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EFFECT OF ULTRA VIOLET RADIATION ON AVOCADO FRUIT EXPLANTS IN VITRO

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Ultra violet light provides a portion of the energy received by plants but is invisible to the human eye. Its effect on the human body is sometimes observed as a "sunburn." This type of solar energy has in general a negative effect on living cells of both plants and animals. Ultra violet "germicidal" lamps are sometimes used where sterile working conditions are sought as in hospital operating rooms or sterile assembly rooms. Wavelengths of 2537 Å are generally considered lethal to organisms. Ultra violet light penetrates only a thin layer of exposed tissue and to a limited depth in a mass of organisms. Microbes are killed by short exposures of 5 to 10 minutes, while damage to higher plants generally requires longer exposure. Intact tissue of some higher plants such as wheat requires 60-100 hours of exposure before visible damage is evident, whereas other species such as *Agave* and *Opuntia* require much longer periods (1).

The present investigation was undertaken to determine the effects of ultra violet irradiation on freshly cut pieces of avocado fruit tissue which are utilized in standard procedures in our tissue culture laboratory. The culture transfer room is sterilized by an ultra violet source.

A preliminary experiment was designed to ascertain the effect, if any, of ultra violet light at various intensities (distances) from exposed avocado pericarp tissue during tissue transfer procedures. The time element of these exposures was also taken into consideration. Another experiment indicates an effect of U. V. exposure after the plant sections had been growing for three days.

The present experiments were conducted with a standard U.V. source—Westinghouse Type SB-30 which utilizes the WL-82-30 Sterilamp. The unit is supported above the transfer table at a height of 35cm (14 inches).

Tissue from avocado fruit was sliced 1mm thick and disks 8mm in diameter were punched with a stainless steel borer (2,3). These disks of uniform size were placed on sterile Nitsch nutrient agar media in screw cap 6 dram glass vials. To expose the tissue at the time of planting the caps were removed from the vials and an entire line of 15 vials was held in a wooden block such that the upper tissue surface was 2, 5 or 12 inches from the lower surface of the U.V. lamp for the specified time period. The caps were replaced following U.V. exposure and the entire group of vials was maintained at 25-27°C in a growth chamber with approximately 90 f.c. light intensity. The experiment was harvested after 50 days at which time fresh weights of the individual disks were determined.

Another experiment consisted of exposing the freshly prepared fruit disk tissues to U.V. light at a distance of 7" for 10 minutes as a pretreatment and then exposing the tissue a second time three days later at 7" distance for 10 minutes for the experimental

test condition. Non-pretreated tissues were exposed to U.V. light 3 days after planting and a third group of tissues, the controls, were not exposed to U.V. light but placed directly in the incubator.

Results

The general results are presented in figure 1. It is noted that the untreated sections maintained under standard conditions increased in fresh weight on the average from 0.106g. to 0.345g. over the 50 day period. Tissue disks exposed at closer distances, namely 2" and 5", regardless of the time of exposure, either 5, 10 or 15 minutes, were somewhat depressed in growth though statistically not of a significant value. Tissues exposed at 12" from the light source appeared to make as much growth as the controls. In fact, a short period (5 minutes) of exposure to U. V. at 12 inches distance appears to be somewhat stimulating compared with the non-exposed controls. Again the stimulation of growth is apparent but not greatly significant. One can conclude that exposure of freshly cut fruit tissue to U.V. light for a short time period may not affect the subsequent tissue growth but longer or more intense exposure does depress the subsequent tissue growth.

Limited experimental observations as indicated in Figure 2 show the effect of exposure time on freshly planted excised fruit tissue disks and of comparable tissue which had been cultured for three days. Exposure of newly excised tissue for a short period such as one minute tends to result in a stimulation of growth compared with exposures of five and fifteen minutes, the latter definitely depressing the amount of subsequent tissue growth. If the tissue is exposed three days following excision and planting there is also noted a stimulation of a short exposure period of one minute and likewise a lesser amount of total growth when the exposure time is five or fifteen minutes. There appear to be no morphological effects of long period exposure as all the materials appeared to exhibit a normal proliferation of cells on the upper surface and on the periphery of the tissue disk.

