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RESEARCH ARTICLE

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Adoption behaviour and constraints in wheat production technologies in saline area of Gir Somnath district of Gujarat

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ABSTRACT : The study was carried out to determine the farmers adoption behaviour on wheat production technologies. The farmers were selected from saline area of Gir Somnath district in Gujarat and were demonstrated production technology during 2011-12, 2012-13 and 2013-14. It was revealed that 36.8 per cent farmers fully adopted demonstrated wheat production technology. Whereas, 21.5 per cent farmers adopted partially.The major constraints observed in wheat production was salt affected soil as well as poor quality of irrigation water. In wheat, with salt affected soil, salt tolerant wheat variety (KRL-19) yielded 34 to 43 per cent higher yield than farmers' practice. The B:C ratio of demonstrated plots under salt affected soil were observed 4.05, 4.03 and 4.21, respectively during three years.

KEY WORDS : Adoption, Wheat production technology, Salt affected soil, Constraints, B :C ratio

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INTRODUCTION

Wheat (*Triticum aestivum* L.) is the second most important food crop in India after rice, both in terms of area and production. India is the second largest wheat producer and produces 12 per cent of the world production. In India wheat is grown between 11^0N to 55^0 N latitude and 72^0E to 92^0E longitude and at an altitude of more than 3000 m above mean sea level.

Soil and water salinity and the lack of irrigation are the principal constraints affecting crop planning in narrow coastal plain of Saurashtra. The physical, soil characteristics, of the well developed soils are good and do not constitute any restriction for good crop production. If efforts are made to evolve and introduce a scientific crop planning in the coastal saline areas, it should be possible to increase wheat productivity substantially.

Higher salinity delayed and reduced germination percentage (Ramden *et al*., 1986). Salinity decreased germination per cent, root length, callus size, coleoptile length and seedling growth (Lallu and Dixit, 2005; Ghannadha *et al*., 2005; Bera *et al*., 2006 and Agnihotri

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et al., 2006). Plant height, stem diameter, dry weight decreased with increasing levels of salinity (Azozz *et al*., 2004 and Asha and Dhingra, 2007). Salinity reduced fertile ears, ear length, grain yield, straw yield, harvest index and test weight (Francois *et al*., 1986 and Asha and Dhingra, 2007). The response of plants exposed to salinity stress is a decrease in plant water potential, which reduces plant water use efficiency (Cha-Um *et al.*, 2004). The salt tolerant species possesses a high capacity to resist salt stress through the biosynthesis and accumulation of compatible solutes. These substances raise the overall osmotic pressure within the cell, thereby enabling plant cell to maintain both turgor and the driving gradient for water uptake (Hasegawa *et al.*, 2000 and Cha-Um *et al.*, 2004). For increasing wheat productivity in salt affected area, it is necessary to make more intensive efforts for evolving suitable salt tolerant variety of wheat. Wheat variety KRL-19, which was tolerate saline (ECe 5 -7 dS m^{-1}) as well as alkaline soil (pH2 9.3 - 9.4). It also does well in areas with brackish or saline ground water (ECiw 15-20 dS m^{-1}, RSC 12-14 meq l^{-1}). It has yield potential 4.5-5.2 t ha^{-1} under normal soil conditions and 2.5-3.5 t ha^{-1} in sodic soils upto pH2 9.3 and saline soils upto ECe 7.0 dS m^{-1}.

Three years study had been conducted for the farmers of Kajardi, Chikhali, Bhingran, Kob, Paladi, Lodhva, Kanjotar, Panch Piplva, Sarakhadi and Panadar villages and Physical constraints of soil testing data had been observed for 7.89 to 8.92 with average 8.46 pH value and for 0.13 dSm^{-1} to 1.94 dSm^{-1} with average 0.63 dSm^{-1} $EC_{2.5}$ value. Due to salt affected soil it had been consider for demonstrations. Hence, a study was undertaken with a view to assess the adoption behaviour as well as the various constraints being faced by the farmers of the narrow coastal plain of Saurashtra region regarding wheat cultivation, so that KVK can make changes in their mode adopted for technology transfer.

