Abstract

Food dyes are added to various food commodities to enhance their appearance. The addition of dyes/colorants to food materials expectedly dates back to around 1500 B.C. where the candy makers used to add natural extracts and wine to improve the product’s appearance. The food colorants then used were extracted mainly from natural sources viz., plants (indigo and saffron), insects (colchinel beetles and lac insects), animals (some species of molluscs and shellfish) and minerals (ferrous sulfate and clay). However, due to the industrial revolution in late 19th century, there occurred a tremendous rise in synthetic food dyes. Since then, many food industrialists have been using artificial dyes to color various food items. The reasons to use synthetic food colorants are to produce high tinctorial power and wide array of shades as well as to correct natural variations in food colors that are lost during storage or processing of food. Apart from this, some food industrialists use synthetic food dye to hide the low quality and staled food products. Many synthetic food dyes like sudan I-IV, amaranth, erythrosine etc. were suspected of being toxic and were banned. The toxicological data also indicated that the indiscriminate use of synthetic food colors could pose serious health problems. Hence presently, the use of synthetic food dye is strictly regulated and each food dye requires Food and Drug Administration (FDA) approval prior to its inclusion to any food product. Considering this, the present study was planned to estimate mutagenic and genotoxic effects of six most commonly used synthetic food dyes viz., bright green, chocolate brown, respebary red, blue, orange and pink employing Ames mutagenicity assay, Allium sativum root chromosomal aberration assay and Rattus micronuclei assay. The chemical characterization of these synthetic food dyes was done by using various analytical techniques viz., ultra high performance liquid chromatography, mass spectrometry whereas elemental analysis was done by using scanning electron microscope – energy dispersive X-ray spectroscopy and atomic absorption spectrophotometry. The present study revealed the mutagenic as well as genotoxic effects of the food dyes in three bioassays. The presence of heavy metals like Co, Cu, Fe, Mn, Pb and Zn in synthetic food dyes is also a matter of concern. Chemical analysis revealed the presence of sunset yellow (E110), tartrazine (E102), brilliant blue
(E133), and erythrosine (E127). As both heavy metals as well as food colorants have been reported to be toxic, prolonged consumption of food products containing these dyes can cause the adverse health effects in human beings. Therefore, the chemical as well as toxicological studies for the food products containing different food additives including the food dyes should be strictly implemented.