TAMIL NADU AGRICULTURAL UNIVERSITY

PROJECT COMPLETION REPORT

BIOEFFICACY TESTING OF GMX ONLINE MAGNETIC WATER CONDITIONER IN GRAPES var. MUSCAT

Sponsored by

M5 – EXOTIC LIFESTYLE CONCEPTS
CHENNAI

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Dr. S. ANBU, Ph.D.,
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Periyakulam (East) – 625 604
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To

Mr. SEKAR JAMES
Managing Director
M5 – Exotic Lifestyle Concepts
Chennai – 600 017

No. HC & RI/PKM/Bio-efficacy trial/Final Report/2005 dt. 30.12.2005

Sir,

Sub: Final Report on Bio efficacy testing of GMX online Magnetic water conditioner in grapes var. Muscat – sending – reg.

I am pleased to send the final report of the project entitled "Bio efficacy testing of GMX online Magnetic water conditioner in grapes var. Muscat " in the prescribed format of Tamil Nadu Agricultural University.

Kindly acknowledge the receipt of the report.

Thanking you sir.

30/12/05

S. ANBU
Dean

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Horticultural College and Research Institute
Tamilnadu Agricultural University
Periyakulam-625601.

Copy to

1. The Director of Research , TNAU, Coimbatore - 641 003
2. Mr. R. J. Eric Dhavaraj, Resident Manager, K.K. Nagar, Madurai.
3. Research Co-ordinator, HC & RI, Periyakulam

PROFORMA I

FINAL REPORT ON BIO EFFICACY TESTING OF GMX ONLINE MAGNETIC WATER CONDITIONER IN GRAPES (*Vitis vinifera*) var. MUSCAT

A. GENERAL

1.	Name of the station	:	**DEPARTMENT OF FRUITS** Horticultural College and Research Institute Tamil Nadu Agricultural University Periyakulam East - 625 604 Tamil Nadu
2.	Name of the chemical/device	:	GMX 8000 Online Magnetic water conditioner
3.	Name of the firm who offered the product	:	M/s. M5 – Exotic Life Style Concepts Chennai
4.	Name of the pest/disease and crop against which it should be tested	:	Does not arise
5.	Date of receipt of the product	:	16.03.2005
7.	Date on which the product has been sent for investigation	:	Does not arise.

B. TEST REPORT

1. Objectives :

1. To test the efficacy of GMX online Magnetic water conditioner on chemical properties and fertility status of the soil.
2. To evaluate the influence of the product on quality parameters of irrigation water
3. To assess the effect of magnetized water on yield and quality of grapes

			var. Muscat.
2.	Crop	:	Grapes (*Vitis vinifera)* cv. Muscat
3.	Purpose for testing	:	Tested for the magnetized water of the product and its effect on soil, water and crop quality.
4.	Season	:	May 2005 –September 2005
5.	Number of chemicals or product tested	:	One (GMX 8000)

6. Treatment details :

T1 - Control – Normal irrigation water (Non-magnetized water)

T2 - Treated water (GMX online Magnetic water)

Installation of GMX Online Magnetic Conditioner

The GMX 8000 Online Magnetic Water Conditioner was installed on 16th April, 2005. **Mr. R. J. Eric Dhavaraj, Resident Manager** installed the two sets of GMX 8000 on the delivery line pipe (2.3"OD PVC) after the filter (Jain Irrigation Systems) and one booster set at 400 feet. The motor make is 10 HP texmo mono block at 70' depth in the well. Each GMX 8000 unit is made up of north magnet on one side and south magnet on the other side. GMX 8000 label on top is **northpole** and the bottom is **southpole** and they are made up of **Strontium Ferrite Permanent Ceramic**. Two north pole magnets (GMX 8000 label) in tandem on top and two south pole magnets on the bottom is one set and this set is strapped together with stainless steel band.

The control plots were irrigated with normal water (non-magnetized water) while the treatment plots were irrigated with water coming through GMX online magnetic conditioner installed pipes. Irrigation with magnetized and non-magnetized water was done at equal duration as and when the crop needed water for its growth and development.

7. Method of Assessment : The bio-efficacy testing of magnetic water conditioner was done on soil, water and crop parameters.

Period of sampling : Initial, 45^{th}, 75^{th}, 105^{th} day of pruning and post harvest stage.

