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MDPI

Development of Sulfur-and nitrogen-doped carbon dots (S,N-CDs) dual biosensor from *Ricinus communis*(castor) seeds for the estimation of Protamine and Uric acid in biological samples

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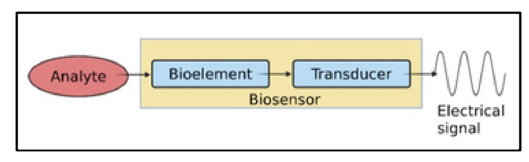
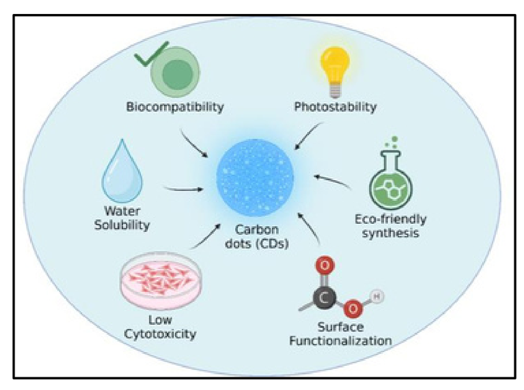
INTRODUCTION

- Biosensors are innovative analytical tools that combine a biological recognition element with a physicochemical transducer to detect and quantify analytes with high specificity and sensitivity.
- Fluorescent biosensors offer advantages such as rapid, visual detection and suitability for bioimaging applications
- Carbon dots (CDs) are emerging nanomaterials
- There is growing interest in using green, low-cost precursors for CD synthesis

