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# Remote Sensing Evaluation of Fire Blight on Quince Using Sentinel 2 Applications

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**Abstract:** ***Traditional methods for detecting plant diseases are time-consuming and costly. A quicker, cheaper alternative is needed to provide early warnings to farmers. To detect fire blight in quinces efficiently, remote sensing with Sentinel 2 images was used. Vegetation indices (VIs) from the VIS-NIR region were assessed for detecting disease onset and intensity. Indices like NDVI and NDMI were compared with climatic conditions during plant growth. The results showed a strong correlation between the images and the ground attack intensity, as well as specific climatic conditions.***

## • Introduction

Fire blight is a destructive necrotic disease that affects fruit species of the Rosaceae family, such as apple (*Malus domestica*), pear (*Pyrus communis*) and quince (*Cydonia oblonga*) with major economic and ecological impact, representing a key concern for numerous research groups around the world. *Erwinia amylovora*, also called the fire blight of rosacea, is one of the most intensively studied pathogenic bacteria.

Remote sensing is a useful and effective means of recording the extent of fire blight damage by detecting changes in the canopy of plants. Remote sensing techniques are based on determining the spectral reflectance characteristics of vegetation to estimate vegetation bio parameters. Vegetation indices (VI's) are combinations of surface reflectance between two or more wavelengths. They highlight a certain vegetation, which can simplify the detection of the level of damage.

## • Material and method

The experimental field, located outside the built-up area of Jucu (46.859N/23.794E), Cluj County, at an altitude of 310 m on a relatively flat terrain, but with a slight inclination to the east. The area cultivated with quince is 3 ha of which 1.5 ha with the Bereczky cultivar (4 x 4.5 m) and 1.5 ha with the Aurii variety (4 x 4 m). The plantation was established in the autumn of 2017 and was later certified organic.

According to monitoring data, the first obvious symptoms of the disease began to appear in 2020, with manifestations varying in frequency and intensity depending on the climatic conditions specific to each experimental year.

Our research is specific to the 2022 experimental year.

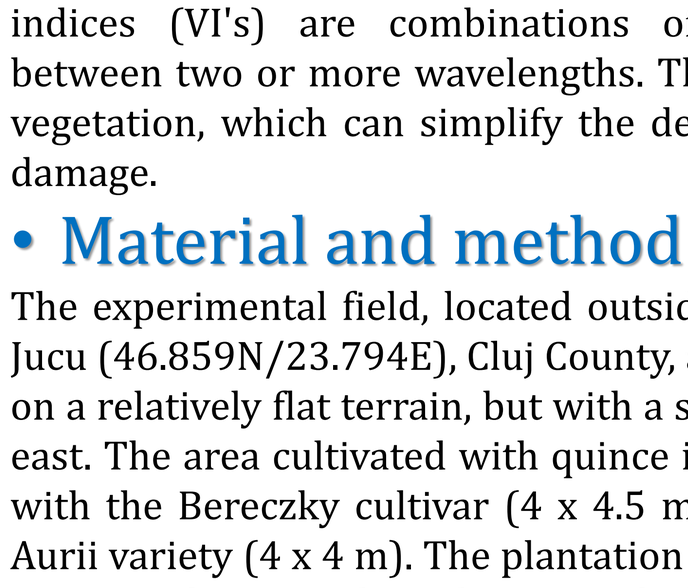

Fig.1. Experimental field

The analyzed VI s were NDVI (Normalized Difference Vegetation Index) which is by far the most widely used VI for precision agriculture applications and has proven to be useful for assessing the impact of stress conditions on plants.

