Appendix A. Supporting Information

Tagetes Erecta as an organic precursor: Synthesis of highly fluorescent CQDs for the micromolar tracing of ferric ions in human blood serum

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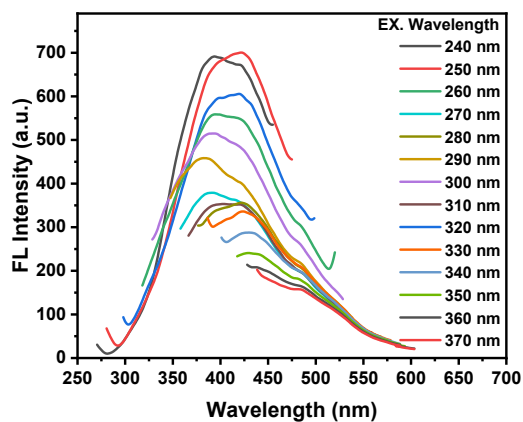
Section B. Supporting Figures:

Figure S1. Photoluminescence spectra of CQDs at different excitation wavelengths
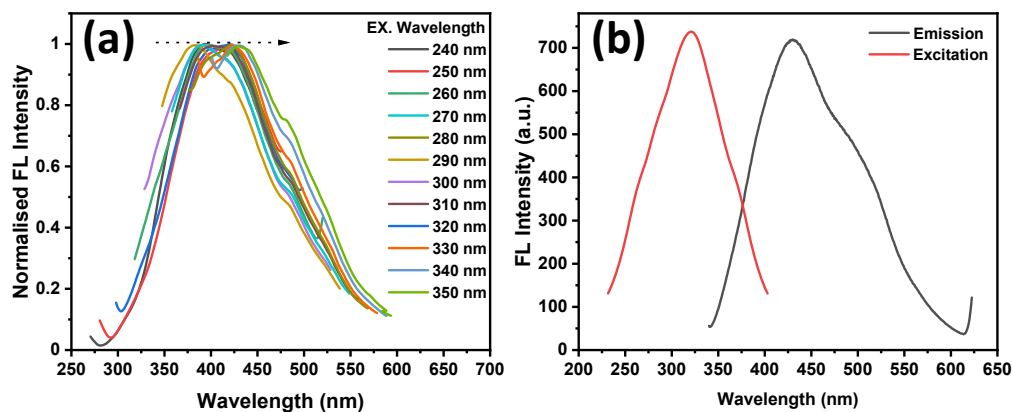

Figure S2. (a) Normalised FL intensity of CQDs depicting the clear red shift at different excitation wavelengths and (b)Excitation profile (Red) at emission wavelength, λ_{em}= 425 nm and emission profile (Black) at excitation wavelength, λ_{ex}= 320 nm peak cantered at ~ 320 nm and ~ 425 nm respectively
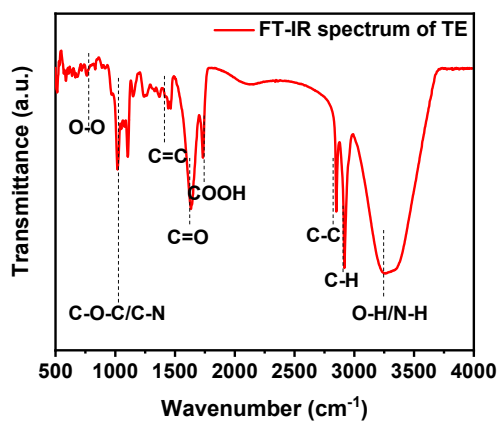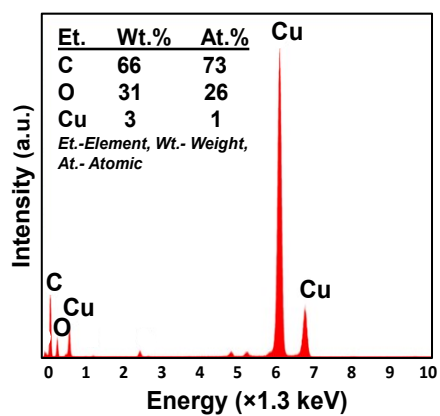
Figure S3. FT-IR spectrum of TE
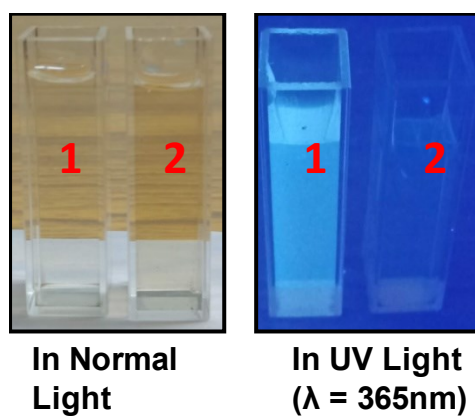

