

Effect of water curtain cultivation (WCC) system on physical and hydrogeochemical characteristics of groundwater

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Groundwater samples were collected bimonthly, from March to June 2014, in 19 wells in Nonsan area and most wells are located in area employing water curtain cultivation (WCC) system. Stream water samples were collected in three sites in every month during the study period. The objective of this study was to understand interaction between groundwater and surface water, to identify sources controlling water chemistry and to decipher a redox condition in groundwater. Furthermore, it is important to evaluate whether the processes were related to WCC system. While WCC system was conducted, flow rate measured in stream water was greatly lowered. In contrast, the flow rate increased during the period that WCC was stopped. The stream water was vulnerable to groundwater pumping due to WCC, implying that physiochemical interaction could occur between groundwater and stream water. The studied groundwater included wide ranges of NO_3^- , Mn^{2+} and Fe^{2+} , and generally showed the higher Cl^- concentration relative to those of stream water and precipitation. These indicated that the groundwater was affected by anthropogenic sources derived from agricultural practices and was under distinct redox conditions. Compared to those in area of non-WCC system, groundwater in area employing WCC system was characterized by elevated SO_4^{2-} concentration and was positively correlated with $\delta^{18}\text{O}$ value, typically. These results suggested that pumping and injecting groundwater for WCC system played a critical role to determine groundwater chemistry. Plot of $\delta^2\text{H}$ and $\delta^{18}\text{O}$ for groundwater showed much lower slope than that of GMWL, indicating that groundwater was substantially evaporated during recharge and that groundwater recharge occurred mainly in summer season.