www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(12): 1899-1901

www.thepharmajournal.com
Received: 15-09-2022
Accepted: 18-10-2022

Anant Kumar
Senior Scientist and Head, Krishi Vigyan Kendra, Gwari, Auraiya, Uttar Pradesh, India

Rashmee Yadav
SMS (Home Science), Krishi Vigyan Kendra, Gwari, Auraiya, Uttar Pradesh, India

Ankur Jha
Programme Assistant (Agriculture), Krishi Vigyan Kendra, Gwari, Auraiya, Uttar Pradesh, India

Indrapal Singh
SMS (Horticulture), Programme Assistant (Agriculture), Krishi Vigyan Kendra, Gwari, Auraiya, Uttar Pradesh, India

Corresponding Author:
Anant Kumar
Senior Scientist and Head, Krishi Vigyan Kendra, Gwari, Auraiya, Uttar Pradesh, India

Varietal assessment in partially reclaimed sodic soil

Anant Kumar, Rashmee Yadav, Ankur Jha and Indrapal Singh

Abstract
Assessment of scented sodic salt tolerant variety of paddy. KVK, Auraiya in U.P. conducted an On Farm Trial to assess the yield effect and low net return in paddy grown in partially reclaimed sodic soil. Introduction of CSR-30 is compared with salt tolerant variety CSR-36 and the local variety Kranti grown by farmers. The results showed the grain yield of 45.82 q/ha in case of CSR-30 as compared to 51.45q/ha in case of CSR-36 & 42.24 q/ha in case of Kranti. In spite of low yield in CSR-30, that net return/ha is found to be high i.e., Rs. 17894/- as compared to Rs. 16246/- in case of CSR-36 & Rs. 12282/- in case of Kranti. This might be due to the reason that scented salt tolerant variety of paddy fetches higher price in the market as compared to other non-scented salt tolerant variety of paddy.
Problem definition: Low yield of rice due to sodic soil.

Keywords: Low yield, sodic soil, partially reclaimed

Introduction

Rice-wheat is a major cropping sequence in the Indo-Gangetic Plains (IGP) of South Asia; covering over 13.5 million ha in Bangladesh, India, Nepal and Pakistan and source of livelihood to millions of people. The problems of post Green Revolution due to intensive farming, imbalance use of fertilizers and faulty irrigation practices cause soil degradation and depletion of soil organic carbon (SOC), water resources and environment pollution leading to stagnation or decline in yields of the rice-wheat cropping system (RWCS) in many parts of South Asia. Cultivation of conventional puddled rice has led to over-exploitation of groundwater leading to an alarming fall of water table in many parts of North-western India. This necessitates for immediate solution through adoption of best management practices for improving soil and environment quality, and maintaining ecosystem services. As an alternative to conventional practices, CA have shown its effectiveness in sustaining and improving productivity of RWCS at the same time preserving scarce natural resources such as energy, labour, time, water and environment quality. Thierfelder and Wall (2009) [14] showed the efficiency of CA systems in slowing down the soil physical, chemical and biological quality degradation while reducing cost of production. Sustaining productivity of RWCS cannot be maintained unless the declining trend in soil fertility resulting from the nutrient mining by these crops is replenished. Increasing fertilizer costs as well as shrinking sources of organic manures (e.g. farm yard manure) along with inadequate input availability caused suboptimal nourishment of agricultural soils. In IGP of North-west (NW) India nearly 44.5 Mt rice residues and 24.5 Mt of wheat straw are burned annually. Burning of crop residues is a serious concern in NW India as major N, S and C fractions in the residue are lost during burning and it accelerates the losses of organic matter, increases CO_2 emissions, and reduces soil microbial activity. Crop residues retention at soil surface conserves soil and water for sustaining crop production and increases SOC, thereby improving soil properties such as soil structures, cation exchange capacity, water holding capacity and lower bulk density. In this aspect, CA could be a better alternative which not only utilizes crop residues at the same time recycles plant nutrients in soil, improves soil properties and provides environmental benefits by avoiding in-situ burning. Furthermore, the conventional puddled transplanted rice (PTR) requires large amount of energy and labour as well as consumes larger quantities of irrigation water, and affects physical and chemical soil properties thereby adversely influencing productivity of the succeeding upland crop (e.g. wheat). This calls for development of a crop production technology throughout Asia to explore rice production technologies that will avoid puddling, require less water, save labour for transplanting, maintain rice yield potential and are environmentally friendly. Direct dry seeding of rice (DSR) into soil has proved to be an appropriate alternative to manually transplanted PTR.

