IJPS INTERNATIONAL JOURNAL OF PLANT SCIENCES
ISSN-0973-1547 Volume 17 | Issue 2 | July, 2022 | 197-201
DOI: 10.15740/HAS/IJPS/17.2/197-201
Visit us - www.researchjournal.co.in

RESEARCH ARTICLE

Influence of variable RSC levels of irrigation water and groundnut varieties on concentration and uptake of nutrients

■ Dewanshi Kumari, M. A. Davara, K. B. Ranpariya and J. V. Polara

SUMMARY

A pot experiment was conducted at Net House, Department of Agricultural Chemistry and Soil Science, Junagadh Agricultural University, Junagadh to assess the different RSC levels of irrigation water and different varieties of groundnut on concentration and uptake of nutrient during summer-2019. The treatment consists of four RSC level of irrigation water (A_0- 0, A_1- 2.5, A_2- 5.0 and A_3- 7.5 meq L^{-1}) and four groundnut varieties (V_1- TG-37-A, V_2- TPG-41, V_3- GJG-31 and V_4- GG-6) in Completely Randomized Design (Factorial) replicated thrice. Significantly the highest concentration of N (4.94 and 1.86 %) by kernel and haulm, respectively were found with RSC – 7.5 meq L^{-1} and the highest uptake of N (57.10 mg plant^{-1}) by kernel was noted with RSC- 0 meq L^{-1}, whereas maximum uptake of N (50.60 mg plant^{-1}) by haulm were registered with RSC- 7.5 meq L^{-1}, while the highest concentration and uptake of P, K, Fe, Mn, Zn and Cu by kernel and haulm were recorded with RSC- 0 meq L^{-1} and the lowest were found with RSC- 7.5 meq L^{-1}. The highest concentration and uptake of N, P, K, Fe, Mn, Zn and Cu by kernel and haulm were found with V_2 (TPG-41) variety of groundnut, except the concentration of N in kernel and concentration of Fe and Zn in haulm. The interaction effect between RSC levels of irrigation water and different varieties of groundnut on concentration and uptake of N by haulm and Mn uptake by kernel were found significantly the highest with $A_3 \times V_2$ (7.5 meq L^{-1} × TPG-41) and $A_O \times V_4$ (0 meq L^{-1} × GG-6), respectively.

Key Words : RSC levels, Irrigation water, Groundnut varieties, Concentration, Uptake, Nutrients

How to cite this article : Kumari, Dewanshi, Davara, M. A., Ranpariya, K. B. and Polara, J. V. (2022). Influence of variable RSC levels of irrigation water and groundnut varieties on concentration and uptake of nutrients. *Internat. J. Plant Sci.*, **17** (2): 197-201, **DOI: 10.15740/HAS/IJPS/17.2/197-201,**

Article chronicle : Received : 30.04.2022; **Revised :** 09.05.2022; **Accepted :** 10.06.2022

MEMBERS OF THE RESEARCH FORUM

Author to be contacted :
J.V. Polara, Department of Agricultural Chemistry and Soil Science, Junagadh Agricultural University, **Junagarh (Gujarat) India**
Email : jvpolara@jau.in

Address of the Co-authors:
Dewanshi Kumari, M. A. Davara and K. B. Ranpariya, Department of Agricultural Chemistry and Soil Science, Junagadh Agricultural University, **Junagarh (Gujarat) India**

Groundnut (*Arachis hypogea* L.) is the important oilseed crop in India as well as world. It is an annual legume crop and a major oilseed of tropical and subtropical countries, which are also known as '*peanut', 'earthnut', 'monkey nut' and 'goobers'*. It is the 13th most important food crop and 4th most important oilseed crop of the world. The yield level of summer groundnut is almost double than those of *Kharif*

groundnut. The crop has its own importance due to high edible oil and nutritional value of kernel as human feed and haulm as rich feed for cattle. Seed is valued both for its oil and protein content as the seeds contain about 40-45 per cent oil, 25-30 per cent protein, 20 per cent carbohydrates and 5 per cent fibre and ash which makes a substantial contribution to human nutrition.

