

## Infestation in Omani Date Palm Orchards by Dubas Bug Is Related to Tree Density

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**Abstract :** Phoenix dactylifera (date palm) is a major crop in many middle-eastern countries, including Oman. The Dubas bug Ommatissus lybicus is the main pest that affects date palm crops. However not all plantations are infested. It is still uncertain why some plantations get infested while others are not. This research investigated whether tree density and the system of planting (random versus systematic) had any relationship with infestation and levels of infestation. Remote Sensing and Geographic Information Systems were used to determine the density of trees (number of trees per unit area) while infestation levels were determined by manual counting of insects on 40 leaflets from two fronds on each tree, with a total of 20-60 trees in each village. The infestation was recorded as the average number of insects per leaflet. For tree density estimation, WorldView-3 scenes, with eight bands and 2m spatial resolution, were used. The Local maxima method, which depends on locating of the pixel of highest brightness inside a certain exploration window, was used to identify the trees in the image and delineating individual trees. This information was then used to determine whether the plantation was random or systematic. The ordinary least square regression (OLS) was used to test the global correlation between tree density and infestation level and the Geographic Weight Regression (GWR) was used to find the local spatial relationship. The accuracy of detecting trees varied from 83-99% in agricultural lands with systematic planting patterns to 50-70% in natural forest areas. Results revealed that the density of the trees in most of the villages was higher than the recommended planting number (120-125 trees/hectare). For infestation correlations, the GWR model showed a good positive significant relationship between infestation and tree density in the spring season with  $R^2 = 0.60$  and medium positive significant relationship in the autumn season, with  $R^2 = 0.30$ . In contrast, the OLS model results showed a weaker positive significant relationship in the spring season with  $R^2 = 0.02$ ,  $p < 0.05$  and insignificant relationship in the autumn season with  $R^2 = 0.01$ ,  $p > 0.05$ . The results showed a positive correlation between infestation and tree density, which suggests the infestation severity increased as the density of date palm trees increased. The correlation result showed that the density alone was responsible for about 60% of the increase in the infestation. This information can be used by the relevant authorities to better control infestations as well as to manage their pesticide spraying programs.

**Keywords :** dubas bug, date palm, tree density, infestation levels

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