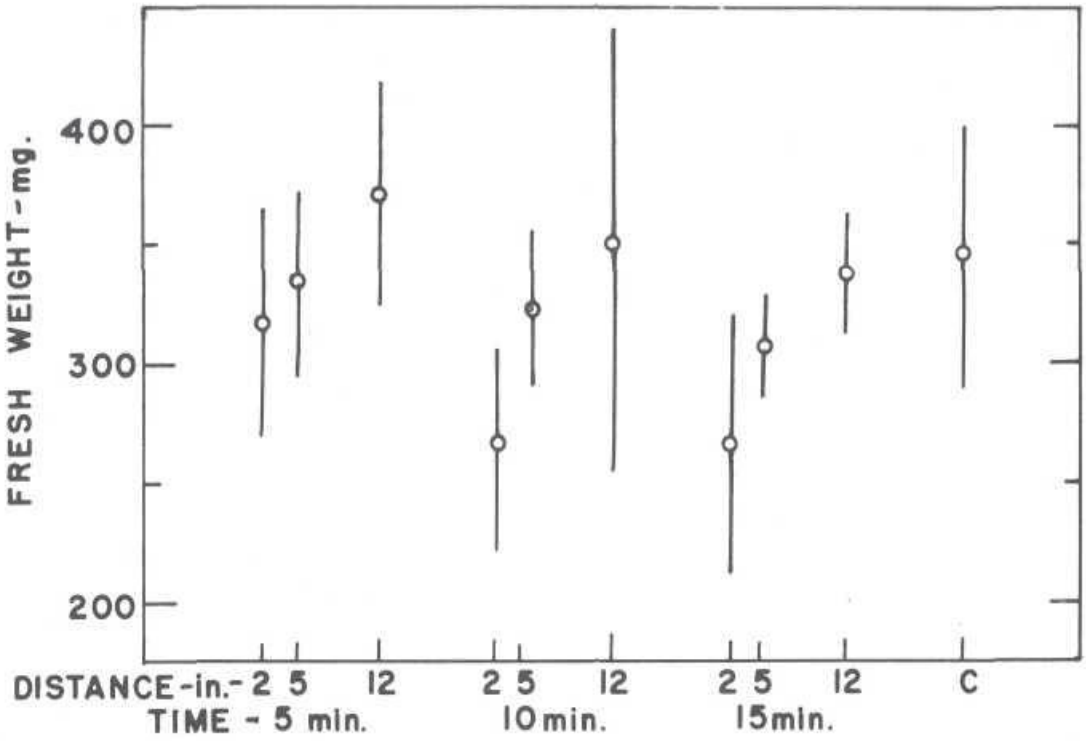

Figure 1. Growth response as fresh weight increase of avocado fruit disks after exposure to ultra violet light at distances of 2, 5 and 12 inches and for time periods of 5,10 and 15 minutes. The control, C, was not exposed. Original weight of disk, 106mg.

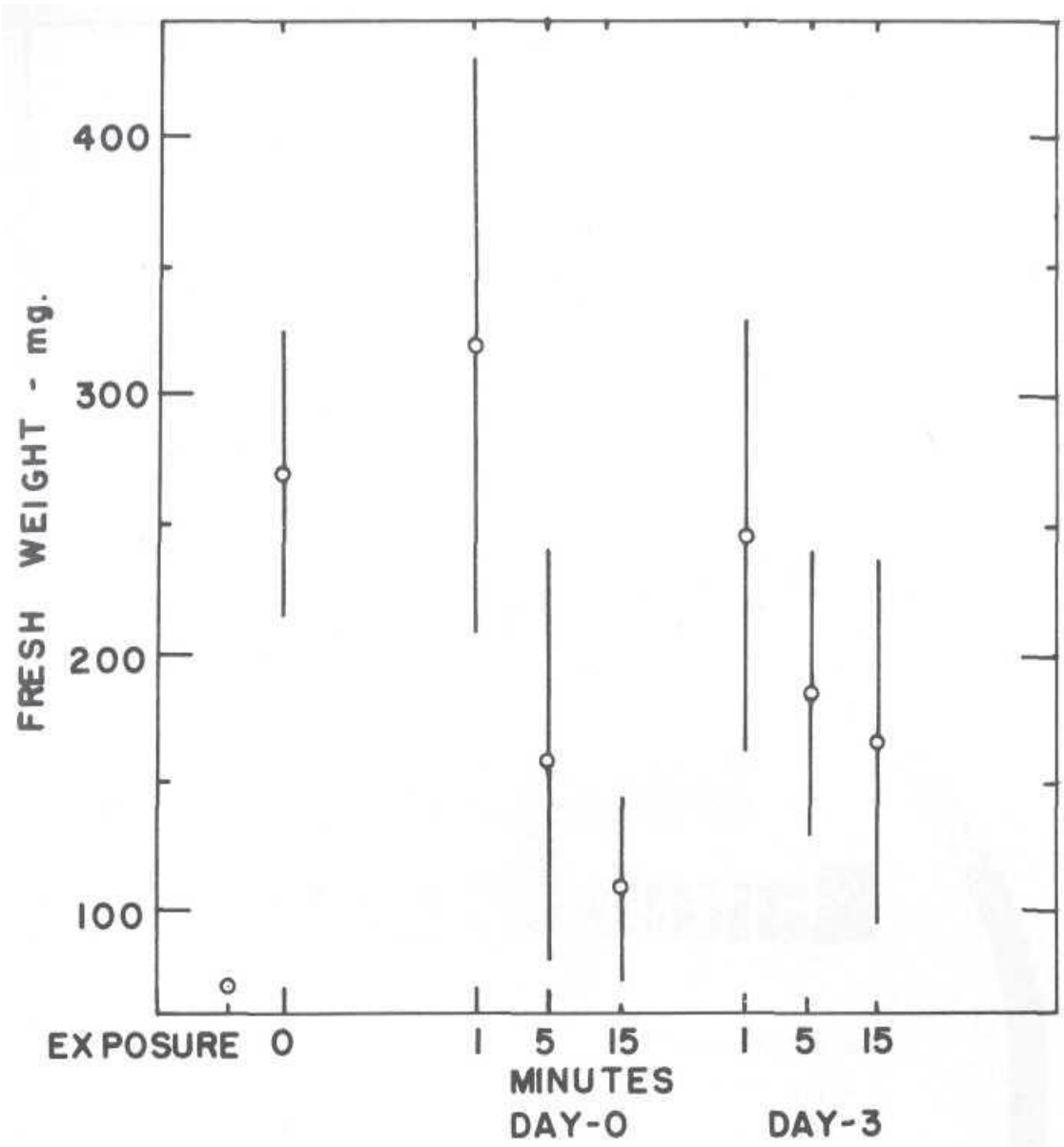

Figure 2. Growth response as fresh weight increase of avocado fruit disks following exposure to ultra violet light for 1,5 or 15 minutes when first planted or three days after planting. Control was not exposed. Original weight of disks, 96mg.

The general results of the observations indicate that there is a slight stimulating effect on avocado fruit disks of short period exposure to ultra violet light but that periods longer than one minute will depress subsequent proliferation of tissue disks maintained in vitro. The amount of exposure required to destroy the individual cell or a given amount of tissue was not determined from the above experiments.

LITERATURE CITED

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