Soil Compaction Assessment in Sugarcane Fields under Different Planting Conditions Using Soil Bulk Density, Relative Bulk Density and Cone Index

A. Veisitabar[1], A. Hemmat[1*] and M. R. Mosaddeghi[2]

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Abstract

Considering soil compaction problem in sugarcane fields due to using heavy harvester and haulout equipment under unsuitable moisture conditions, this research aims to assess soil compaction in sugarcane fields located in Da'balKhazaei Plantation unitofSugarcane Development and By-product Company, Ahvaz. Undisturbed soil samples from the furrow (wheel tracks) were collected for measuring soil water content and bulk density. Considering the changes in soil texture of sugarcane fields, for expressing the degree of soilcompactness, in addition to soil bulk density (BD), relative bulk density (BD divided by reference BD) was also determined. The change in soil mechanical resistance with depth was determined by a cone penetrometer. Results showed that most of soil BD values measured in the sugarcane fields were in the range of small root development scale (high limitation). Comparingthe calculated RBD values with optimum value (0.85), it was observed that most of the values were higher than the optimum values recommended for root growth. This shows excessivesoil compaction in the sugarcane fields. The values of cone indices measured in soil profiles indicated that most of the values were higher than either limiting (2 MPa) or critical (3 MPa) values for root growth. Therefore, for improving soil physical fertility and achieving sustainability in crop production, management of farm machinery traffic in sugarcane fields, especially at the harvest time, needs to be reconsidered.

Keywords: Relative bulk density, cone index, cone penetrometer, mechanical soil strength, sugarcane harvester, haulout.

1. Dept. of Farm Machinery, College of Agric., Isf. Univ. of Technol., Isfahan, Iran.
2. Dept. of Soil Sci., College of Agric., Isf. Univ. of Technol., Isfahan, Iran.
*: Corresponding Author, Email: ahemmat@cc.iut.ac.ir

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