Figure S4. EDX profile of TE-CQDs

Figure S5. 1 and 2 demonstrating optical image of CQDs and CQDs + Fe^{3+}, respectively in presence of normal light and UV light ($\lambda = 365$ nm)
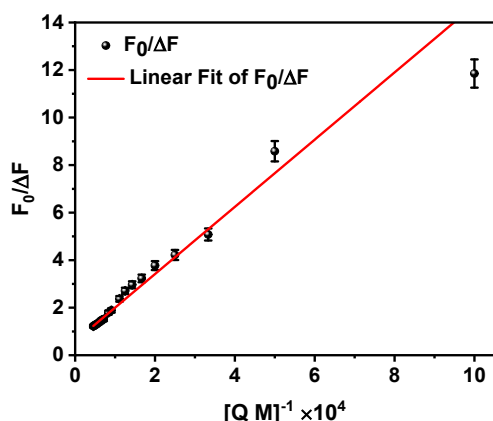
Modified S-V plot for standard solution

Figure S6. Modified S-V plot for the sensing of Fe^{3+} in standard solution

Modified S-V plot for HBS sample1

Similar to standard solution, S-V plot has been plotted and observed that the relative intensity vs concentration curve is exponential, which is quite good agreement of blood serum sample1 with standard solution. Similarly, for better understanding we have plotted modified S-V plot (Figure S7) followed by forthcoming equation:

$$\frac{F_0}{\Delta F} = \frac{1}{f_a K_a (Q)} + \frac{1}{f_a}$$

The estimated values of the f_a^{-1} and $(f_a K_a)^{-1}$ are ~0.289 and ~2.10 M, respectively, demonstrating that most of the initial FL intensity was approachable by the quencher. This tends that 14% of maximum of FL intensity was quenched by quencher. Furthermore, the quenching constant K_a has a value ~1.4 × 10^3 M^{-1} which is ~16 % of the collision quenching phenomena derived constant and suggests a defined way of the quenching by quencher towards the CQDs FL intensity
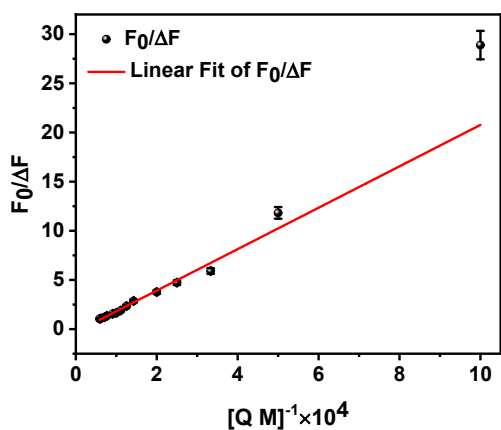
Figure S7. Modified S-V plot for the sensing of Fe^{3+} in HBS sample1

Linearity of probe

It was observed that the S-V plot is linear for some short range of gradual addition of Fe^{3+}ion solution while the overall graph obtained was exponential; fit depicting the complex quenching of FL. The complex quenching nature showed that there must be three different linear regions corresponding to each quenching species. But here we get only one linear plot showing the good linearity of the sensing probe with S-V constant K_{s-v}= 7.5 × 10³ M⁻¹, 8.7 × 10³ M⁻¹ with regression coefficient R^2 =0.99 in both cases (standard solutionand HBS) as shown in Figure S8.

