# Detection of grapevine characteristics using hyperspectral sensors

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Grapevines (*Vitis vinifera*) are large perennial plants for which phenotyping is predominantly bound to the field. However, phenotyping is time consuming, subjective and often destructive. New sensor technologies can help solve this problem. They should be significantly faster, more objective and, above all, non-invasive, so that a feature (trait or subtrait) can be observed over an extended period of time. They provide a level of information, thus being appropriate for plant phenotyping.

As a new field phenotyping platform, the 'Phenoliner', was constructed, which acts as a moveable tunnel and allows the acquisition of phenotypic data in the field under standardized conditions. It is equipped with a geo-referenced (i) multicamera-system and (ii) hyperspectral sensor system.

The hyperspectral sensors detect the visible light as well as the near infrared and short wavelength infrared region (400 – 2500nm). They record the reflection of objects. Because of the characteristic features of the reflectance spectra it is possible to discriminate between water, soil, plants, etc. Furthermore, different soil types as well as plant varieties can be distinguished from each other. With plants they are mainly used for the detection of diseases and the determination of ripeness. In the case of vines, there are many possibilities for the application of these sensors.

Several hundred grapevine cultivars worldwide are in use. It can be assumed that they differ in their spectral data. The aim of this work is to record these differences as baseline for further experiments.

Therefore, reflection spectra of twelve nationally important grapevine cultivars were compared. The ground-based hyperspectral records were accompanied by airborne multispectral measurements performed by an unmanned aerial vehicle (UAV).

At first, only leaves were observed, but in the course of the growing season grapes were also recorded. At the same time, the development stage and the incidence of diseases were assessed. Content of chlorophyll, anthocyanins, sugars, acids, etc. were measured as references.

The results of this work serve as a basis for further experiments, which focus on the early detection of grapevine diseases.