Greenhouse Trial – The effect of liquid Fulvic acid (LiquiCompost) applied as a soil amendment on maize plant growth.

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Introduction

LiquiCompost is a wood extracted phytofulvic acid chelated carbon(C), nitrogen (N), phosphorous (P) and potassium (K), macro and micro-nutrient product that is totally soluble in water. The nutrients are in solution and can be taken up by the roots when applied to the soil as well as through the leaf surface when used as a foliar spray. It has strong chelating characteristics and neutralizes ionic charges of mineral nutrients to assist in the management and prevention of insoluble phosphate salts forming in the soil. At sufficient concentrations this fulvic acid maintains the minerals in a water soluble form in the soil solution for effective uptake and utilization. This phytofulvic acid used in LiquiCompost also has strong wetter/spreader and re-wetter characteristics due to its hygroscopic (water loving) nature. The wetting capacity is directly related to its water dispersing qualities (soapiness) to break the surface tension of water. Where the surface tension of water is 70.5 milliNewton/meter measured with the du Noüy surface tension apparatus, the value for LiquiCompost is 49.4 mN/m. This has a marked effect on improving soil penetration, wetting, structure and nutrient charge neutralization. Fulvic acid molecules have the ability to neutralize cations and anions and therefore enhance nutrient availability and uptake by the plant.

Motivation for doing the trial

To determine the effect of phytofulvic acid as a soil amendment on plant growth as well as to create a dosage response curve to determine the optimum application concentration.

Treatment

LiquiCompost was applied as a soil amendment at different concentrations to determine the optimal concentration for the highest efficiency. The trial was split into two parts. In the first part of the trial plants were treated with a solution containing only the macro- and micro nutrients as per the product analysis and specification. In the second part, plants were treated with a solution containing phytofulvic acid plus the macro- and micro nutrients to determine the absolute effect of the fulvic acid alone.

Crop	Treatment	Application	Control	Repetition
Maize	LiquiCompost + Fulvic acid	15ℓ/ha, 20ℓ/ha, 30ℓ/ha, 40ℓ/ha	Untreated	3
Maize	LiquiCompost - Fulvic Acid	15ℓ/ha, 20ℓ/ha, 30ℓ/ha, 40ℓ/ha	Untreated	3

LiquiCompost contains 18% Phytofulvic acid and is enriched with macro- and micro nutrients.

Composition:

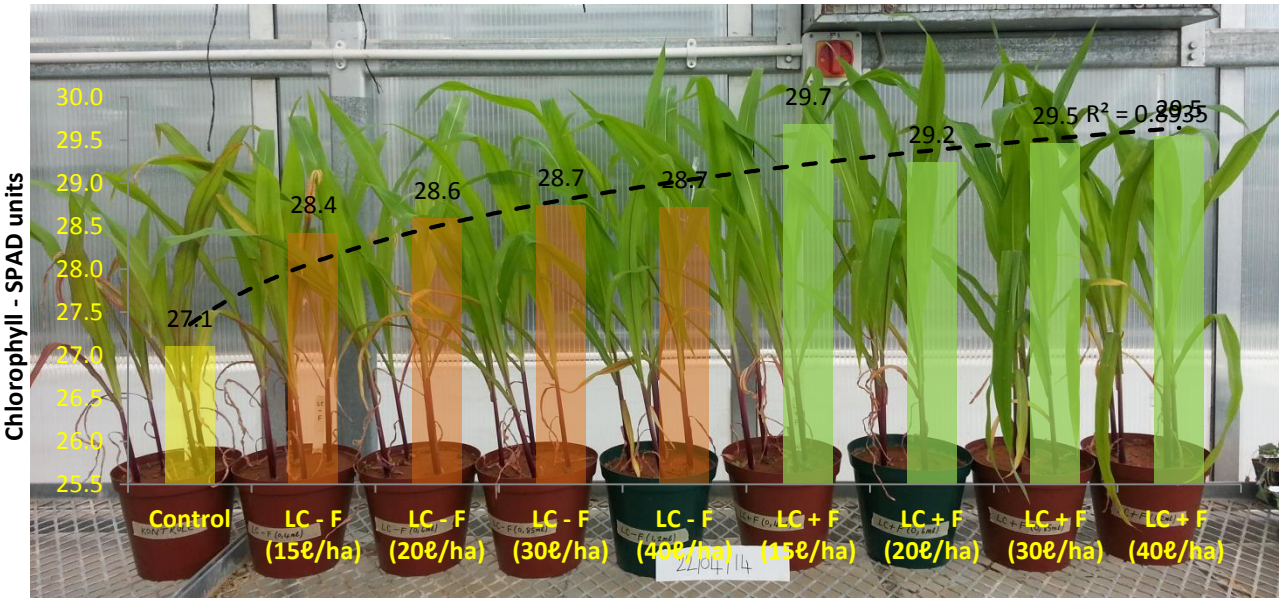
Nitrogen (N)	10 g/kg	Manganese (Mn)	53 mg/kg
Phosphorous (P)	3 g/kg	Copper (Cu)	41 mg/kg
Potassium (K)	6 g/kg	Boron (B)	188 mg/kg
Zinc (Zn)	100 mg/kg	Molybdenum (Mo)	128 mg/kg
Iron (Fe)	82 mg/kg	Fulvic Acid	18%

