TITLE: EFFICACY EVALUATION OF METALOSATE BORON 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 Boron as Liquid Foliar Fertilizer for Banana

Introduction

Banana production is a multimillion endeavor in Mindanao. The cultivation was initially carried out in less fertilization but with the continuous monocropping practice, the soil is so much affected thus there was an imbalance of nutrients which eventually results in poor quality of harvest. At present, every banana plantation are eager to have good quality produce, thus essential nutrients is the ultimate solution.

Boron plays a very important role in plant growth and development. Boron deficiency causes severe growth inhibition of the banana plant. At present a new source of Boron, Metalosate Boron Liquid Foliar Fertilizers from Albion Plant Nutrition is designed for foliar application on plants to prevent and/or correct boron 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 Boron 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. This study evaluated the efficacy of Metalosate Boron Liquid Foliar Fertilizer on banana; evaluated the effect of different rate applications of Metalosate Boron Liquid Foliar Fertilizer in combination with commercial fertilizers used in banana plantations; and generated the bioefficacy data to support the registration of Metalosate Boron Liquid Foliar Fertilizer with Fertilizer and Pesticide Authority (FPA).

Methodology

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

Table 1. Treatments, rate, frequency and method of application of Metalosate Boron in this study

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

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 be 425 gms/hill/year. Metalosate Boron 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.

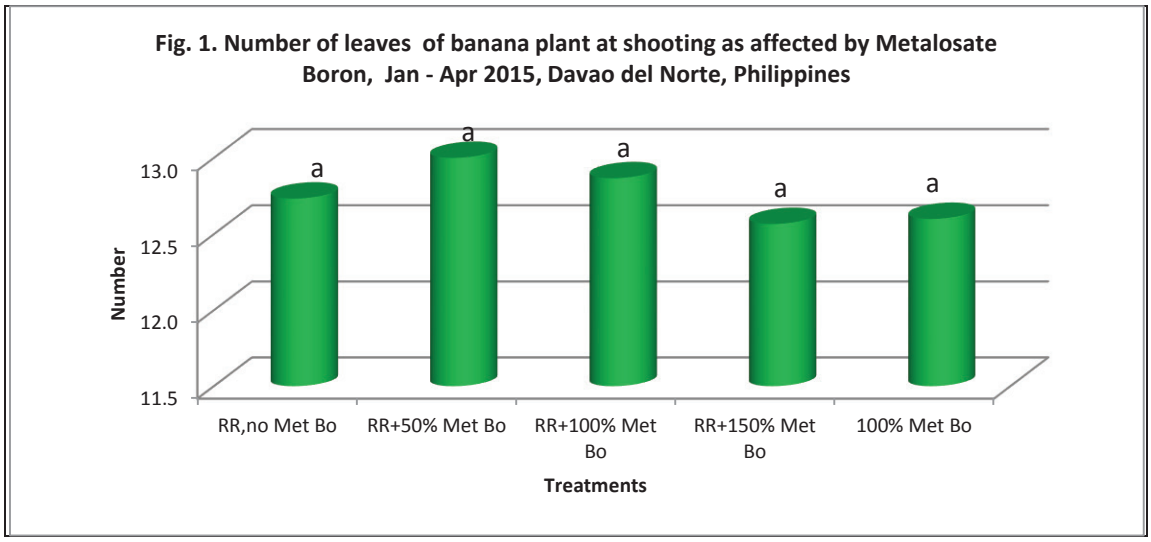
Plants at shooting were randomly chosen where the first application of Metalosate Boron was done thru foliar application. There were 5 plants per replicate with a total of three replicates. The trial followed randomized complete block design.

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

Results and Discussion

The number of leaves at shooting which coincides with the first application of Metalosate Boron is shown in Fig. 1 and Table 2. Plants are vigorous and growing well with leaves ranging from 11.5 to 12.9. Higher number of leaves was noted on plants where RR+ 50% Metalosate Boron (0.25li/ha) was applied and the lowest at RR+ 150% Metalosate Boron(0.75li/ha).

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



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

The age of fruits at harvest ranged from 10.9 to 11 weeks after bagging (Fig. 2 and Table 2) which is a normal age of fruits at harvest. Metalosate Boron application did not affect the age of fruits at harvest.

The average number of hands at harvest is shown in Fig. 3 and Table 2. Plants sprayed with 100% Metalosate Boron or 0.5li/ha rate, have an average of 10.9 hands/bunch while 9.7 hands/bunch in plants without Metalosate Boron with a difference of 1.2 hands/bunch. This

numerical difference means an additional 467 boxes per hectare. This difference is further equals to PhP 87,055 added income to the growers.

