



Adaptability of laser diffraction measurement technique in soil physics methodology

Gyöngyi Barna (1), József Szabó (1), Kálmán Rajkai (1), Zsófia Bakacsi (1), Sándor Koós (1), Péter László (1), Gabriella Hauk (2), and András Makó (1)

(1) Hungarian Academy of Sciences, Centre for Agricultural Research, Institute for Soil Science and Agricultural Chemistry, Budapest, Hungary (gyongyi.barna@rissac.hu), (2) MOTIM Zrt., Mosonmagyaróvár, Hungary (hauk_g@motim.hu)

There are intentions all around the world to harmonize soils' particle size distribution (PSD) data by the laser diffractometer measurements (LDM) to that of the sedimentation techniques (pipette or hydrometer methods). Unfortunately, up to the applied methodology (e. g. type of pre-treatments, kind of dispersant etc.), PSDs of the sedimentation methods (due to different standards) are dissimilar and could be hardly harmonized with each other, as well.

A need was arisen therefore to build up a database, containing PSD values measured by the pipette method according to the Hungarian standard (MSZ-08. 0205: 1978) and the LDM according to a widespread and widely used procedure. In our current publication the first results of statistical analysis of the new and growing PSD database are presented: 204 soil samples measured with pipette method and LDM (Malvern Mastersizer 2000, HydroG dispersion unit) were compared.

Applying usual size limits at the LDM, clay fraction was highly under- and silt fraction was overestimated compared to the pipette method. Subsequently soil texture classes determined from the LDM measurements significantly differ from results of the pipette method. According to previous surveys and relating to each other the two dataset to optimizing, the clay/silt boundary at LDM was changed.

Comparing the results of PSDs by pipette method to that of the LDM, in case of clay and silt fractions the modified size limits gave higher similarities. Extension of upper size limit of clay fraction from 0.002 to 0.0066 mm, and so change the lower size limit of silt fractions causes more easy comparability of pipette method and LDM. Higher correlations were found between clay content and water vapor adsorption, specific surface area in case of modified limit, as well. Texture classes were also found less dissimilar.

The difference between the results of the two kind of PSD measurement methods could be further reduced knowing other routinely analyzed soil parameters (e.g. pH(H₂O), organic carbon and calcium carbonate content).