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Review article

Designing Green Spaces for Health: Using Plants to Reduce the Spread of Airborne Viruses

Book: *Designing Green Spaces for Health: Using Plants to Reduce the Spread of Airborne Viruses*

Author: Stevie Famulari

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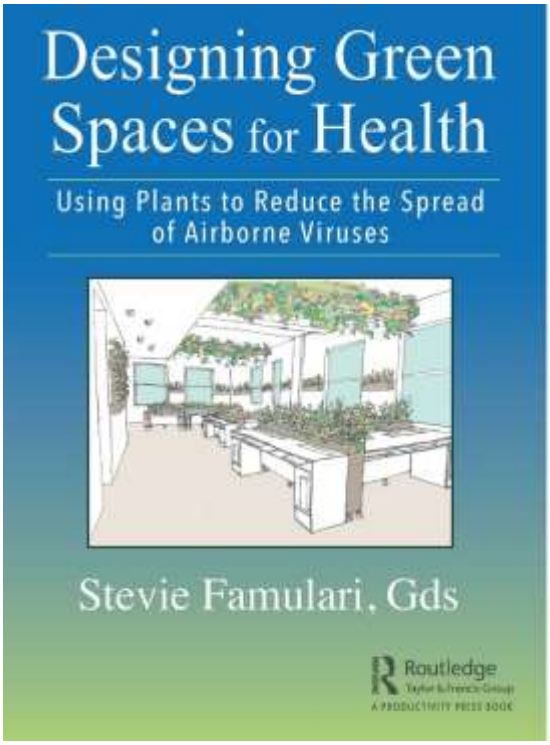

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Figure 1: Book Cover and Table of Contents (Source : Routledge Taylor & Francis Group)

Coronavirus disease (COVID-19) is a virus-borne infection caused by the SARS-CoV-2 virus. COVID-19 transmission risks are increased in crowded, poorly ventilated areas where infected

people spend longer periods of time together in close contact. Outbreaks have been noted in situations where people congregate, particularly in overcrowded indoor settings, and talk, yell, breathe deeply, or sing, such as restaurants, choir practises, fitness classes, nightclubs, workplaces, and places of worship. The daily increase of COVID-19 cases and deaths has resulted in a worldwide lockdown, quarantine, and certain limitations. Scientists and researchers from all around the world are working to solve this challenge. How can a designer contribute in such a situation? It is a matter of thinking about how the effect of COVID-19 can be reduced through the use of minor indoor plants used in homes or workplaces. This book focuses on integrating plants into spatial design to decrease viral infectiousness in various working and living environments. It discusses techniques for indoor and outdoor green design using plants that are expected to be useful for influenza virus tolerance and infectiousness decrease.

Stevie Famulari, Gds, is an author, researcher, environmental artist, phytoremediation expert, green designer, the founder and principal of Engaging Green, and a tenured professor of Landscape and Urban Design at Farmingdale State College, SUNY. She is best known for her seminal contributions to phytoremediation, stormwater design, environmental science, green design, and ecological research. Famulari's research focuses on greening designs and practices to foster healthy living and working environments. Her phytoremediation database of plants that can remove contaminants from the air, soil, and water has been used by the Environmental Protection Agency. She has worked on grants to investigate oil drilling process remediation design, air quality improvement, community remediation design, and interior green applications. Greenwalls, planted roofs, and green remediation designs for interior and exterior applications are examples of her work in greening designs, research, and education that can be seen nationally and internationally are examples of her work in greening designs, research, and education. Her research has been featured in lectures, presentations, and exhibits at Harvard University, UC Berkeley, MECA (Minnesota Erosion Control Association), NDSU (North Dakota State University), and UNM (University of New Mexico), among others.

Stevie Famulari's most recent book, Designing Green Spaces for Health: Using Plants to Reduce the Spread of Airborne Viruses (Figure 1), tries to break the boundaries of our conventional common living spaces and allow nature to be installed as an essential element to rebalance our relationship with nature, protect our health through the use of plants, and also introduces an outstanding, effective strategy to combine multiple sciences with green design. Could plants help to reduce the spread of airborne viruses or flu viruses? Which plants and how should they be used in interior and exterior spaces so that they can benefit your health more? Are indoor plants just decorative objects or do they have some other use as well? The author's Famulari theory is supposed to solve all of these critical issues in this book.

In the current pandemic situation, air purification, virus transmission, and psychological disorders have become serious quandaries for us. On one hand, as a result of industrialization and urbanisation, heavy metals such as mercury (Hg), cadmium (Cd), arsenic (As), chromium (Cr), thallium (Tl), zinc (Zn), copper (Cu), nickel (Ni), and lead (Pb) have become increasingly abundant in the environment, raising severe concerns around the world. People who consume high levels of heavy metals are at risk of acute and chronic toxicity, mental disorders, liver, kidney, and intestinal damage, anaemia, and cancer, among other diseases (Fu et al., 2020). Significant metal

