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

FUNDING AGENCY: JOCANIMA CORPORATION
#42 Mahogany Road, Pilar Village
Las Piñas City, Metro Manila 1750, Philippines

RESEARCHER: Dr. Sergia P. Milagrosa
Agway Chemicals Corp
JP Avenue, Davao City
FPA Accreditation No.: PNT 247

TRIAL DURATION: Four (4) Months

STUDY SITE: Panabo, Davao del Norte

Efficacy Evaluation of Metalosate Magnesium as Liquid Foliar Fertilizer for Banana

Introduction

Banana production in Mindanao have an annual export earnings of more than Php30 billion. This production is mainly concentrated in Mindanao and considered the second biggest export industry in the region. Successful production is mainly dependent on good agricultural practices and one of which is correct application of required fertilizers. Whether the fertilizer required is primary, secondary of micronutrients, they are very essential in producing good quality export banana.

Magnesium is secondary fertilizer to banana and yet its importance is highly considered. A large range of leaf symptoms have been attributed to magnesium deficiency, including marginal yellowing extending to near the midrib, changes in phyllotaxy, purple mottling of the petioles, marginal necrosis and separation of leaf sheaths from Pseudostem. Affected plants produce smaller fruits with yellow pulp. To have a good export quality banana, all fertilizers necessary for production must be provided. At present a new source of Magnesium, Metalosate Magnesium Liquid Foliar Fertilizers from Albion Plant Nutrition is designed for foliar application on plants to prevent and/or correct magnesium 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.

Jocanima Corporation, a leading Filipino owned agrochemical Corporation in collaboration with Albion Plant Nutrition from Utah, USA, introduced Metalosate Magnesium 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 study evaluated the efficacy of Metalosate Magnesium Liquid Foliar Fertilizer on banana; evaluated the effect of different rate applications of Metalosate Magnesium Liquid Foliar Fertilizer in combination with commercial fertilizers used in banana plantations and generated the bioefficacy data to support the registration of Metalosate Magnesium Liquid Foliar Fertilizer with Fertilizer and Pesticide Authority (FPA).

Methodology

The following treatments, method of application and number of cycles per cropping is shown in Table 1.

Table 1. Treatments, dosage, frequency and method of application of Metalosate Magnesium

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

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

application was at shooting, second application at 30 days after shooting, and third application at 60 days after shooting.

Plants at shooting were randomly chosen where the first application of Metalosate Magnesium 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.

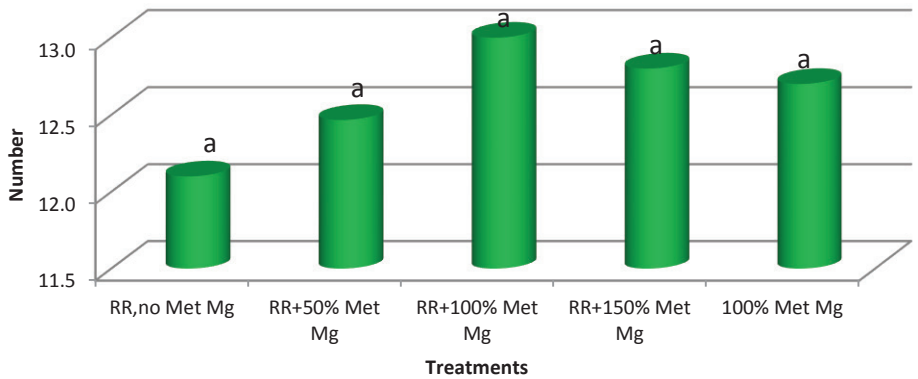
Results and Discussion

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 Magnesium was applied. The number of leaves at shooting was gathered as a baseline data for comparison with number of leaves at harvest.

