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EFFECT OF SALINE IRRIGATION WATER ON YIELD AND NUTRIENT CONTENT OF ONION (*ALLIUM CEPA* L.) VARIETIES

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ABSTRACT

A pot trial was executed at the Department of Agril. Chem. and Soil Sci., College of Agriculture, J.A.U, Junagadh, during the *rabi* cropping season of 2017-18. The research was designed to evaluate the Role of Saline Irrigation Water in Growth, Nutrient Composition, and Yield of Onion (*Allium cepa* L.) Varieties." The experiment included four degree of salinity (<2.0, 4.0, 6.0 and 8.0 dS m^{-1}) and five onion varieties (V_1- GJWO-3, V_2- GJRO-11, V_3- Talaja red, V_4- Pilli Patti & V_5- PWF-131) established in a completely randomized factorial scheme with three replications. The results showed that onion varieties substantially influenced fresh straw yield, bulb yield, and nutrient content. The highest fresh straw yield (37.03 g/pot) and bulb yield (37.49 g/pot) were recorded in the V_4 variety (Pilli Patti). The sodium concentration in the leaves was lowest (0.173%), while potassium (K) (0.213%) and calcium (Ca) (0.584%) concentrations were highest at 45 days after transplanting (DAT) in the V_4 variety. The nitrogen (N), phosphorus (P), potassium (K), and sulphur (S) content in the bulbs and straw at harvest were not markedly influenced by the onion varieties. However, the V_4 variety (Pilli Patti) showed significantly higher calcium and magnesium content in the bulbs and straw, while the sodium content in the straw was lowest for this variety at harvest. The Na^+/K^+ ratio was lowest (0.816) in the bulbs and straw of the V_4 variety, and the Ca^{2+}/Na^+ ratio was highest (0.982) in the leaves of V_4 at both 45 DAT and harvest. This suggests that the V_4 (Pilli Patti) variety performed best in terms of yield and nutrient balance under saline conditions.

Key words: Nutrients, Onion, Salinity levels, Varieties, Yield

Introduction

Onion is atoo crucial, in terms of economics indispensable vegetable, harvested in India, that associate of the family Alliaceae. Worldwide, it is recognized as second most significant vegetable crop, following tomato. Among alliums and cash crops, onion is the most widely grown and favoured. It is farmed in about 170 countries for local consumption and plays a vital role in global exchange. Conforming to the national onion association (2011), more than ninety-two million acres of onions are picked across the globe each year. A plant grown yearly for its bulbs and biennially for seed production, it is regarded as a short-duration crop.

As per Vavilov (1951), the core origin location for onions is he middle of Asia, with the Near East and as well as Mediterranean zones recognized as secondary hotspots. India ranks as the second-largest producer and third-largest supplier concerning onions on a global scale. Onion cultivation in India spans an area of 2.973 million acres, with a harvest volume of 19.401 million tonnes (Anon., 2015). In the state of Gujarat, onions are cultivated across more or less 53,200 hectares, yielding 1.514 million tonnes and a production capacity rate of 14.2 tonnes per hectare (Indian Horticulture Database, 2011).

Onion water requirements vary based on location and the irrigation system used (Al-Jamal *et al.*, 2000). Olalla *et al.*, 2004 reported that in Albacete, Spain, achieving an optimal yield of 75 t ha^{-1} required 662 mm of water under drip irrigation. The most critical period for soil water availability is during bulb growth (Kadayifci *et al*., 2005). Several studies have demonstrated that onions have high water demands, limiting their cultivation in areas with scarce water resources (Bandyopadhyay *et al*., 2003; Rajput and Patel, 2006; Kumar *et al*., 2007). The duration of the germination phase is considered a key factor in determining onion's effective salt tolerance, as rapid root emergence enables seedlings to escape the high salinity of the upper soil layers (De Malach *et al*., 1989). Among vegetables, onions are particularly sensitive to salinity (Brewster, 1997) and are classified as salt-sensitive, with an electrical conductivity (EC) threshold of 1-2 dS m^{-1} (Mangal *et al*., 1989; Mass and Hofman, 1977).