Fig. 2. Age of fruit at harvest as affected by Metalosate Boron, Jan-Apr 2015, Davao del Norte, Philippines

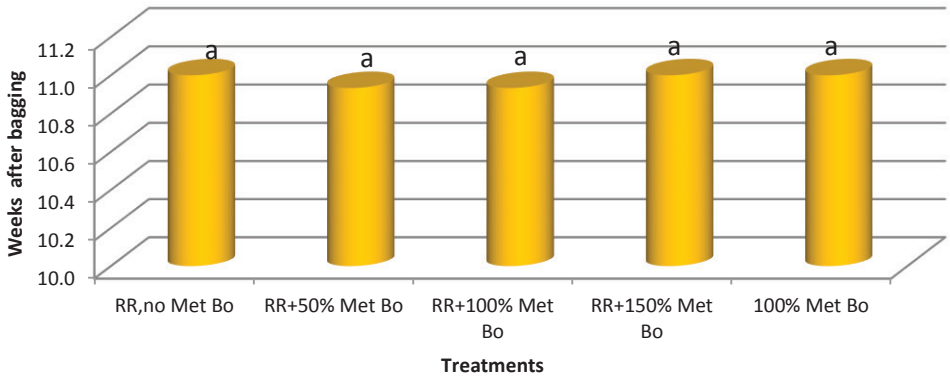


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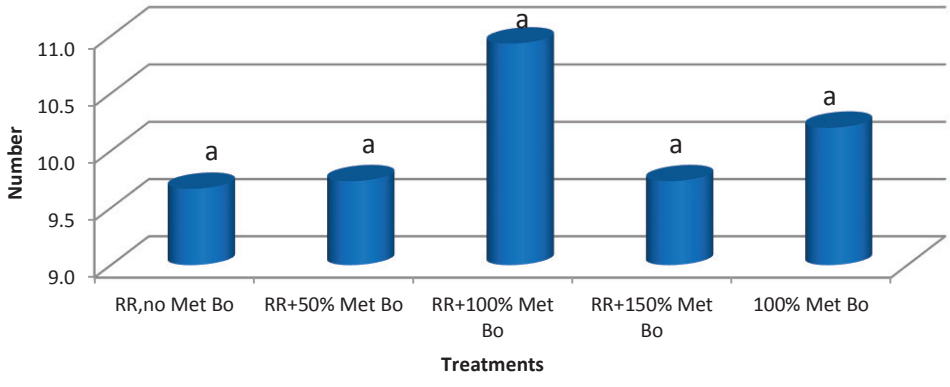
Fig. 3. Number of hands/bunch as affected by Metalosate Boron, Jan-Apr 2015, Davao del Norte, Philippines



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The weight of bunches on plants sprayed with 100% Metalosate Boron are heavier than bunches from plants without Metalosate Boron (Fig. 4 and Table 2). A difference of 3.6 to 3.9kg per bunch was computed in Metalosate Boron-sprayed plants compared to none sprayed ones. This further means that there are less number of hands packed in a box.

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

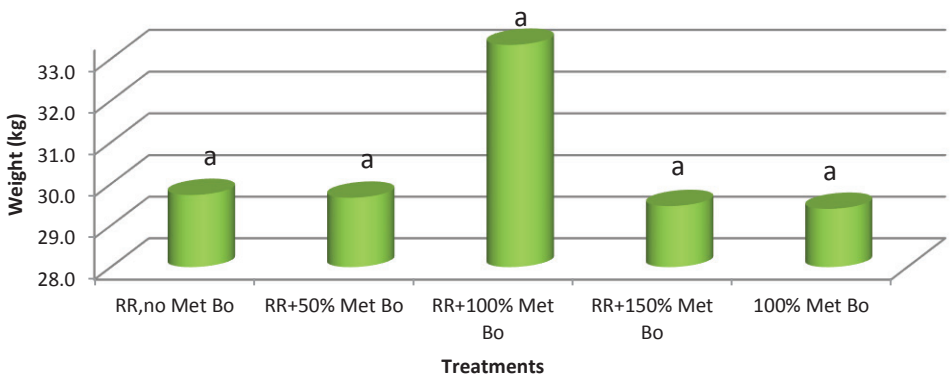

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Table 2. Number of leaves at shooting, age at harvest, hands and bunch weight as affected by Metalosate Boron[a]