MATERIAL AND METHODS

Chemical analysis of kernel and haulm were carried out by taking representative sample from each pot at harvest of crop. The sample were oven dried at 60^0 C for 24 hours and the powdered by using grinder and mixer. Finally, the powdered samples of kernel and haulm were utilized for estimation of nitrogen separately by micro kjeldahl's method as described by Jackson (1973). While the phosphorous was determined by vanadomolybdo phosphoric yellow colour method as described by Koeing and Johnson (1942), potassium by flamephotometer as described by Toth and Prince (1946) and micronutrients *viz*, Fe, Mn, Zn and Cu were estimated by Atomic Absorption Spectrophotometer (AAS) from triacid extract as described by Lindsay and Norvell (1978).

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Effect of variable RSC levels of irrigation water on macronutrient concentration and uptake of groundnut :

The result revealed that the nitrogen concentration in kernel and haulm of groundnut significantly increased with increasing levels of RSC of irrigation water. The highest N concentration (4.93 and 1.86 %) and uptake (57.10 and 50.60 mg plant-1) in kernel and haulm of groundnut, respectively were recorded with RSC- 7.5 meq L^{-1} level of irrigation water except N uptake in kernel recorded with RSC- 0 meq L^{-1}. Similar findings were reported by Kumawat and Yadav (2012) and Dogra (2016) in barley. The highest P (0.48 and 0.16 %) and K concentration (0.68 and 1.11 %) in kernel and haulm, while the highest P (5.94 and 4.86 mg $plant^{-1}$) and K uptake (8.42 and 33.77 mg $plant^{-1}$) by kernel and haulm of groundnut, respectively were observed with RSC- 0 meq L^{-1} level of irrigation water, but the lowest concentration and uptake of P and K by groundnut were

Table 1: Effect of variable RSC levels of irrigation water and groundnut varieties on concentration (%) and uptake (mg $plant^{-1}$) of macronutrients by kernel and haulm

Treatments	Kernel						Haulm					
	N		P		K		N		P		K	
	Conc.	Uptake	Conc.	Uptake	Conc.	Uptake	Conc.	Uptake	Conc.	Uptake	Conc.	Uptake
RSC (A)												
A0: 0 meq L^{-1}	4.60	57.10	0.48	5.94	0.68	8.42	1.46	44.52	0.16	4.86	1.11	33.77
A1: 2.5 meq L^{-1}	4.70	54.58	0.44	5.16	0.63	7.33	1.57	46.80	0.14	4.15	1.03	30.69
A_2: 5.0 meq L^{-1}	4.77	53.38	0.42	4.71	0.59	6.56	1.71	48.36	0.13	3.68	1.01	28.48
A3: 7.5 meq L^{-1}	4.93	46.71	0.39	3.73	0.57	5.38	1.86	50.60	0.11	3.16	0.94	25.48
S.E.±	0.06	1.10	0.01	0.12	0.01	0.21	0.03	1.31	0.004	0.13	0.02	0.73
C.D. (P=0.05)	0.17	3.18	0.03	0.33	0.04	0.62	0.10	3.76	0.01	0.37	0.06	2.10
Variety (V)												
V_1: TG-37-A	4.78	53.61	0.45	5.08	0.59	6.66	1.69	51.31	0.13	3.89	1.01	30.82
V_2: TPG-41	4.82	64.01	0.46	6.10	0.65	8.59	1.87	58.10	0.18	5.65	1.11	34.56
V_3: GJG-31	4.63	39.25	0.40	3.49	0.62	5.32	1.46	36.44	0.11	2.77	0.96	24.21
V_4: GG-6	4.76	54.91	0.42	4.87	0.61	7.13	1.58	44.43	0.13	3.55	1.02	28.83
S.E.+	0.06	1.10	0.01	0.12	0.01	0.21	0.03	1.31	0.004	0.13	0.02	0.73
C.D. (P=0.05)	NS	3.18	0.03	0.33	0.04	0.62	0.10	3.76	0.01	0.37	0.06	2.10
A×V interaction												
S.E.±	0.12	2.21	0.02	0.23	0.03	0.43	0.07	2.61	0.008	0.26	0.04	1.45
C.D. (P=0.05)	NS	NS	NS	NS	NS	NS	NS	7.52	NS	NS	NS	NS
C.V.%	4.37	7.23	7.18	8.22	7.62	10.72	7.04	9.51	9.98	11.28	7.09	8.51

NS= Non-significant

Table 2 : Interaction effect between variable RSC levels of irrigation water and groundnut varieties on nitrogen uptake (g plant^{-1}) by haulm