Soil

Samples at 0 – 30 cm depth were taken from the control and treated plots for analyzing the pH, EC, water soluble cations (Na^+, Ca^{2+}, Mg^{2+} and K^+), water soluble anions (Cl^-, SO_4^{2-}, HCO_3^-) and available nutrient status (N, P and K).

Water

Irrigation water samples were collected from magnetized and non-magnetized PVC pipes and analyzed for parameters viz., pH, EC, concentrations of chloride, sulphate, sodium, potassium, calcium, magnesium, carbonate and bicarbonate. The quality criteria were calculated as follows by using the data from the analysis of water samples.

(a) Total hardness of water was calculated by adding the concentration of Ca^{2+} and Mg^{2+} after converting them into equivalents of $CaCo_3$.

1. ppm of Ca^{2+} = 50.04 / 20.04 = ppm Ca as $CaCo_3$
2. ppm of Mg^{2+} = 50.04 / 12.16 = ppm Mg as $CaCo_3$

(1) + (2) = Total hardness as $CaCo_3$ in ppm

(b) Residual sodium carbonate – (RSC) value was calculated using the formula

$RSC = (CO_3^{2-} + HCO_3^-) - (Ca^{2+} + Mg^{2+})$ (Eaton, 1950)

(C) Potential salinity – (PS) of the water was worked out as

$PS = Cl^- + \frac{1}{2} SO_4^{2-}$ (Doneer, 1975)

Estimation	Method	Reference
Soil reaction (pH)	Potentiometry (1:2 soil / water suspension)	Jackson, 1973
Electrical conductivity (EC)	Conductometry (1:2 soil / water suspension)	Jackson, 1973

Water soluble Na^+ and K^+	Flame photometry	Toth and Prince, 1949
Water soluble Ca^{2+} and Mg^{2+}	Atomic absorption sepectrophotometry	Pratt, 1965
Water soluble Cl^-	Mohr's titration	Jackson, 1973
Water soluble SO_4^{2-}	Turbidimetry	Jackson, 1973
Water soluble bi carbonates	Differential titration	Jackson, 1973

Crop

The effect of treatments (magnetized and non-magnetized water) on leaf area, individual berry weight, berry diameter, number of berries/ bunch, bunch weight, number of bunches per plant, yield per vine, yield per acre, total soluble solids and reducing sugars were observed and recorded.

18. Date of harvest : 09.08.2005

19. Conclusions

Irrigation with magnetized water decreased the pH, EC (soluble salts) and $CaCO_3$ contents of the soil thus enhanced the soil available nutrient status. The total hardness and residual sodium carbonate of the water was brought down to permissible levels when irrigated with magnetized water. This might be due to the dissolution of precipitated salts from the soil and subsequent desalinization of the soil by the magnetized water. The magnetic water irrigated field has recorded higher individual berry weight of 3.52g, bunch weight of 271.52g and number of bunches / vine of 76.37 compared to that of control which has recorded 3.3g, 264.90g and 75.50 of berry weight, bunch weight and number of bunches / vine respectively. This might be due to the fact that the plants that are irrigated using water that is treated by magnetic technology easily take in mineral salts form the soil, increasing the cellular circulation in the plant system resulting in better yield and quality of the produce.

From the above results, it is concluded that installation of GMX Online Magnetic conditioner influenced the irrigation water parameters which in turn resulted in desalination of soil, increased the availability of nutrients to the crop reflecting in higher yield and better quality of fruits when compared to that of the crops irrigated with non-magnetized water.

However, confirmatory trials at different locations are suggested for two seasons to evaluate the performance of magnetic water conditioner in view of the seasonal variations during the experimental period.

PROFORMA II

1.	Name of the chemical / product offered for bioefficacy test	:	Online Magnetic Water Conditioner
2.	Trade Name	:	GMX (Model 8000) Online Magnetic Water Conditioner
3.	Name of the firm offered	:	M/s. M5 – Exotic Life Style Concepts Chennai – 600 017
4.	Crop used for bio efficacy test	:	Grapes var. Muscat
5.	Whether any protocol suggested by the firm	:	--
6.	What are the chemicals chosen for comparison with the chemical now offered	:	Compared with control without GMX water conditioner
7.	For how many seasons this chemical was tested with the other chemicals	:	One season
8.	Result of the performance of the chemicals	:	--

Water quality

The pH of the irrigation water (normal) was 8.75 while that of the magnetized water collected one month after installation of the conditioner was 8.56. The potential salinity of non-magnetized water was 6.3 (nearing critical level) which was brought down to a permissible level of 5.4 in magnetized water. This is an indication of the water conditioner's potential to reduce the salt content (chlorides and sulphates) of the irrigation water. The total hardness and Residual Sodium Carbonate values of the normal water were within the permissible levels (total hardness <100ppm; RSC <1.25) and were further reduced due to the installation of the online magnetic water conditioner.

