

Sulphur's Role in Crop Production

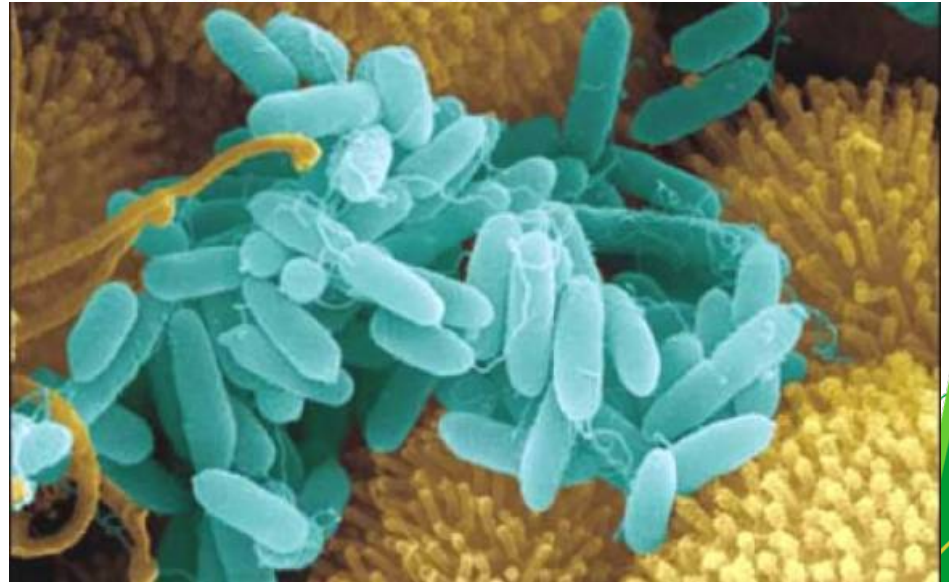
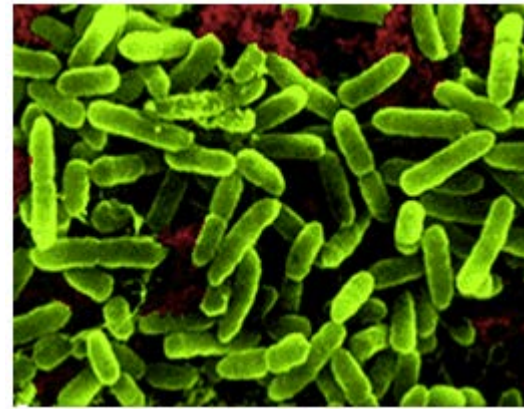
Soil Nutrition and Plant Fertility Symposium
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Presented by
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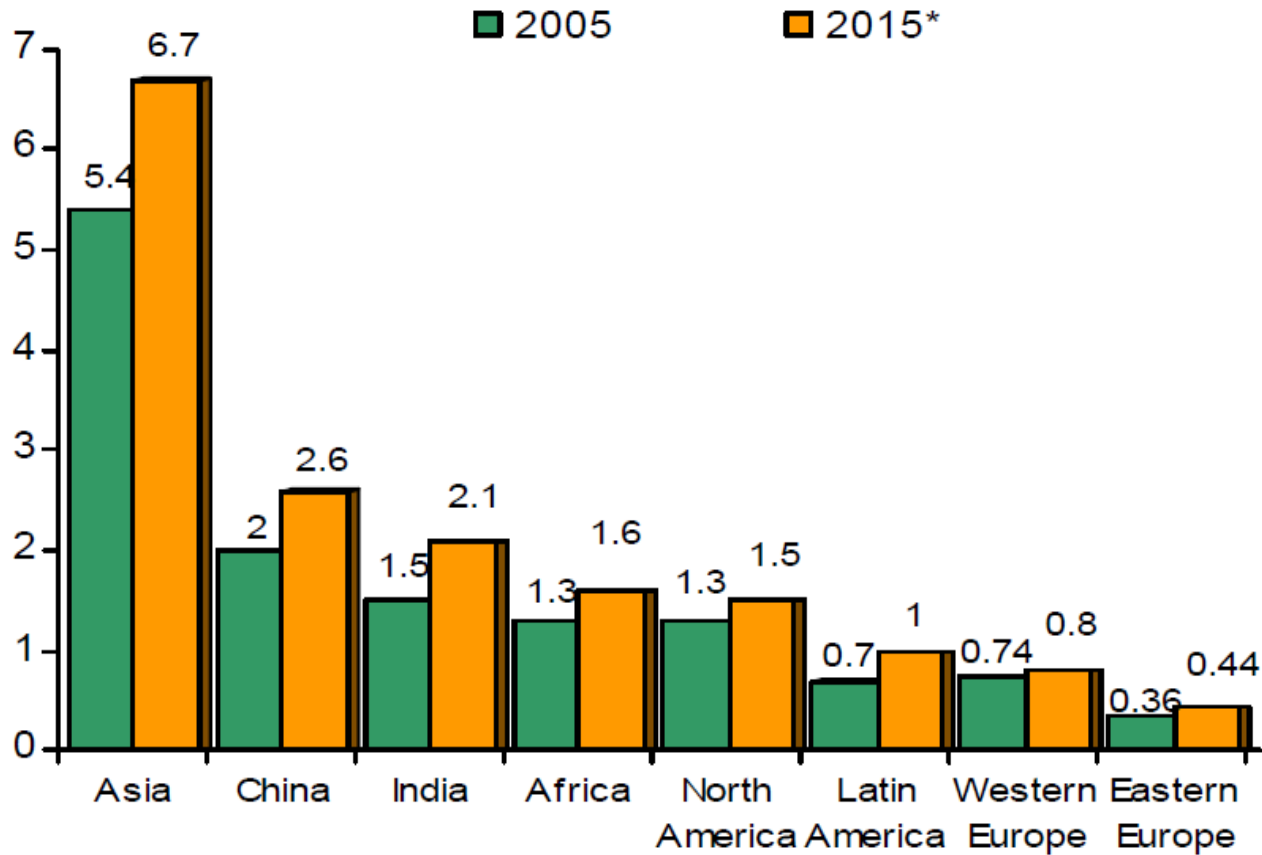
Nature's sulphuric acid plants



