TITLE: EFFICACY EVALUATION OF METALOSATE CALCIUM AS LIQUID FOLIAR FERTILIZER FOR BANANA

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STUDY SITE: Panabo, Davao del Norte

Efficacy Evaluation of Metalosate Calcium as Liquid Foliar Fertilizer for Banana

Introduction

Banana is one of the many crops that are very dependent on fertilizers whether granular or foliar. This is true in all commercial banana plantations because they knew that the quality and quantity of yield are dependent on production practices.

Metalosate Calcium Liquid Foliar Fertilizers from Albion Plant Nutrition is designed for foliar application on plants to prevent and/or correct calcium deficiencies that may limit crop growth and yields. Albion's unique patented manufacturing process and formulations ensures that plants will get the most readily absorbable, highest quality nutrition available.

Albion's Metalosate lines use amino acids in their chelation technology. Chelation is the process of attaching a specific organic molecule to a mineral in two or more places to form a ring. The molecule holds the mineral like a claw to make it stable and readily absorbable. Since amino acids are the basic building blocks of protein found in all living organisms, the chelation of minerals with amino acids provides tremendous advantage in the efficiency of absorption and translocation of minerals within plants.

There are other types of chelation, especially the synthetic types like EDTA and EDDHA. The advantage of using natural chelated forms of minerals is that the amino acid ligands surround and protect the minerals from adverse interactions which take place in a solution, in the soil or on the surface of the leaf. They often render the minerals unavailable to the plant. Because Albion uses natural amino acids to chelate the minerals, they are rapidly absorbed, translocated and metabolized by plants.

Jocanima Corporation, a leading Filipino owned agrochemical Corporation in collaboration with Albion Plant Nutrition from Utah, USA, introduced Metalosate Calcium liquid foliar fertilizer and its novel technology to the Filipino farmers. This helped farmers meet the soaring standards for crop production by improving crop growth, development and yield. The test evaluated the efficacy of Metalosate Calcium Liquid Foliar Fertilizer on banana; evaluated the effect of different rate applications of Metalosate Calcium Liquid Foliar Fertilizer in combination with commercial fertilizers used in banana plantations; and generated the bioefficacy data to support the registration of Metalosate Calcium Liquid Foliar Fertilizer with Fertilizer and Pesticide Authority (FPA).

Methodology

The following treatments, method of application and number of cycles per cropping is shown below:

Treatment Number	Description	Rate of Metalosate Calcium (L/ha/cycle)	Frequency of Application of Metalosate Calcium (Cycles/Cropping)	Method of Application of Metalosate Calcium
T1	RR (no Metalosate Calcium)	-	-	-
T2	RR + 50% Metalosate Calcium	0.25	3	Foliar at shooting, 30 days after shooting and 60 days after shooting
T3	RR + 100% Metalosate Calcium	0.50	3	Foliar at shooting, 30 days after shooting and 60 days after shooting
T4	RR + 150% Metalosate Calcium	0.75	3	Foliar at shooting, 30 days after shooting and 60 days after shooting
T5	100% Metalosate Calcium	0.50	3	Foliar at shooting, 30 days after shooting and 60 days after shooting

The study started in January until April 2015. The experiment was conducted in one banana plantation in Panabo, Davao del Norte. Test plants have uniform fertilization program except for Calcium fertilizers. The cooperator plantation, does not allow the application of any foliar fertilizer due to possible phytotoxicity and RR alone with no Metalosate Calcium served as the standard check. Furthermore, the setting-up of No Fertilizer Application Treatment (T5), means no more additional basal application when Metalosate Calcium application started.

The convenient fertilizers were applied as practiced by the plantation such as urea as source of nitrogen, triple super phosphate as source of phosphorus, and muriate of potash as source of potassium. The rate of application of urea was 456 gms/hill/year. The rate of application of triple super phosphate was 282 gms/hill/year. The rate of application of muriate of potash was 425 gms/hill/year. Metalosate Calcium foliar fertilizer was applied three times; the first application was at shooting, second application at 30 days after shooting, and third application was at 60 days after shooting.