Soil properties

The pH, EC and $CaCO_3$ contents of the magnetic water irrigated soil decreased significantly reflecting the influence of the product in solubilising and leaching of the salts and dissolution of $CaCo_3$ content. The water soluble Na^+ and K^+ and water soluble Cl^- and SO_4^{2-} were found to be lower in the treated plots whereas the corresponding values were higher in the control plots. This signifies the higher potential of the magnetized water in washing away insoluble salts from the soil which would otherwise decrease the soil permeability thus retarding the nutrient supply to the crops.

Crop growth and yield

Leaf area is the primary factor which influences the yield contributing characters like individual berry weight, bunch weight and number of bunches per vine. Grape vines irrigated with magnetized water recorded the maximum leaf area of 200.26cm^2 and in control it was 185.37 cm^2.

The yield contributing characters like individual berry weight, bunch weight and number of bunches / vine were significantly influenced by the application of magnetized water. The individual berry weight (3.52g), bunch weight (271.5g), number of bunches per vine (76.5) were observed to be maximum in the vines irrigated with magnetized water. All these yield contributing characters reflected in higher yield of 23.12.kg/vine and 7.63 tonnes/acre in plots applied with magnetically treated water. In control plots, the yield was 19.85kg/vine and 6.55 tonnes/acre.

The magnetized water influenced the total soluble solids and reducing sugar content in grapes which decided the quality of fruits. The highest TSS percentage of 20.10% and reducing sugar content of 20.45% were observed in grapes treated with magnetized water while that of the control were 18.45% and 18.59% respectively.

However, the receipt of rainfall during the experimental period reduced the number of irrigations with magnetized water and hence confirmatory trials are suggested for two consecutive seasons to evaluate the long-term performance of GMX Online magnetic water conditioner.

From the above results, it is concluded that installation of GMX Online magnetic water conditioner in irrigation pipes for agricultural purposes improves the soil properties, enhances the quality of irrigation water and influences the crop growth and yield parameters resulting in successful cultivation of grapes cv. Muscat.

9. If the chemical offered in item (i) or better than the other chemicals taken for comparison, whether the other chemicals for which approval accorded may be withdrawn	:	--
10. What is the cost benefit ratio of this offered product with that of other tested chemicals / products	:	New tool

30/12/05
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Table 1. Effect of Magnetised Water on Soil Properties (Mean of four replications)

Treatments	pH						EC (dsm^{-1})						$CaCO_3$					
	Initial	45th day of pruning	75th day of pruning	105th day of pruning	Post Harvest	Mean	Initial	45th day of pruning	75th day of pruning	105th day of pruning	Post Harvest	Mean	Initial	45th day of pruning	75th day of pruning	105th day of pruning	Post Harvest	Mean
T1 – Control (Normal irrigation water)	8.86	8.78	8.65	8.62	8.60	8.70	1.55	1.34	1.10	1.10	0.90	1.19	2.51	2.40	2.40	2.32	2.30	2.38
T2 – Magnetized water	8.86	8.60	8.54	8.45	8.40	8.57	1.55	1.10	0.92	0.74	0.70	1.00	2.51	2.25	2.10	1.85	1.80	2.10
Mean	8.86	8.69	8.59	8.53	8.50	8.63	1.55	1.22	1.01	0.92	0.80	1.09	2.51	2.32	2.25	2.06	2.05	2.24

Table 2. Effect of Magnetised Water on Water Soluble Cations (in ppm) (Mean of four replications)

Treatments	Na^+						Ca^{2+}					
	Initial	45th day of pruning	75th day of pruning	105th day of pruning	Post Harvest	Mean	Initial	45th day of pruning	75th day of pruning	105th day of pruning	Post Harvest	Mean
T1 – Control (Normal irrigation water)	10.70	6.20	5.70	3.50	3.10	5.84	4.20	3.70	2.20	1.80	0.90	2.56
T2 – Magnetized water	10.70	6.00	5.20	2.80	2.50	5.44	4.20	3.50	1.90	1.70	0.70	2.40
Mean	10.70	6.10	5.40	3.15	2.80	5.64	4.20	3.60	2.00	1.70	0.80	2.48