	A0 (0 meq L^{-1})	A1 (2.5 meq L^{-1})	A2 (5.0 meq L^{-1})	A3 (7.5 meq L^{-1})	
V1: TG-37-A	45.46	50.34	51.02	58.43	51.31
V2: TPG-41	49.27	56.19	61.70	65.25	58.10
V3: GJG-31	36.58	34.68	37.71	36.77	36.44
V4: GG-6	46.77	45.97	43.00	41.96	44.43
Mean	44.52	46.80	48.36	50.60	
S.E.+	2.61		C.D. (P=0.05)	7.52	

Table 3 : Effect of variable RSC levels of irrigation water and groundnut varieties on concentration (ppm) and uptake (mg plant^{-1}) of micronutrients by kernel and haulm

Treatments	Kernal				Haulm			
	Fe		Zn		Fe		Zn	
	Conc.	Uptake	Conc.	Uptake	Conc.	Uptake	Conc.	Uptake
RSC levels (A)								
A0: 0 meq L^{-1}	233	0.29	64.70	0.081	616	1.87	363	1.11
A1: 2.5 meq L^{-1}	222	0.26	60.23	0.070	613	1.82	360	1.07
A_2: 5.0 meq L^{-1}	214	0.24	57.75	0.065	605	1.70	356	1.00
A3: 7.5 meq L^{-1}	209	0.20	56.37	0.054	591	1.59	352	0.95
S.E.±	4.7	0.01	1.19	0.002	6.6	0.03	2.9	0.02
C.D. (P=0.05)	13.0	0.02	3.44	0.005	NS	0.10	8.21	0.05
Variety (V)								
V_1: TG-37-A	222	0.25	59.73	0.067	608	1.85	360	1.09
V_2: TPG-41	231	0.31	62.53	0.083	614	1.91	362	1.13
V_3: GJG-31	208	0.18	54.62	0.047	595	1.50	354	0.89
V_4: GG-6	217	0.25	62.17	0.072	609	1.72	356	1.01
S.E.±	4.7	0.01	1.19	0.002	6.6	0.03	2.9	0.02
C.D. (P=0.05)	13.0	0.02	3.44	0.005	NS	0.10	NS	0.05
A×V interaction								
S.E.+	9.3	0.01	2.39	0.003	13.2	0.07	5.7	0.04
C.D. (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS
C.V.%	7.35	9.71	6.91	8.83	3.77	6.81	2.76	6.04

Treatments	Kernal				Haulm			
	Mn		Cu		Mn		Cu	
	Conc.	Uptake	Conc.	Uptake	Conc.	Uptake	Conc.	Uptake
RSC levels (A)								
A0: 0 meq L^{-1}	14.97	0.019	51.13	0.064	51.83	0.16	27.83	0.08
A1: 2.5 meq L^{-1}	14.30	0.017	50.33	0.058	48.67	0.15	25.00	0.07
A_2: 5.0 meq L^{-1}	13.93	0.016	49.49	0.055	45.25	0.13	23.58	0.07
A3: 7.5 meq L^{-1}	13.26	0.013	48.78	0.046	42.33	0.12	21.54	0.06
S.E.±	0.18	0.0003	0.44	0.001	0.73	0.003	0.51	0.002
C.D. (P=0.05)	0.51	0.001	1.26	0.003	2.11	0.01	1.47	0.01
Variety (V)								
V_1: TG-37-A	13.20	0.015	49.18	0.055	51.00	0.16	24.17	0.07
V_2: TPG-41	15.42	0.020	51.25	0.068	52.83	0.16	25.79	0.08
V_3: GJG-31	12.53	0.011	49.42	0.042	38.83	0.10	23.00	0.06
V_4: GG-6	15.32	0.018	49.87	0.058	45.42	0.13	25.00	0.07
S.E.±	0.18	0.0003	0.44	0.001	0.73	0.003	0.51	0.002
C.D. (P=0.05)	0.51	0.001	1.26	0.003	2.11	0.01	1.47	0.01
A×V interaction								
S.E.+	0.36	0.001	0.88	0.002	1.46	0.01	1.02	0.004
C.D. (P=0.05)	NS	0.002	NS	NS	NS	NS	NS	NS
C.V.%	4.38	6.18	3.04	6.21	5.39	8.23	7.21	9.98

NS=Non-significant

recorded with RSC- 7.5 meq L^{-1} level of irrigation water. This might be due to the fact that RSC rich waters had increased the ESP and pH of soil. The highest sodicity of soil could have decreased the mobility of P due to presence of CO_3 ions. The physiological availability of P in alkali soil is a function of pH and it decreases as the pH increases over the alkaline range as reported by Dubey *et al*. (1993). The decrease in K concentration due to RSC rich waters might be due to the antagonistic effect of excess Na on the adsorption of K by plant (Dwivedi, 1979). The ability of the crop to grow under high Na saturation is due to the toxic effect between Na and K. Similar results were also observed by Kumawat and Yadav (2012) and Dogra (2016).