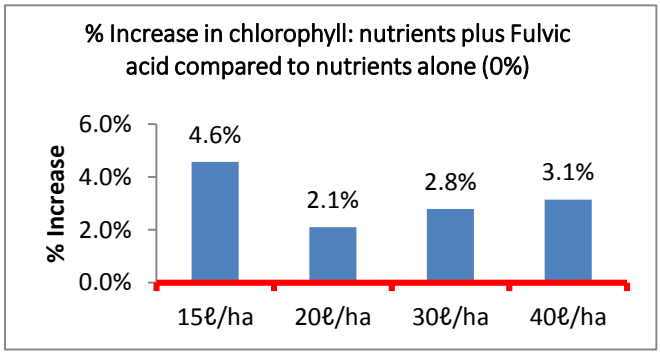
LC - F : Nutrients alone without fulvic acid.
LC + F : Fulvic acid product containing the same nutrient content as above.

Results

Increase in chlorophyll content.

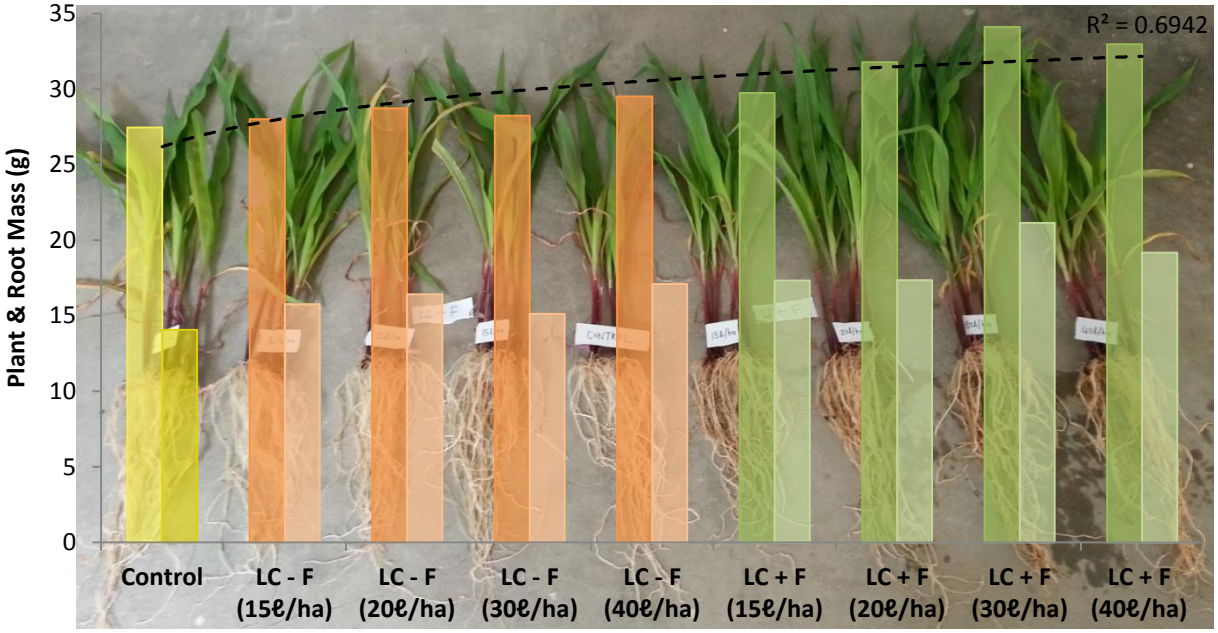
The higher chlorophyll content in the treated plants has a direct effect on the plant's ability to photosynthesize optimally and will affect the plant mass and production directly.