Treatments	Mg^{2+}						K^{2+}					
	Initial	45th day of pruning	75th day of pruning	105th day of pruning	Post Harvest	Mean	Initial	45th day of pruning	75th day of pruning	105th day of pruning	Post Harvest	Mean
T1 – Control (Normal irrigation water)	1.60	1.20	1.00	0.90	0.50	1.04	2.00	1.70	0.90	0.50	0.30	1.08
T2 – Magnetized water	1.60	1.00	1.00	0.70	0.70	1.00	2.00	1.50	0.90	0.30	0.10	0.96
Mean	1.60	1.10	1.00	0.80	0.60	1.02	2.00	1.60	0.90	0.40	0.20	1.02

Table 3. Effect of Magnetised Water on Water Soluble anions (in ppm) (Mean of four replications)

Treat ments	Cl^-						SO_4^{2-}						HCO_3^-					
	Initial	45th day of pruning	75th day of pruning	105th day of pruning	Post Harvest	Mean	Initial	45th day of pruning	75th day of pruning	105th day of pruning	Post Harvest	Mean	Initial	45th day of pruning	75th day of pruning	105th day of pruning	Post Harvest	Mean
T1 – Control (Normal irrigation water)	6.90	5.40	3.20	1.90	1.20	3.72	2.60	1.80	1.40	1.20	0.80	1.56	5.70	4.10	3.80	2.50	2.10	3.64
T2 – Magnetized water	6.90	4.20	2.70	1.10	0.70	3.12	2.60	1.50	1.10	0.70	0.50	1.28	5.70	3.70	3.00	1.80	1.50	3.14
Mean	**6.90**	**4.80**	**2.90**	**1.50**	**0.90**	**3.42**	**2.60**	**1.65**	**1.25**	**0.95**	**0.65**	**1.42**	**5.70**	**3.90**	**3.40**	**2.15**	**1.80**	**3.39**

Table 4. Effect of Magnetised Water on Soil available nutrient status (in $Kgha^{-1}$) (Mean of four replications)

Treat ments	Available N						Available P						Available K					
	Initial	45th day of pruning	75th day of pruning	105th day of pruning	Post Harvest	Mean	Initial	45th day of pruning	75th day of pruning	105th day of pruning	Post Harvest	Mean	Initial	45th day of pruning	75th day of pruning	105th day of pruning	Post Harvest	Mean
T1 – Control (Normal irrigation water)	219.50	260	310	286	245	264.10	9.50	10.80	11.00	10.50	11.80	10.72	325	364	355	340	310	338.80
T2 – Magnetized water	219.50	266.50	322	315	271	277.60	9.50	12.00	12.50	13.20	14.00	12.24	325	370	374	335	322	345.20
Mean	**219.50**	**260.25**	**316**	**300.50**	**258**	**270.85**	**9.50**	**11.40**	**11.75**	**11.85**	**12.90**	**11.48**	**325**	**367**	**364.50**	**337.50**	**316**	**342**

Table 5. Quality Parameters of normal and Magnetised irrigation water (Mean of four replications)

Treat ments	pH	Cl^- (ppm)	$SO4^{2-}$ (ppm)	Potential salinity (ppm)	Total hardness (ppm)	Residual sodium carbonate (ppm)
T1 – Control (Normal irrigation water)	8.75	5.20	2.20	6.30	71	0.95
T2 Magnetized water	8.56	4.50	1.80	5.40	65	0.60
Mean	**8.65**	**4.85**	**2.00**	**5.85**	**68**	**0.77**

Table 6. Bio – efficacy testing of Magnetised water conditioner in grapes var. Muscat.

(Mean of four replications)

Treatments	Leaf area (cm^2)	Individ ual Berry weight (g)	Berry diameter (cm)	No. of berries/ bunch	Bunch weight (g)	No. of Bunches/ plant	Yield / vine (Kg)	Yield / area (tones)	TSS%	Reducing sugars (%)
T1 – Control (Normal irrigation water)	185.37	3.30	4.15	70.50	264.90	75.50	19.85	6.55	18.45	18.59
T2 Magnetized water	215.15	3.52	4.50	74.25	271.52	76.37	23.12	7.63	20.10	20.45
Mean	**200.26**	**3.41**	**4.32**	**72.37**	**268.21**	**75.93**	**21.48**	**7.07**	**14.27**	**19.52**