Effect of different groundnut varieties on concentration and uptake of macronutrients :

Data presented in Table 1 indicates that significantly the highest N (4.82 and 1.87 %), P (0.46 and 0.18 %) and K concentration (0.65 and 1.11 %) and highest N (64.01 and 58.10 mg $plant^{-1}$), P (6.10 and 5.65 mg $plant^{-1}$) and K uptake (8.59 and 34.56 mg $plant^{-1}$) by kernel and haulm of groundnut, respectively were observed with groundnut variety TPG-41, while the lowest concentration and uptake of N,P and K by kernel and haulm of groundnut were observed with variety GJG-31. The results indicated that the concentration of N in kernel was found non-significant. Similar results were found by Pathan *et al*. (2007) in sesame crop.

Interaction effect of variable RSC levels of irrigation water and different varieties of groundnut on concentration and uptake of macronutrients :

The results (Table 2) on interaction effect of variable RSC of irrigation water and groundnut varieties on concentration and uptake of N, P and K by kernel and haulm on groundnut were found non-significant, except, N uptake by haulm. The highest uptake (65.25 mg $plant^{-1}$) was registered with $A_3 \times V_2$ (7.5 meq L^{-1} × TPG-41), while the lowest uptake of N by haulm (34.68 mg $plant^{-1}$) was with $A_1 \times V_3$ (2.5 meq L^{-1} × GJG-31) treatment combination.

Effect of variable RSC levels of irrigation water on micronutrients concentration and uptake by groundnut :

The results showed that the micronutrients concentration and uptake by groundnut decreased with increase RSC levels of irrigation water (Table 3). The RSC levels of irrigation water on concentration and uptake of Fe, Mn, Zn and Cu by kernel and haulm were found significant except Fe concentration by haulm. The highest Fe (233 and 616 ppm),' Zn (64.70 and 363 ppm), Mn (14.97 and 51.83 ppm) and Cu concentration (51.13 and 27.83 ppm) in kernel and haulm, respectively and the highest Fe (0.29 and 1.87 mg $plant^{-1}$), Zn (0.081 and 1.11 mg $plant^{-1}$), Mn (0.019 and 0.16 mg $plant^{-1}$) and Cu (0.064 and 0.08 mg $plant^{-1}$) by kernel and haulm of groundnut, respectively were observed with RSC- 0 meq L^{-1} level of irrigation water, but the lowest concentration and uptake of Fe, Mn, Zn and Cu by kernel and haulm were reported with RSC- 7.5 meq L^{-1} level of irrigation water. This may be due to the less solubility and availability of micronutrients to plant at highest pH arising on account of use of RSC rich water. Similar results were found by Kumawat and Yadav (2012), Jakhar *et al*. (2013) and Dogra (2016).

Effect of different groundnut varieties on concentration and uptake of micronutrients by groundnut :

Data presented in Table 3 indicated that the effect of different varieties of groundnut on concentration and uptake of Fe, Mn, Zn and Cu by kernel and haulm were found significant except Fe and Zn concentration in haulm. The highest Fe (231 and 614 ppm), Zn (62.53 and 362 ppm), Mn (15.42 and 52.83 ppm) and Cu concentration (951.25 and 25.73 ppm) in kernel and

Table 4 : Interaction effect between variable RSC levels of irrigation water and groundnut varieties on Mn uptake (mg $plant^{-1}$) by kernel

	A0 (0 meq L^{-1})	A1 (2.5 meq L^{-1})	A2 (5.0 meq L^{-1})	A3 (7.5 meq L^{-1})	
V1: TG-37-A	0.018	0.017	0.015	0.011	0.015
V2: TPG-41	0.022	0.021	0.021	0.019	0.020
V3: GJG-31	0.013	0.011	0.011	0.008	0.011
V4: GG-6	0.023	0.018	0.017	0.014	0.018
Mean	0.019	0.017	0.016	0.013	
S.E.±	0.001		C.D. (P=0.05)	0.002	

haulm, respectively. while the highest Fe (0.31 and 1.91 mg plant^{-1}), Zn (0.083 and 1.13 mg plant^{-1}), Mn (0.020 and 0.16 mg plant^{-1}) and Cu uptake (0.068 and 0.08 mg plant^{-1}) by karnel and haulm of groundnut varieties, respectively were observed with variety TPG-41. The lowest concentration and uptake of Fe, Mn, Zn and Cu was reported with variety GJG-31 by kernel and haulm.

