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Efficacy of humic-fulvic plus chelate micronutrients on Pechay (*Brassica rapa*)

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Introduction

The need for the agriculture industry to explore new ways of fertilizing the plants continue, and with the need of developing new blends with microelements that will meet crop requirement. The humic-fulvic acids are being tapped as naturally occurring ligands or chelators for their effectivity in various pH ranges. These are organic substances made up of nitrogenous complexes comprising decayed amino acid and aromatic complexes that indirectly affect soil aggregation as it holds ionized salts preventing leaching. The objectives of this efficacy test were to (1) generate parametric data (2) ascertain efficacy in two seasons for product registration.

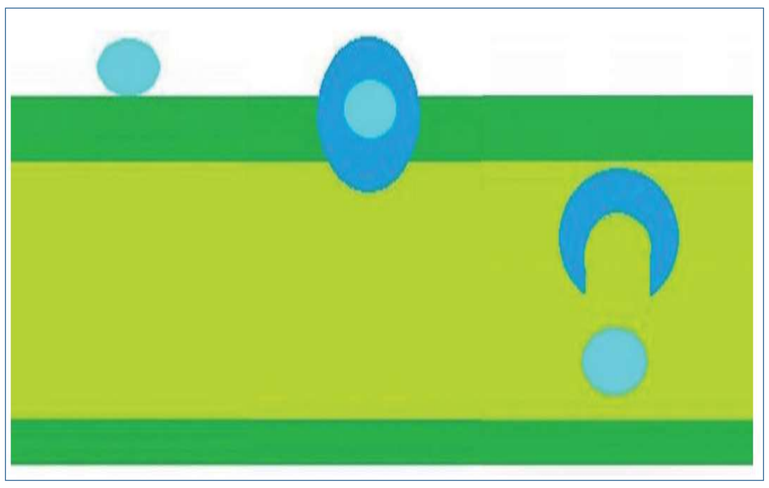

Figure 1: Chelated micronutrients color key: aqua=micronutrient ion; blue=organic ligand; dark green= wax layers on leaves; light green=mesophyll (Fullerton, 2004 as cited in Liu et al., 2022)

Methodology

The study was conducted in a mid-high tunnel, drip irrigated plastic mulched garden beds in a sandy loam soil in two seasons. Wet season study was from December 2022 to February 2023, with an average rainfall of 1.53 mm, minimum 24.77 ^{o}C, maximum 29.26 ^{o}C in temperature.While dry season was from April to May 2023 with an average rainfall of 2.24 mm, minimum 25.00 ^{o}C, maximum 30.87 ^{o}C in temperature.The experiment was conducted in Randomized Complete Block Design with six treatments, replicated four times. The treatments were as follows:

T1 - Control

T2 – 226-47-0 kg ha^{-1} of NPK

T3 – 226-47-0 kg ha^{-1} of NPK + 2.25 kg ha^{-1} humic-fulvic plus chelate micronutrients

T4 – 226-47-0 kg ha^{-1} of NPK + 4.50 kg ha^{-1} of humic-fulvic plus chelate micronutrients

T5 –226-47-0 kg ha^{-1} of NPK + 6.75 kg ha^{-1} humic-fulvic plus chelate micronutrients

T6 – 4.50 kg ha^{-1} of humic-fulvic plus chelate micronutrients

Table 1: Soil analysis result.

Site	Soil Texture	pH	% O.M	ppm P	ppm K	ppm Ca	ppm Mg
1	sandy loam	5.0	2.25	6	83	569	11

The method of application was both foliar and soil targeted hydration in the wet season, while only soil targeted hydration on the dry season, as crops exhibit phytotoxicity among plots with inorganic fertilization in the wet season experiment.

Table 2: Fertilization schedule (and amount) for the wet and dry season experiment in Hda. Carmen, Brgy Granada, Bacolod City, Negros Occidental.

