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Short Communication

Alternative Use of Saline Irrigation Water on Growth and Yield of Summer Greengram

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Irrigation with underground water (usually saline) not only reduces the crop growth and yield but also deteriorates the soil properties. Use of underground water is inevitable in areas where availability of canal water is insufficient for complete crop growth, especially in the tail end of command areas of Karnataka state. Under such situations, farmer is compelled to use good and saline water in conjunction to save the crop from total failure. The present study was initiated to find out the effect of supplementing saline water (6 dS m^{-1}) to supplement good water (best available water) on growth and yield of greengram.

A field experiment was conducted on a pre-salinized vertisol in 2.5 x 2.5 m plots, in a randomized block design during the summer of 1988. The plots were separated by one metre deep polythene sheet to avoid the movement of salts from one plot to the other. Initial pH_2 and EC_2 of soil varied from 8.2 to 8.5 and 0.35 to 0.65 dS m^{-1} in good water (GW) and saline water (SW) irrigations, respectively. The saline water (6 dS m^{-1}) was synthesized by dissolving the salts of NaCl, $NaHCO_3$ and $CaCl_2$, in the ratios, Na:Mg:Ca at 4:1.1:1 and Cl: SO_4: HCO_3 at 2:1:1 by maintaining the neutral pH without precipitation of salts. The above saline water was applied to the field as per the treatments till harvest, with one GW irrigation to all plots prior to sowing (Table 1). Greengram (var. Chinamung) was sown at 30 x 10 cm row spacing and was fertilized with 25:50:00 kg NPK ha^{-1}. Five randomly selected plants from each plot at periodical interval and at harvest were taken to determine dry weight. Leaf area was calculated by punch method and other growth parameters, viz., LAI (Sestak, 1971), LAD (Power *et al.*, 1967), AGR (Radford, 1967) and CGR (Watson, 1952) were computed.

Total dry matter production and its distribution in leaves, stem and pods differed significantly at 50 DAS (Table 1). Good water irrigation alone recorded significantly higher total dry matter (4.947 g $plant^{-1}$) and it decreased with increase in number of SW irrigations. The lowest dry matter yield was under SW irrigation alone (2.489 g $plant^{-1}$). Reduction in dry matter yield with increase in saline water irrigation is due to increase in salt build up and decrease in AGR values during 35 to 50 DAS from 186.9 mg per plant per day (GW irrigation alone) to 67.1 mg per plant per day (SW

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irrigation alone) (Table 1). Paliwal and Maliwal (1980) reported that with increase in salinity of irrigation water, the plant growth and seed yields decreased in greengram and blackgram.

At 50 DAS, GW irrigation alone and two GW, followed by one SW irrigation, recorded higher pod weight per plant of 1.732 g and 1.808 g, respectively. Further increase in number of SW irrigation decreased the pod weight per plant, the lowest being recorded in SW irrigation alone (0.816 g $plant^{-1}$). Garg (1987) reported that plant growth was suppressed with increase in salinity level due to reduction in the chlorophyll, protein, free amino acids, RNA and DNA in the root and shoot of greengram. This is also supported by the significantly higher values of CGR in GW irrigation alone (62.3 mg dm^{-2} day^{-1}) and two GW, followed by one SW irrigation (51.6 mg dm^{-2} day^{-1}), and the lowest was in SW irrigation alone (22.4 mg dm^{-2} day^{-1}) during 35 to 50 DAS. Similarly, higher LAI and LAD was noticed in GW, followed by one SW irrigation (0.947 and 13.92 days), and SW irrigation alone (0.570 and 8.98 days) during 50 DAS and 35-50 DAS, respectively. The results were in agreement with the results of Krishnamurthy *et al.* (1973) who reported that formulation of optimum photosynthetic leaf area and maintaining the leaves photosynthetically active for longer period (LAD) during reproductive stage of crop were essential for higher yields. The reduction in LAI and LAD with increase in number of SW irrigations was due to salinity build up in the soil and might

Table 1. Seed yield, total dry matter production and its distribution, absolute growth rate (AGR), crop growth rate (CGR), leaf area index (LAI) and leaf area duration (LAD) during various growth stages of greengram as influenced by irrigation treatments

Irrigation treatments	Seed yield (q ha^{-1})	Dry matter at pod filling stage (50 DAS)				AGR (mg/pl/day) DAS 35-50	CGR (mg/dm^2/day) DAS 35-50	LAI DAS		LAD DAS 35-50
		Leaves	Stem	Pods	Total			20	50	
Good water alone	7.65	1.843	1.372	1.732	4.947	186.9	62.3	0.146	1.040	15.30
Two good waters, followed by one saline water	7.60	1.560	1.176	1.808	4.544	154.9	51.6	0.153	0.947	13.92
One good water, followed by one saline water	6.18	1.188	1.000	1.004	3.192	83.5	27.8	0.123	0.721	11.46
One good water, followed by two saline waters	6.31	1.324	1.036	1.200	3.560	105.8	35.3	0.112	0.891	12.86
Saline water alone	3.63	0.973	0.700	0.816	2.489	67.1	22.4	0.105	0.570	8.98
S.Em ±	0.49	0.144	0.140	0.222	0.154	22.1	7.3	0.008	0.093	1.22
C.D. at 5%	1.47	0.431	0.419	0.666	0.462	66.1	12.0	0.023	0.278	3.65

have resulted in decrease in total dry matter production and its translocation to pods (Table 1). Chaturvedi and Singh (1981) reported that the increase in salinity of irrigation water from 2 to 10 dS m^{-1} produced a linear decrease in leaf area, water potential and osmotic potential in greengram. Significant and positive correlated values of growth functions, viz., LAI at 50 DAS (0.754), LAD (0.767), CGR (0.760) and NAR (0.410) during 35 to 50 DAS with yield indicate the reduction in plant growth and yield with the increase in SW irrigations.

The higher grain yields were recorded in GW irrigation alone and two GW followed by one SW irrigation (7.65 q ha^{-1} and 7.60 q ha^{-1}, respectively), which were at par with each other, except in SW irrigation alone, recording lowest yield of 3.63 q ha^{-1} (Table 1). This was mainly due to increase in EC_2 of soil from 0.41 dS m^{-1} (GW irrigation alone) to 1.86 dS m^{-1} (SW irrigation alone) resulted in decrease in dry matter production and ultimately, the grain yield.

Under the scarcity of good water (canal water) during crop growth season, especially in summer, greengram can be supplemented with available underground water (saline water) after every two GW irrigations, without much deterioration in soil properties and reduction in crop growth and yield. Higher dry matter production in two GW, followed by one SW irrigation, was due to partial stress created by SW irrigation, which helped to accumulate more photosynthates compared to GW irrigation alone, where no stress was created. Irrigation with SW alone resulted in continuous stress created by excess salts that resulted in lowest nutrient absorption, dry matter production and yield.

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