The extent of saline-affected areas in Gujarat is nearly 1.218 million hectares. Accumulation of salts in soil has consequences for plants on plant proliferation and maturation affecting on a global scale, impairing nearly one-third of irrigated arable land is already impacted by salinity, and this figure continues to rise (Lazof and Bernstein, 1999). Excessive Dissolved salts in the ground in duce solute stress, contributing to ion-specific lethality and ionic fluctuations, which can eventually result in plant death (Rout and Shaw, 2001). Augmenting crop resistance to salt stress is a promising strategy to mitigate the complications posed by salinity. There is a flourishing need to explore and select halo-tolerant genotypes within species, in comparison to halo-sensitive ones, using conventional selection and breeding techniques.

Material and Methods

The soil used for the experiment was silty clay in texture and exhibited an alkaline reaction, with a pH of 8.0, electrical conductivity (EC) of 0.58 dS m^{-1}, calcium carbonate ($CaCO_3$) content of 31.05% and cation exchange capacity (CEC) of 36.2 cmol(p+) kg^{-1}. The soil was characterized by medium levels of available nitrogen (242 kg ha^{-1}), medium levels of available phosphorus (34.20 kg ha^{-1}), high levels of available potassium (298 kg ha^{-1}), and high levels of available sulphur (23.50 mg kg^{-1}). The micronutrient status showed medium availability of iron (6.25 mg kg^{-1}), low availability of zinc (0.45 mg kg^{-1}), high availability of manganese (15.20 mg kg^{-1}) and high availability of copper (1.25 mg kg^{-1}). The experiment was designed using a Factorial Completely Randomized Design (FCRD) with three replications. It consisted of 20 treatment combinations, incorporating all possible combinations of four salinity levels: S_1 - <2 dS m^{-1}, S_2 - 4 dS m^{-1}, S_3 - 6 dS m^{-1} and S_4 - 8 dS m^{-1}, along with five varieties: V_1 - GJWO-3, V_2 - GJRO-11, V_3 - Talaja red, V_4 - Pilli Patti, and V_5 - PWF-131. A basal dose of nitrogen at 20 kg ha^{-1} and phosphorus (as P_2O_5) at 40 kg ha^{-1} was implemented to all pots in the form of urea and di-ammonium phosphate (DAP),

Table 1: Effect of salinity and varieties on yield and nutrient content (at 45 DAT) of onion at harvest.

Treatment	Yield parameters		Nutrient content % (at 45 DAT)				
	Fresh straw weight (g)	Fresh weight of bulb (g)	Na	K	Ca	Na^+/K^+ in fresh leaves	Ca^{+2}/Na^+ in fresh leaves
Salinity (S)							
S_1:< 2.0 dS/m^{-1} (tap water)	34.4	33.77	0.157	0.222	0.584	0.714	3.73
S_2: 4.0 dS m^{-1}	21.19	25.41	0.177	0.214	0.565	0.833	3.2
S_3: 6.0 dS m^{-1}	17.02	15.11	0.188	0.197	0.553	0.961	2.96
S_4: 8.0 dS m^{-1}	13.54	9.68	0.208	0.194	0.518	1.08	2.51
S.Em. ±	0.41	0.37	0.002	0.004	0.006	0.018	0.04
C.D. (P=0.05)	1.16	1.06	0.006	0.011	0.017	0.05	0.13
Variety (V)							
V_1 - GJWO-3	23.49	24.37	0.177	0.211	0.57	0.849	3.26
V_2 -GJRO-11	19.01	19.58	0.184	0.207	0.543	0.9	3
V_3 -Talaja red	20.34	19.57	0.187	0.204	0.554	0.938	3
V_4 -Pilli patti	23.53	25.05	0.173	0.213	0.584	0.816	3.42
V_5 -PWF-131	21.33	16.38	0.192	0.197	0.524	0.982	2.82
S.Em. ±	0.45	0.41	0.002	0.004	0.07	0.02	0.05
C.D. (P=0.05)	1.3	1.18	0.006	NS	0.019	0.056	0.14
S × V Interaction							
S.Em. ±	0.91	0.83	0.004	0.008	0.013	0.039	0.1
C.D. (P=0.05)	2.6	2.37	0.013	NS	NS	NS	NS
C.V.%	7.31	6.83	4.2	7.12	4.17	7.591	5.62

Table 1.1: Interaction effect of salinity and varieties on fresh weight of straw of onion.

