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Effect of saline water and fertigation on the yield contributing parameters of brinjal

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ABSTRACT
A field experiment on brinjal Cv. Krishna was conducted at Inter Faculty Department of Irrigation Water Management, Post Graduate Institute, MPKV., Rahuri during summer season of 1999-2000. The concentration of N was highest in a canal water treatment of 1.60 % in $SW_0 + F_1$ treatment than saline water treatment of 1.20 % in $SW_1 + F_1$ treatment at harvest in plant and 2.81 and 2.08 % in case of fruit. The plant height was highest in canal water treatment of $SW_0 + F_1$ of 71.3 cm at 90 days after transplanting and in lowest height was observed in saline water treatment ($SW_1 + F_1$) of 54.7 cm at 90 days after transplanting. The highest dry matter accumulation in canal water was observed of 112.6 g/plant and lowest was observed of 86.3 g/plant in saline water treatment ($SW_1 + F_3$). The highest dry matter accumulation in fruit was recorded of 87.4 g/plant and lowest was recorded of 66.9 g/plant in $SW_1 + F_1$ treatment.

Key words : NPK concentration, Dry matter, Brinjal.

INTRODUCTION

In Maharashtra, area among different vegetables grown was 22235 ha. Brinjal crop is less trouble some from pests and disease point of view. The brinjal is grown on a variety of soils. The deep fertile and well drained soils are recommended for its cultivation. The brinjal responds well under slightly acidic soil condition however, soils having pH upto 7.5 is also suitable for brinjal. Water is an important factor for increasing the crop production and being limited, its efficient use is very important from the point of agriculture. The soils of Maharashtra are mostly vertisols are associated soils with expanding type of montmorillaonite clay. The clay content varies from 60-65 per cent. The calcium carbonate is very high to the extent of 15-18 per cent showing alkaline reaction. In such a soil use of saline water by surface irrigation methods exhibits and creates several problems for crop production such soil, turn to problematic due to excess irrigation. The use of drip irrigation coupled with fertigation is gradually gaining much importance. Then the application of fertilizers through drip irrigation is the most convenient method. They are supposed to acts as slow release fertilizers and hence nutrient are available to the plants over longer period of growth as they are not easily lost by fixation, leaching etc. as compared to solid fertilizers. Soil salinity generally inhibits N-mineralization. The simultaneous presence of salt and nutrient element in the root zone can influence the ion uptake by plants and its chemical composition(Feigin, 1985). The limited information is available regarding the nutrient and water application. Therefore the experiment on saline water and fertilizer on brinjal was taken with certain objectives.

MATERIALS AND METHODS

A field experiment on brinjal was conducted at Mahatma Phule Krishi Vidyapeeth, Rahuri (M. S.) during the year 1999-2000. The soil was sandy clay loam, pH 8.1, EC 0.22 dS/m, available N, P, K was 148.6, 12.5, 392.0 kg/ha, bulk density 1.3 Mg/m^3. The experiment was laid out in a split plot design with 6 treatments and 4 replications. The details of the treatments are as follows.

Treatments

Salinity level

SW_0 : Best available canal water EC 0.21 dS/m

SW_1 : Saline water EC 2.0 dSm^{-1}

Fertilizer dose

F_1 : 100 % recommended dose of urea N-fertilizer through drip irrigation

F_2 : 75 % recommended dose of urea N-fertilizer through drip irrigation

F_3 : 50 % recommended dose of urea N-fertilizer through drip irrigation

The Cv. Krishna of brinjal was used. The spacing was 90-45 x 60 cm^2, plot size 3.6 x 4.5m. The fertilizer dose was 150:50:50 N, P_2O_5 and K_2O kg/ha. The quantity of urea fertilizer required as per treatment was calculated and applied in splits at transplanting 15, 30 and 45 days after transplanting. The soil and plant samples were collected at 30 days interval and analysed for N, P and K in soils and plant. The yield of brinjal was calculated by summing of total picking.

RESULTS AND DISCUSSION

1. Nutrient concentration

a) Nitrogen concentration

Saline water : It was revealed from the data (Table 1) that the concentration of nitrogen is more in case of fruit of 2.80 % than of 1.60 % in plant in canal water treatment. The nitrogen concentration is highest in canal water irrigation than saline water irrigation treatment of 1.60 and 2.81 for plant and fruit, respectively. Similar results were reported by Rakh (1992) and Pawar et al. (1992). In saline

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water, similar results were obtained by Nanawati and Maliwal (1973).

Fertilizer : The highest N concentration was recorded in canal water treatment of $SW_0 + F_1$ of 1.60 and 2.81 per cent for plant and fruit, respectively and lowest in F_3 treatment of 1.42 and 2.50 per cent in plant and fruit, respectively. The effect of interaction due to different treatment of fertilizer and water and was not significant in both the plant as well as fruit. The combination of saline water irrigation with $SW_1 + F_1$ (100 % recommended dose of urea) treatment in concentration of nitrogen is less than the canal water irrigation with F_1 treatment.

b) Phosphorus concentration

Saline water : It was observed from the data (Table 1) that the concentration of P was highest of 0.46 and 0.77 % ($SW_0 + F_1$) in plant and fruit, respectively in canal water treatment than saline water treatment of 0.38 and 0.38 % in plant and fruit, respectively. This is due to the addition of salt by saline water which affect the imbalance nutrition of leaves and fruits.