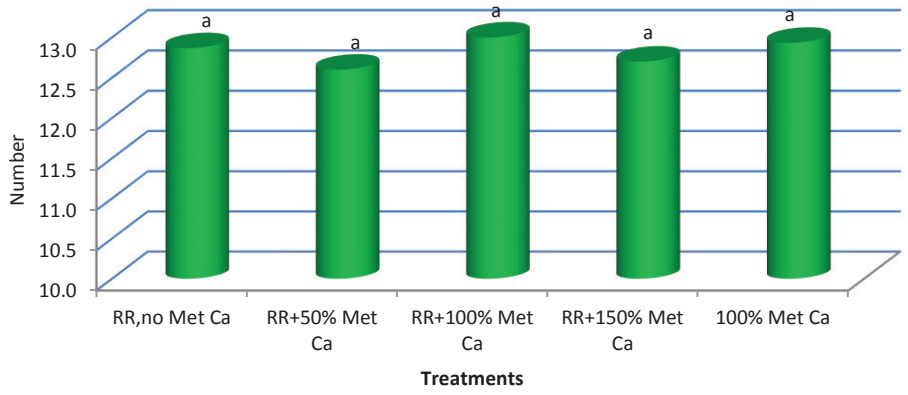
Plants at shooting were randomly chosen where the first application of Metalosate Calcium was done thru foliar application. There were 5 plants per replicate with a total of three replicates. The trial followed randomized complete block design.

Other practices like control of black sigatoka and weeding was strictly followed.

Results and Discussion

All test plants are vigorous and growing properly as shown in the number of leaves at shooting (Fig. 1 and Table 2) ranging from 12.5 to 13.0. This was the condition when the first application of Metalosate Calcium was applied. The number of leaves at shooting was gathered as a baseline data for comparison with number of leaves at harvest.

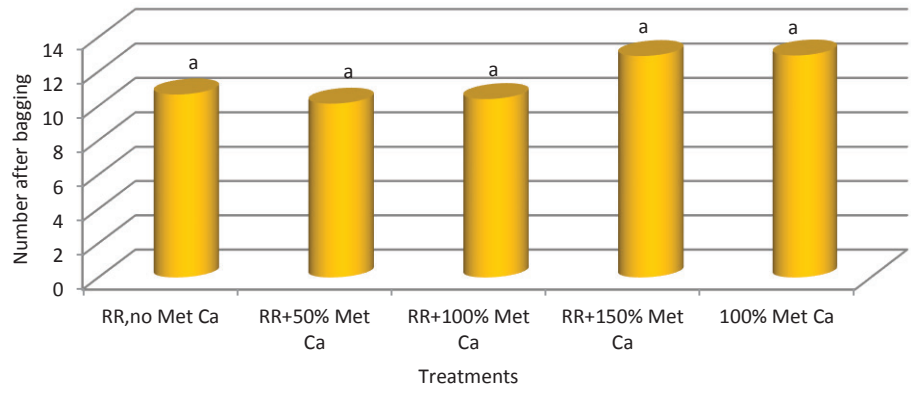
Fig 1. Number of leaves at shooting as affected by Metalosate Calcium , Jan - Apr 2015, Davao del Norte, Philippines[a]



[a] Means with the same letter are not significantly different from each other using Tukey's Studentized Range test

Bunches were harvested at age ranging from 10-12 weeks after bagging (Fig. 2 and Table 2). Statistical analysis showed no significant differences on the ages of bunch at harvest. Despite the long dry condition, fruits were harvested on expected time.

