Toxic Crystal violet dye removal by novel, eco-friendly Seablite biochar-ferrite composite: Adsorption isotherm, kinetics, and Artificial neural network

Disha Mehta[a], Pragnesh N. Dave*[a], V. Vijay Kumar[b]

* Corresponding author

a Department of Chemistry, Sardar Patel University, Vallabh Vidyanagar, 388 120, Gujarat, India

Corresponding author: pragnesh7@yahoo.com

b Gujarat Institute of Desert Ecology, Bhuj- 370 001, Gujarat, India

Supplementary file

Section S1. Synthesis of FCOB

1:1 ,2:1 ,1:2 ,3:1- These four different composites having different ratios of concentrations of BTBC to ternary spinel ferrite were synthesized. The varying compositions of BTBC and different metal salts of ternary spinel ferrite are given in Table. S1. The varying compositions of BTBC mixed with 60 ml distilled water and irradiated with sonication to get properly dispersed BTBC particles. Then, the varying amounts of $Fe(NO_3)_3 \cdot 9H_2O$,$Ni(NO_3)_2.6H_2O$, $Cu(NO_3)_2.3H_2O$ and $Zn(NO_3)_2.6H_2O$ metal salts were mixed with 10 ml of distilled water and stirred for 20 minutes to make the mixture homogenous. This metal slat solution was then added to BTBC solution and continuously stirred for 30 minutes at 60°C followed by the dropwise addition of NaOH to increase the pH of the mixture to $\cong 11$. The precipitates were heated at 60 °C for 2 hrs with continuous stirring. Then it was filtered and washed with distilled water to bring back its neutrality. After oven drying it overnight, the resulting 4 sets of FCOB were used for adsorption experiment of CV.

Figures

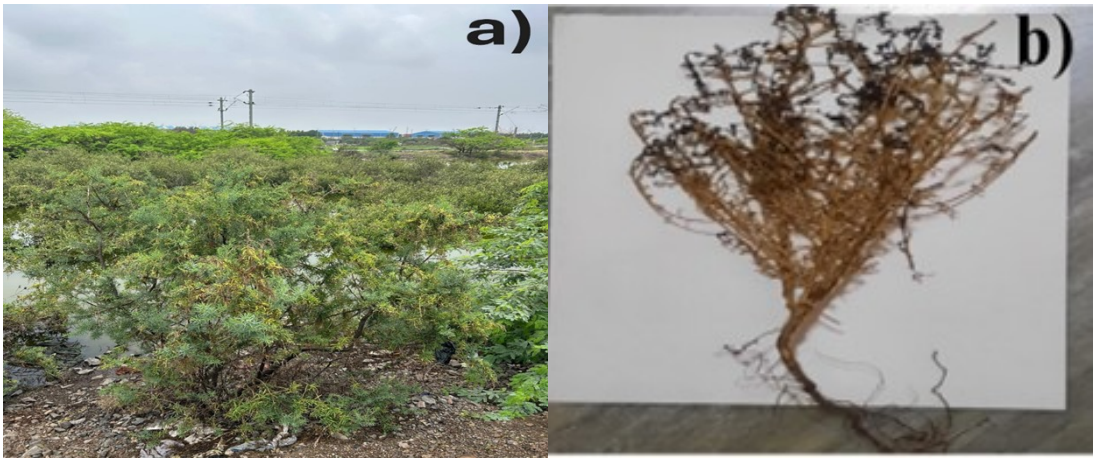


Fig.S1. Location site of plant (a) and dried plant (b)