Interaction	S_1:< 2.0 dS m^{-1} (tap water)	S_2: 4.0 dS m^{-1}	S_3: 6.0 dS m^{-1}	S_4: 8.0 dS m^{-1}	Mean
V_1 - GJWO-3	36.33	22.60	19.73	15.28	23.49
V_2 -GJRO-11	33.13	16.57	14.17	12.17	19.01
V_3 -Talaja red	33.60	20.27	15.07	12.43	20.34
V_4 -Pilli patti	37.03	23.07	19.00	15.00	23.53
V_5 -PWF-131	31.90	23.47	17.13	12.80	21.33
Mean	34.40	21.19	17.02	13.54	
S.Em. ±	**0.91**	**C.D. (P=0.05)**		**2.60**	

respectively. Following germination five plants were retained in every pot under standard agricultural practices irrigation was consistently provided with saline water in accordance with the treatment requirements throughout the growing season.

Fully developed leaves from five selected plants in each pot were collected 45 days after sowing. The leaf samples were sun-dried and subsequently oven-dried at 60°C for 24 hours. Each sample was then crushed with a pestle and mortar and analysed for calcium content using the Versenate EDTA method (Cheng and Bray, 1951), while potassium and sodium were determined using a flame photometer (Jackson, 1974). The Na^+/K^+ and Ca^{2+}/Na^+ ratios were evaluated based on the measured concentrations of potassium, sodium and calcium. Chemical analyses of the leaves and bulbs were carried out using representative samples taken from each pot at harvest. The samples were oven-dried at 60°C for 24 hours and then crushed with a pestle and mortar. The powdered samples were utilized to estimate the contents of nitrogen, phosphorus, potassium, calcium, magnesium, sulphur, sodium, iron, zinc, manganese and copper. Nitrogen content in the plant samples was analysed individually using the micro Kjeldahl method as described by Kanwar and Chopra (1967). Phosphorus was measured using the Vanadomolybdo Phosphoric Yellow Colour method, following Jackson (1974). Potassium and sodium concentrations were analysed with a flame photometer, as outlined by Jackson (1974). Calcium and magnesium content were evaluated through the Versenate EDTA method. Sulphur content was assessed according to the method developed by Williams and Steinberg (1959). Sodium was measured using the flame photometer method described by Jackson (1974). Micronutrients, including iron, zinc, manganese and copper, were quantified using an Atomic Absorption Spectrophotometer (AAS) as detailed by Lindsay and Norvell (1978).

Table 1.2: Interaction effect of salinity and varieties on fresh weight of bulb.

Interaction	S_1:< 2.0 dS m^{-1} (tap water)	S_2: 4.0 dS m^{-1}	S_3: 6.0 dS m^{-1}	S_4: 8.0 dS m^{-1}	Mean
V_1 - GJWO-3	37.21	31.66	17.50	11.06	24.37
V_2 -GJRO-11	32.01	23.89	14.99	7.45	19.58
V_3 -Talaja red	31.96	22.63	13.88	9.79	29.57
V_4 -Pilli patti	37.49	30.32	16.14	12.25	25.05
V_5 -PWF-131	30.17	16.54	10.99	7.83	16.38
Mean	33.77	25.41	15.11	9.68	
S.Em. ±	**0.83**	**C.D. (P=0.05)**		**2.37**	

Table 1.3: Interaction effect of salinity and varieties on sodium (%) content in onion at 45 DAT.

