SUITABILITY OF 7-IN-1 INTEGRATED SOIL SENSOR FOR MEASURING SOIL pH, EC AND MOISTURE IN ALFISOLS, ANURADHAPURA, SRI LANKA

J.P.B.S. Wijethilaka[1], R.A.A.S. Rathnayaka[2], J.P.H.U. Jayaneththi[2], S.J. Sooriyaarachch[3], D.A.U.D. Devasinghe[1] and U.G.A.I. Sirisena[1]

[1]*Department of Plant Sciences, Faculty of Agriculture, Rajarata University of Sri Lanka, Puliyankulama, Anuradhapura, Sri Lanka.*
[2]*Department of Agricultural Engineering and Soil Science, Faculty of Agriculture, Rajarata University of Sri Lanka, Puliyankulama, Anuradhapura, Sri Lanka.*
[3]*Department of Computer Science and Engineering, University of Moratuwa, Sri Lanka.*

Sensor-based approaches are important to facilitate efficient, cost-effective and site-specific soil analysis in precision agricultural applications. Suitability of 7-in-1 Integrated Soil Sensor (7-in-1 ISS) was tested in selected Alfisols for measuring soil pH, electrical conductivity (EC) and moisture content. A bulk soil sample (250 kg) from 0 - 30 cm depth was collected from the research field, Faculty of Agriculture, Rajarata University of Sri Lanka, of which the initial physico-chemical properties were determined. A series of soil pH i.e. 4, 5, 6, 7, 8, and 9 were simulated using 500 g air-dried soils in pots by adding either HCl or KOH based on the developed pH buffering curves. The soil pH was tested by both 7-in-1 ISS and pH meter (1:5 soil/0.01 M $CaCl_2$). Pots containing 5 kg of soil were saturated, drained and dried in a polytunnel and moisture levels were measured by 7-in-1 ISS and a time domain reflectometer. The EC meter measurements and ISS readings were also compared for EC managed under different NPK levels. The data were statistically compared with paired sample t-test using SPSS software. The results revealed that there were significant differences between the standard laboratory procedure and 7-in-1 ISS for measuring soil pH, EC, soil moisture ($p<0.05$). Moreover, strong positive correlations were observed among the standard laboratory procedures for pH ($r=0.943$), EC ($r=0.911$), moisture contents ($r=0.963$), and ISS readings. Overall, it can be concluded that the 7-in-1 ISS has a higher applicability to measure pH, EC and soil moisture in the selected Alfisols based on the regression models describing the relationship between the measurements taken from the standard laboratory procedures and ISS readings.

Keywords: Integrated soil sensor, pH buffering curve, Precision agriculture