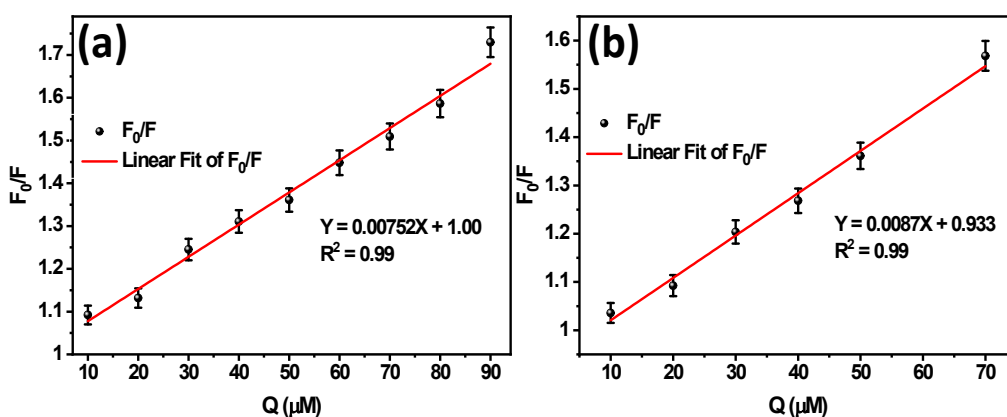**Figure S8.** Linear fit of S-V plot for the concentration range of Fe^{3+} in (a) standard solution (b) HBS sample 1

FL quenching analysis for the HBS sample2

FL quenching study has been performed for HBS sample 2 also. The results have been displayed in Figure S9 depicting the good agreement with the studies for standard solutionand HBS sample 1. Further, comparative study of the present work is shown in Table S2.
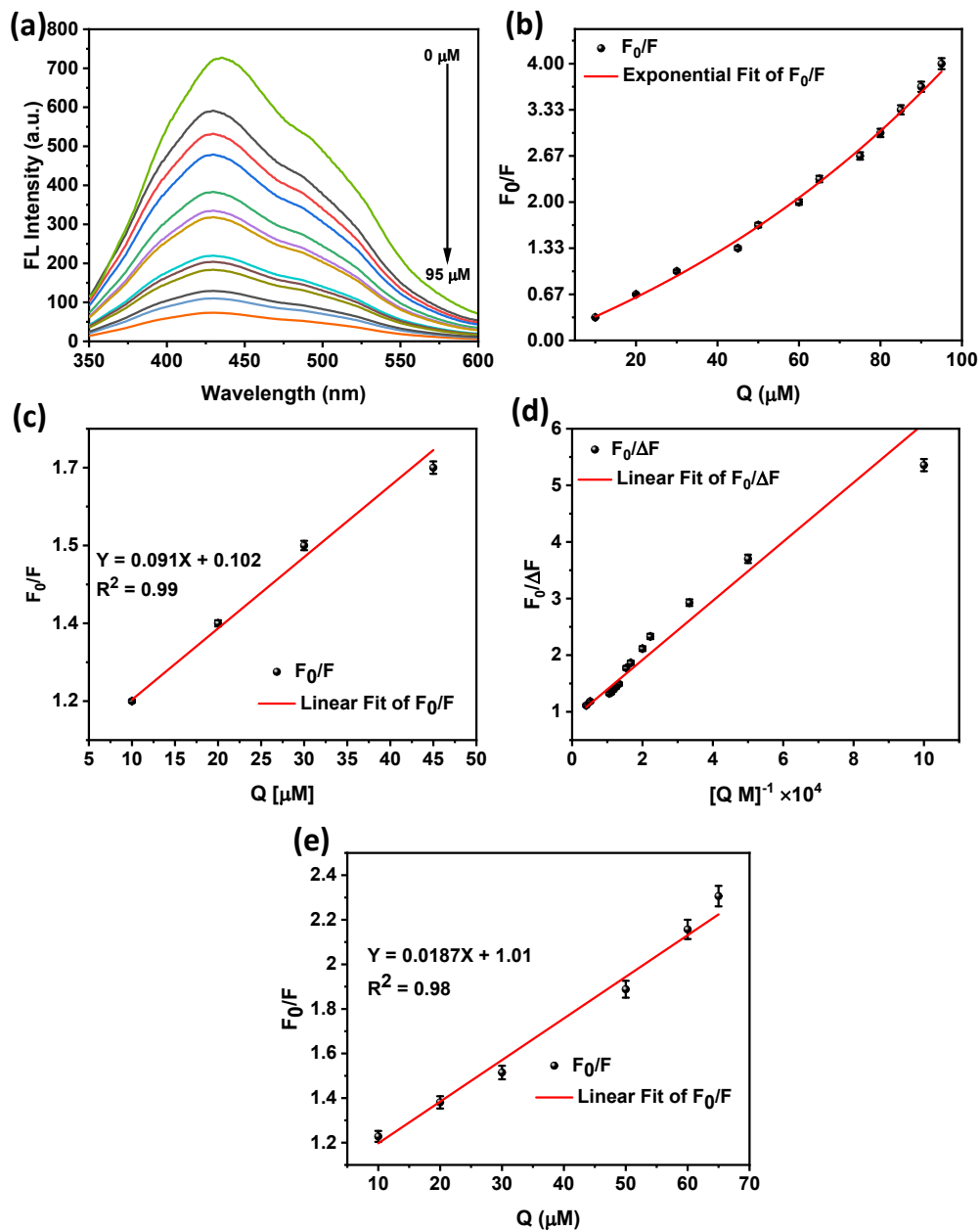
Figure S9. (a) FL quenching plot (b) Exponential fit of S-V plot (c) Linear fit of S-V plot (d) Modified S-V plot and (e) normalised FL intensity vs. log[blood serum Fe^{3+}] plot for the calculation of LOD in the solution of TE-CQDs upon the addition of HBS sample2