contamination has posed a major threat to human health and the ecosystem due to its cytotoxic nature. Consequently, remediation of environmental contamination has become paramount. On the other hand, the Coronavirus outbreak (COVID-19) was caused by the SARS Coronavirus 2 (SARS-CoV-2) and the primary mode of infection with SARS-CoV-2 was through exposure to infectious respiratory fluids (Yuki et al., 2020). The first known case was discovered in December 2019 in Wuhan, China. The disease soon spread around the world, culminating in the COVID-19 pandemic. On February 11, 2020, the WHO announced the formal names COVID19 and SARS-CoV-2. Tedros Adhanom, the Director-General, said that CO stands for corona, VI for virus, D for disease, and 19 for 2019, the year the epidemic was first recognised (Lau et al., 2020). In addition, the WHO refers to "the COVID19 virus" and "the virus responsible for COVID19" in public communications. Fever, cough, fatigue and myalgia are usually the main symptoms of the disease (Klopfenstein et al., 2020). As the COVID-19 pandemic has resulted in a massive shutdown across the world, practically all countries were in a "lockdown" state. The term "lockdown" refers to an emergency plan that prohibits the public from relocating from one location to another (Guzzetta et al., 2020). Complete lockdown means that everyone must stay where they are and no additional entry or exit movements are authorised. While lockdown was a vital and efficient social distancing approach to control the rapidly spreading COVID-19 virus, it also had a variety of psychological consequences for the population. Although lockdowns reduce the physical harm of the virus, the well-being of the population can be significantly damaged (Greyling et al., 2020).In an effort to minimise the spread of COVID-19, the governments of many countries around the world have been forced to issue stringent orders for social isolation and quarantine. The social isolation and quarantine measures were designed to slow the spread of the disease by interrupting the chain of COVID-19 transmission and preventing the emergence of new cases. However, many negative consequences have been observed, such as changes in people's habits, routines, and mental health (Pieh et al., 2021), as well as an increase in the distance between people and nature. The importance of indoor air quality has gained a lot of attention as we spend more time indoors due to the COVID-19 pandemic (Kroll et al., 2020). With the aforementioned issues in mind, the author attempted to persuade people and society to use biophilic design or green design in all types of urban spaces, including external, internal, residential, and professional settings, specifically during this post-pandemic period. In the current context, especially in large urban centres, this may be the only simple and comely way to maintain healthy contact with nature. Biophilic design methods primarily incorporate natural features and ecosystems into the built environment so that humans have an innate biological connection with nature. As a result, this type of green concept and methods in pandemic situations are gaining traction in the fields of environmental design, science, and health.

To meet the needs of the time, the author developed a Famulari theory that combines all the consequential elements of the biophilic concept with a very positive outcome. Famulari's theory emphasises the various greening practises that can be implemented at sites to abbreviate the infectivity potential of the airborne flu virus, particularly in public parks, office buildings and workplaces, airports, and the home or office. To obtain the most effective and optimal design for green spaces that accumulate, diminish, and eliminate the infectiousness of viruses, many techniques from diverse perspectives must be explored. The six fundamental methods are as follows:

1. A minimum temperature of 70 degrees Fahrenheit is required
2. Plants have a large number of stomata on the leaf surfaces
3. Plants with thick leaf clusters and a high transpiration rate
4. Plants having rough leaf surfaces or leaf trichomes (plant hairs)
5. Minimum relative humidity (RH) of 43% or higher
6. Air circulation to direct air with the airborne flu virus to the planted areas

In the Famulari theory, we cannot use any type of plant. It is essential to investigate plants with stomata, trichomes, dense leaf growth, and high transpiration rates that may be effective for virus accumulation at the base of their leaves. Furthermore, this method necessitates a review of the following: the number and types of plants (as well as electronic sources such as humidifiers and dihydrogen monoxide features) required to produce effective humidity for plants in order to reduce the infectiousness or transmission of viruses; the effective distance between people and plants; and the light, water, soil, and temperature requirements. The proper placement of the plants is also an important aspect of this process. The author achieves this through Spatial Green Design, in which a few strategically placed indoor plants outperform a large number of plants. Plants are more than decorative objects, and they can play a vital role in reducing or eliminating the infectiousness of viruses in various working and living environments, as well as in purifying the air and assisting people in recovering from stress, anxiety, and other health benefits. This book also includes brief descriptions of Famulari's six basic principles, which include temperature, plant type and stomata, clumps, surfaces or with trichomes, relative humidity, and air circulation.

The content of the book is well-designed to allow quick access to a variety of statistical dataset information. The book is divided into two sections and ten chapters. The first section (Page numbers 3 to 99), "Applying Green Design and Sciences to Six Different Sites," contains seven chapters, while the second section (Page numbers 103 to 146), "The Famulari Theory, Breaking Down the Theory," contains three chapters. The first section covers the Famulari Theory, methods, principles, and understanding of green design and function, as well as human and plant needs. The first chapter may assist in comprehending the Famulari Theory and providing an overview of green design, thus blurring the line between green design and cognate sciences. In Chapters Second to Seven, the author uses a train station, an interior public site, an exterior urban rooftop in a residential building, and an exterior urban courtyard in a residential building in the Bronx, New York City, as case studies. These sites demonstrate how the Famulari Theory can be applied in a variety of interior and exterior spaces. These sections included colourful site designs, plant lists, perspectives, and other information for each site.

The second section of the book is dedicated to delving deeper into the layers of scientific research and green design. This section goes into more preponderant detail about each of the site conditions required for the Famulari Theory to be efficacious. To help readers understand complex science methods and green design research, chapters eight through ten are written in a linear A–B–C format with line drawings and minimal flat colour. Each chapter discusses how to assess the efficacy of green design solutions. Disturbing the different elements of the flu virus structure, how viruses move through space, and airborne flu virus infectiousness on different surfaces, plant

structure overview, and psychological benefits of using living green plants were all covered. The chapters are concise and clearly define the topics, avoiding unnecessary details.

Looking through this book, it appears that the author endeavoured to solve the problem using a simple but highly effective process inspired by the needs and problems of the time. This book is intended to inspire readers to consider how incorporating living green plants into design can benefit their health. This book introduces a unique and effective strategy for integrating multiple sciences and arts in order to rebalance our relationship with nature and provide a current guide to health and the environment.

Declaration of Conflict of Interests

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