Plants with more leaves at shooting were harvested earlier than other plants with less number of leaves (Fig. 2 and Table 2) with approximately 10.2 weeks after bagging. Plants applied with Metalosate Magnesium at 50%, 100% and 150% gave more hands/bunch than plants with no Metalosate Magnesium (Fig. 3 and Table 2). Application of 0.25 to 0.5l/ha Metalosate Magnesium means an additional of 156 to 596 boxes per hectare, respectively.

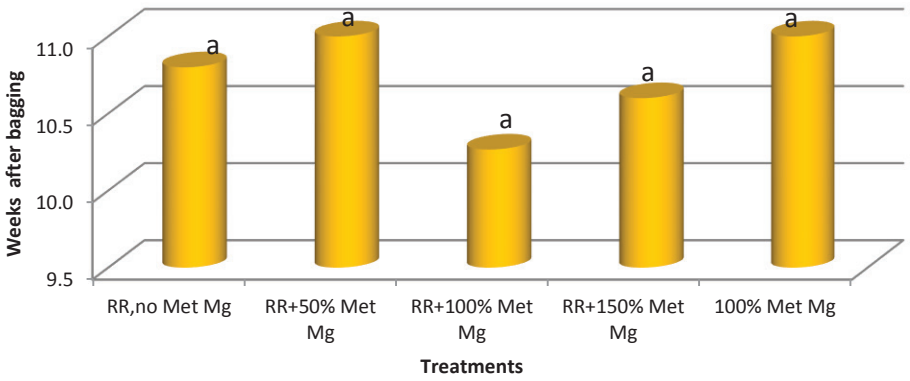
An average of 31.7kg bunch weight was recorded on plants applied with 100% or 0.5li/ha Metalosate Magnesium while 27.1kg on plants without Metalosate Magnesium (Fig. 4 and Table 2). Although no statistical differences were observed among treatments, Metalosate Magnesium-applied plants at 0.5li/ha have 4.0kg more than without Metalosate Magnesium.

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



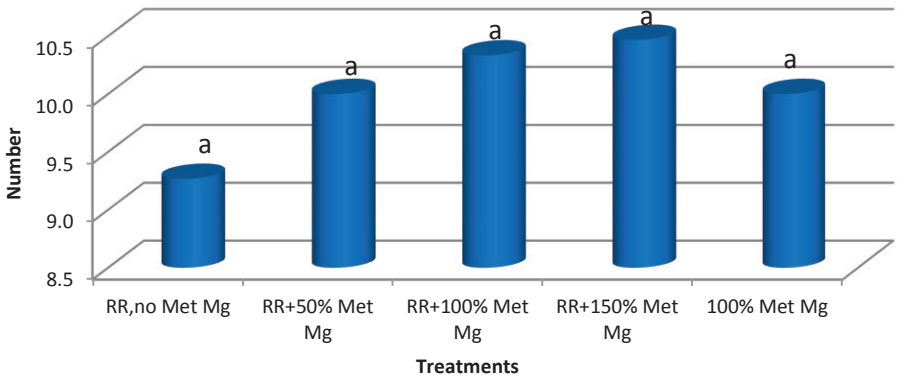
[a]Means followed by a common letter are not significantly different from each other using Tukey's Studentized Range test

Fig. 2. Age of banana plant at harvest as affected by Metalosate Magnesium, Jan-Apr 2015, Davao del Norte, Philippines[a]



