

Study on Efficacy of TM Agricultural on Promoting Tea Growth and Quality

Camellia sinensis



Submitted by

UPASI Tea Research Foundation, Tea Research Institute,
Nirar Dam BPO, Valpari, TN, 642 127, India

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Project summary report 2013-2014

Submitted by

Dr. R.Raj Kumar, Ph D

UPASI Tea Research Foundation, Tea Research Institute,
Nirar Dam BPO, Valpari, TN, 642 127, India



Project Leader

Dr.Martin Doki, Ph D

Best Environmental Technologies

Edmonton, AB, T6E 5T9

Canada

Study on Efficacy of TM Agricultural on Promoting Tea Growth and Quality-INDIA

Summary Report:

Objective:

Evaluation of efficacy of TM Agricultural in mature clonal tea for crop performance and quality by conducting a field study as per the approved and standard protocols.

TM Agricultural application on soil and on bushes schedule dates:

Total 8 rounds were applied including 2 on soil and 6 on crop/bushes.

09-06-13 (on soil), 10-07-13, 29-08-13, 19-09-13 (on soil), 24-10-13, 28-11-13, 17-12-13, 22-01-14.

Information on TM Agricultural spraying

Location : Valparai, Tea Research Institute, TN, INDIA

Spraying details

Period of spray: Totally eight rounds were given as detailed ` here under with six rounds during crop season coinciding with June, July, August, September, October & November, and two rounds during dry season.

The following details obtained and compiled from the records of Meteorological Station/Centre/Department of UPASI Tea Research Foundation, Tea Research Institute, Valparai.

S. No.	Spraying date	Temperature (°C)		Relative humidity (%)		Rainfall (mm/day)	Sunshine (h/day)
		Min	Max	8.30 am	02.30 pm		
1	09-06-2013	17.0	22.5	79	85	0.6	-
2	10-07-2013	20.5	22.5	92	91	1.8	-
3	29-08-2013	16.5	22.5	84	86	0.8	-
4	19-09-2013	16.5	25.0	88	90	1.6	-
5	24-10-2013	15.5	22.2	89	85	1.4	-
6	28-11-2013	16.5	22.0	89	79	1.6	-
7	17-12-2013	14.5	27.0	71	64	-	7.2
8	22-01-2014	16.5	27.8	80	65	-	5.6

Remarks: Foliar application of TM Agricultural was not interrupted by rain where the spraying was executed between 09.00 and 10.30 hours. However, experimental plots experienced evening showers during first six rounds of foliar application. Among the eight rounds of application, scheduled number 1 and 4 are the TM agricultural applied on soil.

Results:

Tea Yield:

Overall analysis of the crop revealed that foliar application of TM Agricultural at 400 mL alone and along with micronutrients* in 200 L of water/ha enhanced yield performance by 13.7 and 13.4%, respectively. Lower concentrations of TM Agricultural with or without micronutrients had marginal effect on yield. In general, foliar application of TM Agricultural improved the yield potential of tea plants related with higher crop productivity.

Physiological components: Foliar application of TM Agricultural at 400 mL ha⁻¹ either alone or with micronutrients improved the photosynthetic carbon dioxide assimilation rate. A linear relationship was recorded between photosynthetic pigments and applied TM Agricultural concentrations. Chlorophylls and carotenoid contents were increased at 300 and 400 mL ha⁻¹ concentration of TM Agricultural.

Green leaf constituents (biochemicals): Foliar application of TM Agricultural influenced biochemical composition of the crop shoot constituents. Polyphenol content had a positive relationship with increasing concentration of TM Agricultural either alone or with micronutrients. Similar trend was also observed in case of catechin. Improvement in amino acid content due to TM Agricultural application at 300 and 400 mL ha⁻¹ either alone or with micronutrients.

Made tea constituents and liquor characteristics: TM Agricultural at 400 mL ha⁻¹ concentration improved the made tea characteristics like theaflavins, thearubigins, high-polymerised substances and Total Liquor Colour. Same trend was observed when TM Agricultural was applied along with micronutrients also. There was a significant improvement in thearubigins (TR) content in the made tea due to the application of TM Agricultural at three different concentrations 200, 300 and 400 mL ha⁻¹ when compared to the untreated control.

Compatibility test (Laboratory study): Laboratory studies showed that TM Agricultural was compatible with commonly used agrochemicals, micronutrients and NK 1% each as per UPASI recommendations. There was no precipitation observed when these combinations were attempted at laboratory scale.

Conclusion: Among different concentrations TM Agricultural tested, significant improvement in crop performance was noticed when TM Agricultural was applied 6 sprays on crop at 400 mL ha⁻¹ with 200 L of water volume. Photosynthetic rate monitored in the present study also substantiated the significant improvement in crop. Polyphenols, catechins, and amino acids of green leaves improved significantly where the tea bushes received foliar application of TM Agricultural. The made tea quality attributes in terms of liquor characteristics also improved by foliar application of TM Agricultural.

**Micronutrients:* 2 kg ZnSO₄, 2 kg MgSO₄, 500 ppm Mn as MnSO₄ and 100 ppm B as Boric acid per ha in 200 L of water per ha as per UPASI recommendation.

Efficacy of TM Agricultural on yield of mature clonal tea

Treatment	Made tea yield* (kg ha ⁻¹)	PI**	Dormant shoots
T1 Control	2719	0.94	85.3
T2 TM 200 mL 200 L ⁻¹	2911 (7.1)	1.00	86.1
T3 TM 300 mL 200 L ⁻¹	2981 (9.6)	1.03	84.5
T4 TM 400 mL 200 L ⁻¹	3091 (13.7)	1.07	81.3
T5 TM 200 mL + Micronutrients 200 L ⁻¹	2715 (1.6)	0.94	85.2
T6 TM 300 mL + Micronutrients 200 L ⁻¹	2824 (3.9)	0.97	87.5
T7 TM 400 mL + Micronutrients 200 L ⁻¹	3084 (13.4)	1.06	86.0
T8 Micronutrients***	2873 (6.9)	0.99	83.6
SEM	183.96		0.19
CD @ P=0.05	360		0.38
CV %	9.99		0.36

*Made tea calculated at an out turn of 22.5%; **PI: ratio between the actual yield of respective treatment and mean yield of the field; figures in parentheses denote per cent increase over untreated control; S.E. standard error; C.D.: critical difference at 5% level; C.V.: co-efficient of variation.

Effect of TM Agricultural on certain green leaf constituents of mature clonal tea

Treatment	Poly (%)	Cat (%)	AA (%)
T1 Control	14.33	15.73	2.41
T2 TM 200 mL 200 L ⁻¹	17.79	15.84	2.67
T3 TM 300 mL 200 L ⁻¹	18.34	16.51	2.88
T4 TM 400 mL 200 L ⁻¹	21.47	16.94	3.93
T5 TM 200 mL + Micronutrients 200 L ⁻¹	17.48	16.33	2.68
T6 TM 300 mL + Micronutrients 200 L ⁻¹	20.40	16.59	2.90
T7 TM 400 mL + Micronutrients 200 L ⁻¹	21.52	17.16	3.93
T8 Micronutrients	20.51	14.87	3.38
SE±	1.53	0.90	0.17
CD @ P=0.05	3.00	1.77	0.32
CV %	12.75	8.77	8.44

Poly: Polyphenol; Cat: Catarchin; AA: Amino acid

Impact of TM Agricultural on quality constituents of black tea

Treatment	TF	TR	HPS	TLC	Caff	CI	BI
T1 Control	0.99	11.34	6.93	3.78	2.36	6.89	23.25
T2 TM 200 mL 200 L ⁻¹	1.01	11.66	7.45	3.86	2.37	6.80	23.39
T3 TM 300 mL 200 L ⁻¹	1.02	11.78	7.63	3.93	2.20	6.80	23.40
T4 TM 400 mL 200 L ⁻¹	1.03	11.94	7.93	4.01	2.38	6.78	23.40
T5 TM 200 mL + Micronutrients 200 L ⁻¹	1.01	11.41	7.05	3.91	2.29	7.00	23.60
T6 TM 300 mL + Micronutrients 200 L ⁻¹	1.02	11.51	7.21	3.97	2.33	6.99	23.59
T7 TM 400 mL + Micronutrients 200 L ⁻¹	1.04	11.96	7.91	4.04	2.19	6.82	23.66
T8 Micronutrients	0.99	11.60	7.34	3.78	2.27	6.75	23.12
SE±	0.02	0.08	0.13	0.01	0.01	0.16	0.36
CD @ P=0.05	0.04	0.15	0.25	0.01	0.03	0.31	0.71
CV %	3.41	0.93	2.75	0.20	0.99	4.10	2.45

*TF: theaflavins (%); TR: thearubigins (%); HPS: high polymerised substances (%); TLC: total liquor colour; Caff: caffeine in per cent; CI: colour index and BI: briskness index

Effect of TM Agricultural on certain liquor characteristics of made tea

Treatment	Infusion	Colour	Strength	Briskness
T1 Control	7.00	6.47	6.90	6.33
T2 TM 200 mL 200 L ⁻¹	6.00	7.03	6.47	6.47
T3 TM 300 mL 200 L ⁻¹	6.50	7.18	6.75	7.03
T4 TM 400 mL 200 L ⁻¹	7.50	6.90	7.47	7.47
T5 TM 200 mL + Micronutrients 200 L ⁻¹	6.00	7.47	6.47	6.33
T6 TM 300 mL + Micronutrients 200 L ⁻¹	6.25	7.03	7.47	6.60
T7 TM 400 mL + Micronutrients 200 L ⁻¹	8.00	7.60	7.90	7.25
T8 Micronutrients	6.00	7.47	7.03	6.82
SE±	0.27	0.14	0.10	0.22
CD @ P=0.05	0.52	0.28	0.19	0.42
CV %	6.33	3.62	2.59	5.92

*score provided by professional tasters (out of ten for each parameter); values represent mean of two professional tasters and two different seasons, individually.

Experimental Field Pictures



