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Article

Changes of Soil Salinity due to Flooding in Newly Reclaimed Saline Soil

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This study was carried out to identify the changes of EC during desalinization due to flooding in newly reclaimed saline soil. To do this, experimental plots were made of rotary tillage+water exchanging plot, flooding plot and rainfall flooding plot. In rotary tillage+water exchanging plot, drainage, rotary tillage and flooding were conducted at the interval of 7 days. In rotary tillage+water exchanging plot and flooding plot, plots were irrigated at the height of 10 cm. After 38 days desalinization, changes of EC values at top soil (0~20 cm) were as follows. In rotary tillage+water exchanging plot, EC decreased from 21.38 dS m^{-1} to 2.16 dS m^{-1} and in flooding plot, EC decreased from 13.97 dS m^{-1} to 2.22 dS m^{-1}. In rotary tillage+water exchanging plot and flooding plot, EC values decreased below the EC criterion (4.0 dS m^{-1}) of saline soil. In rainfall flooding plot, EC values decreased or increased according to amounts of rainfall and rainfall time. After 38 days, EC decreased from 16.7 dS m^{-1} to 12.35 dS m^{-1}. In flooding plot, changes of EC due to soil depth were investigated. After 38 days desalinization, changes of EC due to soil depth were as follows. At 0~10 cm depth, EC value decreased from 13.08 dS m^{-1} to 0.74 dS m^{-1} (94.3% of salt was desalinized). At 10~20 cm depth, EC value decreased from 14.80 dS m^{-1} to 3.69 dS m^{-1} (75.2% of salt was desalinized). At 20~30 cm depth, soil was desalinized slowly compared with upper soil, EC value decreased from 13.57 dS m^{-1} to 6.93 dS m^{-1} (48.9% of salt was desalinized).

Keywords: Reclaimed land, Desalinization, EC, Salinity, Rice

Introduction

Majority of reclaimed lands in Korea were made through dike construction and have very high salt concentrations in early periods, so to cultivate crops normally in newly reclaimed lands, soils must be desalinized properly. For salt-affected soil which have relatively good permeability, desalinization through vertical drainage is effective method for desalinization.

This study was carried out to identify the changes of EC during desalinization due to flooding in newly reclaimed saline soil.

Materials and Methods

Experimental field was located on Saemangeum reclaimed land, Korea. The soil series was Munpo and soil texture was sandy loam. Experimental plots were made of rotary tillage+water exchanging plot, flooding plot and rainfall flooding plot. In rotary tillage+water exchanging plot, drainage, rotary tillage and flooding were conducted at the interval of 7 days. In rotary tillage+water exchanging plot and flooding plot, plots were irrigated at the height of 10 cm. In rainfall flooding plot, irrigation water depended on rainfall during experiment. Soil samples were collected 6 times during experiment at every 10 cm depth.

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Results and Discussion

Figure 1 shows the changes of EC values at top soil (0~20 cm) in each plot during experiment. In rotary tillage+water exchanging plot, soil was desalinized rapidly within 1 week, and thereafter the soil was desalinized rather slowly, during 38 days experiment EC value decreased from 21.38 dS m^{-1} to 2.16 dS m^{-1} (89.9% of salt was desalinized). In flooding plot EC decreased from 13.97 dS m^{-1} to 2.22 dS m^{-1} during 38 days expriment (84.1% of salt was desalinized). In rotary

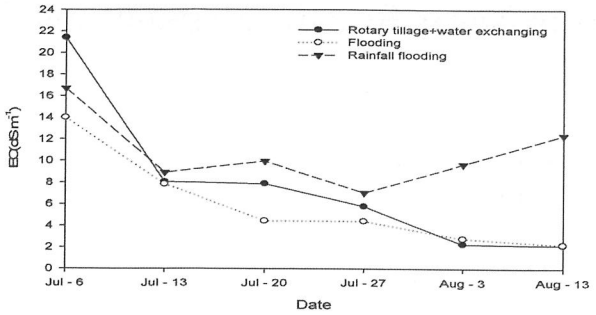

Figure 1. Changes of EC values at top soil(0~20 cm) during experiment.

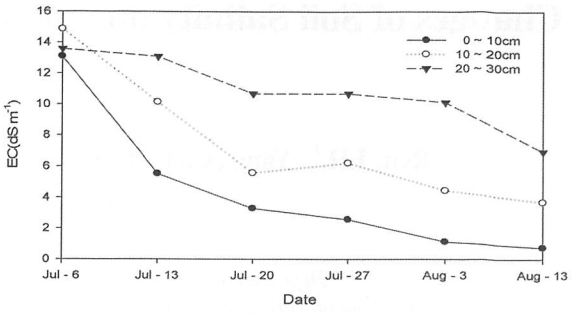

Figure 2. Changes of EC values due to soil depth in flooding plot during experiment.

tillage+water exchanging plot and flooding plot, EC values decreased below the EC criterion (4.0 dS m^{-1}) of saline soil(1954, U.S. Salinity Laboratory). In rainfall flooding plot, EC values decreased or increased according to amounts of rainfall and rainfall time. After 38 days, EC decreased from 16.7 dS m^{-1} to 12.35 dS m^{-1}.

Figure 2 shows the changes of EC values due to soil depth in flooding plot during experiment. At 0~10 cm depth, after 14 days irrigation, EC value decreased from 13.08 dS m^{-1} to 3.28dS m^{-1} (74.9% of salt was desalinized). At 10~20 cm depth, after 38 days irrigation, EC value decreased from 14.80dS m^{-1} to 3.69 dS m^{-1} (75.2% of salt was desalinized). At 20~30 cm depth, soil was desalinized slowly compared with upper soil, after 38 days desalinization, EC decreased from 13.57 dS m^{-1} to 6.93 dS m^{-1} 48.9% of salt was desalinized).

Conclusion

In rotary tillage+water exchanging plot and flooding plot, after 38 days irrigation, the EC values of the top soil (0~20 cm) decreased below the EC criterion (4.0 dS m^{-1}) of saline soil and the EC limit (4.7 dS m^{-1}) for rice cultivation (Son et al., 2000). From this we could assume that Saemangeum experimental field could be used for rice cropping after desalinzation about a month.

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신간척지 토양에서 담수에 의한 토양염도 변화에 대한 개관

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간척지 토양은 도시화와 산업화로 인해 잠식되는 농경지를 대체하는 식량공급원으로 간척지는 쌀 산업 외에 원예, 축산 등 다양한 생물산업 기반으로 활용되고 있다 그리고 간척지 논농업(간척지 논 30.7만 ha)은 온실가스 저감 기능을 가지고 있으며 년간 논 1ha당 이산화탄소 흡수량 21.9t, 산소 공급량 15.9t으로 알려져 있다. 그러나 높은 염농도와 지하수위, 지하수 상승에 의한 재염화 현상, 토양 물리화학성과 배수 불량, 논의 경우 적정 유효토심은 50cm 정도이나 간척지 논 유효토심 20cm 이하로 유효토심이 매우 낮은 편이다. 또한 간척년대 경과할수록 제염은 되나 토양물리성 불량, 시비량 과다와 양분 불균형 발생으로 인하여 수분과 양분보유능 향상 토양관리 기술 개발 필요하다.