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Design and Development of a Solar Concentrator through Glass-Water Media to Trigger Crop Productivity

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A solar concentrator that uses the existing natural sunlight to obtain higher light intensities of uniform spectra through refracted Glass-Water media was designed, fabricated, and developed to improve the plant growth at initial stage. A spherical glass lens, reflecting material, and a frame with telescopic legs and casters to hold the spherical lens were the main components of the spherical glass solar concentrator. Diffused sunlight refracted through the Glass-Water media concentrates on one small focal point, where it moves according to the position of the sun. The focal point directs towards the bottom of the lens by the half-cylindrical shaped reflecting material (Aluminum) fabricated surrounding the lens. An increment of 1.67 times higher solar energy than the open environment was recorded for the solar concentrator placed best at 60 cm above *Solanum lycopersicum* seedlings. Concentrated rays move from one point to the next without scorching the seedlings, unlike costly available panels that cut totally UV rays. The concentrated rays from this solar concentrator directed towards the nursery trays showed a higher germination percentage (89.6%), lower germination time enhancing the seed germination and reduced the time for seed germination (3 days) with higher average plant height, fresh weight (4.74 g) and dry weight (0.47 g) than recommended environments. Inevitably, they showed larger stem diameters, lesser leaf thickness. The lowest time for flower initiation (18 days earlier) and a higher number of fruits and continuous growth without the interference of transplantation shock were obtained from the transplanted seedlings. It is a novel technology for culturing young seedlings. There is greater refracted solar radiation, reducing the effect of changes in the sun position, less space required, lightweight, portable, still effective in bad weather are some of the advantages. Also, cropping time can be reduced and off seasonal productions can be increased. Thereby plants can be adapted to climate change.

Key words: Concentrated radiation, plant nurseries, transplanting, cropping time, climate change.