

Horticulture Research Institute
"Liliana DIMITROVA "

Ministry of Agriculture (MINAG)

TECHNICAL REPORT: VALIDATION FOR THE CENTRAL FERTILIZER REGISTRY
(RCF)

Agronomic evaluation of IHO -AGRO MINERAL on green pepper crops
(*Capsicum annum L.*) and gladiolus (*Gladiolus spp .*)

Summary of Results by IHO-Agro International Inc.



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INTRODUCTION

In order to include it in the Registry of Fertilizers of the Republic of Cuba, tests were conducted on crops of agricultural importance (pepper and gladiolus) at the Horticultural Research Institute "Liliana Dimitrova "(IIHLD), to determine the agronomic effectiveness of IHO-Mineral.

In both crops a dose of 425 ml of IHO Mineral / 100 L H₂O was applied in foliar spraying, with a frequency of 3 applications, starting with the 15-th day after planting. For peppers ground and foliar + ground application was tested.

This document includes the highlights of results.

Summary of Results - Peppers

Methods:

The research was conducted under production conditions.

IHO Mineral was used as a complement to the normal fertilization.

Normal fertilization was applied to test and control groups.

Statgraphics version 5.0 (SGC USA , 2000) was used on analysis of results.

To evaluate the economic results the methodology proposed by FAO (1984) was used.

RESULTS AND INTERPRETATION

Plant height: IHO-Agro Mineral Foliar application and foliar + soil showed significant increases in the growth variable, assessed at 60 days (beginning of harvest).The calculated plant height increase of 24.61- 28.11 % compared to the control group.

Stem diameter 60 days after transplant, in particular through the first internode showed similar trends found for plant height; the highest values were quantified when IHO-Agro Mineral was applied foliar and foliar + soil.

The relative chlorophyll content, expressed in SPAD units, was significantly higher in the group that received IHO-Agro Mineral foliar and soil + foliar both in the lower leaves, as well as the in the top leaves.

During the growing season a generalized deficiency of Mg was observed in all groups. Phonological observations showed that this deficiency was less severe in the plants treated with of IHO-AGRO Mineral soil + foliar, whereas the foliar treatment group did not show this deficiency. IHO- Mineral in this case acted as a **corrector for deficient element**.

The application of IHO-AGRO Mineral foliar **significantly increased the percentage of N**, while all plants treated with the product showed significantly higher percentages of Mg compared to the control group. The combination of the highest concentration of N and Mg in the foliar treatment with IHO-AGRO Mineral could be the factor that influenced the sharper green color of the plant.

Yield - number of fruits / plant and **average fruit mass** were statistically favored when the plants were treated with IHO-AGRO Mineral - foliar and foliar + soil. The length and equatorial diameter of the fruit did not show variations between the applications.

Test groups	Fruits/plant (u)	Average Fruit weight (g)	Average Fruit length (cm)	Average equatorial diameter (cm)
T1. Control	3.55 b	73.67 b	7.28	6.42
T2. Soil	3.19 b	81.33 b	7.29	7.59
T3. Foliar	6.22 a	99.89 a	7.75	7.56
T4. Foliar + Soil	6.32 a	97.12 a	7.28	7.61
EsX	0.963**	2.698***	0.658 ns	0.589 ns

IHO-AGRO Mineral yield pepper trials

The total pepper fruit yield was higher with the foliar application of IHO-AGRO Mineral, and foliar + soil, with significant increases between 134.83% and 137.53 %, compared to the control .**These increases are consistent with tests carried out IHO-AGRO Mineral in vegetable crops such as tomatoes, lettuce, cucumber and spinach.**

Post-harvest losses: In general and regardless of inconsistent behavior observed in each evaluation, it was observed that the foliar application of IHO-AGRO Mineral always showed less post harvest losses up until 12 days of storage. At 14 days, the fruits of all treatments with IHO-AGRO Mineral showed **significantly lower post harvest losses** than control group.

