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Solar Powered UV-C LED Water Sterilizer

Procedure

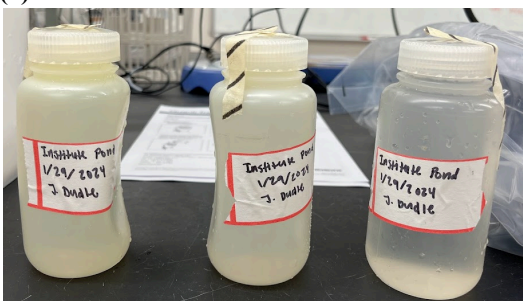
Firstly, the pond water from Institute Pond at the Worcester Polytechnic Institute needed to be tested to verify the existence of coliforms for experimentation with the device. Three samples of water were collected from Institute Pond at the Worcester Polytechnic Insitute in sterilized bottles. Once collected, 100mL of each sample was transferred into sterilized bottles. One packet of Colilert was added to each 100mL sample, then gently inverted to dissolve the powder. Once dissolved, each mixture was poured into a Quanti-Tray and sealed using a Quanti-Tray Plus. All three samples were incubated for 24 hours at 35 degrees Celcius.

After 24 hours, the 3 samples were examined for coliform development. Each tray had turned a vibrant yellow, indicating that the sample was positive for coliforms (see Figure 2). This result led to the conclusion that the water from Institute Pond may be used for testing the Solar Powered UV-C LED Water Sterilizer because of the coliforms that can be tested before and after treatment.

Figure 2

Samples of water from Institute Pond.

(a)



(b)

Note. (Figure 2a) A photograph of three samples of water collected from Institute Pond. (Figure 2b) A photograph of the three water samples tested for coliforms.

To test the device, water was collected in a bucket from Institute Pond. A tube was then inserted into the bucket, through which the pump introduced the water into the device's body. The contaminated water flowed through a water filter to reduce its turbidity. UV-C water sterilizers work best when the water's turbidity is as low as possible, making the water filtration step vital. After filtration, the water pump pushed the water into a bucket raised to a higher level than the sterilizer. Using gravity, the filtered water flowed through the UV-C sterilizer. Once passing through the sterilizer, the water was released through an outlet, where sterilized water could be collected and sampled for experimentation.

Adjusting the water flow rate with a valve connected to a pipe in the device, three samples of treated water were collected at flow rates of 0.99 L/min, 0.94 L/min, and 0.58 L/min. One control sample of untreated pond water and the three treated water samples were tested using the Quanti-Tray system. Each water sample was divided into three 100 mL bottles. The first bottle remained undiluted, the second bottle was diluted by 90% with phosphate buffer

solution, and the third bottle was diluted by 99% with buffer solution. Additionally, each sample was tested for turbidity (measured in NTU (Nephelometric Turbidity Unit)) using a digital turbidity meter.