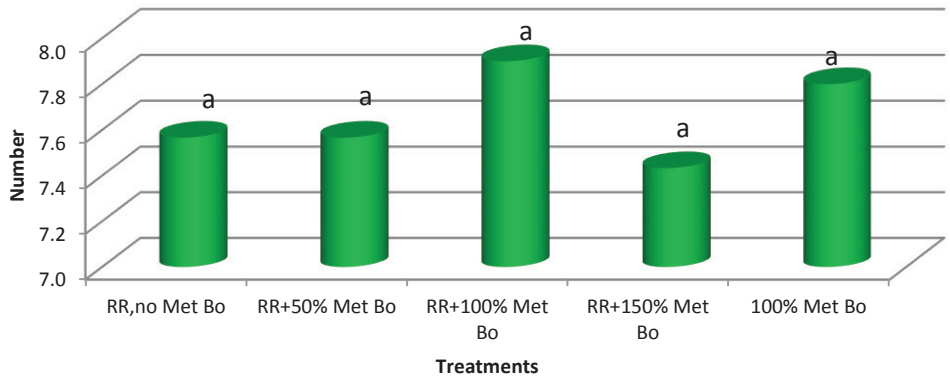
Treatment Description	Number of leaves at shooting	Age at Harvest (weeks after bagging)	Average Number of Hands/bunch	Bunch Weight (kg)
RR (no Metalosate Boron)	12.7a	11.0a	9.7a	29.7a
RR + 50% Metalosate Boron	13.2a	10.9a	9.7a	29.7a
RR + 100% Metalosate Boron	12.9a	10.9a	10.9a	33.3a
RR + 150% Metalosate Boron	12.6a	11.0a	9.7a	29.5a
100% Metalosate Boron	12.6a	11.0a	10.2a	29.4a

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

Fig. 5 and Table 3 showed a slight increase in the number of leaves on plants sprayed with Metalosate Boron compared to plants without Metalosate Boron. Plants applied with RR + 100% Metalosate Boron (0.5li/ha) have more leaves than untreated ones and this is followed by plants sprayed with 100% Metalosate Boron (0.5li/ha). The slight increase could be attributed to the

effect of Metalosate Boron which eventually gave a lower number of lost leaves at harvest. This effect could be brought by Metalosate Boron application.

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



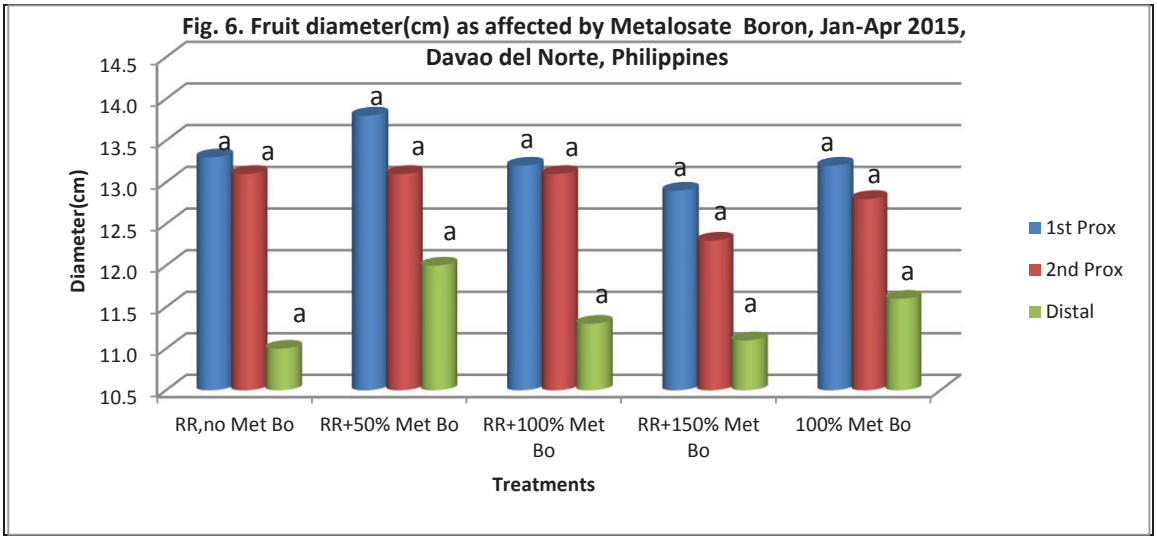
[a]Means followed by a common letter are not significantly different from each other using Tukey's Studentized Range test

Table 3. The difference 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 Boron)	12.7a	7.6a	5.1
RR + 50% Metalosate Boron	13.2a	7.6a	5.6
RR + 100% Metalosate Boron	12.9a	7.9a	5.0
RR + 150% Metalosate Boron	12.6a	7.4a	5.2
100% Metalosate Boron	12.6a	7.8a	4.8

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

Fruit diameter of first proximal and distal hands of 50% Metalosate Boron (0.25li/ha) sprayed plants were bigger than other treatments (Fig 6 and Table 3). The length of the first proximal and distal hands (Fig. 7 and Table 3) were also longer in plants sprayed with 100% Metalosate Boron (0.5li/ha). This could be the reason why heavier bunches was recorded on Metalosate Boron-sprayed plants. Metalosate Boron at 0.25 to 0.5li/ha increased the diameter and length of fingers which eventually gave higher yield.