Fig. 2. Age at harvest (weeks) of banana plants as affected by Metalosate Calcium, Jan - Apr 2015, Davao del Norte, Philippines [a]



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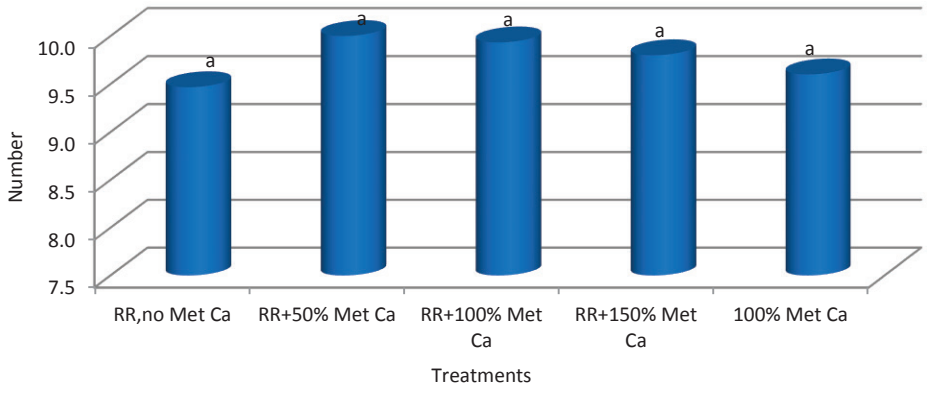
The highest average number of hands/bunch was provided by RR + 0.25li/ha or 50% Metalosate Calcium, (Fig. 3 and Table 2), the numerical difference between non-treated with Metalosate Calcium is approximately 0.5hands/bunch or equivalent to 127 bunches/hectare or 228.6 boxes/hectare. The additional boxes of banana provided by Metalosate Calcium means an additional income for growers.

Fig. 3. Average number of hands/bunch as affected by Metalosate Calcium , Jan - Apr 2015, Davao del Norte, Philippines [a]



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The highest bunch weight came from plants sprayed with 0.25li/ha or 50% Metalosate Calcium with an average of 32.7kg followed by 30.2 kg from 0.5li/ha or 100% Metalosate Calcium-sprayed plants while the lowest bunch weight (29.1kg) came from unsprayed plants (Fig. 4 and Table 2).

Fig. 4. Bunch weight(kg) as affected by Metalosate Calcium, Jan - Apr 2015, Davao del Norte, Philippines[a]

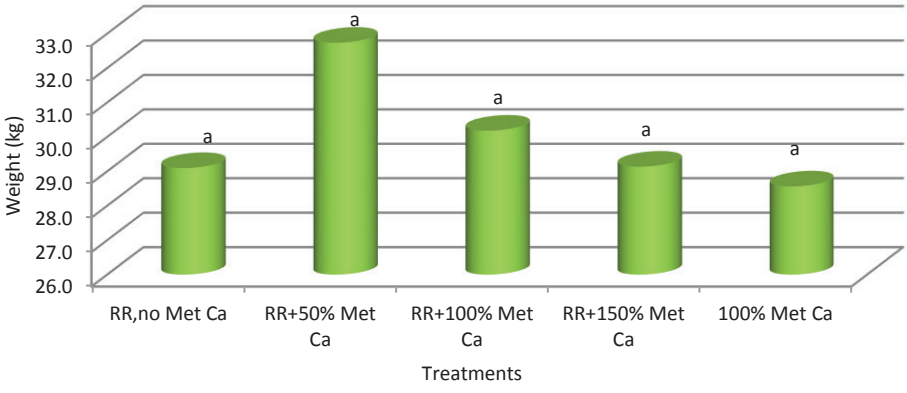

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Table 1. Number of leaves at shooting, age at harvest, hands and bunch weight as affected by Metalosate Calcium