Maize due to its higher water use efficiency can be an excellent alternative to PTR in NW India where lowering of ground water level is a grave concern. Mungbean grown in between wheat and rice is beneficial in enhancing the carbon and nitrogen concentration in soil thereby improving the overall soil quality (Singh *et al*. 2015) [13]. Information on soil properties, especially physical properties and nutrient availability under different agricultural management systems is essential for sustainability of the systems. There is an improvement in numerous parameters of soil health (physical, chemical and biological quality) under conservation tillage by increasing carbon and nutrients concentration at the surface soil. Advantages of zero tillage (ZT) after burning or removal of crop residues in the RWCS were reported in the IGP, particularly in NW India (Erenstein and Laxmi 2008) [7]. In most of the cases ZT is practised in wheat for the timely sowing of wheat, control of Phalaris minor, reducing cost of cultivation and water saving without taking into account improvements in soil properties and nutrient availability. Studies on changes in macro and micro nutrient availability as well as soil properties under different CA-based practices in RWCS are very limited. Information on changes in soil properties and nutrient availability as well as nutrient savings through nutrient omission experiment under different CA-based practices in IGP is also limited. Therefore, an attempt was made to study the effect of CA practices on selected soil properties and nutrient availability and nutrient (N and K) savings after 4 years of cereal-based cropping systems in western IGP of India.

Reclaiming Sodic and Saline-Sodic Soils Sodic and saline-sodic soils are reclaimed by replacing the exchangeable sodium with calcium. This is commonly accomplished by adding gypsum, since it is relatively soluble and inexpensive. However, if the soils are naturally high in calcium carbonate (lime), fine-ground elemental sulfur or sulfuric acid can be applied without having to apply calcium directly to the soil. The sulfur, with the aid of soil microbes, will oxidize in the moist soil to form sulfuric acid, which will dissolve the lime, making its calcium available in solution to replace the sodium on the soil exchange sites. This is a fairly slow process, dependent on the exposed surface area of the sulfur particles. Sulfur should be mixed into the surface layer of the soil. Acid can be applied to the soil or injected into the irrigation water. Care must be taken to ensure that the calcium reaches all depths designated for reclamation. Saline-sodic soils should be leached with good-quality (low-sodium) water after treatment with calcium-bearing amendments or sulfur. As with saline soil reclamation, adequate drainage must be maintained for both sodic and saline-sodic soils to flush sodium out of the system (Horneck, *et al*. 2007) [10]. Restoration of sodic and saline-sodic soils is a slow process. Reclamation will occur sequentially with depth as the calcium saturates the cation-exchange sites and moves down through the soil profile. Therefore, if deeper reclamation is desirable, you need to add sufficient gypsum to ensure that reclamation extends to the full desired depth. However, it is best not to apply the gypsum all at once. It is better and more effective to add the gypsum in annual increments until the desired exchangeable sodium percentage (ESP) is reached at the desired depth. Organic materials such as composts and manures as well as salt-tolerant cover crops can be helpful in maintaining surface soil structure/aggregation for adequate infiltration and completion of the reclamation process (Davis *et al*. 2014) [6]. Continued monitoring of salinity and sodicity is also recommended. Basically, reclamation or improvement of sodic soils requires the removal of part or most of the exchangeable sodium and its replacement by the more favourable calcium ions in the root zone. This can be accomplished in many ways, the best dictated by local conditions, available resources and the kind of crops to be grown on the reclaimed soils. If the cultivator can spend very little for reclamation and the amendments are expensive or not available, and he is willing to wait many years before he can get good crop yields, soil can still be reclaimed but at a slow rate by long-continued irrigated cropping, ideally including a rice crop and sodic tolerant crops in the cropping sequence, along with the incorporation of organic residues and/or farmyard manure. For reasonably quick results cropping must be preceded by the application of chemical soil amendments followed by leaching for removal of salts derived from the reaction of the amendment with the sodic soil. Soil amendments are materials, such as gypsum or calcium chloride, that directly supply soluble calcium for the replacement of exchangeable sodium, or other substances, such as sulphuric acid and sulphur, that indirectly through chemical or biological action, make the relatively insoluble calcium carbonate commonly found in sodic soils, available for replacement of sodium. Organic matter (i.e. straw, farm and green manures), decomposition and plant root action also help dissolve the calcium compounds found in most soils, thus promoting reclamation but this is relatively a slow process. The kind and quantity of a chemical amendment to be used for replacement of exchangeable sodium in the soils depend on the soil characteristics including the extent of soil deterioration, desired level of soil improvement including crops intended to be grown and economic considerations.