The foliar application is less expensive as similar performance values are obtained when compared with foliar + soil , which indicates that foliar feeding is sufficient to achieve the expected results.

The foliar application of 9l/ha of IHO Mineral has increased the peppers productivity 137% (6663.33 Kg/ha control v.s 15824.67 Kg/ha foliar)

Conclusion - Peppers

Based on the results it was once again proven that foliar application of IHO-AGRO Mineral, complementing the fertilization, is highly efficient from agronomic and economic point of view. Results are consistent with previous tests on other vegetable crops such as tomatoes, lettuce, cucumber and spinach.

Foliar in three applications every two weeks starting with the 15-Th day after planting was confirmed as sufficient. There is no need for soil application.

IHO-AGRO Mineral was included in the Official List of fertilizer for growing peppers.

Summary of Results - GLADIOLUS

Methods:

The research was conducted under production conditions. IHO Mineral was used as a complement to the normal fertilization. Normal fertilization was applied to test and control groups. Statistical Package: Statgraphics version 5.0 (SGC USA , 2000) was used on analysis of results. To evaluate the economic results the methodology proposed by FAO (1984) was used.

RESULTS AND INTERPRETATION

During the growing season the following evaluations were performed:

Plant height: The application of IHO -AGRO Mineral **statistically outperformed the control** at 45 and 60 days after sowing (127% at 45 respectively 131% at 60 days)

Relative chlorophyll content SPAD units (Soil Plant Analysis Development): The relative chlorophyll content **statistically outperformed the control** at 45 and 60 days after sowing (108% at 45 respectively 105% at 60)

Percentage of flowering (%): at 69 days after sowing (start of harvest), in the test group where IHO-AGRO Mineral was applied, 15% of the total flowering stems were harvested, compared to only 1.60% in the control group. Between the first and second harvest, in the control group only 5 flower stalks were harvested, while in the test group - IHO-AGRO Mineral - total harvested stems was 46 in the 20 linear meters. These results indicate that the IHO-AGRO Mineral **advanced the flowering** of the gladiolus.

Quality of flowering stems- The specifications are as follows:

Flower stem length	80 cm	70 cm	50 cm	40 cm
Inflorescence Length	30 cm	20 cm	15 cm	10 cm
	EXTRA	FIRST	SECOND	THIRD

The application of IHO-AGRO Mineral produced bigger florescence, with a longer first flower, and with a greater number of flowers to open, significantly higher than the control. The yield was favorable where the product was applied; an increase of 86% was calculated compared to the control.

Moreover, foliar application of IHO -AGRO Mineral significantly favored the production of gladiolus flower stalks of “extra quality”, longer, while decreased statistically the percentage of stems in the first category. **In the IHO-Mineral applications section all stalks were extra and first quality** none of second and third quality were harvested.

Bulbs:

Once the crop cycle was completed the number and the average weight of bulbs and mini bulbs harvested per linear meter was quantified. It was determined the number of bulbs greater than 5 cm (jumbo category), and less than 5 cm, with relation to the total number of bulbs collected on the experimental parcel.

Post-harvest Conservation:

At the end of the harvest, the plants treated with IHO -AGRO Mineral showed superior foliar contents of N , Ca , Zn and Mn compared to the control group Therefore these plants are nutritionally better prepared for transport and storage.

Total Return (Dozens / ha):

A significantly higher value for harvest was obtained due to the foliar application of IHO-Agro Mineral (9 l / ha) of 16642.86 dozens/ha, while the control group produced 8928.57 dozens/ha. This is a 86% increase.

Conclusion – Gladiolus

Based on the results it was proven that foliar fertilization IHO-AGRO Mineral, complementing the normal fertilization in the cultivation of gladiolus, is highly efficient from agronomic and economic point of view.

Foliar in three applications every two weeks starting with the 15-Th day after planting was confirmed as sufficient.

IHO-AGRO Mineral was included in the Official List of fertilizer for growing gladiolus.