The aspects of splash erosion in the eye of high-speed camera

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Introduction

Soil as the important component of many ecosystems and non-renewable resource, may undergo processes of different degradation. One of the form of physical degradation is water erosion which is initiated by the splash phenomenon. This process occurs when impacting raindrops cause the detachment and transport of soil material. The precise nature of the phenomena that cause this degradation is necessary to develop and improve methods to prevent it.

The aim of this study was to present the possibilities of high-speed cameras in observation of main aspects of splash erosion caused by the single drop impact.

Materials and method

Laboratory experiments were conducted on soil samples with different texture and initial moisture content in context of the most effective observation of phenomena occurring on the soil surface. The splash was caused by water drop with diameter of 4.2 mm. A single drop impact was registered by a set of Phantom Miro M310 high-speed cameras recording with 3260 fps (frames per second).

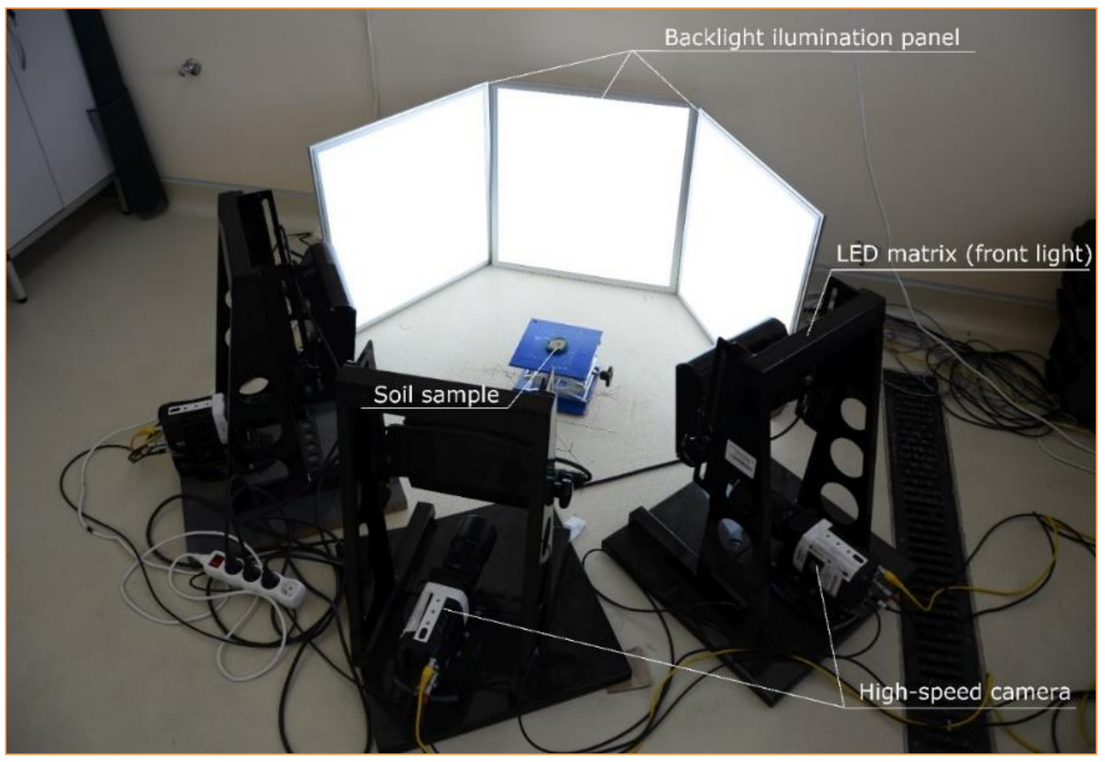

Fig. 1 Measurement stand

Results

After the splash phenomenon on different soil surfaces, the following aspects were observed by cameras and quantitatively characterized with developed algorithms:

a) **ejection of particles** - as a result of the impact of a single drop on the soil surface, there is an ejection of particles which are transferred over different distances and in different directions.
b) **crown formation** – this aspect refers to moist surfaces (liquid layer), where as a result of the momentum of a falling drop, a layer of liquid is lifted up and creates a form with a crown shape. During the forming stage, a lot of tiny droplets could be ejected over different distances from crown rim.
c) **micro-crater** - the hollow formed in the surface layer of soil after the single drop impact of rain. As a result of the impact, the part of the soil directly underneath the falling drop is compacted and the other part is shifted outside forming the walls of the crater with rim.