Treatments	0 DAT	7 DAT	14 DAT	21 DAT
T1 (Control)	-	-	-	-
T2 (226-47-0) 46-0-0 18-46-0	- 200 g 100 g	- - -	- 246 g -	- - -
T3 (226-47-0) 46-0-0 18-46-0 $^{1}/_{2}$ product	 200 g 100 g 2.25 g	 - - 2.25 g	 246 g 2.25 g	 - - 2.25 g
T4 (226-47-0) 46-0-0 18-46-0 full product	 200 g 100 g 4.50 g	 - - 4.50 g	 246 g - 4.50 g	 - - 4.50 g
T5 (226-47-0) 46-0-0 18-46-0 $1^{1}/_{2}$ product	 200 g 100 g 7.75 g	 - - 7.75 g	 246 g - 7.75 g	 - - 7.75 g
T6 Full product	4.50 g	4.50g	4.50 g	4.50 g

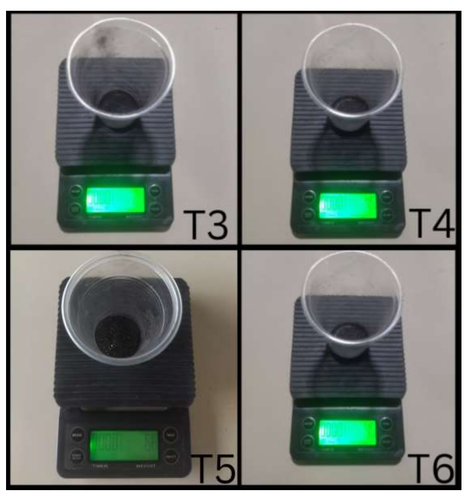

Figure 2: Humic-fulvic plus chelate micronutrients.

Results and Discussion

The wet season experiment was highly significant in parametric data: leaf size, number of leaves, plot yield and yield (tons ha^{1-}). Dry season experiment was highly significant in most parametric data, except leaf size (cm). Significant season effect (p=0.0001), where dry season had 52% better in yield. Pooled treatment effects(P<0.0001) highlights 4.50 kg ha^{-1} , 6.75 kg ha^{-1}, 2.25 kg ha^{-1} with inorganic fertilization to double the yield (52%-55%) than the control. Highly significant season*treatment effect (P<0.0001), directed towards the dry season, highest by 226-47-0 + 4.50 kg ha^{-1}.

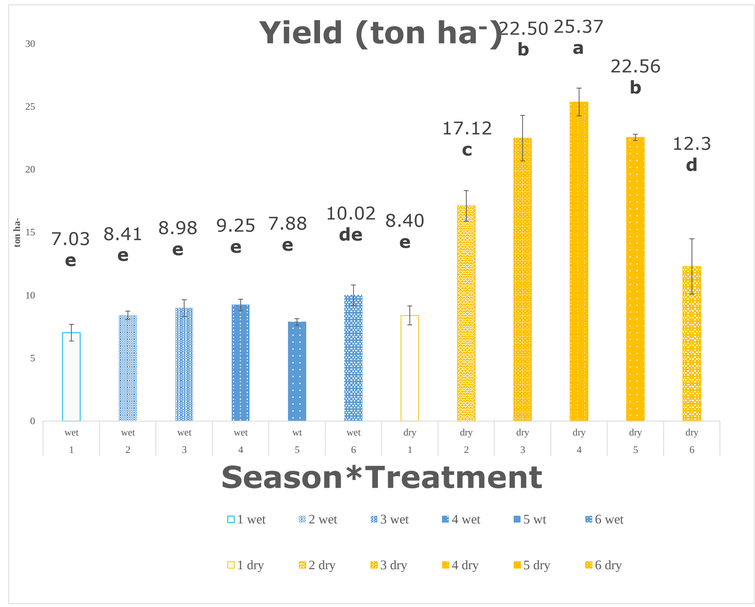

Figure 3: Nested ANOVA season * treatment; p=0.0001; means with the same letter are not significantly different according to DMRT; n=4.

Chelating potential and stability of humic fulvic acids plus chelate micronutrients depends on the concentration of the other ions, pH, water and availability of nitrates for the utilization by the ligands for plant uptake of the biovailable and photocatalyst plant nutrients (Jones, 2012; Hasegawa, 2023; Jastrzebska et. al, 2023).

Conclusions

Replinish nitrates for the use of the ligands through regenerative practices.

References

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