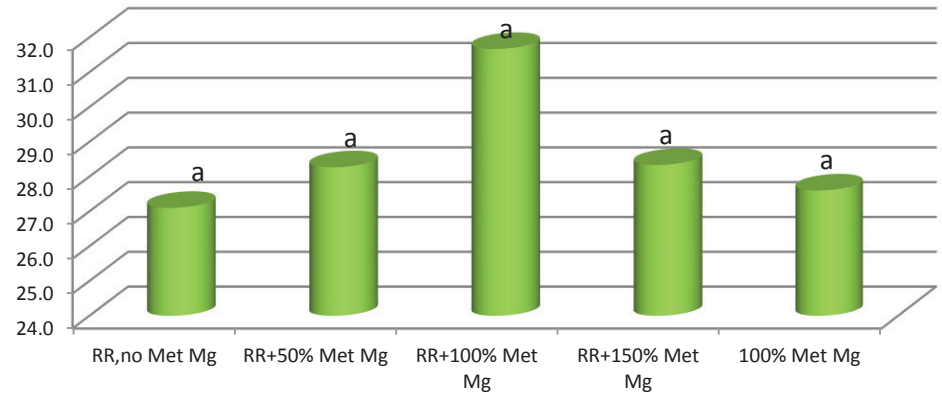
[a]Means followed by a common letter are not significantly different from each other using Tukey's Studentized Range test

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



[a] Means followed by a common letter are not significantly different from each other using Tukey's Studentized Range test

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



[a] Means followed by a common letter are not significantly different from each other using Tukey's Studentized Range test

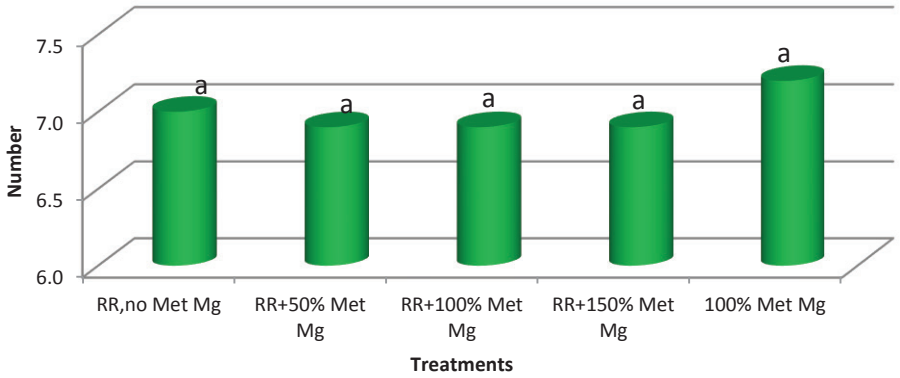
Table 2. Number of leaves at shooting, age at harvest, hands and bunch weight as affected by Metalosate Magnesium[a]

Treatment Description	Number of leaves at shooting	Age at Harvest (weeks after bagging)	Average Number of Hands/bunch	Bunch Weight (kg)
RR (no Metalosate Magnesium)	12.1a	10.8a	9.3a	27.1a
RR + 50% Metalosate Magnesium	12.5a	11.0a	10.0a	28.3a
RR + 100% Metalosate Magnesium	13.2a	10.3a	10.3a	31.7a
RR + 150% Metalosate Magnesium	12.8a	10.6a	10.5a	28.3a
100% Metalosate Magnesium	12.7a	11.0a	10.0a	27.6a

[a] Means followed by a common letter are not significantly different from each other using Tukey's Studentized Range test

The number of leaves at harvest (Fig. 5 and Table 3), Metalosate Magnesium did not affect the number of leaves at harvest, although the highest number of leaves was noted on plants with 100% Metalosate Magnesium. The loss of leaves from shooting to harvest did not affect the plant.

