$) (Limestone or marl) the incidence and severity of potato scab is increased in proportion to the increase in soil pH[3].

Tiger 90CR (0-0-0-90) can be used to combat common scab

Tiger 90CR sulphur is a degradable form of sulphur which breakdowns rapidly allowing for increased oxidization of sulphur as compared to straight elemental sulphurs[4] that oxidize very slowly and produce little or no sulphuric acid. Tiger 90CR sulphur features a very low salt index so high levels can be applied during potato production[5] either as a broadcast application or blended and placed with phosphate fertilizer as part of the starter program.

Tiger 90CR Sulphur degrades into a finely divided powder that begins to oxidize soon after application, reducing the soil pH.

Tiger 90CR Sulphur has no ammonia or salt effect, and is safer to use in close proximity with potato production.

How Tiger 90CR sulphur can be used as a soil amendment:

As Tiger 90CR breaks down and is converted from elemental sulphur to plant available sulphate, sulphuric acid is released. The sulphuric acid will then react with the free lime in the soil creating carbonic acid and gypsum. The gypsum created by the oxidation of Tiger 90CR Sulphur will help with the flocculation of the soil.

Soil flocculation is caused by the Calcium, from the gypsum, and the clay colloid interacting in a cation exchange reaction in which the positively charged calcium ions will adhere to the negatively charged clay colloid. Thus giving the soil more tilth and reduce the soil crusting.

Along with the softening of the soil, Tiger 90CR will also help to reduce the salting problem associated with calcareous soils. Calcium will kickoff sodium from the clay colloid and into the soil solution where it can be leached out.

The benefits to using Tiger 90CR sulphur as a soil amendment are as follows:

1. Release of Phosphate and micronutrients
2. Forms gypsum
3. Less crusting
4. Faster water penetration
5. Faster water runoff
6. Removes sodium
7. Better aeration of soil

Tiger 90CR sulphur effect on soil pH depends on soil Type.

Approximate pounds of S (based on 99% S) needed to lower soil pH of one acre-foot of soil.

Pounds of Sulphur required per acre.			
Change in pH	Sand	Loam	Clay
8.5 - 6.5	3500	4375	5250
8.0 - 6.5	2450	2625	3500
7.5 - 6.5	875	1400	1750
7.0 - 6.5	175	275	525
Source: John P. Taberna, Soil Scientist, Parma Idaho			

Tiger 90CR Sulphur Vs. other Soil Amendment materials

Tiger 90CR, because of its improved breakdown and quicker sulphate conversion (thus quicker sulphuric acid conversion) will make an effective soil amendment, in soil with free lime present above 1.0%. The following chart* shows the type of soil amendment used and the amount to drop the pH in equivalent amounts.

Amendment Material	Equivalent Amounts
Tiger 90CR Sulphur	1000
Gypsum	5400
Sulphuric Acid (98%)	3060
Ammonium Sulphate	4120
Ammonium Thiosulphate	3850
Source : Stokenholtz Laboratory Manual	

[1]Management of Common Scab of Potato with Plant Nutrients, A. Keinath and R. Loria, Cornell University
[2]Potato Field Manual, J.R. Simplot Co., K. Campbell.
[3]Management of Common Scab of Potato with Plant Nutrients, A. Keinath and R. Loria, Cornell University.
[4]Soil Column Study Evaluating Sulphur Conversion and Leaching, Dr J. Smith, J.R. Simplot Co.
[5]Potato Country, Production Sense, Select Fertilizer Formulations Carefully, S. Holland.

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