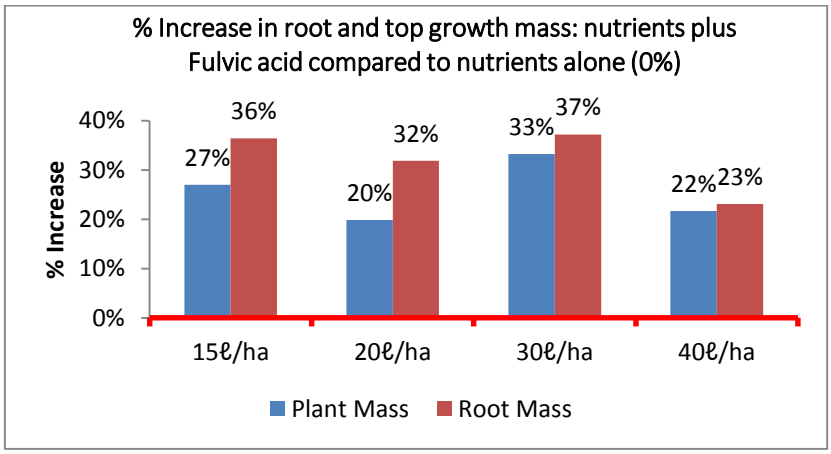




Improved growth.

Enchanced top and root growth are clearly visible as illustrated in the photograph below. Fulvic acid treatments showed better growth compared to nutrient solutions alone. Between 30 and 40ℓ/ha a reaction plataeu was observed. It is therefore recommended that soil applications rates of LiquiCompost not to exceed a concentration of 40ℓ/ha at any one time. Note the darker colour of the fulvic acid treated roots.





Conclusions

The application of LiquiCompost resulted in enhanced plant growth and chlorophyll content which ultimately will contribute to better yield and quality. Ideally LiquiCompost should be applied with each fertilizer application and preferably with water soluble fertilizers and added after dissolving the fertilizers in water. Fulvic acid ions have the ability to neutralize cations and anions and therefore enhance nutrient availability and uptake by the plant. LiquiCompost acts as a temporaty buffer to prevent soil chemical interaction of opposing ions which is specifically important in the reactions between dications and the negatively charged phosphate anion that will result in insoluble phosphate molecules and once in this form it is poorly available for utilization by crops.

The enhanced efficiency of LiquiCompost compared to mineral nutrients alone can therefore specifically be attributed to the high concentration of Phytofulvic acid (18.9%).

LiquiCompost can therefore be defined as a water soluble mineral nutrient phytofulvic acid chelated product that will improve nutrient use efficiency when used as a soil amendment product in conjunction with soluble fertilizers.