MICROPA: A Novel Approach and a Device for the Detection, Quantification, and Filtration of Microplastics in Drinking Water

Sharma, Tejas (School: Bharatiya Vidya Bhavan's R.K. Sarda Vidya Mandir)
Chauhan, Aditya (School: Bharatiya Vidya Bhavan's R.K. Sarda Vidya Mandir)

Microplastics are very small particles mostly ranging from 0.1 µm to 0.2µm size and are found frequently in drinking water samples. These are difficult to identify or removed by existing techniques. They are known to be toxic and can cause serious health problems in entering the human body. Hence, a unique device named ‘MICROPA’ with the novel approach is conceptualized and developed for its easy detection, quantification, and removal from drinking water. Here, an optimized dose of Nile Red dye in1:100 ratio, v/v is used to stain the microplastics in order to be detected due to their property to shine under UV rays. The image of the fluorescent spots provided the exact particle count of microplastics using the newly developed web app based on the Open CV image processing algorithm for pattern recognition. In this device, Rhodomonas salina microalgae are used for the removal of microplastic contaminants from drinking water, owing to its property to form natural hetero-aggregates with microplastics. The microalgae are non-toxic and are washed and cleaned to remove any kind of external contamination which in turn forms the most efficient aggregate. A layer of nitrocellulose membrane filter (0.22µm) is used to restrict the aggregate to get to the outlet. Standard samples of microplastics are used for calibration, detection and quantification procedures. Pre and post-filtration samples are quantified to evaluate the filtration system. Results confirm that MICROPA provides great accuracy in quantification (Tol.±5 particles) and a high filtration rate (average 85%). Therefore, based on these observations it can be confirmed that this novel and validated MICROPA kit gives a green edge to the accurate removal of microplastics from drinking water

Awards Won: