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ENVIRONMENTAL AND MORPHOLOGICAL ANALYSIS OFTHE CULTIVATED RICE VARIETY – KANNAGI AROUND THALAIYUTH SANKAR CEMENT FACTORY OF TIRUNELVELI DISTRICT – INDIA

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ABSTRACT

The degree of relation among different variables for the environmental and morphological parameters of the cultivated *Oryza sativa* plants was evaluated by pilotingstandard deviation, correlation co-efficient, multiple regressions and multiple linear regression analysisare positively correlated at 0.01 and 0.05 level of significant.

KEY WORDS: *Oryza sativa*, correlation, multiple regressions, multiple linear regressions

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INTRODUCTION

Cement dust is a common particulate air pollutant around the cement factories and construction sites. Even though cement is very useful to mankind for building purposes, badly affects the vegetation produces considerable heavy metal accumulation in the soil, leaves, stem and fruits (Asubiojo *et al*., 1991; Ade-Ademilua and Umebese, 2007).

The fall out of cement dust areas lead to changes in the soil characteristics and plant structure affects the plant growth with the formation of crusts on leaves, branches, flowers and fruits. These changes reflect irreparable habitat degradation. The cement polluted plants are directly affected through leaf stomata and indirectly by changing the pH of the soil (Singh, 1981).

MATERIALS AND METHODS

Experimental field work was carried out around the Sankar cement factory at Thalaiyuth in Tirunelveli district. The cultivated rice variety Kannagi around the vicinity of the factory i.e. 3-10 kilometers was treated as cement polluted and beyond 10kms as control plants. Morphological evaluation and bio-chemical estimations were carried out as prescribed by Sadasivam and Manickam.

RESULTS AND DISCUSSION

Environmental parameters via atmospheric temperature, rainfall, pH and relative humidity at the sampling sites revealed maximum value at the cement polluted site and minimum values at the control site (Table -1). Environmental parameters are positively correlated at 0.01 and 0.05 level of significant (Table -2).Multiple regression analysis revealed that the environmental parameters are highly dependent against the variables, R^2 value (0.998872343) and multiple R(0.999980326) at the control sites in summer, R^2 value (0.998423128) and multiple R (0.997890789) at the cement polluted site in summer.

On the other hand, the environmental parameter is slightly dependent against the variables R^2 (0.955634281) and multiple R (0.965321273) at the control site, R^2 value (0.954236974) and multiple R (0.994524359) at the cement polluted site in monsoon.

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Table -1 Standard Deviation for Environmental Parameters of Cement and Non-cement polluted Rice Plants

S.No	Parameters	A_1	A_2	A_3	A_4
1	AT	33.00 ± 0.000	38.00 ± 0.707	25.00 ± 0.707	28.00 ± 0.000
2	R	28.00 ± 0.000	24.00 ± 0.414	58.00 ± 0.414	45.00 ± 0.414
3	pH	8.10 ± 0.000	10.40 ± 0.141	8.00 ± 0.141	10.30 ± 0.141
4	RH	48.00 ± 0.000	32.00 ± 0.707	58.00 ± 0.414	46.00 ± 0.414

AT- Atmospheric temperature in ^{0}C; R- Rainfall per annum in cm; RH-Relative Humidity in %;Non-cement polluted rice in summer (A_1); Cement polluted rice in summer (A_2);Non-cement polluted rice in monsoon (A_3); Cement polluted rice in Monsoon (A_4)

Table: 2 Correlation co-efficient for Environmental Parameters of Cement and Non-cement polluted Rice Plants

S.No	Parameters	A_1- A_3	A_2 - A_1	A_3 - A_4	A_4 - A_2
1	AT	-0.07	0.86*	0.87*	0.96**
2	R	0.35	0.88*	0.86**	0.95**
3	pH	-0.08	0.99*	0.98*	0.90*
4	RH	0.01	0.99*	0.99**	0.91*

* 0.05 level significant; ** 0.01 level significant

Morphological Parameters

Morphological parameters via tiller length, number of leaves, length of inflorescence, number of paddy, weight of paddy and moisture content revealed minimum production in the cement polluted soil observed during summer and maximum production in monsoon (Table-4).The morphological parameters are positively correlated at 0.01 and 0.05 level of significant (Table -5). Multiple regression analysis revealed that the morphological parameter are highly dependent against the variables, R^2 value (0.998723521) and multiple R (0.997732103) of the control

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paddy in summer, R^2 value (0.9977263291) and multiple R (0.987734569) of the cement polluted paddy in summer. On the other hand, the morphological parameter is highly dependent against the variables R^2 value (0.999735672) and multiple R (0.999713281) of the control paddy, R^2 value (0.995562432) and multiple R (0.987326423) of the cement polluted paddy in monsoon.

Table: 3 Standard Deviation for Morphological Parameters of Cement and Non-cement polluted Rice Plants

S.No	Parameters	A_1	A_2	A_3	A_4
1.	TL	22.60 ± 0.212	17.90 ± 0.283	23.50 ± 0.000	18.50 ± 0.141
2.	NL	18.00 ± 0.000	11.00 ± 0.000	18.00 ± 0.707	11.00 ± 0.707
3.	LI	30.50 ± 0.707	16.50 ± 0.414	30.70 ± 0.707	17.80 ± 0.707
4.	NP	120.00 ± 0.000	70.00 ± 0.000	120.00 ± 0.707	70.00 ± 0.707
5.	WP	13.90 ± 0.212	6.60 ± 0.071	14.10 ± 0.556	6.80 ± 0.838
6.	MCP	96.80 ± 0.638	70.10 ± 0.263	97.50 ± 0.171	72.10 ± 0.171

TL- Tiller Length in inches; NL-Number of Leaves; LI- Length of Inflorescence in inches; NP- Number of Paddy / inflorescence; WP - Weight of Paddy in mgs; MCP- Moisture content of Paddy in %

Table: 4 Correlation Co-efficient for Morphological Parameters of Cement and Non-cement polluted Rice Plants

S.No	M.P	A_1- A_3	A_2 - A_1	A_3 - A_4	A_4 - A_2
1.	TL	0.02	0.99**	0.98**	0.59
2.	NL	- 0.08	0.98**	0.85*	0.35
3.	LI	- 0.30	0.99*	0.86*	0.31
4.	NP	0.07	0.98*	0.99**	0.98**
5.	WP	0.02	0.86*	0.85*	0.009
6.	MCP	- 0.21	0.87*	0.86*	0.99**

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Table: 5 Multiple Linear Regression Analysis for Environmental and Morphological Parameters of Cement polluted and non-cement polluted Rice

Variables	Parameters	Multiple regression analysis
A1	E.P	Y= 0.1670; X_1+ -0.2249; X_2+ 0.0437; X_3+ 0.0121; X_4+ 0.0627
A1	M.P	Y = 0.9320; X_1+ 2.2284; X_2+ 8.4398; X_3+ 13.2316;X_4+13.3569; X_5+ -20.1747; X_6+ -22.1747
A2	E.P	Y= 0.5624; X_1+ -2.6922; X_2+ 3.8949; X_3+ 4.7657; X_4+ -4.3692
A2	M.P	Y= 2.4321; X_1+ 2.0096; X_2+ 0.2099; X_3+ -3.4426; X_4+ 5.7010; X_5+ 0.3882; X_6+ 1.4981
A3	E.P	Y= 1.7942; X1+ -2.7372; X2+ -6.2648; X3+ 8.6992;X4+9.7897
A3	M.P	Y= 1.7953; X_1+ -11.8808; X_2+ -15.9782; X_3+ 16.9782; X_4+ 19.0858; X_5+ 193.2171; X_6+ -14.7030
A4	E.P	Y= 0.2984; X_1+ -0.5180; X_2+ -1.5259; X_3+ -2.8983; X_4+ -3.3367
A4	M.P	Y= -0.2983; X_1+ -2.8249; X_2+ -2.9892; X_3+ -3.3367; X_4+ -4.1870; X_5+ -3.8823; X_6+ -4.2890

Y = Number of fruits / plant associated with yield
E.P – X_1 to X_4- Different Environmental parameters
M.P – X_1 to X_6 - Different Morphological parameters

CONCLUSION

Cement dust emanating from the Thalaiyuth Cement factory settles on the surfaces of the vegetation observed during summer and monsoon season reported morphological flopof the rice plants, stimulate us to mitigate cement dust aroundthe cultivated and vegetated areas.

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