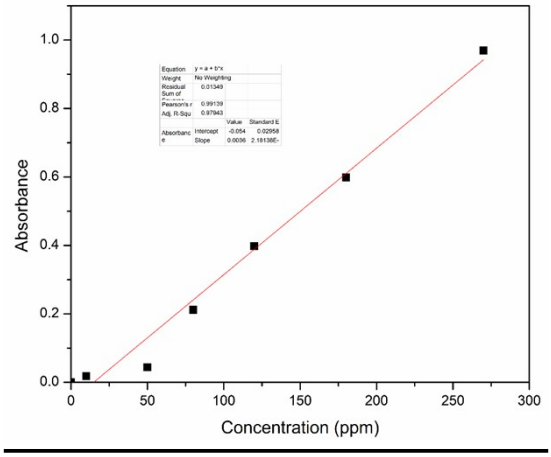
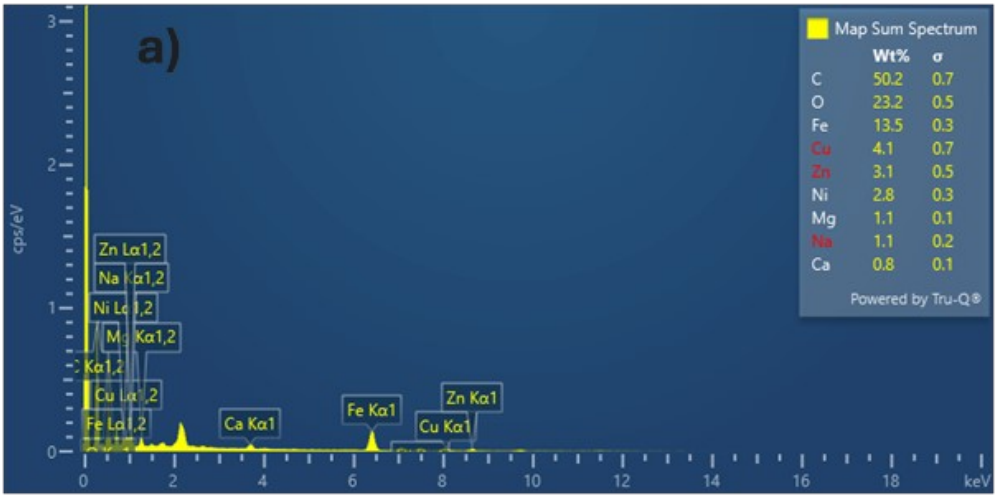


Fig.S2. Calibration curve of Crystal violet dye



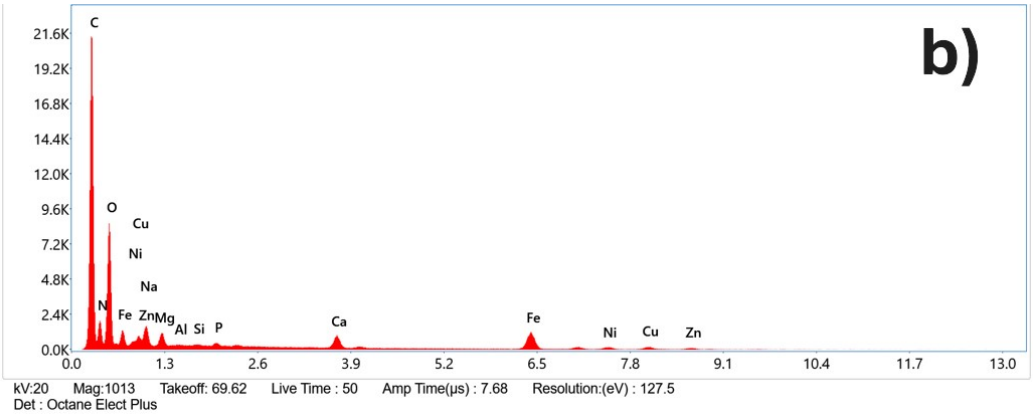


Fig.S3. EDS spectrum of FC-CV (a), FCOB (b)

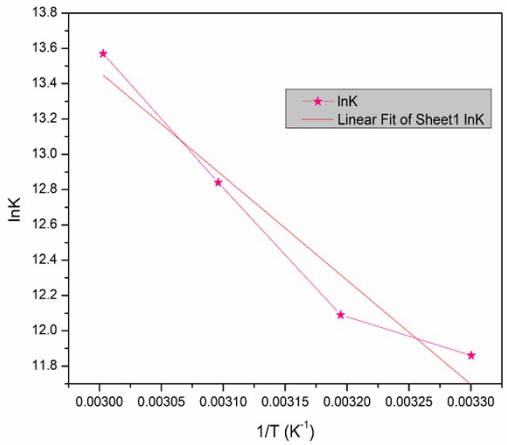


Fig.S4. Thermodynamic parameter graph

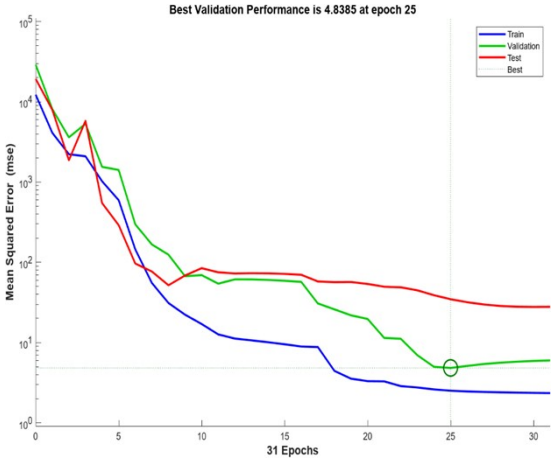


Fig.S5.Performance plot for LM algorithm for both R% and adsorption capacity output

