Geostatistical Approach for Spatial Distribution Analysis of *Lobesia botrana* (Den. & Schiff.): (Lepidoptera: Tortricidae) in Douro Demarcated Region (DDR).

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**INTRODUCTION**

The European grapevine moth (EGVM), *Lobesia botrana* (Den. & Schiff.) (Fig.1) is the most important vineyard pest in Douro Demarcated Region (DDR), a hilly landscape located in the North of Portugal. The mating disruption (MD) technique, an environmental safe control method against this pest was first used in this region in 2000, being increasingly applied since then.

This study aimed at investigating the spatial-temporal dynamics of the EGVM population, both inside and outside of vineyard plots, in order to evaluate the effect of landscape elements on the distribution of the pest and on the effectiveness of MD, as a basis to improve the use of MD under the DDR conditions.

**MATERIAL AND METHODS**

The experimental area is located in five commercial vineyards of the DDR - Quinta de São Luiz, Quinta do Vallado, Quinta Dona Matilde, Quinta do Sibio e Quinta das Carvalhas. The landscape was categorized in habitats according to the land use and digitized by means of a GIS software (ArcGIS 10.x) (Fig.2).

During 2018, surfaces ranging from 8.2 to 78.7ha were treated with MD (Shin-Etsu Chemical Co. Ltd Isonet-LTT® dispensers loaded with 344 mg of synthetic *L. botrana* female sex pheromone, E7,Z9-12:Ac, Fig.3) at a dose of 400 dispensers/ha. A higher dose than recommended by fabricant (250 dispensers/ha) was used due to several constrains previously identified (ECOVITIS project), in particular those related with climatic (temperature, humidity, wind) and topographic conditions (rugged orography) in DDR.

The activity of EGVM males was monitored weekly, inside and outside the MD treated area, using 1mg pheromone-baited sticks delta traps, since the end of March until the end of October. A total of 124 sampling points were installed within vineyards and surrounding areas, and surveyed for 8 months in order to collect data about grape moth presence. The traps were placed at the height of ± 1.30m above the ground and positioned within a distance that ranged from ± 298 m. Untreated areas consisted in olive crops and non-crop habitats such as forest and scrubland.

A characterization of spatial-temporal distribution, based on adult male catches in pheromone traps, was performed through geostatistical methods (IDW - Inverse Distance Weighting), as well as an estimation of EGVM damages, by plot and by farm, in the three pest generations.

**RESULTS AND FUTURE PROSPECTS**

Within Douro Demarcated Region (DDR), were the study areas are located, farms are characterised by a very fragmented landscape, with vineyards organized in small plots. Vineyards area could range from 25 up to 80% of total farm surface, usually bounded by olive groves and by unmanaged non-crop habitats (Fig.4). This spatial organization could represent a constraint to the homogeneous cloud pheromone distribution among the MD treated vineyards.

Achieved results analysis allowed to understand about pest population dynamics in each of the five farms, reporting about hotspots where the EGVM pressure is higher and about pest spatial distribution through the vineyards. These results are helpful to farmers as they allow them, in future years, to know how to reinforce the dispensers dose in problematic areas.

The results reflect (Fig.5) that the EGVM is not only present in vineyards as it also reaches surrounding landscapes elements such olive crops and non-cropped areas. Next stage will consist in a 3D model of the terrain surface as well detailed land cover analysis performed over digital images obtain by unmanned vehicle (Phantom 4 Pro) and satellite images.

Moreover, previous achieved results demonstrated that the climatic conditions in DDR allow a high biotic potential for EGVM development. Along next steps, an integrated analysis on climatic data such as wind speed and wind direction, humidity, temperature, collected in the five farms, will be performed in order to understand about the influence of climate parameters.

The achieved results will be then used for improving pheromone dispenser location as a way to get a homogeneous pheromone cloud distribution, according to terrain morphology and landscape characteristics and to introduce improvements in the use of MD at the plot level, in DDR conditions.

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