Fertilizer levels : It was evident from the given data that in canal water treatment the phosphorus percentage was highest of 0.46 % in F_1 (100 % recommended dose of urea) and 0.77 % in plant and fruit than F_2 (75 % recommended dose of urea) and F_3 treatment (50 % recommended dose of urea). Similar results were reported by Rakh (1992). The interaction effect due to the different treatment of fertilizer level and irrigation (canal water and saline water) level was not found significant.

c) Potassium concentration

Saline water : The concentration of K was lowest in SW_1 of 2.46 and 3.56 % in plant and fruit respectively than SW_0 treatment of 2.87 and 3.96 in plant and fruit, respectively. This was due to the increasing Na^+ and Cl^- in soil solution. Barkat (1996) reported that reduction in potato crop yield was associated with increasing Na^+ and Cl^- in soil solution and decreasing K^+ contents in leaves and tubers.

Fertilizer level : There was a decrease in per cent concentration of K of 3.96, 3.94, 3.75 % in F_1, F_2 and F_3, respectively in case of fruit. Similar trend was observed in plant. As fertilizer level decreases, the concentration of potassium also decreases.

Table 1 : Concentration of N, P and K in brinjal plant at harvest as influenced by various treatments.

Treatments	N (%)		P (%)		K (%)	
	Plant	Fruit	Plant	Fruit	Plant	Fruit
$SW_0 + F_1$	1.60	2.81	0.46	0.77	2.87	3.96
$SW_0 + F_2$	1.58	2.80	0.42	0.76	2.69	3.94
$SW_0 + F_3$	1.42	2.50	0.33	0.64	2.55	3.75
$SW_1 + F_1$	1.37	2.36	0.33	0.38	2.46	3.56
$SW_1 + F_2$	1.35	2.34	0.29	0.37	2.37	3.54
$SW_1 + F_3$	1.20	2.08	0.25	0.28	2.15	3.37
	NS	N. S.	N. S.	N. S.	N.S.	N. S.

N.S. = Non significant

Plant height

Saline water : The data revealed that (Table 2) the highest plant height of 83.53 cm was observed in $SW_0 + F_1$ of canal water treatment and (SW_1) saline water of 76.13cm. The height increases significantly from 30 to 90 days after transplanting. The plant height was less due to accumulation of salts on soil layer in saline water treatment as compared

Table 2 : Plant height (cm) as influenced periodically by different treatments of canal and saline water

Treatments	Days after transplanting			
	30	60	90	At harvest
$SW_0 + F_1$	23.13	53.36	83.53	71.39
$SW_0 + F_2$	21.57	52.09	82.07	70.15
$SW_0 + F_3$	16.74	46.31	71.21	60.86
$SW_1 + F_1$	16.95	48.06	76.13	62.72
$SW_1 + F_2$	14.83	44.42	75.37	64.42
$SW_1 + F_3$	12.52	41.53	64.04	54.74
	N. S.	N. S.	N. S.	N. S.
General mean	16.72	47.62	75.39	64.04

N. S. = Non significant

Table 3 : Dry matter content in plant and fruit of brinjal as influenced by different treatment.

Treatment	Dry matter accumulation			
	Plant (g)	Fruit (g)	Plant (kg/ha)	Fruit (kg/ha)
$SW_0 + F_1$	112.66	87.45	4172.6	3239.0
$SW_0 + F_2$	110.70	85.73	4100.6	3175.0
$SW_0 + F_3$	96.04	74.54	3557.0	2761.0
$SW_1 + F_1$	103.72	80.34	3841.5	2976.0
$SW_1 + F_2$	101.66	78.92	3765.2	2933.0
$SW_1 + F_3$	86.38	66.98	3199.3	2480.0
	N. S.	N. S.	N. S.	N. S.
General mean	101.68	78.99	3766.0	2927.30

N. S. = Non significant

to canal water treatment. The plant height was 16.9, 48.6, 76.13 and 62.72 cm at 30, 60, 90 days and at harvest after transplanting in saline water treatment ($SW_1 + F_1$).

Fertilizer level : It was evident that $SW_0 + F_1$ (100 % recommended dose of urea) treatment of canal water was superior over F_2 and F_3 fertilizer level. The highest plant height of 23.13 cm was observed in $SW_0 + F_1$ level at 20 days and lowest of 16.74 cm was observed in $SW_0 + F_3$ (50 % recommended dose of urea) at 30 days after transplanting. At 60 days after transplanting no any treatment was significant. All interactions were non significant. However, plant height increases from 30 days to 90 days after transplanting. The lowest plant height was recorded at 20 days after transplanting in saline water (SW_1) treatment.

Dry matter accumulation of brinjal

Saline water : The dry matter of brinjal plant and fruit (Table 3) was highest in canal water (SW_0) of 112.66 and 87.45 g/plant in plant and fruit respectively than SW_1 of 103.72 and 80.34 g/plant in plant and fruit, respectively. Hunshal et al. (1992) reported that the lowest dry matter production and translocation to productive parts of crop in saline water irrigation created continuous stress by excess salt resulting in lowest nutrient absorption. Patil et al. (1996) showed in the green gram crop that saline irrigation water of ECe 6 dSm^{-1} when applied then leaf, stem pod and total dry matter production at 20, 35 and 50 days after sowing were reduced by increasing saline irrigation. Similar results were reported by Kadam and Patel (2000).

Fertilizer level : As the fertilizer level increases the dry matter accumulations were 103.72, 101.66 and 86.38 g/plant in F_1, F_2 and F_3 in saline water treatment. In fruit it was 80.34, 78.92 and 66.98 g/plant in F_1, F_2 and F_3, respectively. The similar results were reported by Rakh (1992) and Kale (1995). None of the interaction effect due to different fertilizer level and water level was significant on both plant and fruit. However, the dry matter accumulated in plant, respectively.

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