

Using the UAV Thermography for Cultivation and Phenotyping of Cereals

The process of cultivation leading to the target properties of new cereal varieties is time-consuming due to the need to characterize a large number of potential gene resources. Genetic resources of minor cereals are tested in three-year seed-beds with elementary evaluation according to the applicable methodology of work with collections of genetic resources. The genetic resources evaluated include winter and spring wheat, winter barley, both forms of triticales, vain types of Hordeae and a number of minor crops.

Availability of modern technologies of thermographic imaging from the UAV platform (Unmanned Aerial Vehicle) offers new possibilities for description of genetic resources, extension of the range of classifiers, in terms of thermal behaviour of plants in relation to transpiration response of plants.

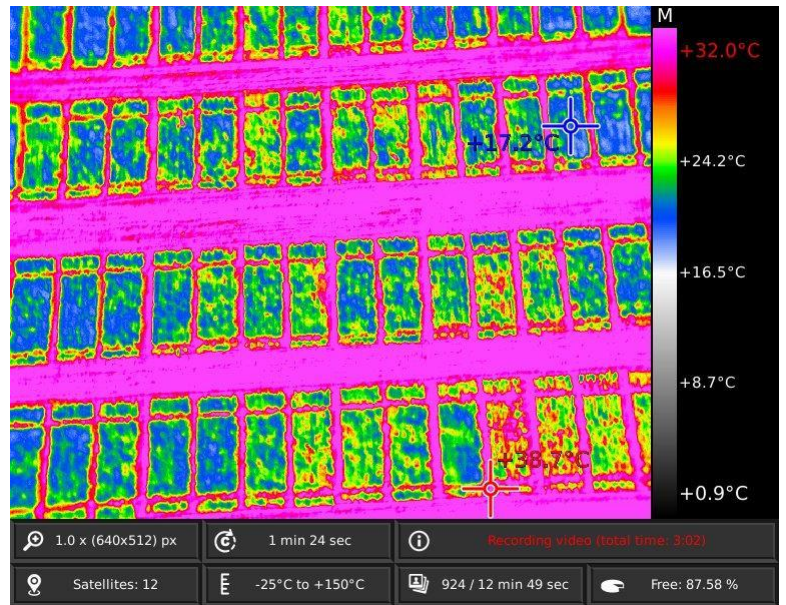
In the vegetation period 2015 – 2016 there were the field experiments in which 325 items of winter wheat, 82 items of winter barley and 60 items of winter triticale were planted in total.



Ground station with Workswell WIRIS, LCD screen and second drone.

Within the spring forms, 224 genotypes of wheat and 10 genotypes of triticale have been sown. While in line sowing and in the plots of 2 m², we recovered 33 items of winter forms and 99 items of spring forms, within the renewal of collection, due to small amount of seeds stored in the GB warehouse.

For scanning the temperature condition of experimental varieties, we used a thermal imaging camera **Workswell WIRIS** supported by UAV based on Gryphon Dynamics frames system. The flight was pre-programmed using UGCS Ground Station. The data have been processed in the program Pix4D and analyzed by software **Workswell CorePlayer** and **Workswell Thermoformat**.



Thermal image from WIRIS with additional information such a GPS, Zoom, memory etc.

Preliminary analysis of the data indicates usefulness of this approach for the process of cultivation and phenotyping where the varieties have specific symptoms and significant differences in the areas of both visible and infrared radiation. For the detailed analysis of the resulting thermogram, integration and support of camera hardware with ortho-rectification program such a Pix4D or Agisoft will be required in order to maintain all radiometric information in the resulting map. In WIRIS 2nd Gen there is possible to save images directly into **TIFF format** for easy importing to programs mentioned above.

