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Sawmill waste derived carbon dots as a fluorescent probe for synthetic dyes in soft drinks

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Herein, for the first time the carbon dots (CDs) were synthesized by reflux method from sawmill waste material. We also represent a novel strategy based on fluorescent CDs for determination of ponceau 4R and allura red dyes in soft drinks. Interestingly, both the dyes were sensitive and showed effective fluorescence quenching of the CDs owing to the interaction between them. The analytical applicability of CDs were evaluated for detection of both the dyes with a good linear relationship between the concentration range of 0.0 to 3.0 $\mu\text{g mL}^{-1}$ and having detection limit 0.45 and 0.47 $\mu\text{g mL}^{-1}$ for allura red and ponceau 4R dyes respectively. Meanwhile, the potential application of this novel fluorescent probe for dyes determination in real samples was validated in different soft drink samples with good accuracy and precision. Thus, these findings provides new insights for the potential risk assessment of both the dyes. Moreover, CDs acted as an excellent fluorescent material in cellular imaging owing to their cellular uptake and localization.

Decent health has utmost importance throughout the life of human beings. It depends on so many factors such as exercise, proper nutrients, stress management and most vital healthy food. Among these healthy or organic food have attracted numerous attention in recent years owing to their tremendous benefits. But, recently food safety became major concern of the people because of contamination and excessive additives in food. Food additives have been employed to improve the appearance, freshness, nutritional value, texture and taste of food. Synthetic dyes or colorant is commonly used additives in foodstuffs because of their intriguing properties such as brightness, high stability, more cost-efficient and excellent color uniformity and ultimately food becomes appealing. These colorants are acceptable up to the certain extent, described by food regulation bodies. However, excessive consumption of these dyes poses some potential risks such as carcinogenic, mutagenic and teratogenic effect to human health¹.

Among the different synthetic dyes Allura Red and Ponceau-4R, as water-soluble, red colored, synthetic azo dyes, are widely used in various foods such as drinks, jelly, fruit juice, candies, sweets and other foods in India. Despite of the overwhelming applications of these synthetic dyes, their toxic effect could not be ignored. The overconsumption of azo dyes leading hyperactivity, physical and mental affect in children, develop insomnia, asthma and allergies, frequent headaches in adults^{2,3}. Therefore, their amount into food is strictly controlled by laws and regulations at national as well as international level to ensure the consumers safety. European Food Safety Authority (EFSA) have set permissible concentrations of Allura Red is 0–7 mg/kg/bw/day while acceptable daily intake for Ponceau 4R is 0.025–0.5 g/kg (GB2760-2011) depending on the type of food. Thus, quality of food and eventually safety of consumer is inevitably depending on the additives of food. So, foodstuffs having synthetic dyes must pass a thorough quality control and development of simple, rapid, convenient analytical method for the simultaneous determination of Ponceau-4R and Allura Red in foodstuffs is of great importance.

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