Treatment Description	Number of leaves at shooting	Age at Harvest (weeks after bagging)	Average Number of Hands/bunch	Bunch Weight (kg)
RR (no Metalosate Calcium)	12.9a	10.7a	9.5a	29.1a
RR + 50% Metalosate Calcium	12.6a	10.1a	10.0a	32.7a
RR + 100% Metalosate Calcium	13.1a	10.4a	9.9a	30.2a
RR + 150% Metalosate Calcium	12.7a	12.9a	9.8a	29.1a
100% Metalosate Calcium	12.9a	12.9a	9.6a	28.6a

[a] Means with the same letter are not significantly different from each other using Tukey's Studentized Range test

The number of leaves at harvest ranged from 6.6 to 7.4/plant (Fig. 5). The highest number of leaves was noted on plants with RR + 100% Metalosate Calcium. Considering the number of leaves at shooting and number of leaves at harvest, the treatment helped decrease the lost in the number of leaves at harvest (Table 3). This may be considered as an indirect effect of Metalosate Calcium. Probably, the control of black sigatoka was better; hence, removal of leaves or deleafing was not much on treated plants than untreated.

Fig . 5. Number of leaves at harvest as affected by Metalosate Calcium, Jan - Apr 2015, Davao del Norte, Philippines[a]

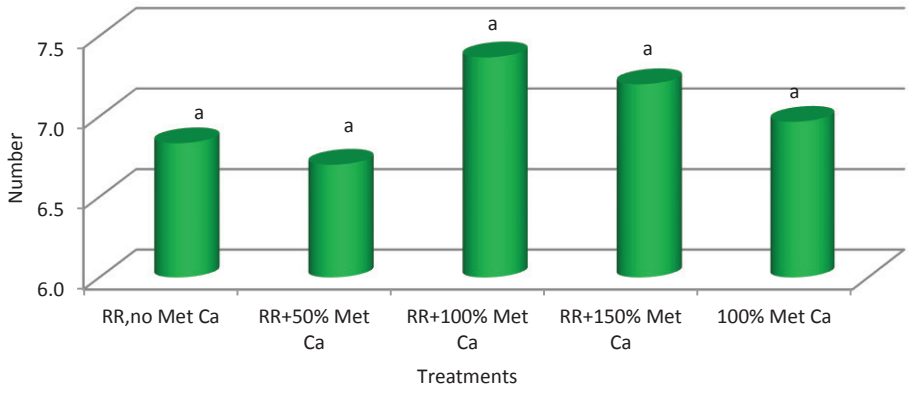

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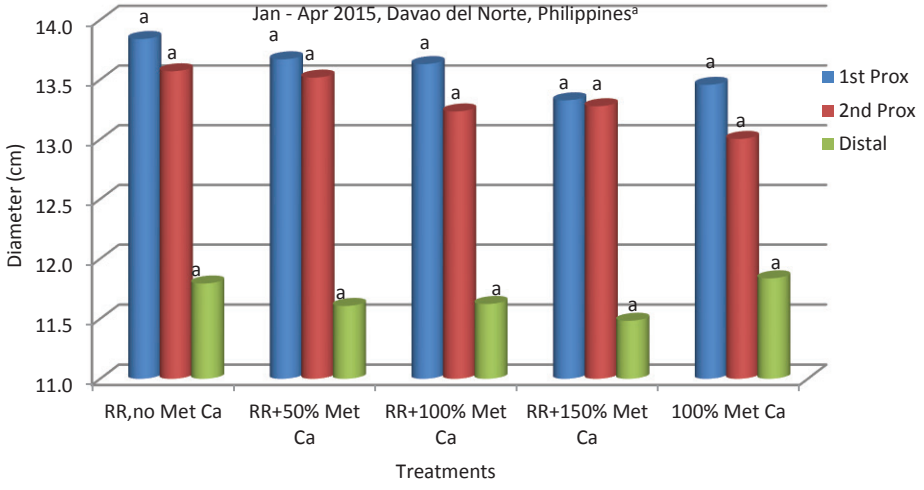
Table 2. The difference number of leaves as affected by the treatment			
Treatment Description	**Number of leaves at shooting**	**Number of leaves at harvest**	**Difference**
RR (no Metalosate Calcium)	12.9a	6.8	6.1
RR + 50% Metalosate Calcium	12.6a	6.7	5.9
RR + 100% Metalosate Calcium	13.1a	7.4	5.7
RR + 150% Metalosate Calcium	12.7a	7.2	5.5
100% Metalosate Calcium	12.9a	7.0	5.0