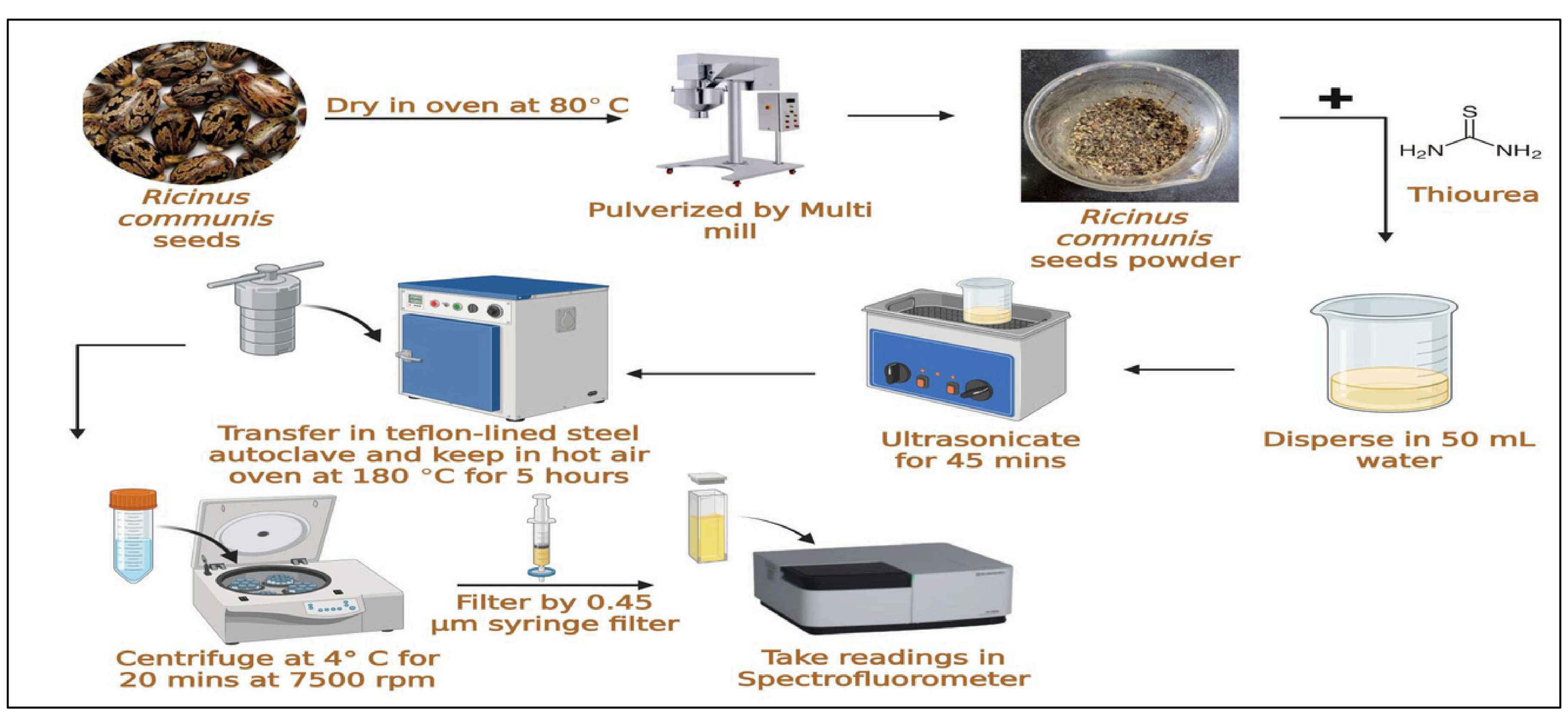




AIM

To fabricate multi-functional *Ricinus communis* seeds derived carbon dots and explore their various applications