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



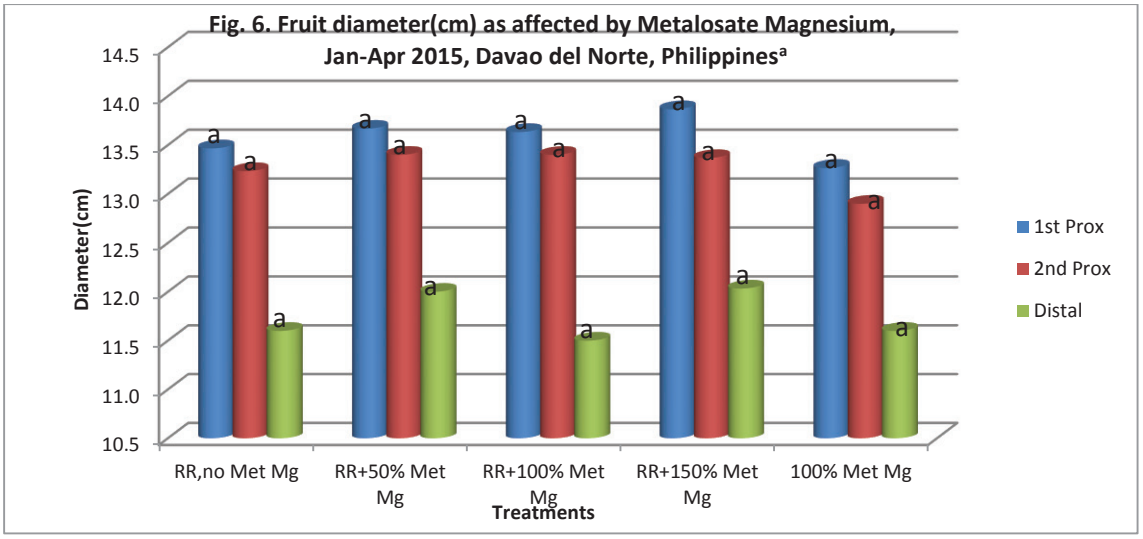
[a] Means followed by a common letter are not significantly different from each other using Tukey's Studentized Range test

Table 3. The difference in number of leaves as affected by the treatment[a]

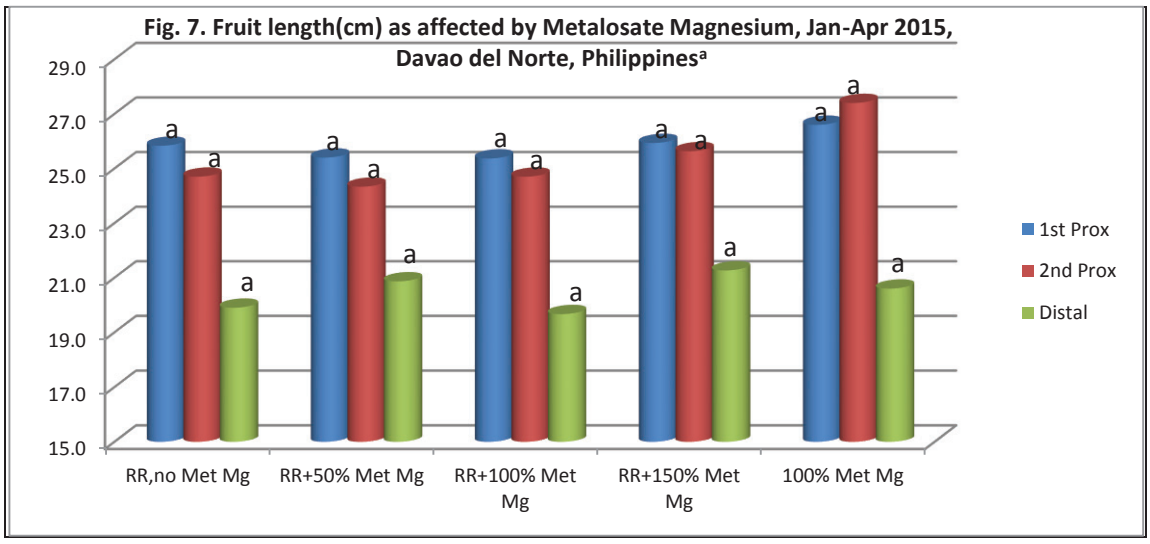
Treatment Description	Number of leaves at shooting	Number of leaves at harvest	Difference
RR (no Metalosate Magnesium)	12.1a	7.0	5.1
RR + 50% Metalosate Magnesium	12.5a	6.9	5.6
RR + 100% Metalosate Magnesium	13.2a	6.9	6.3
RR + 150% Metalosate Magnesium	12.8a	6.9	5.9
100% Metalosate Magnesium	12.7a	7.2	5.5

