Conference

Saline Futures

Addressing climate change and food security

Book of Abstracts

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Sindhura, K., Prasad, T. N. V. K. V., Selvam, P. O. and Hussain, M., 2014, Synthesis, characterization and evaluation of effect of phytogenic zinc nanoparticles on soil exo-enzymes. *Appl. Nanosci*., 4: 819-827.

K. Harish Kumar, Doctoral degree: In Agricultural Microbiology (Persuing), Research Problem: Development of Cobalamin rich product, Propionibacterium spp., Master's research: Evaluation of microbially synthesized zinc nanoparticles, on Growth and yield of Maize (*Zea mays* L.) Bachelors: Bachelor of Science in Agriculture

60. Building small farmers' capacities on climate-resilience farming in saline affected regions of Haryana, India - Pawan Kumar

Building small farmers' capacities on climate-resilience farming in saline affected regions of Haryana, India

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India, Saline crops, Wheat, Mustard, Broccoli, Beetroot, Small farmers

Introduction

Soil and water salinity is one of the major constraints in sustainable food production in many parts of the world's , affecting 20% of cultivated land, and 33% of irrigated land6. In India alone, the area under salt-affected soils is about 6.73 million ha. The five states together accounting for almost 75% of saline and sodic soils in the country. The area under salt-affected soils in country would almost triple to 20 million ha by 2050

S M Sehgal Foundation (SMSF), a NGO's works with small farmers in Nuh district, Haryana. Agriculture is the mainstay of livelihoods and 75% of the district area has saline ground water. Tube wells is used mostly for flood irrigation. The skewed application of fertilizers, flood irrigation and high evapotranspiration rate further increases soil salinity resulting low farm productivity.

Study Conducted

With the objective to analyze the effect of saline water irrigation on yields of salt-tolerant crops, the study was conducted in three blocks7 of Nuh district,8 engaging 78 farmers from 13 salt-affected villages.

The field demonstrations of salt tolerant varieties KRL 10 for Wheat (cereal), Saki F1 for broccoli, Indum Ruby Queen for beetroot (vegetables) and CS 58 for mustard (oil crop) done at farmers' fields. The one-acre plot area is considered for this study.

Soil samples were collected from each farmer's field before planting. Two water samples were collected during the crop season. Direct seed sowing was done for wheat, mustard and beetroot, whereas broccoli grown with transplanted seedlings. The minimum and maximum salinity of irrigation water varied from 0.97 to 4.158dS/m for broccoli, 2.178 to 6.922dS/m for beetroot, 0.97 to 7.946dS/m for mustard and 2.882 to 7.946dS/m for wheat. Soil EC varied from 0.15 to 4.29 dS/m with pH between 6.5 to 8.8.

For economic viability analysis gross benefit calculated for each crop. Comparative benefit analysis of broccoli and beetroot done with salt tolerant wheat (STW) and salt tolerant mustard (STM). Similarly, the gross benefit received from STW and STM compared with salt intolerant wheat (SITW) and mustard (SITM).

[6] Pooja Srivastava, Rajesh Kumar: Soil salinity: A serious environmental issue and plant growth promoting bacteria as one of the tools for its alleviation. Saudi J Biol Sci. 2015 Mar; 22(2): 123–131. Published online 2014 Dec 9. doi: 10.1016/j.sjbs.2014.12.001

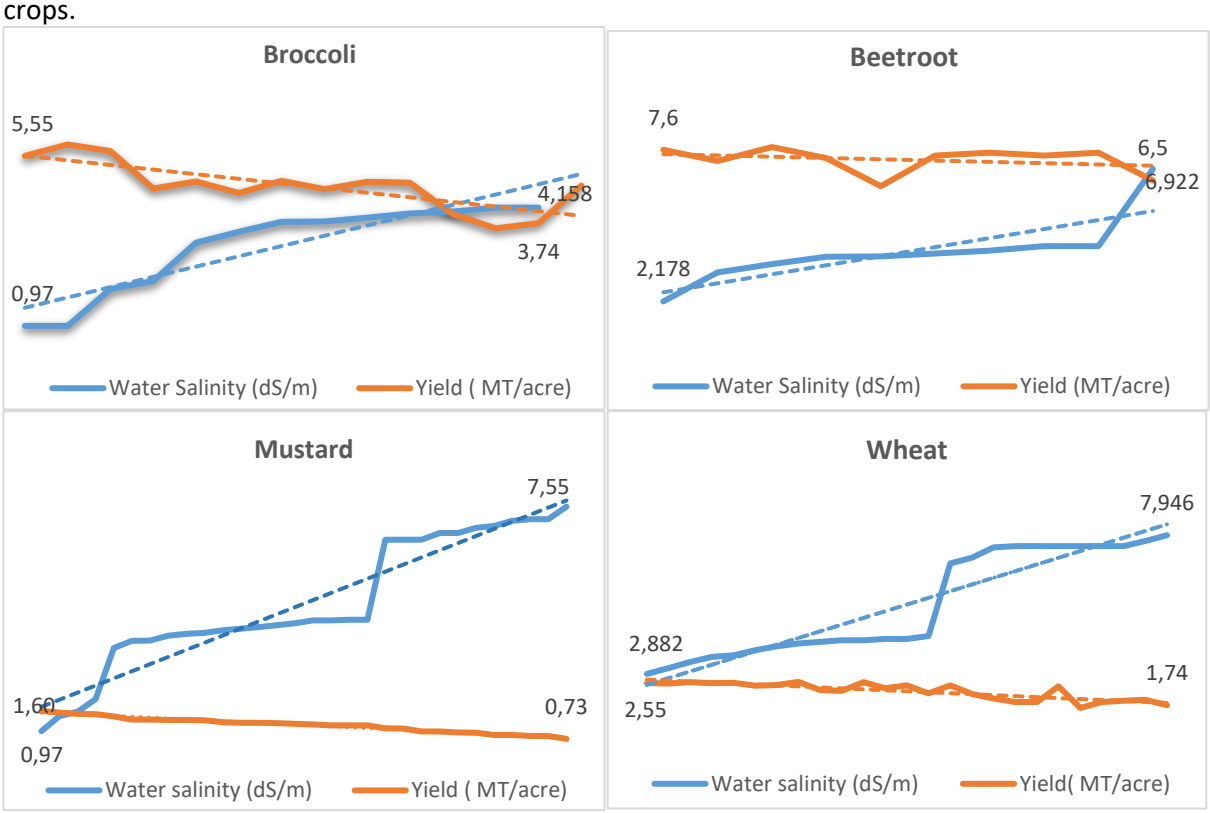
[7] Block is a district subdivision for the purpose of Rural Development Department and panchayati raj institutes.