Interaction effect of variable RSC levels of irrigation water and different varieties of groundnut on concentration and uptake of macronutrients :

The combine effect between variable RSC levels of irrigation water and groundnut varieties was non-significant with respect to the concentration and uptake of Fe, Mn, Zn and Cu by kernel and haulm, except Mn uptake by kernel was found significant. Significantly the highest interaction effect on uptake of Mn by kernel (0.023 mg plant^{-1}) was recorded with $A_0 \times V_4$ (0 meq L^{-1} × GG-6) treatment combination. The lowest uptake (0.008 mg plant-1) of Mn by kernel was noted with $A_3 \times V_3$ (7.5 meq L^{-1} × GJG-31) treatment combination.

Conclusion :

The RSC level of irrigation water affected chemical composition and uptake of nutrients by kernel and haulm of groundnut. The nutrient concentration and uptake of P, K, Fe, Mn, Zn and Cu by kernel and haulm of groundnut significantly decrease with increasing levels of RSC of irrigation water, except Fe concentration in haulm decrease with increased levels of RSC of irrigation water but result found non-significant. While the N concentration increase with increased levels of RSC of irrigation water. The highest nutrient concentration and uptake of all macro and micronutrients recorded with the groundnut variety TPG-41 and the lowest result with GJG-31 variety of groundnut, but the Fe and Zn concentration in haulm of groundnut variety were found non-significant. The combined effect of RSC levels of irrigation water and groundnut varieties were found significant on N uptake by haulm and Mn uptake by kernel of groundnut.

REFERENCES

Dogra, P. (2016). Effect of FYM and zinc application on soil properties, nutrient availability and yield of barley (*Hordeum vulgare* L.) under Irrigation with different RSC water. Ph.D. Thesis, Sri Karan Narendra Agricultural University, Jobner (Rajasthan) India.

Dubey, S.K., Sinha, A.K. and Yadav, B.R. (1993). Effect of sodic waters and applied phosphorus on uptake of phosphorus and grain yield of green gram. *J. Indian Society of Soil Science*, **41**: 205-209.

Dwivedi, R.S. (1979). *Plant physiology in a decade of Research CSSRI (ICAR) Karnal*. pp. 115.

Jackson, M. L. (1973). *Soil chemical analysis*. Prentice Hall of India Pvt. Ltd., New Delhi, India.

Jakhar, R.K., Yadav, B.L and Kumawat, A. (2013). Productivity and nutrient concentration of fenugreek (*Trigonella foenum graecum* L.) as influenced by different RSC waters and zinc fertilization. *Agriculture for Sustainable Development*, **1**: 111-113.

Koeing, R.A. and Jonhson, C.R. (1942). Calorimetric determination of phosphorus in biological material. *Industrial and Engineering Chemistry, Analytical Edition* , **14** (2): 155-162.

Kumawat, S. R. and Yadav, B.L. (2012). Effect of zinc and vermicompost on fenugreek (*Trigonella foenum graecum* L.) under irrigation with different RSC water. *J. Food Legumes*, **25**(2): 156-158.

Lindsay, W.L. and Norvell, W.A. (1978). Development of a diethylene triamine penta acetate soil test for zinc, iron, manganese and copper. *Soil Science Society of America J.*, **42** (3) : 421-428.

Pathan, A.B.M.B.U., Mazid Miah, M. A., Islam, F. and Hossain, A.B.M. and Islam, M.R. (2007). Mineral nutrition and yield of sesame in the gangas tidal flood plain soil. *Bangladesh J. Agric. Res.*, **32** (3) : 387-391.

Toth, S.J. and Prince, A.L. (1946). Estimation of CEC and exchangeable Ca, K, Na contents of soils by flame photometer technique. *J. Indian Society of Soil Science,* **67**(2): 439-445.