Selective detection of γ-aminobutyric acid through corn-derived fluorescent carbon dots

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A facile and cost-effective enzymatic fluorescent sensing method was developed by using eco-friendly carbon dots (CDs) from corn juice (Zea mays) via the hydrothermal method. The as-prepared CDs derived from corn juice are referred as CCDs. In the present research, we present a novel enzymatic fluorescence sensing approach for the detection of gamma-aminobutyric acid (GABA). In this regard, CCDs were functionalized with 3-aminophenyl boronic acid (APBA) and Nicotinamide adenine dinucleotide phosphate ($NADP^+$) through 1-ethyl-3-(3-dimethylaminopropyl) carbodiimide hydrochloride/N-Hydroxy-succinimide (EDC/NHS) coupling reaction. By functionalization of the CCDs, these are termed as CANs. The CANs by utilizing enzyme GABase were successfully employed to detect GABA by fluorescence quenching via electron transfer between enzyme and substrate. This forms a reduced form of NADPH. The proposed method allows detecting GABA in the linear range of 0-90 μM with a detection limit of 6.46 μM. This sensor was also applied in human cerebrospinal fluid (CSF) and serum for determining the GABA. This demonstrates better recovery results of 93.2-101.5% and 96.4-104.6%, respectively.