Section B. Supporting Tables:

TRPL spectroscopy analysis of sensing probe

TableS1. Decay time of TE-CQDs in presence of different concentrations of Fe^{3+} ions

Conc. of Fe^{3+}	τ_1(ns)	τ_2(ns)	τ_3(ns)	$\sim \tau_{av}$ (ns)	τ_0 / τ_{av}
0	1.8535	0.60562	6.05982	2.83	1
10	1.80603	0.57695	5.83148	2.73	1.03
20	1.71447	0.56922	5.34463	2.57	1.07
30	1.69233	0.52221	5.50963	2.54	1.09
40	1.68596	0.55662	5.40341	2.55	1.11
50	1.64476	0.49623	5.49316	2.54	1.13
60	1.55471	0.44828	5.28276	2.42	1.16
70	1.47459	0.42191	5.06344	2.31	1.22
80	1.46834	0.43099	4.96987	2.29	1.23
140	0.86816	0.10763	3.35158	1.98	1.43
200	0.4559	0.04537	3.2208	1.24	2.28

Table S2. Brief study of the present work

Name	Previously	Addition	K_{s-v}	LOD	Linearity range

	Fe^{3+}/Iron concentration	of Fe^{3+}/HBS during the experiment (µM)		(µM)	(µM)
Standard solution	0	0-220	7.5×10^3	0.37	0-90
HBS sample1	63.8 mg/dL (11.42 µM)	0-170	8.7×10^3	0.36	0-70
HBS sample2	20.2 mg/dL (3.61 µM)	0-95	-	0.59	0-50

The quantitative *in vitro* determination of Iron in HBS has been performed by**R**x series instruments (Randox Laboratories Ltd. Crumlin, County Antrim, BT29 4QY, United Kingdom) which include Rx Daytona and Rx Imola (R1. Buffer, R2. Chromogen).