EXPERIMENTAL METHODS

This study was undertaken to demonstrate the effect of salt tolerant wheat var. KRL-19 and timely agronomic practices in the enhancement of wheat yield. During the year 2011-12, 2012-13 and 2013-14, 36 demonstrations were conducted on castal belt of Gir Somnath district. All demonstrations were conducted on either salt affected soil or with saline irrigation water. The villages *viz.*, Kajardi, Chikhali, Bhingran, Kob, Paladi, Lodhva, Kanjotar, Panch Piplva, Sarakhadi and Panadar are selected due to salt affected soils or saline water irrigation. Selection of the farmers was done randomly. Under farmers practice seed of locally grown varieties were used. Yield under farmers practice was recorded at five farmers field each randomly under irrigated condition from the same villages. The data regarding adoption of technology and constraints experienced by the farmers were collected with the structured interview schedule from selected farmers where wheat demonstrations were laid out. Mean and per cent values were used to classify the data and its analysis. Similarly, the level of adoption of the farmers was classified into three categories *viz.*, low, medium and high.

EXPERIMENTAL RESULTS AND ANALYSIS

The results obtained from the present investigation as well as relevant discussion have been summarized under the following heads :

Wheat grain yield :

The average wheat yield obtained during three years under demonstrations were 28.23, 30.1 and 32.4 q/ha respectively, which was 34 to 43 per cent higher over farmers' practice on salt affected soil (Table 1). It was due to local variety, salt affected soil or with poor quality of irrigation water. Sometimes sowing of local wheat variety with higher saline soil gives poor germination, less tillering and ultimately less crop yield. In early stage higher levels of salt concentration in the germinating media to build up the high osmotic pressure of the solution which will prevent intake of water which is necessary for

Table 1: Yield and economics of KRL-19 and other local varieties

Year	Salt tolerant variety				Local variety			
	Av. yield (q/ha)	Gross return Rs./ha	Net return Rs./ha	B:C ratio	Av. yield (q/ha)	Gross return Rs./ha	Net return Rs./ha	B:C ratio
2011-12	28.23	39522	29772	1:4.05	18.59	26026	16226	1:2.65
2012-13	30.1	45150	33950	1:4.03	21.0	31500	20940	1:2.98
2013-14	32.34	48510	37010	1:4.21	24.06	36090	24890	1:3.22

germination. Higher salt causes toxic effect on embryo. Higher salinity delayed and reduced germination percentage (Ramden *et al*., 1986). The use of salt tolerant wheat variety on salty soil or with poor quality of irrigation water gives higher yield than the local variety. This finding were in agreement with Kumar *et al*. (2012).

Adoption behaviour :

The farmers involved in the salt tolerant wheat demonstrations were asked questions in order to determine the extent of adoption of demonstrated package of practices. The data (Table 2) indicated that 70 per cent of the respondents had completely adopted the recommended salt tolerant variety of wheat, 66 per cent line sowing and 54 per cent proper with timely harvesting. The respondents acknowledged the need of proper FYM application but its availability was the major constraint. About 70 per cent farmers did not adopt seed treatment and 71 per cent did not perform any plant protection measure in wheat crop due to non-occurrence of any disease and pest. These findings were in agreement with Patel *et al.* (2003) and Kumbhare and Singh (2011).

Constraints perceived :

The constraints expressed by the wheat growers have been given in Table 3. Under technological constraints, non-availability of salt tolerant variety seeds (45.71%) of wheat, followed by inadequate availability of chemical fertilizer (31.42%) and lack of market facility (11.2%) were expressed as perceived constraints by the

Table 2 : Extent of adoption of wheat production technology

Sr. No.	Parameter	Extent of adoption (n=70)		
		Full adoption	Partial adoption	No adoption
1.	Salt tolerant variety	49 (70.0)	5(07.1)	15(21.4)
2.	Seed treatment	8(11.4)	13(18.6)	49(70.0)
3.	Sowing time	31(44.3)	10(14.3)	29(41.4)
4.	Recommended seed rate	24(34.3)	15(21.4)	31(44.3)
5.	Line sowing	46(65.7)	15(21.4)	9(12.3)
6.	Time of irrigation	34(48.6)	18(25.7)	18(25.7)
7.	Recommended fertilizer dose	26(37.1)	21(30.0)	23(32.9)
8.	Recommended dose of FYM	9(12.9)	14(20.0)	47(67.1)
9.	Proper and effective weed control	12(17.1)	15(21.4)	43(61.4)
10.	Plant protection measures	7(10.0)	13(18.6)	50(71.4)
11.	Proper and timely harvesting	38(54.3)	27(38.6)	5(07.1)

