



Improve Crop Vigour, Yield and Quality with the use of a Newly Developed, Completely Water Soluble Sulphur Product.

Although Sulphur is an important macro-element and is known to be an **essential** element for plant growth and development, the analysis and addition of sulphur to soils in South Africa has been ignored for a long time. The importance of sulphur and its role in sustainable agriculture are generally not being considered by agronomists and soil scientists because they are of the opinion that “there is enough in the soil” or “that sulphur leaches out so quickly that it is not even important to analyse for it”. Agrilibrium has invested a lot of time and effort to develop a new high concentration water soluble sulphur product to address analysed and measured crop needs and commonly found soil sulphur deficiencies.

Sulphur-containing amino acids, methionine and cysteine, are essential for production of proteins in plants and are very important in the general metabolism of all living organisms. Without these amino acids a plant will not be able to produce the optimum yield required and quality characteristics like colour, aroma and shelf life will be impeded. Soil and 1:2 water extract analysis in South Africa has shown that in more than 90% of cases, sulphur is deficient to almost absent and these results always correlate with low yields and poor quality. This range includes grain and oil crops, export fruit, wine and vegetables. Furthermore the commonly occurring imbalances between phosphorus and sulphur in South African soils, with phosphorous usually much higher than sulphur in agricultural soils, are of great concern. The reason for the concern is that all 2+ cations are being bound to PO_4^{2-} to become **insoluble** and unavailable for plant root uptake. Contrary to the above, all 2+ cations associated with SO_4^{2-} are **soluble** and thus available for utilization by crops.

Greenhouse trials on 5 crops (cabbage, onions, maize were done to demonstrate that crop sulphur deficiencies and imbalances can be treated with a soil application of the water soluble and crop available sulphur product, **DynoSulf**.

Greenhouse trial treatments:

Crop	Number of Pots	Treatment 1: DynoSulf	Treatment 2: Urea	Control	Repetitions
Cabbage	4	1.5% Foliar application; 1.5% Soil Treatment	Equivalent N to match N content in DynoSulf	Untreated	3
Onions	4			Untreated	3
Maize	4		-	Untreated	3
Wheat	4		-	Untreated	3
Canola	4		-	Untreated	3

DynoSulf is a water soluble Phyto-fulvate complexed high concentration liquid sulphur (S) product with a low nitrogen to sulphur ratio (S 20.8%, N 9.6% w/v). The product was tested in greenhouse trials to determine its efficacy as water soluble and therefore a root uptakeable sulphur source applied as both soil and foliar treatments. Results have shown that the soil treatment outperforms a foliar treatment by far and only soil treatment results are shown (see complete results on www.agrilibrium.co.za).

Measurements:

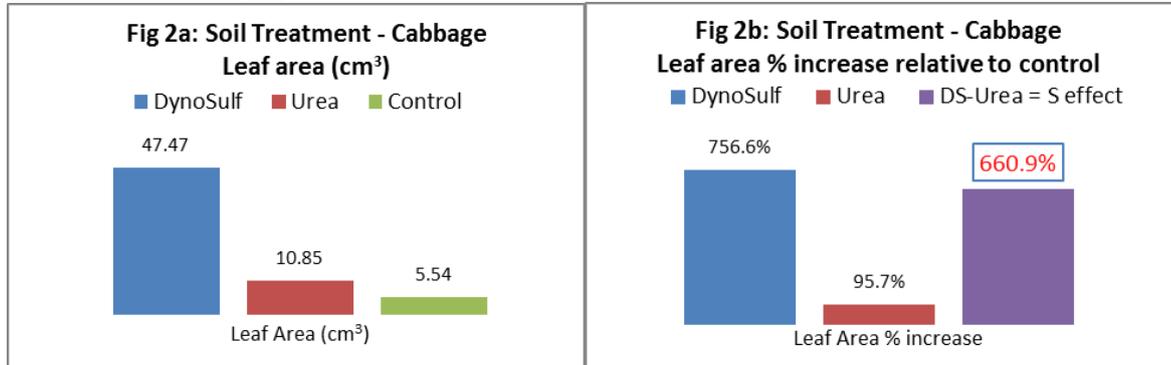
1. Chlorophyll (SPAD meter).
2. To quantify growth/yield, plants were harvested 4/5 weeks after planting and the following measurements were done:
 - a. Leaf area

- b. Fresh and dry mass(drying for 24 hours at 80°C) of top growth and roots separately
- c. Leaf analysis of plant material (Bemlab, Somerset West) for macro and micro nutrients.