Can we use S as an indicator of the health of nutrition in the agricultural sector?

- Sulphur balance sheet
- Soil status
- Crop disease

1. Sulphur balance sheet



Source: TSI

2: Soil status

- Parent material
- Soil organic content
- Management practices



3: Crop disease

Are we contributing to increased disease pressure?

- Sulphur Induced Resistance



Trophobiosis

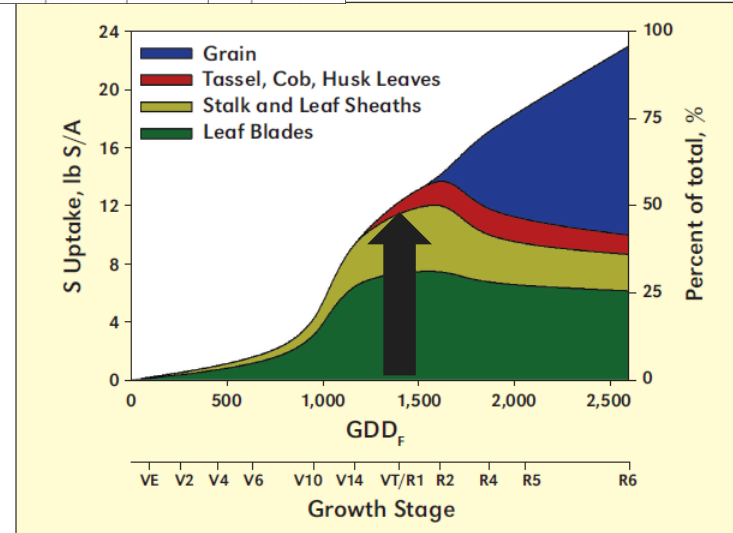
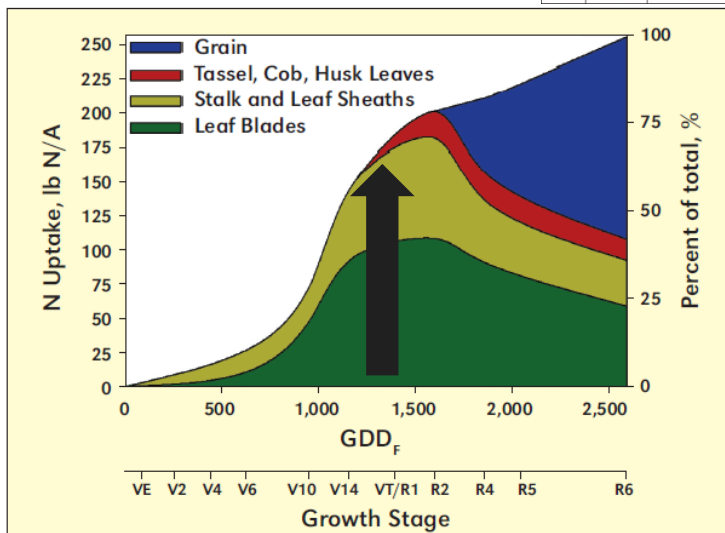
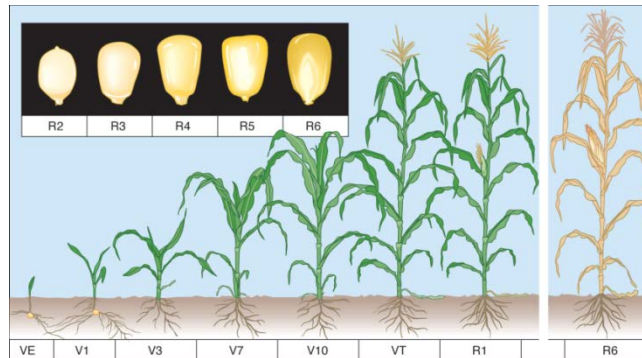
- “Plant are made immune to the extent that they lack the nutritional factors that parasites require for their development”

Francis Chaboussou, Healthy Crops, A New Agricultural Revolution, 2004



Codling moth (*Cydia pomonella*)

Sulphur uptake pattern



Total maize N and S uptake and partitioning across four plant stover fractions: leaf, stalk, reproductive, and grain tissues. Each value is a mean of six hybrids across two site-years at Urbana, IL (2010) and DeKalb, IL (2010).

GGDF = growing degree days (Fahrenheit)

Bender et.al. Better Crops/Vol. 97 (2013, No. 1)

Sulphur fertilisers

- Sulphates
- Thiosulphates
- Elemental S

- 4R's Stewardship Programme - IPNI
 - Right Type
 - Right Place
 - Right Time
 - Right Rate



Sulphates

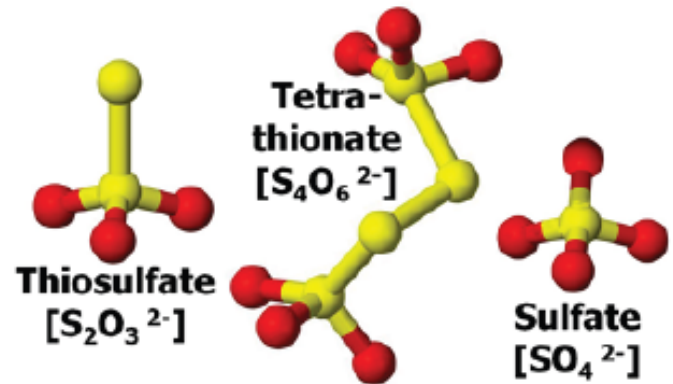
	Benefits	Drawbacks
Single superphosphate (0-5-0-11)	Simple manufacturing Cost Supply of Ca and P	Low analysis
Gypsum (0-0-0-24)	Widely available Source of S and Ca Removes Na ions	Low solubility Difficult to apply High rates to get S
Ammonium sulphate (21-0-0-24)	Widely available Cost High analysis Ease of blending	Fixed N to S ratio Strongly acidifying High salt index

Thiosulphates

- A versatile liquid sulphur fertiliser

Cation	
Ammonium	12-0-0-16
Potassium	0-0-20-17
Calcium	0-0-0-10 6Ca
Magnesium	0-0-0-10 4Mg

