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Remote sensing tools used to adapt agriculture to future scenarios of water scarcity in orchards and vineyards

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In the world, water availability for irrigation has been reduced in the last years due to frequent drought and competition for water resources among agriculture, industry and urban area. For these reasons, the drip irrigation system has been widely adopted by farmers to optimize water application in new plantations of orchards and vineyards. However, drip-irrigated vineyards and orchards require a correct irrigation scheduling in order to maintain existing production levels and fruit quality. A key to achieve these targets is the accurate estimation of crop water requirements or actual evapotranspiration (ETa). In this regard, remote sensing tools have been found to be useful to estimate ETa at regional and field scales while using satellite images. Also, modern optical remote sensors aboard an unmanned aerial vehicle (UAV) provide the basis for the generation of remote sensing images which have been used to compute ETa at high spatial resolution. In this regard, the presentation model to estimate crop water requirements or Eta, using multispectral and thermal images obtained from Landsat satellite. Results indicated that METRIC was able to generate ETa maps that have been used for optimizing irrigation management at regional and farm levels. Also, the presentation will describe the potential use of multispectral and thermal cameras placed on an unmanned aerial vehicle (UAV) to estimate orchard and vineyard water requirements at very high spatial resolution (6 cmx6 cm). Results demonstrated that remote sensors placed on an UAV may provide an excellent tool to evaluate the effect of spatial variability of soil and canopy size on the estimation of canopy transpiration and soil evaporation.

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Optimization of supercritical extraction CO2 of essential oil from neem leaves using response surface methodology

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 \mathbf{N} eem tree or Azadirachta indica has been proven to give a lot of benefits in medicinal point of view. Each parts of the tree have its own biological activity which could aid in fighting and curing diseases. These biological activities were found to come from the sesquiterpenes compounds that exist in the leaf. The main biological activities of neem leaf are anti-inflammatory and anti-allergy properties. Supercritical carbon dioxide extraction was applied for the extraction of essential oil since it gives higher oil yield and does not require extra unit to separate the solvent used. The optimization of supercritical carbon dioxide extraction was studied and the optimized parameters were 20.25 MPa pressure and 319.33 K using 0.23 mm sample determined through RSM. GCMS analysis was carried out on the essential oil of neem leaves and 43 compounds were identified. 1.06% of sesquiterpenes compound of γ-elemene and α-farenesene is found. The major compounds in the extract composed mainly carboxylic acids which was 49.11%. 17.02% of hexadecanoic acid, 31.63% of phytol and 24.2% of 9,12,15-octadecatrienoic acid, (Z,Z,Z) were also found in the extract. In addition, supercritical carbon dioxide extraction of essential oil from neem leaves has been proven to give higher oil yield (0.6%) compared to hydrodistillation technique which can only extracted about 0.1% of the essential oil. Supercritical CO₂ extraction uses environmental friendly solvent such as CO₂ and which is recyclable.

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