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EFFECTS OF UV BLOCKING AND HEAT-RESISTANT PLASTIC BAGS ON SOLAR DISINFECTION OF RAINWATER AT DIFFERENT WEATHERS

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Abstract

The efficiency of solar disinfection (SODIS) was evaluated and enhanced by concentrating sunlight at low pH values in a solar collector disinfection (SOCODIS) system at different sunlight intensities and is highlighted in the author's earlier findings. In order for further improving the rainwater disinfection, simple technique like wrapping the PET bottles with heat-resistant plastic bags (Wp) were used for enhancing the thermal/synergistic effects of solar radiations. An analysis of the PET bottle's samples showed increased absorbance with exposure time. The effect of ultraviolet (UV) radiations, as determined by blocking UV radiations, is a predominant factor in microbial inactivation and it is mainly the UV radiations which determine the efficiency of the disinfection. A microbial inactivation of about 20-30% in UV blocked Wp-SODIS/Wp-SOCODIS systems signifies the heating effects of solar radiations suggesting 45-50°C as critical value above which thermal radiations (Vis+IR) contribute towards disinfection. The inactivation of total and fecal coliform, *Escherichia coli* (*E. coli*) and Heterotrophic Plate Counts (HPC) remained unchanged Wp-SODIS or Wp-SOCODIS system at weak weather. At moderate weather, however, HPC was the only inactivated microbial parameter in Wp-SOCODIS system. An increase of 5-6% in microbial inactivation in Wp-SODIS system at this weather suggests a temperature value of 40-45°C beyond which synergistic effects play role in disinfection. Rainwater was disinfected completely at strong weather in a Wp-SOCODIS system while disinfection efficiency was enhanced by about 10% in Wp-SODIS due to a temperature increase of about 7°C. The analysis of the exposed and controlled rainwater samples over a period of 6 months showed no leaching of the harmful byproducts from PET bottles into stored rainwater samples.

Key words: disinfection, plastic bag, potable, radiations, rainwater

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