[a] Means with the same letter are not significantly different from each other using Tukey's Studentized Range test

Fruit diameter and length in first, second proximal and distal hands did not vary between treatments, however, longer fruits were recorded from plants sprayed with 0.5li/ha or 100% Metalosate Calcium (Figs. 6, 7 and Table 3). It was also observed that there were no small hands from all test plants and no phytotoxicity of Metalosate Calcium on fruits was noted.

Fig. 6. Fruit diameter (cm) of banana fruits as affected by Metalosate Calcium, Jan - Apr 2015, Davao del Norte, Philippines[a]



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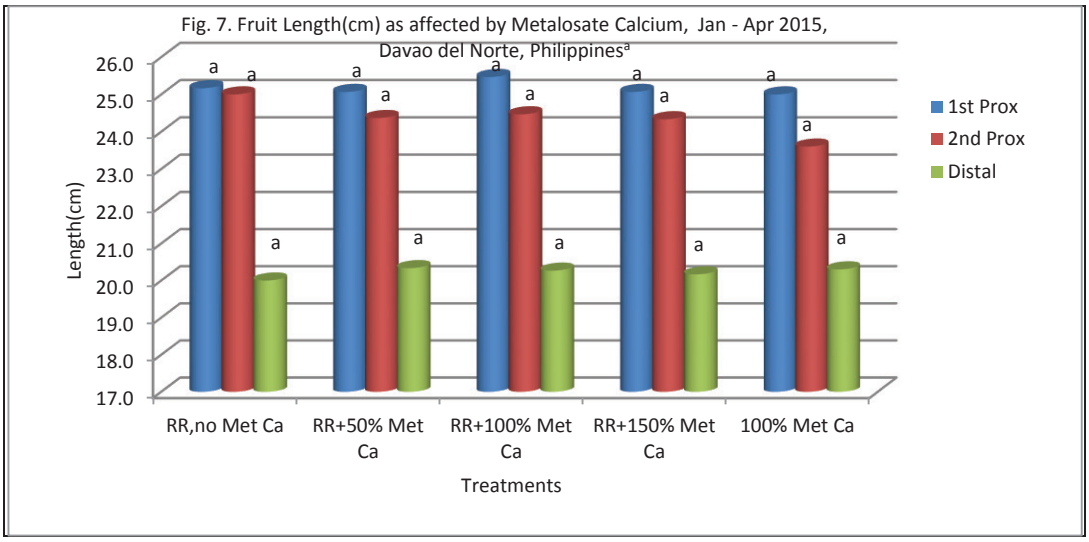

[a] Means with the same letter are not significantly different from each other using Tukey's Studentized Range test.

Table 3. Fruit measurements as affected by Metalosate Calcium

	Diameter (cm)			Length (cm)		
Treatment Description	**First Proximal**	**Second Proximal**	**Distal**	**First Proximal**	**Second Proximal**	**Distal**
RR (no Metalosate Calcium)	13.8a	13.6a	11.8a	25.2a	25.0a	20.0a
RR + 50% Metalosate Calcium	13.7a	13.5a	11.6a	25.1a	24.4a	20.3a
RR + 100% Metalosate Calcium	13.6a	13.2a	11.6a	25.5a	24.5a	20.3a
RR + 150% Metalosate Calcium	13.3a	13.3a	11.5a	25.1a	24.3a	20.2a
100% Metalosate Calcium	13.5a	13.0a	11.8a	25.0a	23.6a	20.3a

[a] Means with the same letter are not significantly different from each other using Tukey's Studentized Range test

Above results show that application of 0.25 and 0.5li/ha Metalosate Calcium at shooting, 30 days after shooting and 90 days after shooting, in addition to plantation practice fertilizer (RR) quantitatively provided more harvestable fruits and heavier bunches than unsprayed plants. Increase on bunch weight is directly related to number of exportable banana boxes (Table 4).