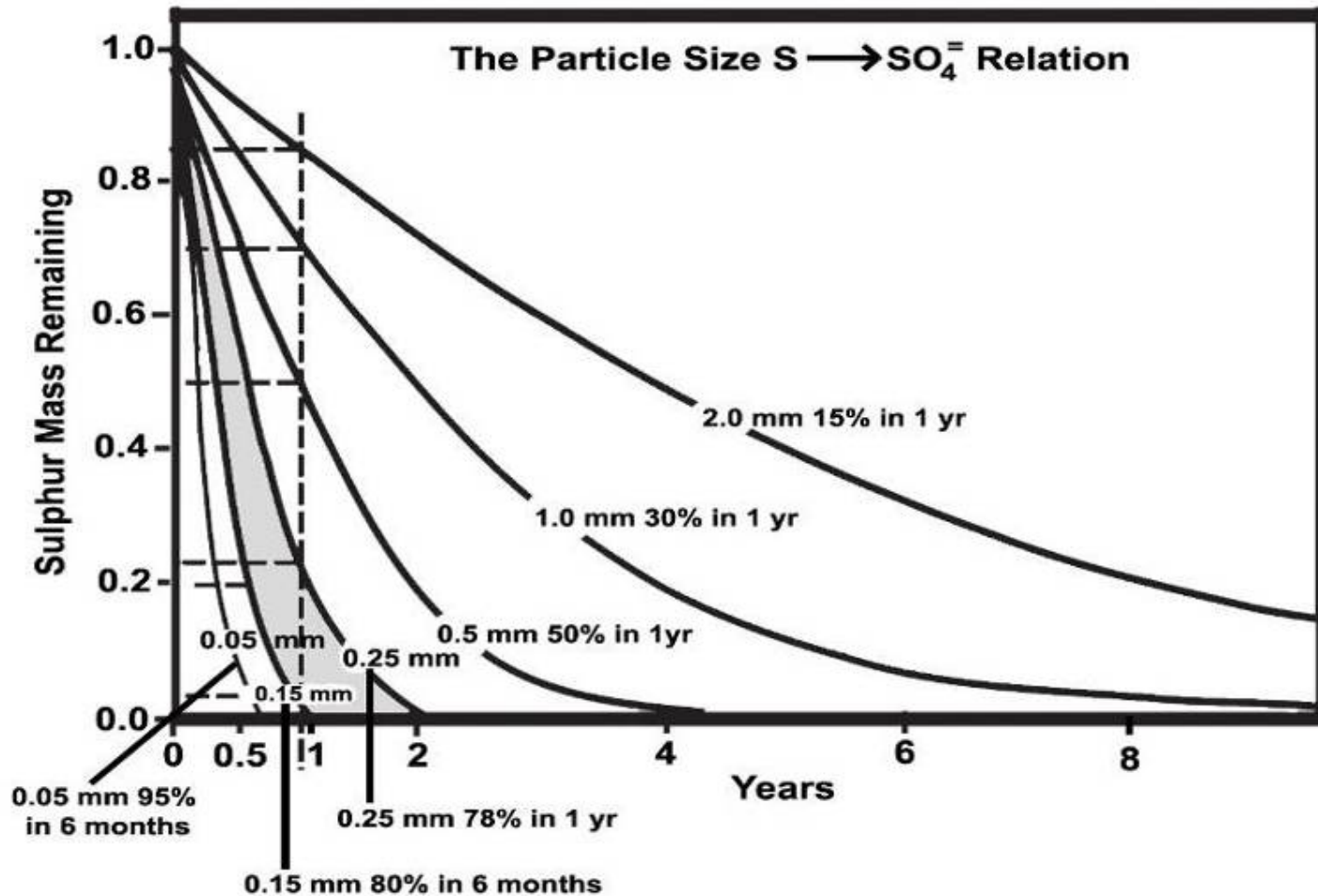
- Near neutral pH
- Compatible with other liquid fertilisers
- Urease and nitrification inhibitor



Elemental sulphur

- The key factors in S^0 oxidation to sulphate:
 - Thiobacillus population
 - Temperature
 - Oxygen
 - Moisture
 - Particle size

S⁰ particle size effect



Applying the 4R's

	Ammonium sulphate	Thiosulphate	Elemental S
Timing	Before and after seeding	Before crop emergence	Before planting
Placement	Broadcast, incorporation and foliar	Broadcast irrigation and drip	Broadcast and incorporation
Rate	Multiple applications – crop specific	Longer term availability – crop specific	Long term availability – crop specific
Caution	Leaching Seed damage if too close	Do not mix with acidic products (SO ₂ release), ATS not to be foliar applied	Low salt index, but banding not recommended due to slow conversion rate

Conclusions

- S - as a barometer of 'health' of agriculture sector
- S - crop health
- S management using the 4R Nutrient Stewardship Principles