

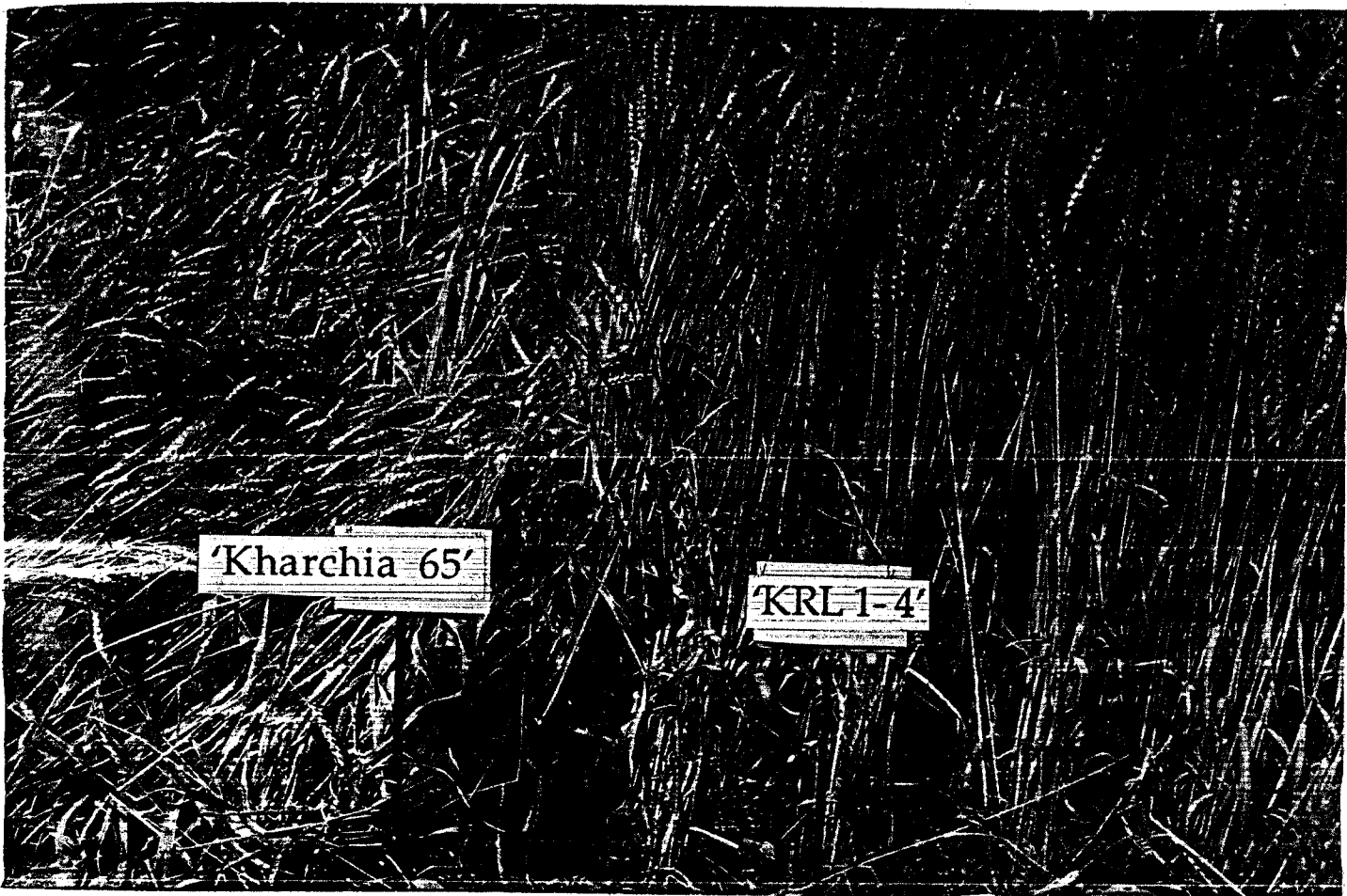
From IWIS-Bib

**TrAE IN KRL 1-4 Cultivar Source: Central Soil Salinity Research Institute,
Karnal (Haryana) IN CID:87565 SID:1**

S M A Naqvi, J P Tandon. Wheat varieties for salt-affected lands. *Indian Farming* 41
(1): 11-14 (1991)

This document is supplied on the condition that it will be
used solely for research. Further reproduction may be
prohibited by copyright law.

**IWIS-Bib
5996**



Till recently, 'Kharchia 65' (left) was the only variety suitable for cultivation in salt-affected soils. It is prone to lodging and susceptible to rusts. 'KRL 1-4' (right) the first systematically bred variety for salt-affected soils, is stiff-strawed, resistant to diseases and yields 23% more than 'Kharchia 65'.