Table 4. Benefit-cost analysis for the application of 0.25 to 0.5l/ha of Metalosate Calcium over plantation practice.

Treatments	Bunch Weight (Kg)	Net Packable Wt. (Kg)	Wt. Difference Against SOP (Kg)	Box Stem Ratio	Exportable Boxes/ Ha/Yr	Boxes Gain/ Ha/ Yr	Gross Sales/ Ha/Yr (PhP)	Net Value of Gain/ Ha/ Yr (PhP)	% Gain	Peso Gain/ Peso Investment
T1. RR (Plantation SOP)	29.1	23.57	-	1.75	3,771	-	712,787	-	-	-
T2. RR + 0.25 L/Ha Metalosate Calcium	32.7	26.49	2.92	1.96	4,238	467	800,967	87,617	12%	155.76
T3. RR + 0.5 L/Ha Metalosate Calcium	30.2	24.46	0.89	1.81	3,914	143	739,731	25,819	4%	22.95

Notes:

1. Average population density of 2,000 hill/ has.
2. Average ratoon ratio of 1.2
3. Average total bunches/ha/year of 2160
4. Average fruit stalk of 10% of the bunch weight.
5. Average field loss of 10% of the net fruit weight.
6. Box weight of 13.5 kl/ bx.
7. A price per box of $4.2 @ Php45/ 1$.
8. Product was applied 3 cycles per cropping.
9. Estimated selling price of product is PhP 750/L

Wt. Difference against SOP	=	Net Packable Wt. of T2 – Net Packable Wt. of T1
Box Stem Ratio	=	Net Packable Wt. ÷ 13.5 Kg/Box
Exportable Boxes/Ha/Yr	=	Box Stem Ratio X 2,160 bunches/Ha/Yr
Boxes Gain/ Ha/Yr	=	Exportable Boxes/Ha/Yr of T2 – Exportable Boxes/Ha/Yr of T1
Net Value of Gain/Ha/Yr	=	[Gross Sales/Ha/Yr of T2 – Gross Sales/Ha/Yr of T1] – Cost of Product/Yr
% Gain	=	{[Gross Sales/Ha/Yr of T2 - Gross Sales/Ha/Yr of T1] ÷ Gross Sales/Ha/Yr of T1} x 100
Peso Gain/Peso Investment	=	Net Value of Gain/Ha/Yr ÷ Cost of Product/Yr

Conclusion and Recommendation

Metalosate Calcium at 0.25 and 0.5li/ha applied at shooting, and repeated 30 and 60 days after in addition to plantation practice fertilizer (RR) provided more harvestable fruits and heavier bunches than those that did not received Metalosate Calcium. The higher number of hands per bunch and more leaves between treated and untreated plants showed further the value added contribution of Metalosate Calcium in the production of export quality banana.

Metalosate Calcium at the rate of 0.25 and 0.5 liter product per hectare provided more exportable boxes of banana /ha, 4,238 and 3,914 boxes, respectively, compared to SOP of 3,771 boxes per hectare. The additional boxes from the application of Metalosate Calcium (0.25 and 0.5 l/ha) translates to incremental income of PhP 87,617 and PhP 25,819 per hectare per year. These mean that for every peso invested in applying Metalosate Calcium at 0.25 and 0.5 l/ha, we get a benefit-cost ratio of 155.76 and 22.95, respectively. These benefits can also be enjoyed by relatively small and independent banana growers.

Metalosate Calcium at 0.25 to 0.5li/ha is recommended for registration with the Fertilizer and Pesticide Authority.

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