Materials and Methods

Assessment of seed treatment in paddy crop Location of the study: one village were studied namely- Makanpur block Bhagyanagar In through Krishi Vigyan Kendra Auraiya, in village 05 farmers were selected for the Varietal assessment in Partially Reclaimed Sodic Soil In district Auraiya UP India

Results and Discussion

Table 1: Comparison of scented sodic salt tolerant variety of paddy as compared to non-scented variety

Technology Option	No. of trials	Yield (t/ha)	Net Returns (Rs. in lakh /ha)
T_1- Kranti	05	4.22	0.123
T_2- CSR-30		4.58	0.179
T_3- CSR-36		5.15	0.162

The study reveals that table no: 1 Comparison of scented sodic salt tolerant variety of paddy as compared to non-scented variety of CSR-30 is compared with salt tolerant variety CSR-36 and the local variety Kranti grown by farmers. The results showed the grain yield of 45.82 q/ha in case of CSR-30 as compared to 51.45 q/ha in case of CSR-36 & 42.24 q/ha in case of Kranti. In spite of low yield in CSR-30, that net return/ha is found to be high i.e., Rs. 17894/- as compared to Rs. 16246/- in case of CSR-36 & Rs. 12282/- in case of Kranti. This might be due to the reason that scented salt tolerant variety of paddy fetches higher price in the market as compared to other non-scented salt tolerant variety of paddy.

Conclusion
It is concluded that the substantial area of sodic soils in central plan zone, can be economically utilized by suitable reclamation. The soils can be reclaimed by using DSW, gypsum and ferro gypsum, alone or in combination with organics. There has been overall improvement in soil physico-chemical properties by amendments application. Rice based cropping system can be profitably adopted in these reclaimed soils. Comparison of scented sodic salt tolerant variety of paddy as compared to non-scented variety of CSR-30 is compared with salt tolerant variety CSR-36 and the local variety Kranti grown by farmers. This might be due to the reason that scented salt tolerant variety of paddy fetches higher price in the market as compared to other non-scented salt tolerant variety of paddy.

References

1. Bhushan L, Ladha JK, Gupta RK, Singh S, Tirol-Padre A, Saharawat YS, *et al*. Saving of water and labor in a rice–wheat system with no-tillage and direct seeding technologies. Agron J. 2007;99:1288-1296.
2. Biederbeck V, Campbell CA, Bowren KE, Schnitzer M, Mclver RN. Effect of burning cereal straw on soil properties and grain yields in Saskatchewan. Soil Sci Soc Am J. 1980;44:103-111.
3. Blake GR, Hartge KH. Bulk density. In: Klute A, editor. Methods of soil analysis: part 1—physical and mineralogical methods. SSSA Book Ser. 5.1. Madison (WI): ASA and SSSA; c1986. p. 363-375.
4. Blanco-Canqui H, Lal R, Owens LB, Post WM, Izaurralde RC. Strength properties and organic carbon of soil in the North Appalachian region. Soil Sci Soc Am J. 2005;69:663-673.
5. Chesnin L, Yien CH. Turbidimetric determination of available sulphates. Soil Sci Soc Am Proc. 1951;15:149-151.
6. Davis JG, Waskom RM, Bauder TA. Managing sodic soils, Colorado State University Extension Publication no. 0.504; c2014. www.ext.colostate.edu/pubs/crops/00504.html
7. Erenstein O, Laxmi V. Zero tillage impacts in India's rice-wheat systems: A review. Soil Tillage Res. 2008;100:1-14.
8. Grattan S. Irrigation water salinity and crop production, 2002. UC ANR Publication 8066. anrcatalog.ucdavis.edu
9. Hanson BR, Grattan SR, Fulton A. Agricultural salinity and drainage, UC ANR Publication 3375; c2006. anrcatalog.ucdavis.edu
10. Horneck DA, Ellsworth JW, Hopkins BG, Sullivan DM, Stevens RG. Managing salt-affected soils for crop production. A Pacific Northwest Extension Publication: Oregon State University, University of Idaho, and Washington State University PNW 601-E; c2007.
11. Panse VG, Sukhatme PV. Statistical methods for agricultural Workers. ICAR, New Delhi; c1978.
12. Rajukkannu K, Manickam TS, Shanmugam K, Chandrasekaran A, Gladis R. Distillery spent wash - Development of technology for using it is an amendment for reclamation of sodic soil. Proc. of National Symposium on use of distillery and sugar industry waste in Agriculture, ADAC & RI Trichy; c1996. p. 33.
13. Singh G, Kumar D, Sharma P. Effect of organics, biofertilizers and crop residue application on soil microbial activity in rice-wheat and rice-wheat mungbean cropping systems in the Indo-Gangetic plains. Cogent Geosci. 2015;1:1085296.
14. Thierfelder C, Wall PC. Effects of conservation agriculture techniques on infiltration and soil water content in Zambia and Zimbabwe. Soil Tillage Res. 2009;105:217-227.