Interaction	S_1:< 2.0 dS m^{-1} (tap water)	S_2: 4.0 dS m^{-1}	S_3: 6.0 dS m^{-1}	S_4: 8.0 dS m^{-1}	Mean
V_1 - GJWO-3	0.151	0.172	0.181	0.205	0.177
V_2 -GJRO-11	0.162	0.175	0.191	0.206	0.184
V_3 -Talaja red	0.166	0.182	0.19	0.208	0.187
V_4 -Pilli patti	0.147	0.174	0.18	0.189	0.173
V_5 -PWF-131	0.159	0.18	0.197	0.23	0.192
Mean	0.157	0.177	0.188	0.208	
S.Em. ±	**0.004**	**C.D. (P=0.05)**		**0.012**	

Results and Discussion

Yield parameter

Fresh straw yield and fresh bulb yield were substantially affected by changing salinity levels across different onion varieties. The highest fresh straw yield (23.53 g) and fresh bulb yield (25.05 g) were observed in the variety V_4 (Pilli Patti) (Table 1). The interaction between salinity levels and varieties showed that the highest yields were founded in the combination of S_1 (<2 dS m^{-1}) x V_4 (Pilli Patti), with fresh straw yield at 37.07 g and fresh bulb yield at 37.49 g (Tables 1.1 and 1.2). This salinity tolerance could be attributed to selective ion uptake and the ability to adjust to osmotic pressure without accumulating excessive salts, as noted by Hayward and Wadleigh (1949). These findings align with those of Bernstein and Ayers (1953), Francois (1994) and Singh and Pandita (1981), who documented that salinity reduces bulb weight.

Nutrient content

Nutrient content at 45 DAT

The sodium content of onions at 45 DAT increased with rising salinity levels. The highest sodium content (0.208%) in onion straw was observed with the application

Table 2: Effect of salinity and varieties on major nutrients content (N, P and K) in bulb and straw of onion at harvest.

Treatment	Major nutrient content (%)					
	N		P		K	
	Bulb	Straw	Bulb	Straw	Bulb	Straw
Salinity (S)						
S_1:< 2.0 dS m^{-1} (tap water)	1.56	0.86	0.285	0.142	1.04	0.200
S_2: 4.0 dS m^{-1}	1.53	0.82	0.282	0.141	0.83	0.197
S_3: 6.0 dS m^{-1}	1.50	0.8	0.277	0.139	0.70	0.185
S_4: 8.0 dS m^{-1}	1.49	0.79	0.275	0.137	0.63	0.160
S.Em±	0.02	0.02	0.004	0.002	0.02	0.004
C.D. (P=0.05)	NS	NS	NS	NS	NS	0.012
Variety (V)						
V_1:GJWO-3	1.55	0.85	0.284	0.142	0.79	0.192
V_2:GJRO-11	1.53	0.83	0.284	0.139	0.81	0.188
V_3: Talaja red	1.50	0.80	0.275	0.137	0.80	0.188
V_4: Pilli patti	1.54	0.84	0.279	0.140	0.84	0.183
V_5: PWF-1	1.48	0.77	0.277	0.141	0.77	0.178
S.Em±	0.02	0.02	0.004	0.002	0.02	0.005
C.D. (P=0.05)	NS	NS	NS	NS	NS	NS
S × V Interaction						
S.Em±	0.05	0.04	0.01	0.003	0.04	0.01
C.D. (P=0.05)	NS	NS	NS	NS	NS	NS
C.V.%	5.31	9.3	5.09	4.24	7.67	4.23

of irrigation water having an EC of 8.0 dS m^{-1} (S_4). In contrast, the lowest sodium content (0.157%) was recorded under irrigation water with an EC of <2.0 dS m^{-1}

Table 3.1: Interaction effect of salinity and varieties on Ca content in bulb of onion at harvest.