Results and Discussion

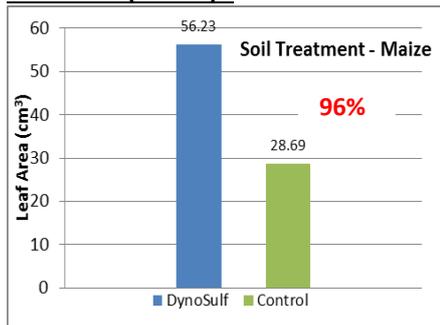
In all data the contribution of nitrogen in DynoSulf is quantified separately with the Urea treatment and subtracted from the initial DynoSulf result to establish the net- effect of sulphur: DynoSulf (DS – Urea= S effect).

1. Leaf area (cabbage):

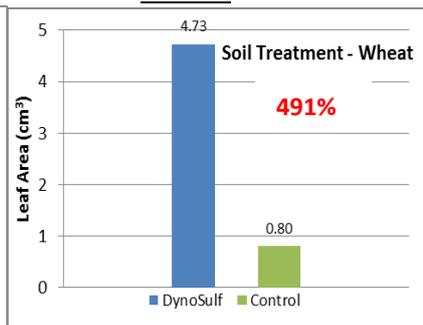


The massively improved leaf area (Fig's 2a and b and the 3 graphs below) and higher chlorophyll content (Fig's below) of the treated plants have a great influence on the plant's ability to photosynthesize optimally which affects plant mass and yield directly.

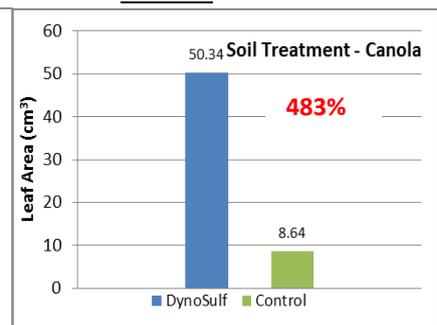
Leaf area (Maize):



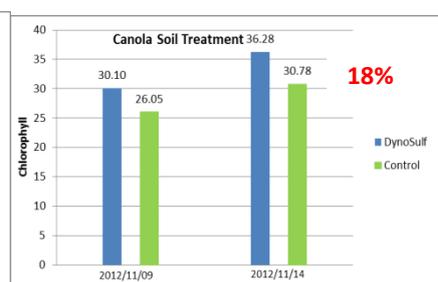
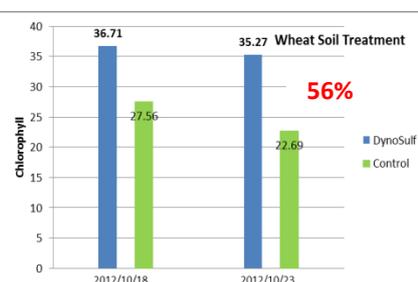
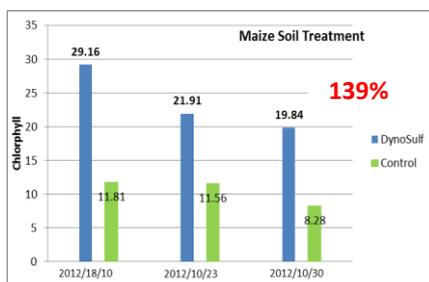
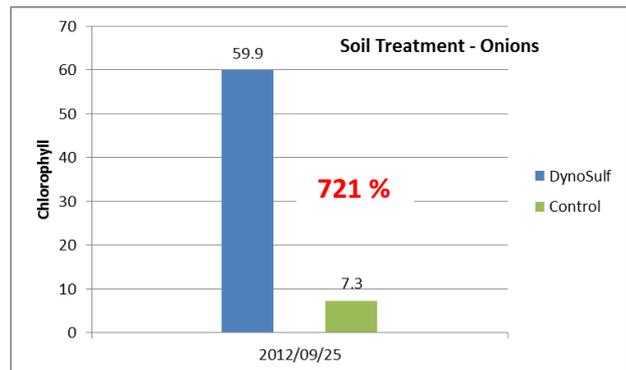
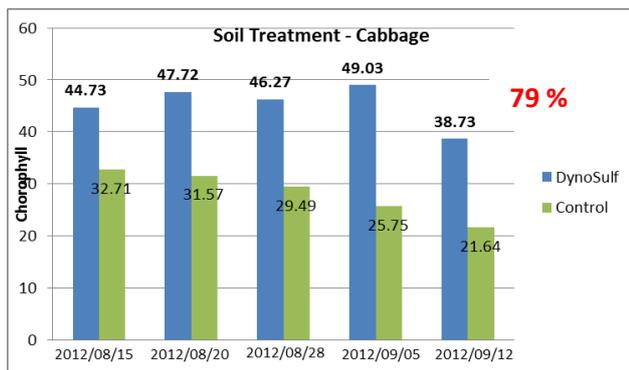
Wheat:



Canola:



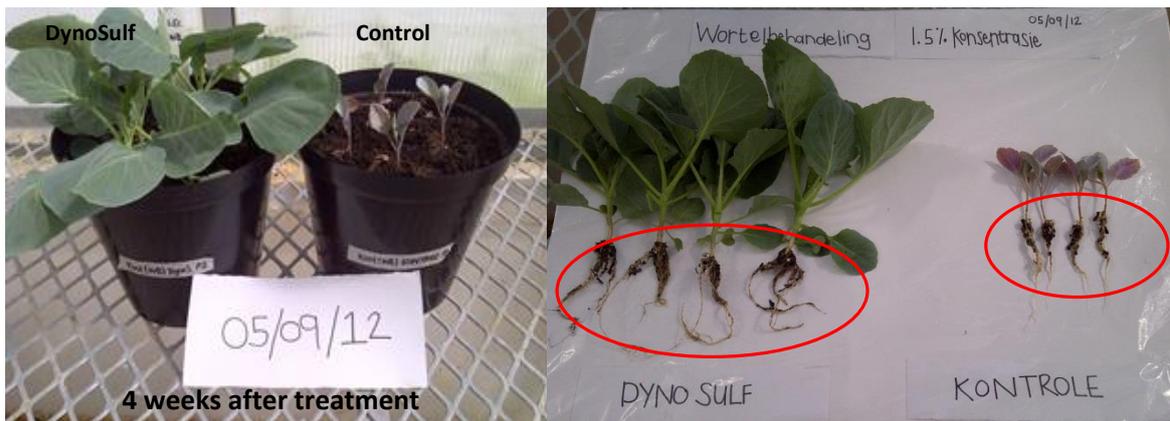
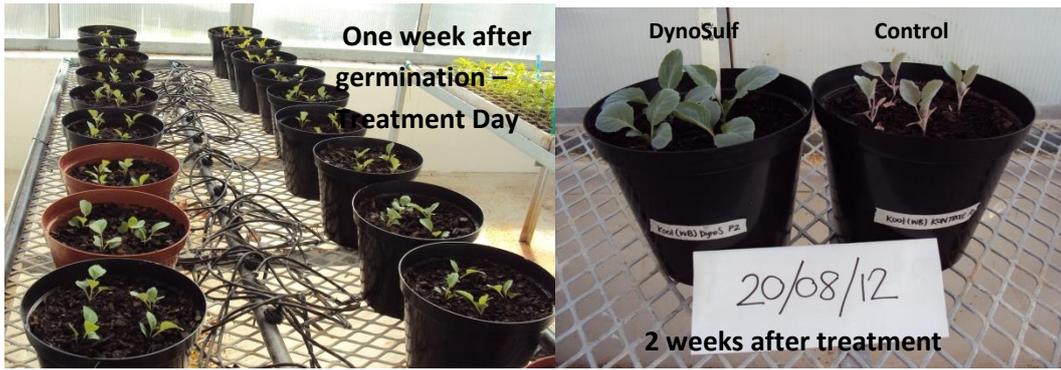
2. Chlorophyll content:



3. Growth:

Significant enhanced growth of cabbage seedlings can be seen as illustrated in the photographs below.

Cabbage soil treatment:



Note purple phosphorous deficiency symptom in control plants compared to sulphur treated showing the effect of DynoSulf on availability of water soluble nutrients (in this case phosphorous) in the root zone.

Onion soil treatment: Note the distinct colour difference between the treatment and the control.



Maize soil treatment:



Two weeks after treatment

Wheat soil treatment:



Canola soil treatment:



Three weeks after treatment

Maize



Wheat



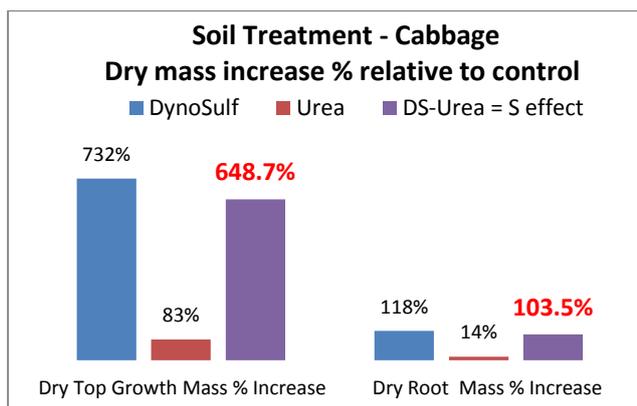
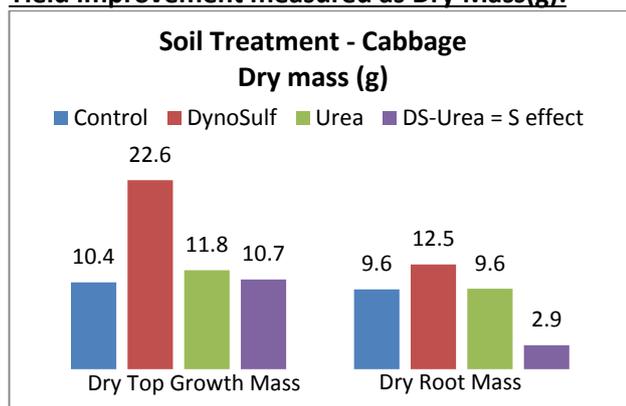
Canola



4. Increase in plant mass/yield:

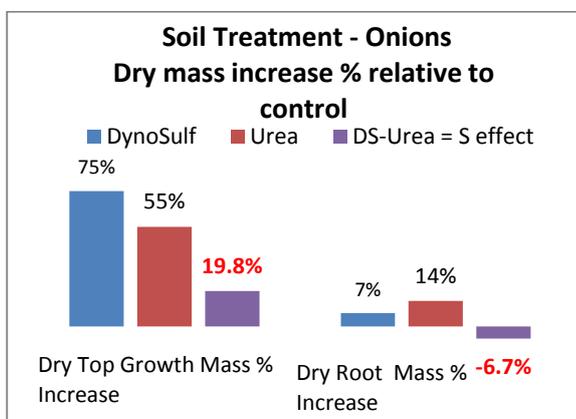
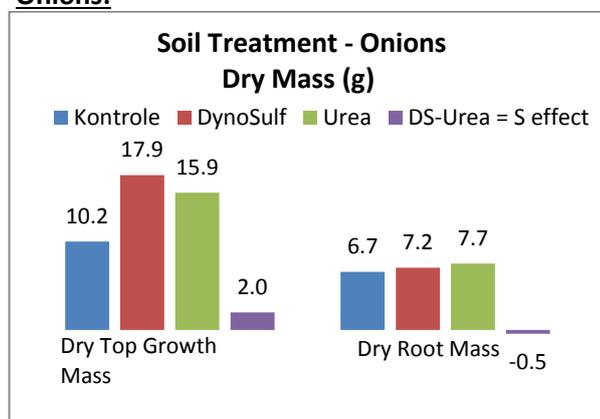
An increase in readily available nutrients in the soil water solution during the growth period resulted in enhanced growth. The result was a higher mass of wet and dry plant material for both top and root growth.

Yield improvement measured as Dry Mass(g):



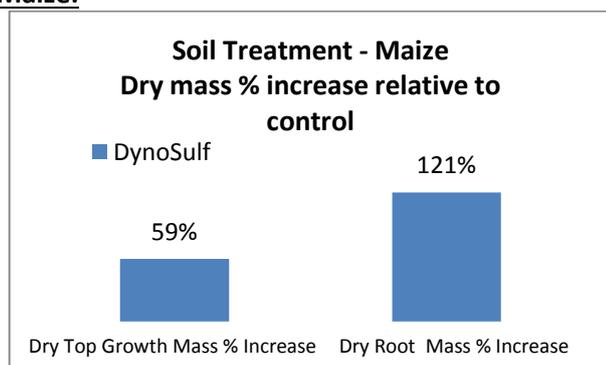
The marked effect on growth of the **DynoSulf** soil treatment (Fig's above) is again very obvious. Note the 648 % improvement relative to the control in terms of top growth dry mass.

Onions:

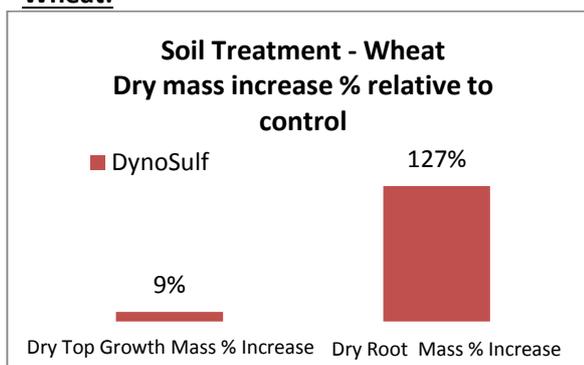


A similar trend as for cabbage in response to a soil treatment with **DynoSulf** can be observed for top growth in onions. See graphs above.