METHOD

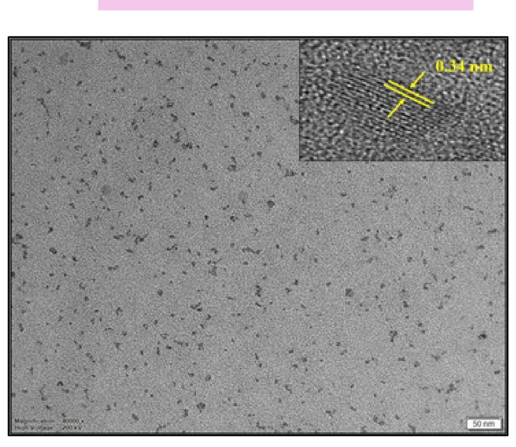


Fabrication of CDs by castor seeds & thiourea

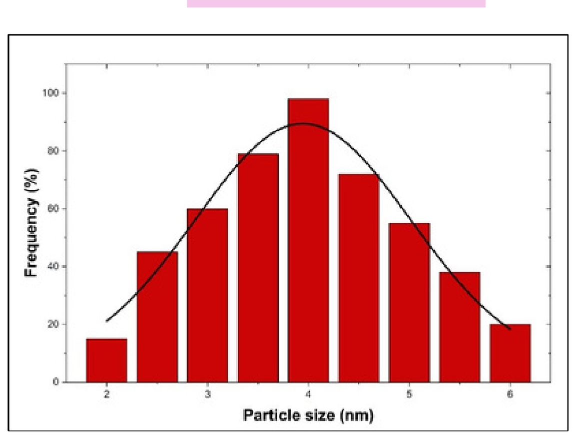
RESULTS & DISCUSSION

1. Characterizationof S, N-CDs

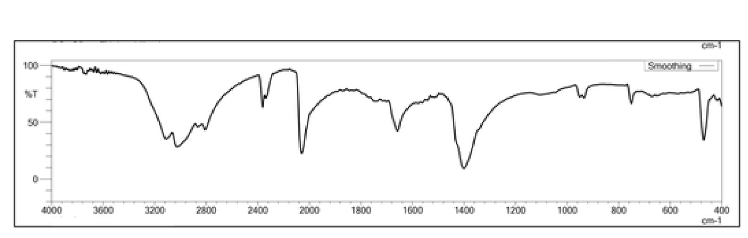
1.1 HRTEM



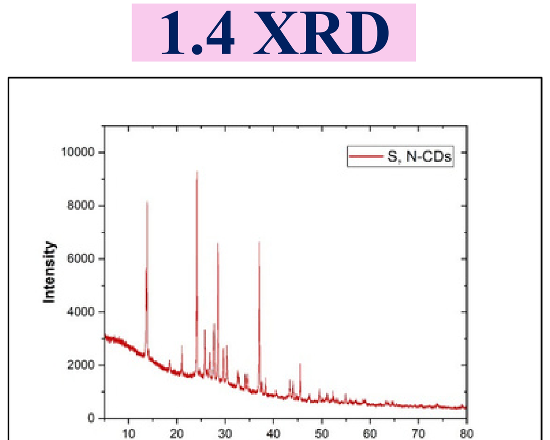
1.2 DLS



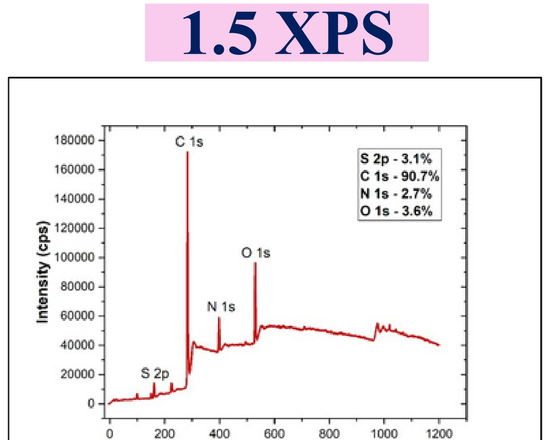
1.3 FTIR



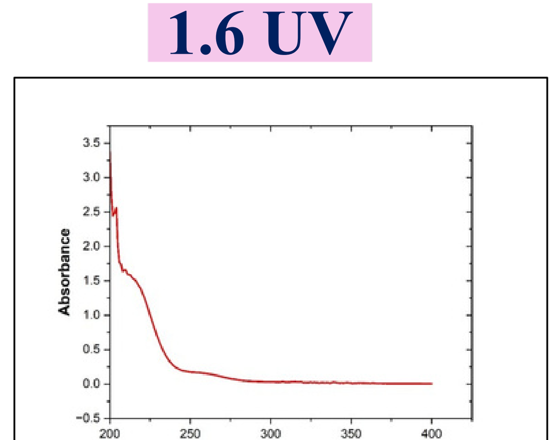
1.4 XRD



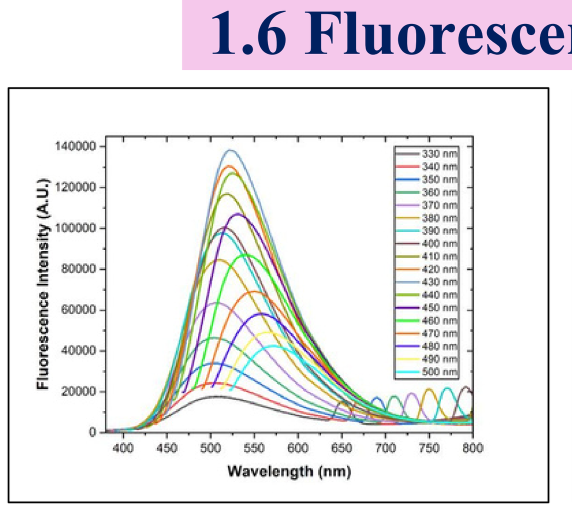
1.5 XPS

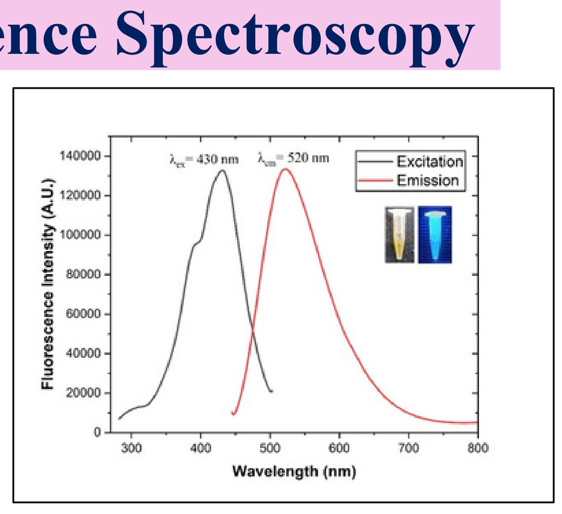


1.6 UV

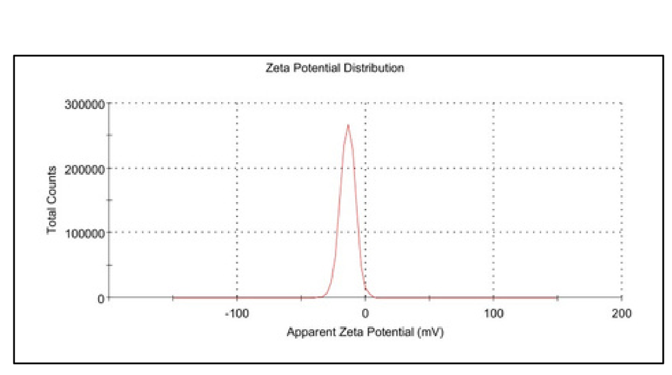


1.6 Fluorescence Spectroscopy





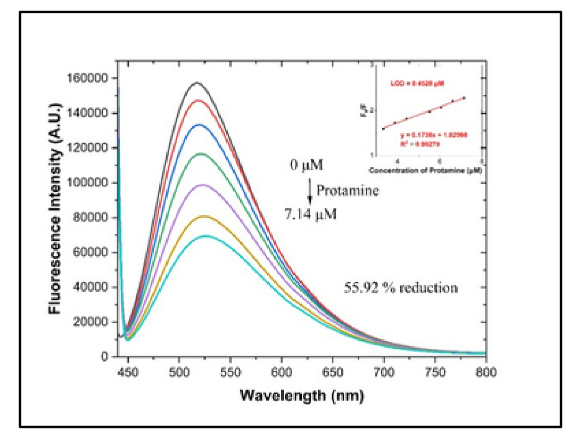
1.7 Zeta Potential



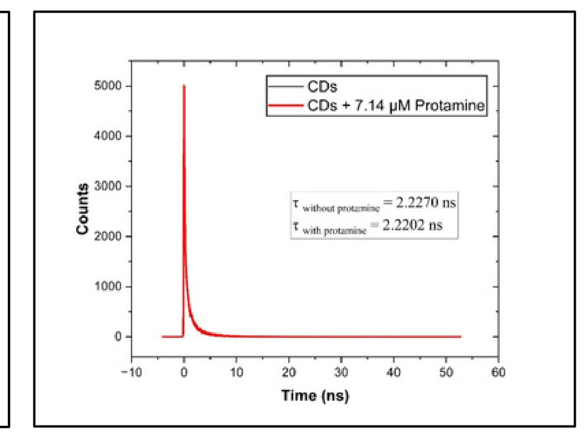
2. Analyte Detection

2.1 Protamine

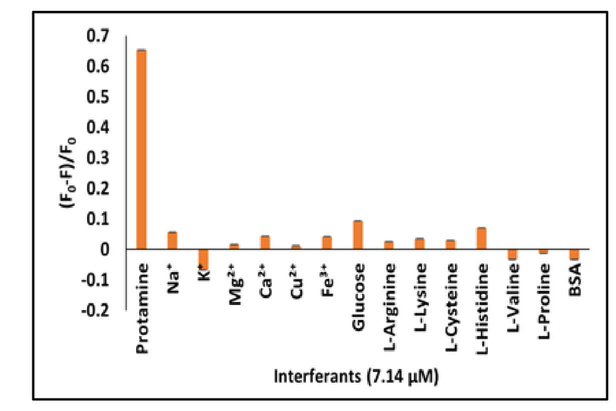
2.1.1 Fluorescence Spectra



2.1.2 TCSPC



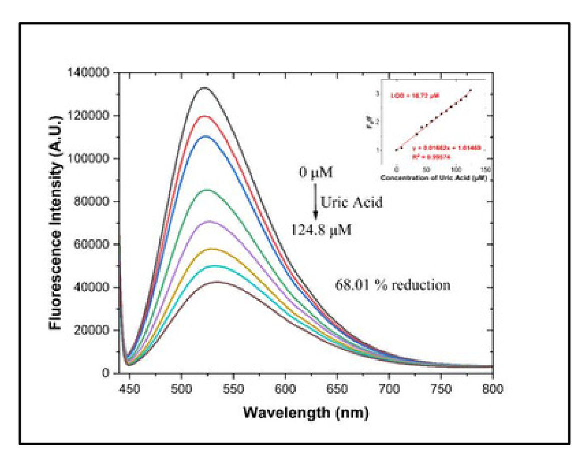
2.1.3 Selectivity