Interaction	S_1:< 2.0 dS m^{-1} (tap water)	S_2: 4.0 dS m^{-1}	S_3: 6.0 dS m^{-1}	S_4: 8.0 dS m^{-1}	Mean
V_1 - GJWO-3	2.16	2.02	1.81	1.57	1.89
V_2 -GJRO-11	2.04	1.93	1.73	1.33	1.76
V_3 -Talaja red	2.03	1.89	1.71	1.63	1.81
V_4 -Pilli patti	2.22	1.98	1.83	1.66	1.92
V_5 -PWF-131	2.03	1.73	1.70	1.25	1.68
Mean	2.1	1.91	1.75	1.49	
S.Em. ±	**0.05**	**C.D. (P=0.05)**		**0.14**	

(S_1). Among the onion varieties, the highest sodium content (0.192%) was found in V_3 (Talaja Red), while the lowest sodium content (0.173%) was observed in V4 (Pilli Patti). Bayuelo-Jimenez *et al.*, (2003) concluded that increased NaCl concentrations raise Na^+ and Cl^- levels while reducing Ca^{2+}, K^+ and Mg^{2+} levels in many plant species.

Significantly diminished potassium content (0.194%) was documented With the implementation of irrigation water at an EC of 8.0 dS m^{-1} (S_4), while the maximum potassium concentration (0.222%) was documented using irrigation water at an EC of <2.0 dS m^{-1} (S_1). The maximum calcium content (0.584%) was detected at the salinity level of <2.0 dS m^{-1} (S_1), whereas the minimal calcium content (0.518%) was documented at the salinity

Table 3: Effect of salinity and varieties on content of secondary nutrients (Ca, Mg & S) and Na in bulb and straw of onion at harvest.

Treatments	Secondary nutrient and Na content (%)							
	Ca		Mg		S		Na	
	Bulb	Straw	Bulb	Straw	Bulb	Straw	Bulb	Straw
Salinity (S)								
S_1:< 2.0 dS m^{-1} (tap water)	2.1	1.94	0.83	0.59	0.30	0.24	0.83	0.308
S_2: 4.0 dS m^{-1}	1.91	1.69	0.78	0.57	0.29	0.23	0.78	0.37
S_3: 6.0 dS m^{-1}	1.75	1.33	0.73	0.56	0.29	0.23	0.73	0.40
S_4: 8.0 dS m^{-1}	1.49	1.22	0.71	0.54	0.29	0.22	0.71	0.44
S.Em±	0.02	0.02	0.01	0.01	0.01	0.00	0.01	0.01
C.D. (P=0.05)	0.06	0.06	0.03	0.02	NS	NS	0.03	0.014
Variety (V)								
V_1 - GJWO-3	1.89	1.45	0.78	0.58	0.289	0.224	0.78	0.37
V_2 -GJRO-11	1.76	1.68	0.76	0.56	0.292	0.23	0.76	0.38
V_3 -Talaja red	1.81	1.36	0.76	0.56	0.29	0.22	0.76	0.39
V_4 -Pilli patti	1.92	1.76	0.79	0.59	0.30	0.23	0.79	0.36
V_5 -PWF-131	1.68	1.48	0.73	0.55	0.29	0.23	0.73	0.40
S.Em±	0.02	0.02	0.01	0.01	0.01	0.00	0.01	0.01
C.D. (P=0.05)	0.07	0.07	0.04	0.03	NS	NS	0.04	0.02
S × V Interaction								
S.Em±	0.05	0.05	0.02	0.01	0.01	0.01	0.02	0.01
C.D. (P=0.05)	0.14	0.13	NS	NS	NS	NS	NS	0.03
C.V.%	4.69	5.28	5.58	5.51	6.1	6.77	5.58	5.09

Table 3.2: Interaction effect of salinity and varieties on Ca content in straw of onion at harvest.

