



SHORT COMMUNICATION

SODIUM POTASSIUM RATIO AS AN INDEX TO SODICITY TOLERANCE OF TOMATO

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Eight varieties/hybrids of tomato were tested at Dilipnagar Research Farm, Kanpur at 38.0, 26.0, 14.0 and 11.6 ESP levels during 2000-01 and 36.5, 25.3, 13.5 and 11.2 ESP levels during 2001-02. These ESP levels were obtained by adding different doses of gypsum, i.e. @100% GR, 66% GR and 33% GR in alkali soil. In control, gypsum was not applied. Salt tolerant variety Angoorlata produced significantly higher fruit yield and characterized by lower Na/K ratio, than other varieties / hybrids of tomato that were tested.

Key words: Salt tolerance, sodium potassium ratio, tomato.

Tomato is one of the major vegetable crops of India and its low average yield is attributable to genetical as well as environmental causes. In alkali soil excess exchangeable sodium hinders the normal growth of most of the crop plants. The study of plant response to salt stress has been a central feature for environmental physiologists attempting to understand how plants function in their natural environment and in particular to explain patterns of plant distribution and their performance alongwith environmental gradients (Jones and Jones 1989). Sodium potassium ratio has been related with salt tolerance in many crop plants (Ali Qadar 1988, Pandey and Srivastava 1991). However, research work on salt tolerant and salt sensitive cultivars of tomato in sodic soils of Uttar Pradesh is scanty. The present study analysed the relationship of Na/K ratio with sodicity tolerance in eight cultivars of tomato.

This experiment was started with the objective to screen salt tolerant varieties/ hybrids of tomato in the year 1994-95 at different ESP gradients under field conditions at Dalipnagar Research Farm, Kanpur. Four

ESP gradients, i.e. 51.1, 36.5, 26.2 and 17.3 were created under field conditions in September, 1994 by adding required amount of gypsum @ 100% GR (gypsum requirement) 66% GR, 33% GR and control (Gypsum was not applied). Physical and chemical properties of the soil improved due to continuous cropping for five consecutive years (1994-95, 1995-96, 1996-97, 1997-98 and 1998-99) and ESP of the same experimental field at 0-15cm depth came down to 39.0, 26.5, 14.9 and 11.3 in control, 33% GR, 66% GR and 100% GR gypsum treated plots in 1999-2000, respectively. In the year 2000-01 and 20001-02 eight varieties/ hybrids of tomato were grown at 4 ESP levels, i.e. 38.5, 26.0, 14.0 and 11.6 in 2000-01 and 36.5, 23.3, 13.5 and 11.2 in 2001-02. The ESP levels of the same field came down due to improvement of physical and chemical properties of the soil as compared to previous years. Thirty days old seedling of tomato varieties/hybrids were transplanted at the distance of 45x45 cm (row to row and plant to plant) with three replications in split plot design. Recommended doses of fertilizer, i.e. NPK were applied @50:50:50 kg/ha respectively as basal, before transplanting, later on 50

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kg N/ha was given in standing crop after one month of transplanting. Before transplanting FYM (farm yard manure) was applied @ 20 t/ha uniformly in the field. Inter culture operations and irrigations were given as and when required. Data in regard to fruits yield of tomato were recorded during each years. At harvest plant samples of tomato were collected, prepared and chemically analysed for Na and K content by flame photometer following Chapman and Pratt (1961).

Table 1. Effect of sodicity levels on fruit yield (q/ha) of different varieties/ hybrid of tomato.

Varieties/hybrids	2000-01				Mean
	ESP levels				
	38.0	26.0	14.0	11.6	
Navodaya (hybrid)	97.9	150.7	173.6	212.5	158.7
PKM-1 (hybrid)	105.6	126.4	169.5	206.3	151.9
Apoorwa (hybrid)	118.7	143.8	180.6	218.1	165.1
Sun-230 (hybrid)	119.5	144.5	183.4	220.2	111.8
K-71	114.6	148.6	170.9	208.4	160.6
Angoorlata	191.0	279.9	320.2	359.1	287.5
K-21	131.4	184.7	227.8	287.5	207.8
Pusa Ruby	125.7	158.4	185.4	230.6	175.0
Treatment mean	125.35	167.12	201.42	242.8	
	Variety		Treatment		Interaction
LSD (P=0.05)	11.2		7.9		22.5
Varieties/hybrids	2001-02				Mean
	ESP Levels				
	36.5	25.3	13.5	11.2	
Navodaya (hybrid)	107.9	161.3	181.3	219.1	167.4
KS-17	53.9	74.5	116.8	131.8	92.3
KS-118	146.2	168.6	225.6	285.6	206.5
Angoorlata	212.1	289.6	326.8	360.7	297.3
Azad T-3	65.5	86.3	150.7	165.7	117.0
Azad -T-2	149.3	181.9	239.6	296.6	216.8
Type-1	76.3	116.3	162.6	202.8	139.6
Pusa Ruby	131.9	164.1	192.3	236.6	181.2
Treatment mean	117.9	155.3	199.5	237.3	
	Variety		Treatment		Interaction
LSD (P=0.05)	4.7		3.4		9.5

