

ICAR-CIPHET, Ludhiana Develops

“Portable Smart Ultraviolet-C Disinfection System” (UViC)

ICAR-Central Institute of Post-Harvest Engineering and Technology (CIPHET), Ludhiana has developed a smart, compact and portable surface disinfection system to help fight against COVID-19 pandemic. The system is named as UViC which is a Portable Smart UV-C Disinfection System that can be used to disinfect personal items and office stationery.

In general, it is not feasible to disinfect each paper, file and similar items using the alcohol-based sanitizing gel. Thus, such a compact, smart and efficient system is needed to disinfect such items, in reducing the risk of infection among people. Unlike chemical sanitizers, UV-C does not leave a residue and does not require extensive safety equipment. It works as a mode of surface sterilization by destroying nucleic acid and disrupting the DNA of microorganisms.

As per the report of Tseng & Li (2007), single-stranded RNA viruses, such as Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2), are generally inactivated by UVGI exposure of 2-5 mJ/cm². Thus, in this study, the chosen UV-C exposure of 1.22 J/cm² (total dose) exceeds well above the amount of exposure needed to inactivate SARS-CoV-2 which is in line with the recent report of Nebraska Medicine (2020).

The working capacity of the unit in terms of the total surface area of the objects to be treated/exposed is 25 × 25 cm². The estimated cost of the unit is approximately Rs. 1500. However, the system can be scaled up as per the need.

Features of Portable Smart Ultraviolet-C Disinfection System (UViC)

1. The portable system is made of food-grade stainless steel coated with reflective material on the inner surfaces.
2. The LCD can prompt the user to operate the system.
3. The system can be used in two modes:
 - a. **For lightweight removable objects:** A drawer arrangement for placing objects, for example, purse, wallets, phones, currency notes, papers, packed groceries, files, and mask.
 - b. **For items which are fixed on surfaces:** A hood-shaped arrangement that can be placed on fixed items.
4. Alarm beeps after a minimum of six minutes of treatment time and a message for completion of the disinfection process is displayed on LCD.
5. After completion of irradiation/treatment, switch off the UV-C light button and open the drawer to remove objects. It is advisable to flip (top becomes bottom) the object and irradiate it.
6. The users should avoid direct exposure of UV-C radiation on body parts, especially eye.

The system has been tested for inactivation of *Escherichia coli* as classic examples of gram-negative bacteria. In this experiment, *E. coli* was spread on LB agar plates and half portion of each plate was exposed to UV-C radiation. The influence of the treatment parameter, that is, the time has been investigated on *E. coli*. Findings indicated that no visible *E. coli* colonies were observed after six minutes of continuous UV-C exposure.

The developed system is unique, portable and cost-effective which can be installed in offices, homes, shops, hospitals, malls etc. This portable system has been

designed and developed by Dr. K Narsaiah, Dr. Bhupendra M Ghodki, Er. Yogesh Kalnar and Ms. Surya Tushir under the guidance and encouragement of Dr. R.K. Singh, Director, ICAR-CIPHET, Ludhiana (Punjab).



Fig. 1: Portable Smart UV-C Disinfection System (UViC)



Fig. 2: Demonstration of Portable Smart UV-C Disinfection System (UViC)