Interaction	S_1:< 2.0 dS m^{-1} (tap water)	S_2: 4.0 dS m^{-1}	S_3: 6.0 dS m^{-1}	S_4: 8.0 dS m^{-1}	Mean
V_1 - GJWO-3	1.86	1.55	1.16	1.22	1.45
V_2-GJRO-11	2.02	1.83	1.46	1.40	1.68
V_3-Talaja red	1.69	1.39	1.19	1.16	1.36
V_4-Pilli patti	2.20	1.91	1.60	1.31	1.76
V_5-PWF-131	1.91	1.76	1.22	1.01	1.48
Mean	1.94	1.69	1.33	1.22	
S.Em. ±	**0.05**	**C.D. (P=0.05)**		**0.13**	

Table 3.3: Interaction effect of salinity and varieties on Na content in straw of onion at harvest.

Interaction	S_1:< 2.0 dS m^{-1} (tap water)	S_2: 4.0 dS m^{-1}	S_3: 6.0 dS m^{-1}	S_4: 8.0 dS m^{-1}	Mean
V_1 - GJWO-3	0.133	0.152	0.159	0.18	0.16
V_2-GJRO-11	0.143	0.154	0.168	0.182	0.16
V_3-Talaja red	0.146	0.16	0.168	0.183	0.16
V_4-Pilli patti	0.13	0.162	0.158	0.171	0.16
V_5-PWF-131	0.14	0.159	0.174	0.197	0.17
Mean	0.138	0.157	0.165	0.183	
S.Em. ±	**0.001**	**C.D. (P=0.05)**		**0.03**	

level of 8.0 dS m^{-1} (S_4). Among the varieties, V_4 (Pilli Patti) showed significantly high calcium content (0.584%), while V_5 (PWF-131) had the lowest calcium content (0.524%).

The variety Pilli Patti exhibited a lower Na^+/K^+ ratio and a higher Ca^{+2}/Na^+ ratio in its leaves at 45 DAT, as well as in its bulbs and straw at harvest, indicating its halo-tolerance. However, despite this, certain genetic types may possess varying degrees of halo-tolerance (Rao *et al.*, 2002). Serraj (2002) noted that dissimilarities in salt tolerance occur not exclusively among diverse species but also among genotypes within the homologous species. The K^+/Na^+ ratio decreased in both the shoots and roots of the tested cultivars, while Na content increased under saline conditions. These data are harmonious with the research of Essa (2002) and Bazrafshan and Ehsanzadeh (2014).

Nutrient content at harvest

Various salt concentrations had a non-significant influence on the nitrogen (N) content in the bulb and straw. Though, overall N, phosphorus (P) and potassium (K) content in both the bulb and straw decreased as salinity levels elevated from <2.0 to 8.0 dS m^{-1}. The elevated N (1.56%), P (0.25%) and K (1.04%) content in the bulb, and N (0.86%), P (0.142%) and K (0.200%) content in the straw, were remarked at the salinity level of <2.0 dS m^{-1}. Data presented in (Table 2) indicate that the onion

Table 4: Effect of salinity and varieties on micro nutrients (Fe, Mn Zn and Cu) content in bulb and straw onion at harvest.

Treatments	Micro nutrient (mg kg^{-1})							
	Fe		Mn		Zn		Cu	
	Bulb	Straw	Bulb	Straw	Bulb	Straw	Bulb	Straw
Salinity (S)								
S_1:< 2.0 dS m^{-1} (tap water)	643.36	930.48	98.46	27.8	50.41	37.93	29.05	37.47
S_2: 4.0 dS m^{-1}	627.45	926.59	97.41	26.88	49.32	36.68	28.5	36.74
S_3: 6.0 dS m^{-1}	607.58	921.14	96.65	26.52	47.77	36.12	27.93	36.26
S_4: 8.0 dS m^{-1}	605.93	918.54	93.65	25.6	45.69	35.34	27.45	35.61
S.Em±	11.63	13.16	1.29	0.60	1.22	0.66	0.43	0.54
C.D. (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS
Variety (V)								
V_1 - GJWO-3	621.93	929.00	97.77	26.71	50.33	36.28	28.24	36.19
V_2-GJRO-11	595.08	926.62	95.86	26.57	47.71	35.88	28.08	36.63
V_3-Talaja red	637.50	914.39	96.73	26.45	47.07	35.9	28.21	36.49
V_4-Pilli patti	632.01	931.02	97.99	26.77	50.56	37.69	29.05	37.00
V_5-PWF-131	618.87	919.91	94.38	27.01	45.81	36.83	27.56	36.30
S.Em±	13.00	14.72	1.44	0.67	1.37	0.73	0.48	0.61
C.D. (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS
S × V Interaction								
S.Em±	26.01	29.43	2.87	1.34	2.73	1.47	0.96	1.22
C.D. (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS
C.V.%	7.25	5.52	5.16	8.72	9.80	6.95	5.88	5.78