## • Results and discussions

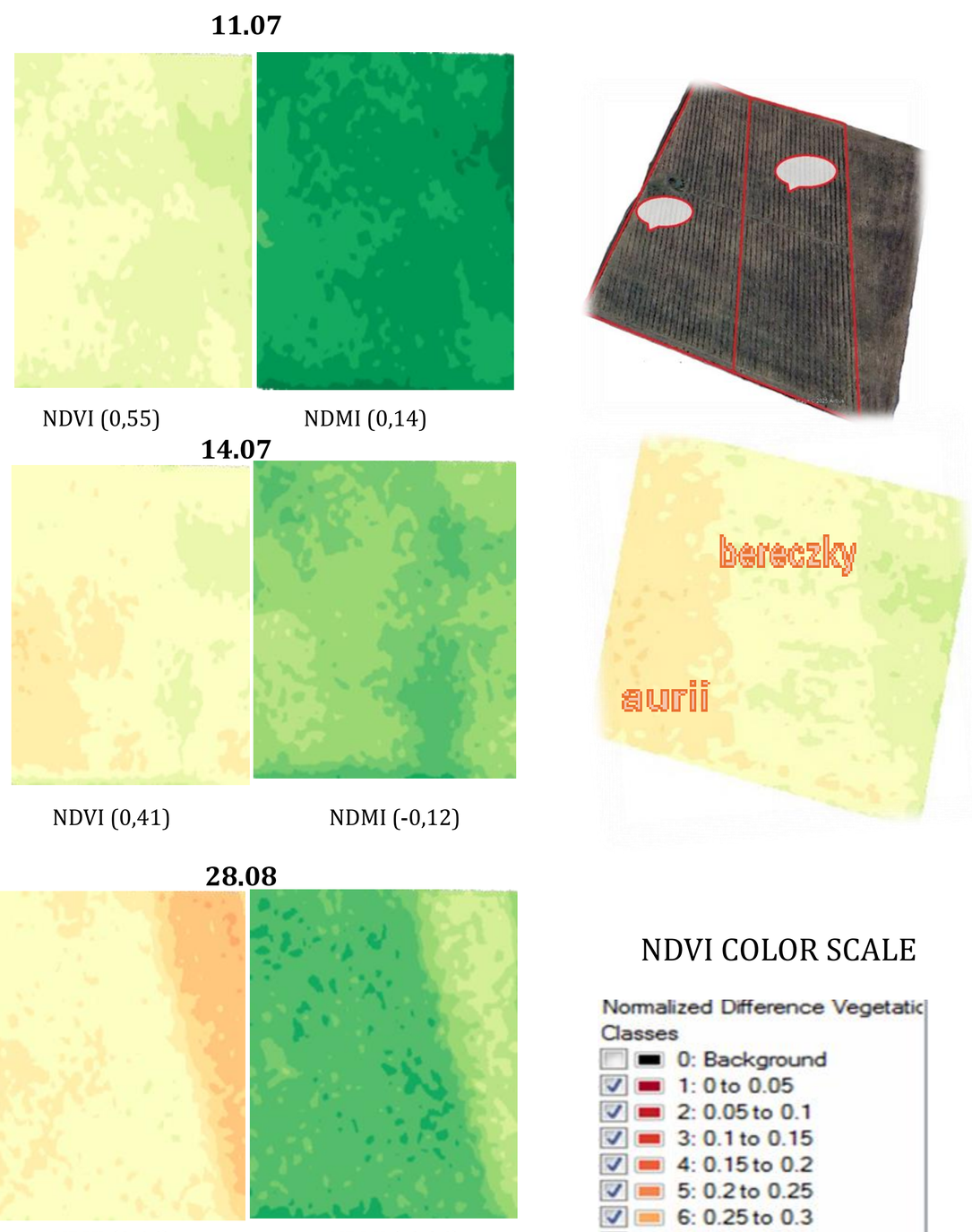


Fig.2. Satellite images and values of studied VI's

**Conclusions:** satellite images and experimental data obtained by using Sentinel 1 are valuable tools in determining and evaluating the dynamics of the intensity of the attack of the pathogen E. Amylovora on quinces. The NDVI vegetation index is not directly related to NDMI, so the intensity of vegetation color is not intrinsically correlated with soil moisture.