Fig. 2 Ejection of particles

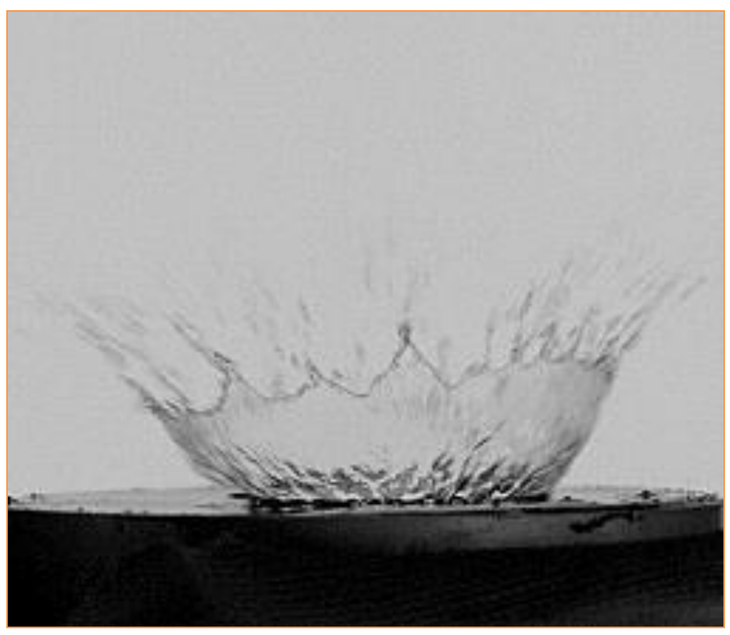

Fig. 3 Crown formation

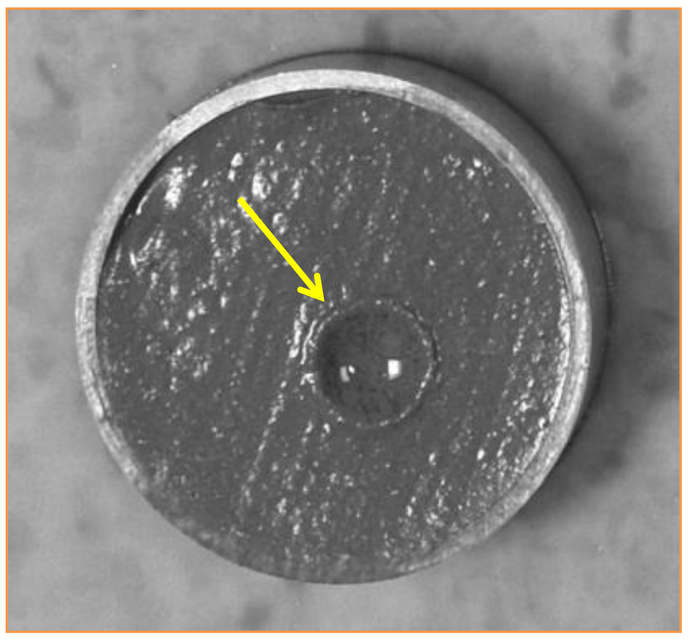

Fig. 4 Micro-crater

Conclusions

In general, the high-speed cameras are effective are an effective tool for quantitative and qualitative description of splash erosion aspects taking place on the soil surface.

Acknowledgement

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