

Effect of Conjunctive Use of Saline and Canal Waters on Urd -Potato -Mungbean Crops

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The two options available for making conjunctive use of saline and canal waters are either to apply after mixing or to apply canal water at sensitive growth stages and make use of saline water at comparatively tolerant stages (Minhas and Gupta 1990, Rhoades et al. 1989). Minhas et al. (1989) reported that higher salinity waters could be used for mungbean if no saline water is substituted at presowing stage to leach out the salts at the seeding zone for its better germination. However, the other stages of pulse crops where saline water should not be used need to be identified.

The experiment was conducted for four years (1980-84) at Bichpuri, Agra, on a sandy loam soil (clay 16%). The soil had an initial pHe 8.6, EC 2.9 dSm^{-1} , Organic Carbon 0.18% and CaCO_3 content of 1%. Microplots of size 2.5 x 2.5 m, lined with polythene down to 0.9 m soil depth so as to avoid lateral salt and water movement, were used. Various treatments (Table 2) imposed in completely randomized design with four replications consisted of application modes of saline (EC 6.0 dS m^{-1}) and canal water (EC 1.0 dS m^{-1}), (1) irrigated with canal water only (C), (2) two canal water irrigations followed by one saline water irrigation (2 C : 1S), (3) one canal water irrigation followed by one saline water irrigation (1C : 1S), (4) one canal water irrigation followed by two saline water irrigation (1C : 2S), and (5) saline water irrigations only. The saline water was prepared by dissolving salts viz. NaCl, Na_2SO_4 and MgCl_2 s in canal water. Potato (Var. C-140). Mungbean (Var. Pusa Baisakhi) and Urd (var. T-9) were grown in sequence and the package of agronomic practices as recommended for the area was followed. The amount of rainfall received and the number of

irrigation applied to the crops are shown in (table 1).

The yields of potato, mungbean and urd in general decreased with increased substitution of saline water and were lowest when only saline water was used (Table 2). On an average, the relative tuber yields of potato were 96,99, 95, 68% for 2 C : 1S, 1C : 1S, 1C : 2S and all saline irrigations, respectively when compared with the yields under treatment receiving canal water only (potential yields). The corresponding yields for mungbean were 58, 42,11 and 0%. Though urd was mainly grown after the onset of monsoon and it received just one irrigation that too only during 2nd and 3rd year, the accumulated salts from the previous crops reduced its yields by 21,26,39 and 45% under 2C : 1S, 1C : 2S and saline water treatments, respectively.

The salinity build up in the soil occurred during potato and summer mungbean crop season and most of the salts were leached out of the -0.9 m profile during the growth of the urd due to monsoon rains. In only saline water treatments, the soils attained salinity of about 12.5 dSm^{-1} in potato and 20.0 dS m^{-1} in summer mungbean at harvest. Depending upon the rain received, the amount of salt retained at the harvest of urd was 22 to 35% as a fraction of salts present compared with at the time of mungbean harvest.

It seems possible to apply one saline water irrigation in potato crop after first two irrigations with canal water. However, major yield losses would occur in the sensitive crop like mungbean. The residual effects of salinity build up during winter (potato) and summer (mungbean) could also be obviated when this crop was sown after the

Table 1 Rainfall and irrigation during experimental period

| Particulars | 1980 | 1981 | 1982 | 1983 | 1984 | Average |
|---------------------|---------|---------|---------|------|---------|---------|
| Total rainfall (mm) | 693 | 865 | 707 | 788 | - | 763 |
| Urd | | | | | | |
| Rainfall (mm) | 610 | 812 | 771 | - | - | 667 |
| Nos. of irrigation | nil | 1 | 1 | nil | - | 0.5 |
| Summer mung | | | | | | |
| Rainfall (mm) | | | 75 | 87 | 3 | 55 |
| Nos. of irrigation | * | * | 3 | 2 | 4 | 3 |
| | 1980-81 | 1981-82 | 1982-83 | | 1983-84 | |
| Potato | | | | | | |
| Rainfall (mm) | 65 | 40 | 59 | | 13 | 44 |
| Nos. of irrigation | 4 | 5 | 6 | | 5 | 5 |

* Crop failed

Table 2 Effect of various conjunctive use modes of saline and canal water on crop yields ($q\ ha^{-1}$)

| Irrigation mode (Treatment) | 80-81 | | 81-82 | | 82-83 | | 83-84 | | Pooled | |
|--------------------------------|-------|-------|-------|--------|-------|-------|-------|-------|--------|-------|
| | Mung | Urd | Mung | Urd | Mung | Urd | Mung | Urd | Mung | Urd |
| C | * | 8.3 | 1.9 | 7.4 | 4.5 | 8.6 | 1.5 | 15.2 | 2.6 | 9.9 |
| 2 C : 1S | * | 7.1 | 1.4 | 5.8 | 2.3 | 5.9 | 0.7 | 12.5 | 1.5 | 7.8 |
| 1 C : 1S | * | 7.1 | 1.0 | 6.4 | 2.0 | 6.9 | 0.3 | 8.7 | 1.1 | 7.3 |
| 1 C : 2S | * | 6.8 | 0.2 | 5.3 | 0.6 | 6.1 | 0.2 | 5.7 | 0.3 | 6.0 |
| S | * | 4.5 | 0.0 | 3.5 | 0.0 | 6.5 | 0.0 | 3.7 | 0.0 | 4.5 |
| CD 5% | - | 1.8 | 0.2 | NS | 1.1 | NS | 0.8 | 5.0 | 0.6 | 1.2 |
| | | | | Potato | | | | | | |
| C | | 282.7 | | 314.9 | | 328.3 | | 230.9 | | 289.2 |
| 2 C : 1S | | 264.0 | | 326.4 | | 305.1 | | 218.7 | | 278.5 |
| 1 C : 1S | | 293.9 | | 322.7 | | 308.5 | | 223.5 | | 287.1 |
| 1 C : 2S | | 272.5 | | 330.4 | | 289.6 | | 202.7 | | 273.9 |
| S | | 243.2 | | 229.9 | | 187.0 | | 124.3 | | 196.3 |
| CD 5% | | NS | | 33.5 | | 44.4 | | 28.1 | | 13.4 |

* Crop failed : C = Canal water (EC = 1 dSm⁻¹), S = Saline water (EC = 6 dsm⁻¹)

initial showers of monsoons leached the surface soil.

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