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STUDY THE EFFICIENCY OF DRIP IRRIGATION SYSTEM USING LASER BEAM – IN VITRO

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ABSTRACT

The present study was executed in the Laboratory of Laser Applications in Agricultural Engineering at the National Institute of Laser Enhanced Science (NILES) at Cairo University to obtain the peak of optical properties at transmission and absorption intensities of irrigation water samples which carried out at the National Irrigation Laboratory of Agricultural Engineering Research Institute (AEnRI), ARC, Dokki, Giza.

The main objectives of the present work are to create a selection of suitable wavelength to study the optical properties of suspended solids in filters and determination of concentration suspended solids in the filtration media.

In the drip irrigation system, the small openings can be easily clogged by suspended solids according to the level of TSS and plugging is caused fall into three categories (<50, 50-100, >100) (Slight, Moderate, Severe) respectively.

Light was measured via remote sensing reflectance (Rrs) spectra deduced from radiance and irradiance measurements that were performed using an Ocean Optics USB650 to detect suitable wavelengths from visible and invisible light (ultraviolet, visible and infrared wavelengths) to measure the peak of optical properties at reflection, transmission and absorption.

It was found that using a media filter of Local basalt media increased TSS in a water sample and created filter pressure differential results. It increased from 0.2 bar to 0.6 bar and also increased absorption (0.189 to 0.447a.u.). Reflection and transmission decreased (79.285 to 49.645a.u.), (78.288 to 44.711a.u.).

When using a media filter of Al-Abaster Misr Bank media. This increased TSS in the water sample and created filter pressure differential results that increased from 0.2 bar to 0.6 bar and increased absorption (0.205 to 0.520 a.u.) while decreasing reflection and transmission (76.047 to 36.672a.u.), (80.759 to 36.278a.u.).

A media filter of Ward El-Nile Zaffaran media increased TSS in the water sample and created filter pressure differential results that increased from 0.2 bar to 0.6 bar while increasing absorption (0.224 to 0.815a.u.) and decreasing reflection and transmission (67.37 to 27.37a.u.), (69.65 to 26.64a.u.).

Meanwhile, an evaluation of the dripper’s efficiency according to the use of appropriate filtration media for the first filter yielded the following results: Local basalt media (0.2, 0.4 and 0.6 bar) showed emission uniformity of EU% 94.73, 89.553 and 79.649% (excellent, good and fair results, respectively). The second filter of Al-Abaster Misr Bank media (0.2, 0.4 and 0.6 bar) showed EU% 95.578, 87.561 and 68.562% (excellent, good and poor results, respectively). The third filter of Ward El-Nile Zaffaran media (0.2, 0.4 and 0.6 bar) showed EU% 95.836, 89.664 and 79.566% (excellent, good and fair results, respectively).

For determining the most accurate filtering media type with the highest efficiency for filtration, the values were 79.3% and 76.9%, respectively, for Local basalt media and Al-Abaster Misr Bank media. When using the filter of Ward El-Nile Zaffaran media, however, the removal efficiency was low at 40.97%.

These results show that there are two kinds of filtering media, Local basalt media and Al-Abaster Misr Bank media, that are acceptable and another kind, Ward El-Nile Zaffaran media that is unacceptable. It is possible to distinguish and evaluate the optical properties for Local basalt media and Al-Abaster Misr Bank media. Laser properties measurements were performed using a He-Ne laser at 632.8 nm.

KEYWORDS:-

Filter - Drip irrigation system - Total Suspended Soiled (TSS) - Optical Properties - Ocean Optics - He-Ne Laser.

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