Wheat Varieties for Salt-affected Lands

S. M. A. NAQVI and J. P. TANDON

Saline and sodic soils are spread over 7 million hectares in our country. 'KRL 1-4' wheat variety was specially bred for growing on such soils. Screening of the other released varieties has shown that 'WH 157', 'Raj 1972', 'Lok 1', 'WH 283', 'PBW 65' and 'Raj 3077' are also suited for growing on salt-affected lands. All of them have resistance or tolerance to rusts.

SALT-AFFECTED soils are spread over 7 million hectares in India. These soils contain excessive concentration of chlorides and sulphates of sodium, calcium and magnesium

(saline soils) or an excess of exchangeable sodium (alkaline or sodic soils). Both these adverse situations frequently exist simultaneously. Salt-affected soils are extensive in the arid

parts of Haryana, Punjab, Uttar Pradesh, Rajasthan, Gujarat and Maharashtra. They occur to a lesser extent in other states.

In these soils the germination of

wheat is erratic, plant growth is restricted, and yields are low. Wheat yields start getting adversely affected when the pH value exceeds 8.5 or ECe value goes above 4.0. As the pH approaches 9.5 or ECe value increases above 10, the yields are reduced so drastically that wheat cultivation is not economical without soil amendments. At levels in between these, the

extent of damage is highly variable and is greatly influenced by the nature of the soil and the climate. The use of saline water also seriously restricts the yield potential of wheat.

In spite of the widespread prevalence of the problem, very little effort has been made in the country to breed and identify wheat varieties capable of producing good yields on

salt-affected soils. The soil-amendment practices recommended for such situations cannot always be adopted, mainly because of the high cost of amendments. Salt-tolerant varieties in combination with soil amendments can increase productivity within the tolerance limit in which wheat can grow. However, till recently the only variety available for cultivation in such soils was Kharchia 65, a selection from a local land-race of Rajasthan. Although this variety possesses fairly good tolerance to saline and sodic conditions, it is highly susceptible to all the rusts, is tall, weak-strawed, and red-grained. Due to its high susceptibility to lodging, the use of fertilizers is not possible. Its realizable yield potential, even in well-managed normal soils, is very low.

The development of high-yielding varieties tolerant to salt-affected soils has been given a serious consideration by the All-India Co-ordinated Wheat Improvement Project during the last few years. A multilocation variety-screening nursery was started in 1983-84 for identifying suitable wheat varieties. Regular multilocation yield-evaluation trials were initiated in 1984-85. As a result of several years of screening of hundreds of varieties and germplasm, some tolerant types have been identified. Among these a few released varieties are also included which can be put to practical use immediately. The released varieties with fairly good level of tolerance to salt-affected soils are 'WH 157', 'PBW 655', 'Raj 1972', 'Raj 3077', 'WH 283' and 'Lok 1'. A new improved variety 'KRL 1-4' has also been identified. The performance of these varieties in trials on salt-affected soils and their desirable features are given in Tables 1 and 2. The main characteristic features of these varieties are given below.

'KRL 1-4'

This is the first systematically bred variety for salt-affected soils in the

Suitable for timely as well as late sowing in the irrigated fertile lands of north-western plains, 'Raj 3077' has wide adaptability and produces amber, medium-sized hard grains.