Table 3: Constraints perceived in wheat cultivation

Constraints	Number	Per cent	Rank
Salt affected soil	55	78.57	I
Saline/brackish water for irrigation	48	68.57	II
Non- availability of salt tolerant vari. seeds	32	45.71	III
Inadequate availability of chemical fertilizer	22	31.42	IV
Lack of market facility	8	11.42	V

Table 4: Suggestion given by the respondents to overcome the constraints in wheat production

Suggestion	Number	Per cent	Rank
Use of salt tolerant variety	49	70.0	I
Proper irrigation methods	45	64.28	II
Adequate availability of salt tolerant vari. seeds	43	61.42	III
Timely availability of chemical fertilizer	25	35.71	IV
Good market facility	15	21.42	V

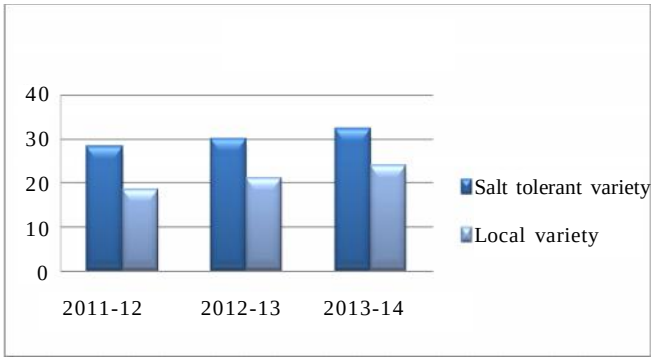

Fig. 1 : Average yield (q/ha)

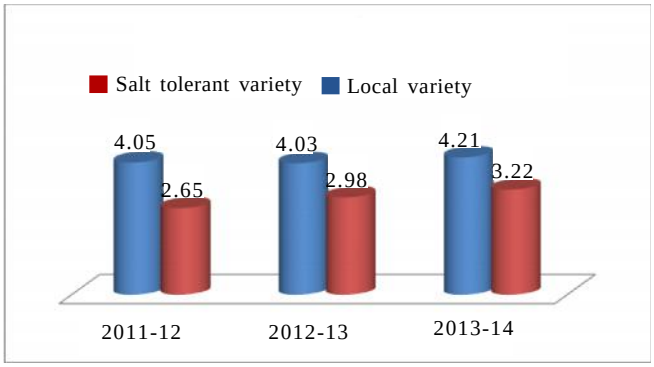

Fig. 2 : B:C ratio

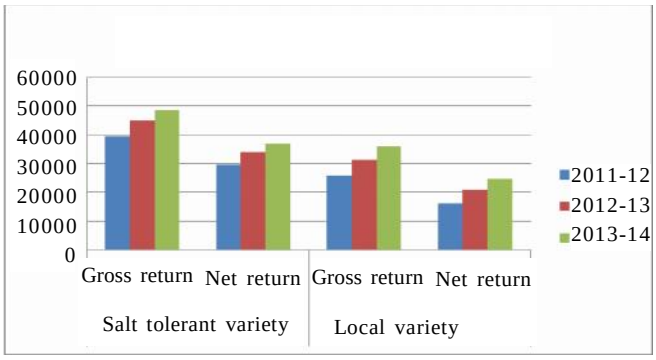

Fig. 3 : Gross and net return in Rs./ha

respondents. Likewise under resource constraints, 78.57 per cent farmers reported posses salt affected soil is major constraint in wheat production followed by poor quality of irrigation water (68.57%). The soils along the coastal belt have high to medium salinity. The irrigation water is also inferior quality or saline water in this castal belt.

To overcome these constraints 70 per cent respondent expressed to use of salt tolerant wheat variety (KRL-19) for boost the productivity (Table 4), while 64.28 per cent expressed that proper irrigation methods with the use of this salt tolerant variety are required for better production, 61.42 per cent said that adequate availability of salt tolerant variety seeds need to be ensured. In castal belt of this region of Gujarat, introduction of salt tolerant wheat till date has not been done. Therefore, less wheat production especially on salt affected soil were found.

Conclusion :

It was concluded that the introduction of salt tolerant wheat variety on salt affected soil with proper agronomic practices are followed then wheat yield increased by 34 to 43 per cent. Full adoption of salt tolerant wheat production technology was reported by 36.8 per cent and partially adopted by 21.5 per cent. The major constraints perceived by farmers were salt affected soil followed by poor quality of irrigation water. If these constraints are managed somehow then farmers can harvest more yield with the same level of inputs which would definitely improve their socio-economic status.

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