[8] A district (zilā) is an administrative division of an Indian state or territory.

All four crops are grown in winter season, therefore, the comparative study helps farmers to make decision on the selection of crop and area under each crop.

Results and Discussions

The results showed that yield reduced with increase in water salinity, though no set trend was observed between salinity and yield. Figures below show impacts of saline water irrigation on yield of different crops.



Crop	Increase in Salinity (dS/m)	Yield Reduction MT /acre
Broccoli	3.19	-1.81
Beetroot	4.74	-1.10
Mustard	6.98	-0.87
Wheat	5.06	-0.81

Among all, broccoli is most sensitive to salinity and yield reduces up to 1.81 MT/ acre with increase of 3.19 dS/m water salinity, whereas wheat is least affected with salinity and yield is decreased only 0.81 MT/ acre with increase in salinity from 2.88 to 7.94. Wheat crop is more salt tolerant than mustard because it requires 5-6 irrigations. Mustard needs one irrigation only.

The economic benefit analysis shows broccoli more profitable than all other crops, which provides highest income of INR 107,292 per acre compared with INR 72,400, INR 41,634 and INR 40,646 received respectively from beetroot, mustard and wheat. Moreover, broccoli also resulted higher returns of 61.83% (INR 66,342) and 62.16% (INR 66,692) over STW and STM respectively, whereas beetroot resulted 43.44% (INR 31,450) and 43.92% (INR 31,800) higher returns per acre over STW and STM. Although, STW and STM gave 6.20% (INR 2431) and 7.53% (INR 2847) higher return per acre against local salt-intolerant varieties.

Conclusions

Broccoli and beetroot are more profitable crops can be grown between 2.178 to 6.92 dS/m irrigation water salinity, whereas wheat and mustard well adopted to high salinity and can withstand up to salinity of 7.946

dS/m. The germination of STW and STM are found 12% higher than SITW and SITM. Greater income and reduction in cultivation cost create huge potential for small farmers particularly who do not have access to freshwater, and will help them come out of vicious cycle of extreme poverty.

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61. Effect of irrigation water alkalinity on performance of some wheat cultivars in a semi-arid region of northwest India - Pawitar Singh, O P Choudhary and Pritpal Singh

Effect of irrigation water alkalinity on performance of some wheat cultivars in a semi-arid region of northwest India

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RSC, Cultivar, Grain yield, Yield parameters

Introduction

It is estimated that about 10 m ha of irrigated land in the world suffer from secondary salinization and sodification. In Northwestern parts of India, this problem is more acute in groundwater's which contain high concentrations of bicarbonates and variable soluble salts. These poor quality ground waters are also concentrated in drier Southwestern regions of Punjab which constitutes about 25 percent saline, 69 percent alkali and 6 percent saline-alkali water, where wheat is the most common winter crop. Therefore, the present research study was conducted with objective to observe the performance of six wheat cultivars (KRL 210, PBW 621, HD2967, PBW 590, PBW 550 and Berbet) to four levels of residual sodium carbonate (RSC) in irrigation water (0, 3, 6.5 and 10 me L^{-1}).

Methodology:

The experiment was conducted at research farm of Punjab Agricultural University, Ludhiana, India in a split plot design with three replications on *sandy loam* soil. The soil in 0-30 cm layer had pH = 7.9; electrical conductivity (EC) (1:2 soil : water suspension) = 0.20 dSm^{-1}; organic carbon = 0.28%; calcium carbonate <1 %; clay content = 7.2% and exchangeable sodium percentage (ESP) = 4.2. Good quality water (GW) used as control (RSC 0) had EC = 0.40 dS m^{-1} and sodium adsorption ratio (SAR) = 1.2. Three levels of RSC water (3 me L^{-1} [EC 0.60 dS m^{-1} and SAR 3.8], 6.5 me L^{-1}[EC 0.90 dSm^{-1} and SAR 7.3] and 10 me L^{-1}[EC 1.40 dSm^{-1} and SAR11.0] were created by dissolving 0.25, 0.55 and 0.84 g of $NaHCO_3$ per liter in GW. The experimental field plots had been receiving respective alkali irrigation water for 18 years before start of this experiment.

Results and Discussion

Soil pH and ESP significantly increased with increasing levels of RSC of irrigation water (Table 1). The soil pH progressively increased to 7.80, 8.59, and 9.46 at RSC 3, 6.5, and 10 levels compared to GW at 0-15 cm soil depth. The value of ESP at RSC 10 was highest (58.62) over RSC 0 (4.20) at respective soil depth. The data presented in Table 1 revealed that grain yield of different wheat cultivars differed considerably at different RSC levels.