SODIUM POTASSIUM RATIO IN TOMATO

Fruits yield data depicted in (Table 1) showed that fruit yield of all the varieties/ hybrids of tomato decreased significantly with increasing ESP levels. Highest fruits yield of all the varieties/hybrids of tomato were recorded at lowest ESP levels 11.6 and 11.2 and lowest fruits yield of all the varieties/hybrids were recorded at highest ESP levels 38.0 and 36.5 during 2000-01 and 2001-02 respectively. Tomato variety Angoorlata produced highest fruits yield 359.1, 320.2, 279.9 and 191.0 q/ha at ESP levels 11.6, 14.0, 26.0 and 38.0 during 2000-01 and 360.72, 326.80, 289.58 and 212.08 q/ha at ESP levels 11.2, 13.5, 25.3 and 36.5 during 2001-02 respectively.

Table 2. Effect of sodicity levels on Na/K ratio of different varieties/hybrids of tomato.

Varieties/hybrids	2000-01 ESP levels				Mean
	38.0	26.0	14.0	11.6	
Navodaya (hybrid)	1.64	1.40	1.26	1.08	1.35
PKM-1 (hybrid)	1.72	1.52	1.36	1.18	1.45
Apoorwa (hybrid)	1.62	1.38	1.24	1.08	1.33
Sun-230 (hybrid)	1.58	1.38	1.20	1.06	1.31
K-71	1.68	1.46	1.30	1.12	1.39
Angoorlata	1.10	1.02	0.80	0.56	0.87
K-21	1.32	1.15	1.03	0.88	1.10
Pusa Ruby	1.54	1.35	1.18	0.98	1.26
Treatment mean	1.52	1.33	1.17	0.99	
	Variety		Treatment		Interaction
LSD (P=0.05)	0.062		0.135		0.137

Varieties/hybrids	2001-02 ESP Levels				Mean
	36.5	25.3	13.5	11.2	
Navodaya (hybrid)	1.60	1.36	1.22	1.06	1.31
KS-17	1.74	1.50	1.20	1.16	1.40
KS-118	1.18	1.12	0.98	0.94	1.05
Angoorlata	1.06	1.00	0.78	0.54	0.84
Azad T-3	1.62	1.40	1.18	1.14	1.33
Azad -T-2	1.22	1.12	0.96	0.92	1.05
Type-1	1.56	1.34	1.20	1.16	1.31
Pusa Ruby	1.50	1.32	1.16	0.94	1.23
Treatment mean	1.43	1.27	1.08	0.98	
	Variety		Treatment		Interaction
LSD (P=0.05)	0.045		0.059		0.119

Reduction in fruit yield from lower ESP (11.6 and 11.2) to higher ESP levels was noted minimum in variety Angoorlata in comparison to other varieties/hybrids of tomato during both the years. Minimum reduction and highest fruit yield of tomato from lower ESP (11.6 and 11.2) to higher ESP (38.0 and 36.5) in variety Angoorlata showed that the variety Angoorlata is more tolerant in comparison to other varieties/hybrids of tomato tested at different ESP levels during 2000-2001 and 2001-2002 respectively. It is interesting to report that all the varieties/hybrids of tomato showed reduction in fruit yields within lower ESP levels 11.6 to 14.0 and 11.2 to 13.5 during 2000-01 and 2001-02. Reduction in fruit yield of all the varieties/hybrids of tomato at lower level to higher levels may be due to the maximum improvement in physico-chemical properties of the soil at lower ESP levels in comparison to higher ESP levels .

There was a decrease in Na/K ratio in all the varieties /hybrids of tomato with decreasing levels of alkalinity (Table 2). Lowest Na/K ratio of all the varieties/hybrids of tomato were noted at lowest ESP levels (11.6 and 11.2) and highest at highest ESP levels 38.0 and 36.5 during 2000-01 and 2001-02 respectively. Variety Angoorlata showed minimum Na/K ratio, i.e. 1.10. 1.02.

0.80 and 0.56 at ESP levels 38.0, 26.0, 14.0 and 11.6 respectively during 2000-01 and 1.06, 1.00, 0.78 and 0.54 at ESP levels 36.5,25.3, 13.5 and 11.2 respectively during 2001-02. Similar decrease in Na/K ratio was also reported by Pandey & Srivastava (1991) in paddy and Parihar and Singh (1996) in mustard.

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