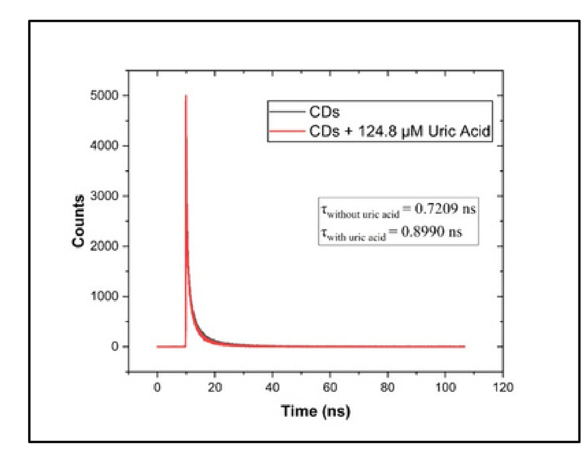
Sample	Spiked Concentration (µM)	Amount found (µM)	% Recovery	% RSD
Human Serum	1.12	1.11	99.77	1.79
	4.98	5.13	103.14	1.03
	6.06	5.99	98.87	0.98
	7.15	7.15	100.01	0.78

2.2 UricAcid

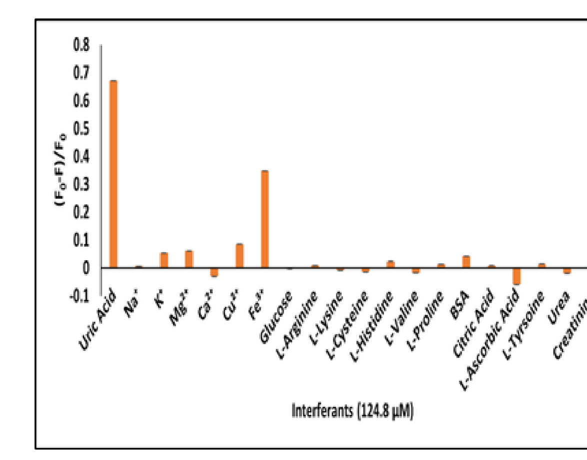
2.2.1 Fluorescence Spectra



2.2.2 TCSPC



2.2.3 Selectivity



Sample	Spiked Concentration (µM)	Amount found (µM)	% Recovery	% RSD
Serum	-	19.64	-	-
	50.57	48.35	95.63	1.07
	108.48	109.00	100.48	1.08
Urine	-	5.12	-	-
	50.57	53.00	104.82	0.43
	108.48	104.22	96.07	0.45

CONCLUSION

- Multi-functional carbon dots were successfully fabricated using *Ricinus communis* seeds and thiourea via hydrothermal approach. The CDs showed
- excellent fluorescence, good stability, and favorable physicochemical properties. The developed fluorescent method enabled sensitive and
- selective detection of protamine and uric acid in real serum and urine samples with good recovery. These findings highlight the versatility of developed CDs for use in analytical sensing and biomedical applications.
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FUTURE WORK / REFERENCES

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2. Wang, G., Shuang, S., Zhou, Y., Dong, C., & Du, F. (2023). Nitrogen doped biomass derived carbon dots as a fluorescence dual-mode sensing platform for detection of tetracyclines in 134245. biological and food samples. *Food Chemistry*, *402*(134245), doi:10.1016/j.foodchem.2022.134245 Li, F., Rui, J., Yan, Z., Qiu, P., & Tang, X. (2021). A highly
3. sensitive dual-read assay using nitrogen- doped carbon dots forthe quantitation of uric acid in human serum and urine samples. *Mikrochimica Acta*, *188*(9), 311. doi:10.1007/s00604-021-04971-2