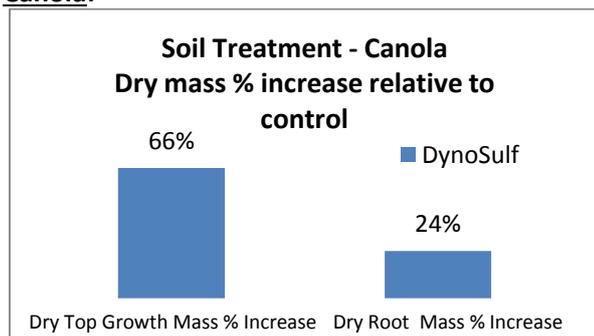
Maize:



Wheat:



Canola:

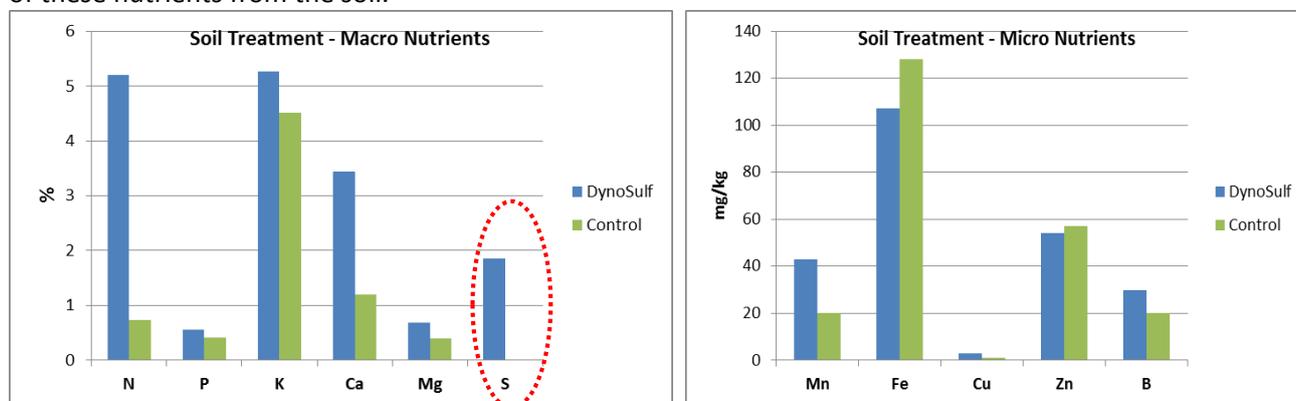


The growth enhancing effect of a soil treatment with **DynoSulf** is also very clear in the case of maize, wheat and canola as shown in the graphs above and to the left.

5. Increase in nutrient availability resulted in better growth.

Leaf Analysis: Cabbage

Leaf analysis of cabbage plants from **DynoSulf** treatments compared to controls show a definite increase in macro mineral nutrient content as well as for micro nutrients (graphs below). This suggests that the enhancement of growth is also linked to the effect of this specific sulphur formulation on availability and uptake of these nutrients from the soil.



Leaf Analysis: Onions

Since the volume of leaf material for the controls were not sufficient, leaf analysis was not possible with onions.

Conclusions:

From the trial results it is clear that the use of **DynoSulf** as treatment to supply water soluble and root uptakeable sulphur, the product is very efficient in supplying this deficient nutrient. It had a significant impact on growth, colour and photosynthetic capacity in terms of chlorophyll and leaf area. This resulted in an increase in dry matter material and mineral nutrient content which is extremely important in Agrilibrum's drive and effort to improve the nutritional value of food crops to consumers.

The efficiency of **DynoSulf** can be attributed to the specific components in the product:

- A high concentration of Phyto-fulvic acid and readily available high concentration of water soluble sulphur,
- The Phyto-fulvic acid has the ability to neutralize the electrical charges of cations and anions to prevent these normally charged inorganic elements from binding to each other and form **insoluble** compounds which are not available for plant uptake.
- The high surface tension breaking capacity and improved wetting properties of the Phyto-fulvic acid (see test results in FulMax document on www.agrilibrum.co.za) ensures that nutrients are evenly spread and concentrated in the root zone of the plant for efficient uptake and utilization.
- Balancing the ratio of phosphorous to sulphur significantly improves the plant available water soluble mineral nutrient content in soil, therefore utilizing applied nutrients more efficiently and cost effectively.