varieties tested in the study did not have a serious impact on N, P and K content in the bulb and straw at harvest.

Cramer *et al*., (1991) and Grattan & Grieve (1999) observed that high concentrations of NaCl hinder the uptake of other nutrients, such as nitrogen. Bargaz *et al*., (2016) found that vacuoles store phosphorus (P) in leaves, but P mobility decreases in the presence of high salt levels. Jouyban (2012) noted that excessive sodium ions at the root surface interfere with plant potassium uptake. High sodium levels in irrigation water can cause calcium and potassium deficiencies in soils low in these nutrients, leading to crops responding positively to fertilization with these elements.

Significantly higher calcium (Ca) content in the bulb (2.10%) and straw (1.49%) was observed with irrigation water at an EC of <2.0 dS m^{-1} (S_1). These findings are supported by Virdiya *et al*., (2008) and Talei Daryush (2012). The variety V_4 (Pilli Patti) also recorded significantly higher Ca content in the bulb (1.92%) and straw (1.76%). The interaction between salinity levels and varieties had a significant effect on Ca content in both the bulb and straw, with the highest values recorded in the combination of S_1 (<2.0 dS m^{-1}) and V_4 (Pilli Patti), showing 2.22% in the bulb and 2.20% in the straw. The lowest sodium (Na) content was 0.709% in the bulb at the S_4 level and 0.308% in the straw at the S_1 level (<2.0 dS m^{-1}). Increased NaCl treatments elevated Na^+ and Cl^- levels while reducing Ca^{+2}, Mg^{+2} and K^+ levels in various plants, consistent with the findings of Akbar and Alieh (2013).

The quantity of Cu, Fe, Mn and Zn in the bulb and straw were not substantially affected by varying levels of saline irrigation water at the crop's harvest. Salinity can influence micronutrient quantities differently, depending on the crop cultivar and the salinity level (Oertli, 1991). The effect of salinity on micronutrient concentrations in plants is highly variable (Grattan and Grieve, 1992).

Conclusion

Augmenting salt concentration notably raised the Na content in onions at 45 DAT, while Ca and K content remained unaffected. Different salinity levels had a substantial impact on the Na^+/K^+ ratio and Ca^{2+}/Na^+ ratio. The lowest Na^+/K^+ ratio (0.714) was recorded under S_1 (<2.0 dS m^{-1}) in onion straw at 45 DAT. Although the Ca^{+2}/Na^+ ratio was substantially influenced by variety and salinity levels, their combined effect on the crop at 45 DAT was non-significant. The highest Ca^{2+}/Na^+ ratio (3.73) was observed with irrigation at the S_1 level (<2.0 dS m^{-1}) in onion straw at 45 DAT.

At the point of harvest, nitrogen, phosphorus, potassium (Table 2), S and Mg (Table 3) concentration in the bulb and straw were insignificantly altered by varying salinity levels. However, the Ca content in both the bulb and straw was substantially affected by salinity levels. Additionally, the Na amount in the straw at harvest was substantially impacted by irrigation using saltwater, with the highest Na levels found at the S_4 salinity level (8.0 dS m^{-1}), reaching 0.71% in the bulb and 0.44% in the straw. Meanwhile, the distinct amount of Cu, Fe, Mn and Zn in the bulb and straw were not substantially affected by distinct degrees of irrigation using saltwater at harvest.

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