[a] Means followed by a common letter are not significantly different from each other using Tukey's Studentized Range test

Fruit diameter and length (Fig.6, 7 and Table 4) did not differ statistically among test plants, however, the diameter of the first proximal hands were slightly bigger on Metalosate Magnesium-treated plants than none sprayed plants. The result suggests that Metalosate Magnesium application have an advantage over the no application. Should there be more sample plants, may be about a hectare plantation applied with Metalosate Magnesium, a great difference on yield can be attained.



[a] Means followed by a common letter are not significantly different from each other using Tukey's Studentized Range test



[a] Means followed by a common letter are not significantly different from each other using Tukey's Studentized Range test

Table 4. Fruit measurements as affected by Metalosate Magnesium[a]						
	Diameter (cm)			Length (cm)		
Treatment Description	**First Proximal**	**Second Proximal**	**Distal**	**First Proximal**	**Second Proximal**	**Distal**
RR (no Metalosate Magnesium)	13.5a	13.2a	11.6a	25.8a	24.7a	19.9a
RR + 50% Metalosate Magnesium	13.7a	13.4a	12.0a	25.4a	24.3a	20.9a
RR + 100% Metalosate Magnesium	13.6a	13.4a	11.5a	25.4a	24.7a	19.7a
RR + 150% Metalosate Magnesium	13.9a	13.4a	12.0a	25.9a	25.6a	21.3a
100% Metalosate Magnesium	13.9a	12.9a	11.6a	26.6a	27.4a	20.6a

[a] Means followed by a common 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 Magnesium 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 5).

Table 5. Benefit-cost analysis for the application of 0.25 to 0.5l/ha of Metalosate Magnesium 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)	27.1	21.95	-	1.63	3,512	-	663,798	-	-	-
T2. RR + 0.25 L/Ha Metalosate Magnesium	28.3	22.92	0.97	1.70	3,668	156	693,192	28,831	4%	51.25
T3. RR + 0.5 L/Ha Metalosate Magnesium	31.7	25.68	3.73	1.90	4,108	596	776,472	111,549	17%	99.15

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

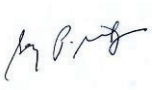
Wt. Difference against SOP	=	Net Packable Wt. of T2 – Net Packable Wt. of T1
Box Stem Ratio	=	Net Packable Wt. ÷ 13.5 Kg/Box
Exportable Boxes/Ha/Yr	=	Box Stem Ratio X 2,160 bunches/Ha/Yr
Boxes Gain/ Ha/Yr	=	Exportable Boxes/Ha/Yr of T2 – Exportable Boxes/Ha/Yr of T1
Net Value of Gain/Ha/Yr	=	[Gross Sales/Ha/Yr 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 Magnesium 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 Magnesium. The higher number of hands per bunch and bigger first proximal hands between treated and untreated plants showed further the value added performance of Metalosate Magnesium in the production of export quality banana.

Metalosate Magnesium at the rate of 0.25 and 0.5 liter product per hectare provided more exportable boxes of banana /ha, 3,668 and 4,108 boxes, respectively, compared to SOP of 3,512 boxes per hectare. The additional boxes from the application of Metalosate Magnesium (0.25 and 0.5 l/ha) translates to incremental income of PhP 28,831 and PhP 111,549 per hectare per year. These mean that for every peso invested in applying Metalosate Magnesium at 0.25 and 0.5 l/ha, we get a benefit-cost ratio of 51.25 and 99.15, respectively. These benefits can also be enjoyed by relatively small and independent banana growers.

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



Sergia P Milagrosa
Fertilizer and Pesticide
Accredited Researcher, PNT 247