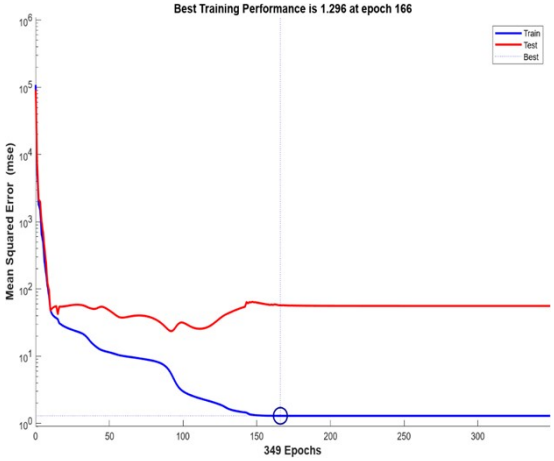


Fig.S6. Performance plot for BR algorithm for both R% and adsorption capacity output

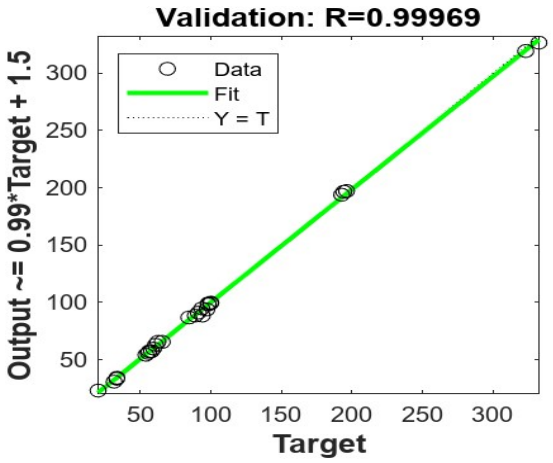


Fig.S7.Regression plot of tested data series using LM algorithm for both R% and adsorption capacity output

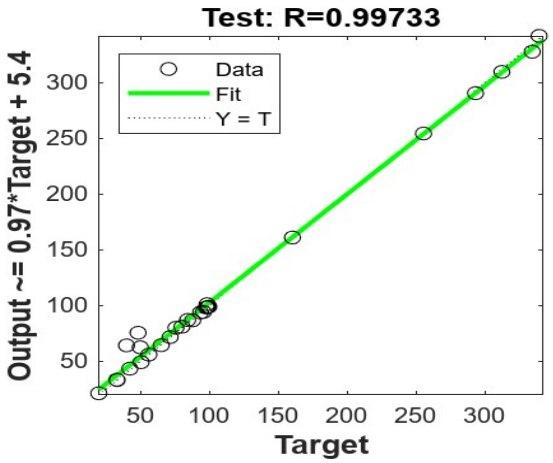


Fig.S8. Regression plot of tested data series using BR algorithm for both R% and adsorption capacity output

Tables

Table.S1. Feed composition for synthesis of FCOB

BTBC:Ferrite spinel composition ratio	**BTBC (g)**	**$Fe(NO_3)_2.6H_2O$ (g)**	**$Ni(NO_3)_2.6H_2O$ (g)**	**$Cu(NO_3)_2.2H_2O$ (g)**	**$Zn(NO_3)_2.6H_2O$ (g)**
1:1-FS1	0.50	0.50	0.17	0.14	0.18
1:2-FS2	0.50	1.00	0.33	0.28	0.34
2:1-FS3	1.00	0.50	0.17	0.14	0.18
3:1-FS4	0.90	0.30	0.10	0.08	0.10

Table .S2.R and MSE values of the processed data

Algorithm		LM-ANN	BR-ANN
R	Training	0.99	0.99
	Validation	0.98	-
	Test	0.98	0.99
	Overall	0.99	0.99
MSE	Training	4.83	1.296