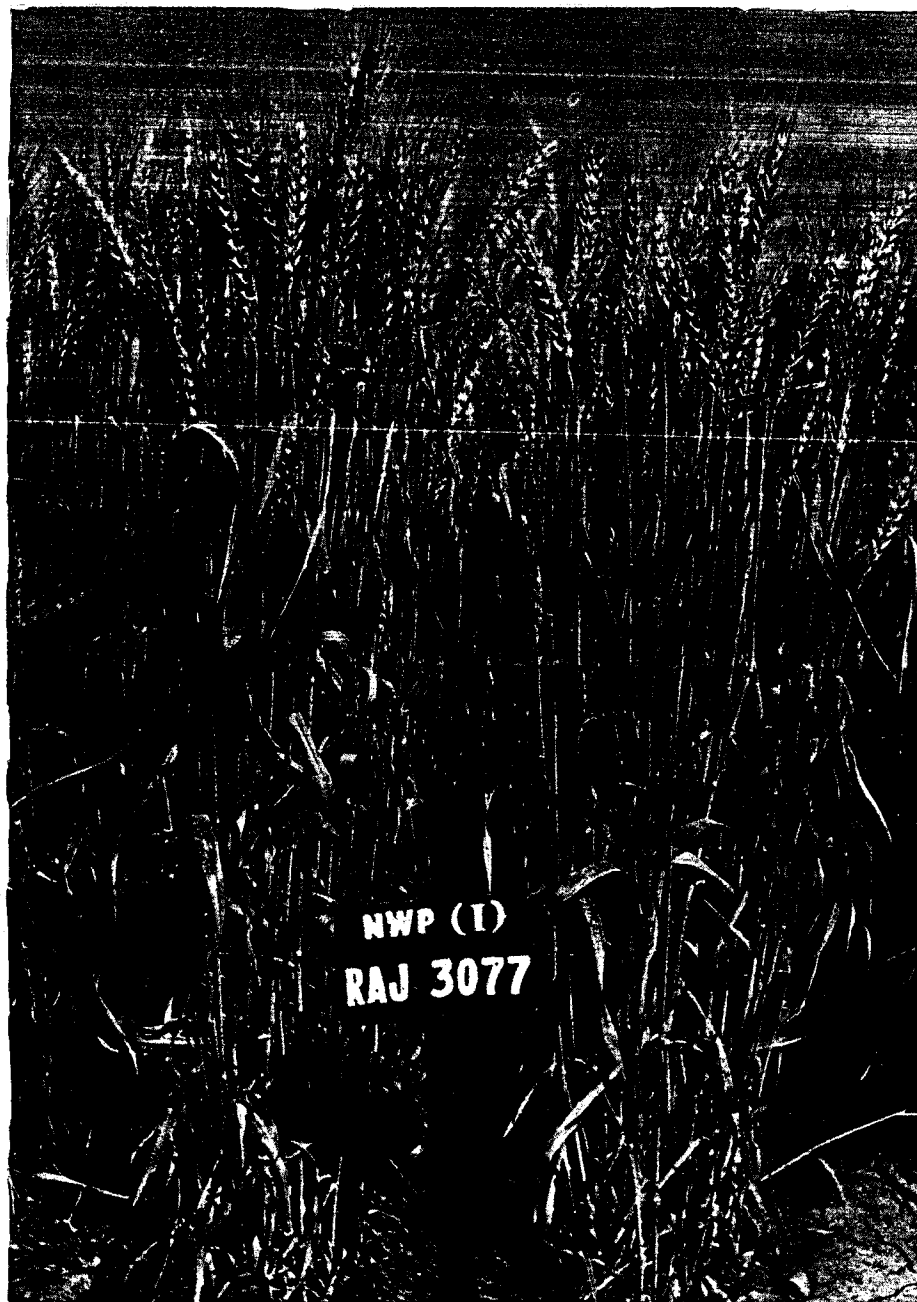


Table 1. Mean yields of wheat varieties in all-India co-ordinated salinity and alkalinity-tolerant varieties trials (1985-86 to 1988-89)

| Variety | Mean yield (q/ha) | Number of trials/year | Percentage increase in yield over the check |
|-----------------------|-------------------|-----------------------|---|
| 'KRL 1-4' | 23.2 | 27/3 | 23.2 |
| 'WH 157' | 22.2 | 37/4 | 18.0 |
| 'Raj 1972' | 22.8 | 37/4 | 20.6 |
| 'Lok 1' | 21.9 | 27/3 | 11.5 |
| 'WH 283' | 21.5 | 37/4 | 15.5 |
| 'PBW 65' | 20.7 | 37/4 | 11.3 |
| 'Raj 3077' | 20.3 | 18/2 | 7.4 |
| 'Kharchia 65' (check) | 18.9 | 37/4 | - |

ECe (range) 4.0-18.5; pH (range) 8.5-9.5.

Table 2. Main features of the varieties suitable for cultivation in salt-affected soils

| Variety | Plant height (cm) | Days to flower | 1,000-grain weight | Hectolitre weight (kg) | Grain texture | Rust resistance |
|-----------------------|-------------------|----------------|--------------------|------------------------|---------------|----------------------|
| 'KRL 1-4' | 95 | 78 | 40 | 78.06 | Hard | Moderately resistant |
| 'WH 157' | 90 | 80 | 45 | 77.07 | Hard | Tolerant |
| 'Raj 1972' | 95 | 80 | 40 | 76.19 | Hard | Resistant |
| 'Lok 1' | 90 | 75 | 50 | 77.07 | Hard | Tolerant |
| 'WH 283' | 85 | 72 | 40 | - | Hard | Moderately resistant |
| 'PRW 65' | 95 | 80 | 40 | - | Hard | Resistant |
| 'Raj 3077' | 95 | 78 | 38 | 78.19 | Hard | Resistant |
| 'Kharchia 65' (check) | 125 | 80 | 38 | 79.18 | Semi-hard | Highly susceptible |