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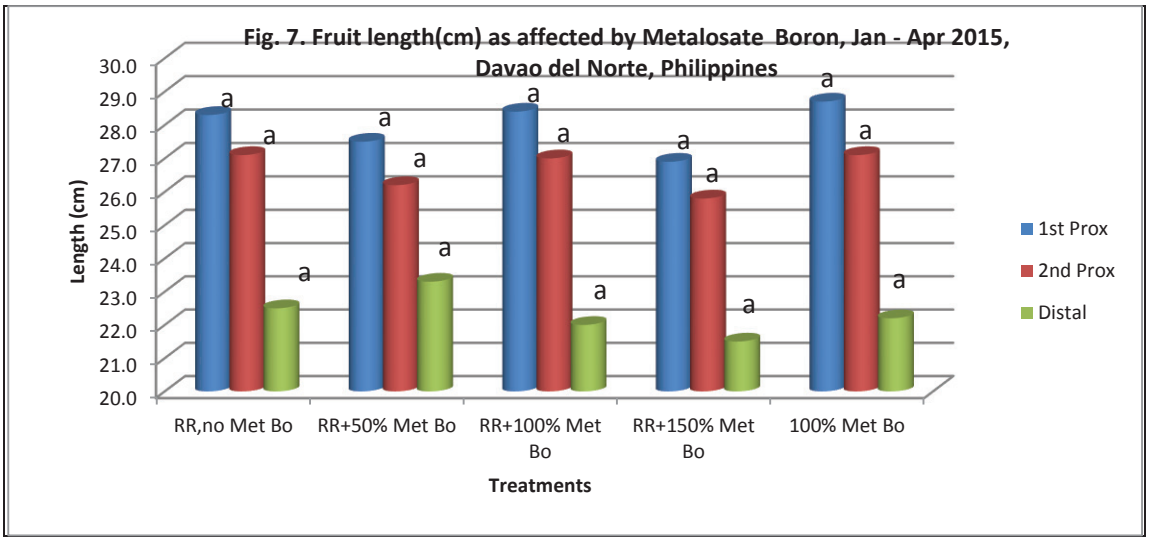

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Table 4. Fruit measurements as affected by Metalosate Boron[a]						
	Diameter (cm)			Length (cm)		
Treatment Description	**First Proximal**	**Second Proximal**	**Distal**	**First Proximal**	**Second Proximal**	**Distal**
RR (no Metalosate Boron)	13.3a	13.1a	11.0a	28.3a	27.1a	22.5a
RR + 50% Metalosate Boron	13.8a	13.1a	12.0a	27.5a	26.2a	23.3a
RR + 100% Metalosate Boron	13.2a	13.1a	11.3a	28.4a	27.0a	22.0a
RR + 150% Metalosate Boron	12.9a	12.3a	11.1a	26.9a	25.8a	21.5a
100% Metalosate Boron	13.2a	12.8a	11.6a	28.7a	27.1a	22.2a

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Above results show that application of 0.5li/ha Metalosate Boron 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 0.5l/ha of Metalosate Boron 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)	29.7	24.06	-	1.78	3,849	-	727,484	-	-	-
T3. RR + 0.5 L/Ha Metalosate Boron	33.3	26.97	2.91	2.00	4,316	467	815,664	87,055	12%	77.38

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

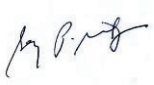
Wt. Difference against SOP	=	Net Packable Wt. of T2 – Net Packable Wt. of T1
Box Stem Ratio	=	Net Packable Wt. ÷ 13.5 Kg/Box
Exportable Boxes/Ha/Yr	=	Box Stem Ratio X 2,160 bunches/Ha/Yr
Boxes Gain/ Ha/Yr	=	Exportable Boxes/Ha/Yr of T2 – Exportable Boxes/Ha/Yr of T1
Net Value of Gain/Ha/Yr	=	[Gross Sales/Ha/Yr 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 Boron at 0.5li/ha applied at shooting, and repeated 30 and 60 days after in addition to plantation practice fertilizer (RR) increased the number of hands and bunch weight at harvest. Bigger diameter and longer first proximal and distal fruits were also brought by Metalosate Boron application.

Metalosate Boron at the rate of 0.5 liter product per hectare provided more exportable boxes of banana /ha, 4,316 boxes, compared to SOP of 3,849 boxes per hectare. The additional boxes from the application of Metalosate Boron (0.5 l/ha) translates to incremental income of PhP 87,055 per hectare per year. These mean that for every peso invested in applying Metalosate Boron at 0.5 l/ha, we get a benefit-cost ratio of 77.38. These benefits can also be enjoyed by relatively small and independent banana growers.

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



Sergia P. Milagrosa
FPA Accredited Researcher, PNT 247