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Water use efficiency regulated by automatic surface drip irrigation control on soybean

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The farmers have been using irrigation techniques through manual control which farmers irrigate lands at regular intervals. Automatic irrigation systems can be programmed to provide automatic irrigation to the plants which helps in saving money and water and to discharge more precise amounts of water in a targeted area, which promotes water conservation. The objective of this study was to determine the possible effect of automatic irrigation systems based on soil moisture on soybean growth. This experiment was conducted on an upland field with sandy loam soils in Department of Southern Area Crop, NICS and RDA. The study had three different irrigation methods; sprinkle irrigation (SI), surface drip irrigation (SDI) and fountain irrigation (FI). SI was installed at spacing of 7×7 m and 1.8m³/hour as square for per irrigation plot, a lateral pipe of SDI was laid down to 1.2 m row spacing with 2.3 L h⁻¹ discharge rate, the distance between laterals was 20 cm spacing between dripper and FI was laid down in 3 m interval as square for per irrigation plot. This automatic irrigation system had valves to turn irrigation on/off easily by automated controller, solenoids and moisture sensor which were set the reference level as available soil moisture levels of 30% at 10 cm depth. The efficiency of applied irrigation was obtained by dividing the total water stored in the effective root zone to the applied irrigation water. Results showed that seasonal applied irrigation water amounts were 60.4 ton 10a⁻¹ (SI), 47.3 ton 10a⁻¹ (SDI) and 92.6 ton 10a⁻¹ (FI), respectively. This system saved a large quantity of water by 27.5% and 95.6% compared to SI, FI system. The average soybean yield was significantly affected by different irrigation methods. The soybean yield by different irrigation methods were 309.7 kg 10a⁻¹ from SDI 282.2 kg 10a⁻¹ from SI, 289.4 kg 10a⁻¹ from FI and 206.3 kg 10a⁻¹ from control, respectively. SDI resulted in increase of soybean yield by 50.1%, 7.0% 9.8% compared to non-irrigation (control), FI and SI, respectively. Therefore, the automatic irrigation system supplied water only useful when the soil moisture in the soil went below the reference. Thus the system is efficient and compatible to changing environment. In conclusion, improving automatic irrigation system can contribute greatly to reducing production costs of crops and making the industry more competitive and sustainable.

Biography

Ki-Yuol Jung is a soil scientist at National Institute of Crop Science, Rural Development Administration (RDA) in Republic of Korea. He has received his PhD degree in in soil science from Gyeongsang National University. Currently, he conducts researches on water management practices for field crop production in upland and paddy fields. He has contributed to improve water use efficiency, crop yield and plant functional compounds for soybean, sesame and sorghum by groundwater control system, trenchless subsurface drainage of paddy fields and subsurface drip irrigation systems.

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