country and was developed at the Central Soil Salinity Research Institute, Karnal, using 'Kharchia 65' as donor parent. It has been identified for the irrigated, timely-sown conditions in all salt-affected soils in India by the 1989 All-India Wheat Workshop and has been approved by the Central Varietal Release Committee also. It grows equally well when irrigated with saline water. On an average it has yielded 25 q/ha in salt-affected soils — 23% higher than 'Kharchia 65' under similar conditions. On well-managed normal soils it can yield up to 45 q/ha. It is fairly tolerant to leaf-rust and stem-rust. The medium-early, semi-dwarf variety produces medium-bold, amber, hard and attractive grains.

WH 157'

'WH 157' was identified by the 1989 All-India Wheat Workshop for cultivation in all salt-affected soils. It was earlier released in Haryana for cultivation in the irrigated timely-sown regions, but did not become very popular. In salt-affected soils it has yielded about 18% higher than 'Kharchia 65'. The semi-dwarf, medium-duration variety produces very bold, amber, hard and attractive grains, which have a high amount of protein.

Raj 1972'

This variety was earlier released for the timely-sown irrigated lands of good fertility in the north-western

plains. It has given 21% more yield than 'Kharchia 65' on saline and alkaline soils. It is semi-dwarf, highly resistant to rusts and has amber, hard and medium-bold grains. It has very good *chapati*-making properties.

'Lok 1'

It was earlier released for the irrigated, fertile, timely-sown as well as late-sown regions in the central zone. It has yielded 12% more than 'Kharchia 65' in salt-affected soils. This semi-dwarf variety of early maturity is tolerant to rusts. Its grains are amber, hard, very bold and good for *chapati*-making.

'WH 283'

This variety was earlier released for cultivation in the timely-sown, fertile, irrigated lands of the north-western plains. In co-ordinated trials under salt-stressed conditions it has given about 16% more yield than 'Kharchia 65'. This medium-early, semi-dwarf has good tolerance to rusts. Its grains are amber, hard and medium-bold.

'PBW 65'

It was earlier recommended for the timely-sown rainfed lands of low fertility in the northern plains. In trials under salt-stressed conditions, it has yielded 11% more than 'Kharchia 65'. It is a semi-dwarf type of medium-late maturity, resistant to loose-smut and fairly resistant to rusts. Its grains are amber, hard, bold and very good for *chapati*-making.

'Raj 3077'

This variety was earlier recommended for cultivation in the timely-sown as well as late-sown irrigated, fertile lands of north-western plains. It has yielded 7% more than 'Kharchia 65' in trials under salt stress. It is a semi-dwarf, early-maturing variety with resistance to leaf-rust. It has wide adaptability. The grains are amber, medium-sized and hard.

Achieving High Productivity

Besides growing a salt-tolerant variety, the following cultural practices should be followed for increasing wheat production from salt-affected soils.

Alkaline or sodic soils

- Use 10-15% higher seed rate than normal.
- Apply 20% more nitrogen
- Use of compost wherever possible.

Following a proper schedule for field preparation to avoid bad seed-beds.

- If the pH is above 9.5, soil amendment is necessary.
- Use of gypsum @ 10 or 15 tonnes/ha depending upon soil test,

and cultivate irrigated rice before wheat.

Saline Soils

- Use slightly higher seed rate.
- Apply normal (recommended) levels of nitrogen in 3 equal splits, at seedling, tillering and grain-filling stages.
- Follow a rigid water-management schedule, which involves a heavier-than-normal first irrigation, followed by frequent light irrigations with occasional heavy irrigations.

Since all the varieties except 'KRL 1-4' are already released earlier, the availability of the seeds of these varieties should not be a constraint. The seeds can be obtained from the

National or State Seeds Corporations or concerned agricultural universities. Requests for small quantity of the seeds of 'KRL 1-4' may be made to the Director, Central Soil Salinity Research Institute, Karnal, or Project Director (Wheat), Indian Agricultural Research Institute, New Delhi 110 012. The State Farms Corporation has also multiplied its seed for use in mini-kit demonstrations to be organized by the Ministry of Agriculture.

S. M. A. Naqvi, is Senior Wheat Breeder, and J. P. Tandon is Project Director (Wheat), Directorate of Wheat Research (ICAR), Indian Agricultural Research Institute, New Delhi 110 012.
