RESEARCH PAPER

ADVANCE RESEARCH JOURNAL OF
C R P
IMPROVEMENT
Volume 6 | Issue 2 | December, 2015 | 166-169
e ISSN-2231-640X

DOI :
10.15740/HAS/ARJCI/6.2/166-169
Visit us: *www.researchjournal.co.in*

Effect of potassium and sulphur on quality parameters of onion and chilli intercrops in a vertisol

■ K.S. POORNIMA*, N. MAMATHA[1] AND H.S. RAMESH[2]

AUTHORS' INFO

Associated Co-author :

[1]Office of Assistant Registrar of Co-operative Societies, Sahakara Bhavan, SHIMOGA (KARNATAKA) INDIA
Email : mamathadavanagere@gmail.com

[2]Department of Veterinary Physiology and Biochemistry, Veterinary College, Vinobhanagar, SHIMOGA (KARNATAKA) INDIA
Email : ramamabhi@gmail.com

Author for correspondence:
K.S. POORNIMA
Fertilizer Control Laboratory, MANDYA (KARNATAKA) INDIA
Email : poornapavana@gmail.com

ABSTRACT : A field experiment was conducted during *Kharif* 2006 on black clay soil to study the effect of potassium and sulphur on onion and chilli intercrops in a vertisol with four levels of potassium (0, 50, 75 and 100 kg K_2O ha^{-1}) and three levels of sulphur (0, 15 and 30 kg S ha^{-1}). Quality parameters of both onion and chilli increased with the individual application of 100 kg K_2O ha^{-1} and 30 kg S ha^{-1}. The quality parameters of onion like pyruvic acid content, total soluble solids and keeping quality and the quality parameters of chilli like total extractable colour and ascorbic acid content were recorded maximum with the combined application of 100 kg K_2O plus 30 kg S ha^{-1}.

KEY WORDS : Quality parameters, Soil sodium, Soil potassium, Bulb, Vertisol, Intercrops

How to cite this paper : Poornima, K.S., Mamatha, N. and Ramesh, H.S. (2015). Effect of potassium and sulphur on quality parameters of onion and chilli intercrops in a vertisol. *Adv. Res. J. Crop Improv.*, **6** (2) : 166-169.

Paper History : **Received :** 08.06.2015; **Revised :** 14.10.2015; **Accepted :** 27.11.2015

Among the major nutrients, potassium and sulphur plays a vital role in plant metabolism and they also considered as a quality element as it improves quality of many vegetable crops including chilli and onion. Potassium improves colour, glossiness and dry matter accumulation besides improving keeping quality of the chilli and onion. Sulphur is also required for the synthesis of allyl propyl disulphide and the capsaicin alkaloids responsible for pungency of onion and chilli, respectively. Intercropping system of onion plus chilli is an age old practices in transitional belt of Dharwad district (Zone 8). To know the effect of these nutrients on quality of both onion and chilli intercrops in a vertisol, this study was undertaken.

RESEARCH PROCEDURE

An experiment was conducted during *Kharif* 2006 under rainfed situation in Main Agricultural Research Station, Dharwad. The soil of the experimental field was black clay soil with a pH of 7.54, organic carbon (5.80 g kg^{-1}), available nitrogen (303.80 kg ha^{-1}), available P (22.00 g ha^{-1}), available K (401.00 kg ha^{-1}) and available sulphur (11.50 mg kg^{-1}). The experiment was laid out in Split Plot Design with four potassium levels (0, 50, 75 and 100 kg K_2O ha^{-1}) and three levels of sulphur (0, 15 and 30 kg S ha^{-1}) and onion var. Bellary red and chilli as Byadagi dabbi was test crops (intercrops). The recommended dose of 100 kg N, 50 kg P_2O_5 and 50 kg K_2O ha^{-1} of onion and sulphur were supplied through factomphos a complex fertilizer (20 : 20 : 0 : 15 kg N, P_2O_5, K_2O and S) and remaining amount of N, P_2O_5 and K_2O were applied through urea, diammonium phosphate and muriate of potash respectively, shallow furrows at a distance of 15 cm were opened using a marker, so as to maintain a row proportion of 4 : 1 (onion : chilli). Chilli

were sown with a row spacing of 75 cm apart and in between the chilli rows, 4 rows of onion were sown with an inter row spacing of 15 cm. All the recommended cultural practices were followed.

Total soluble solids content of onion was tested as brix value with the help of hand held refractometer (0-30). Pungency (pyruvic acid content) was estimated in terms of enzymatically formed pyruvic acid following the method developed by Yov *et al*. (1995). Bulbs were stored in ventilated room at room temperature for 75 days. The per cent loss in weight, sprouting and rotting during storage were recorded and total weight loss was calculated. Ascorbic acid content of green chilli fruits was determined volumetrically by reducing 2, 6-dichlorophenol indophenol dye to get a pink end point (Sadasivam and Manikam, 1992). Total extractable colour of red chilli fruits was estimated by using isopropanol then calculated in ASTA Units (Woodbury, 1977).

RESEARCH ANALYSIS AND REASONING

Total soluble solids content in onion bulb was higher in K_3 treatment (100 kg K_2O ha^{-1}) than control and other potassium levels except K_2 (75 kg K_2O ha^{-1}) which was at par with K_3 (Table 1). This could be ascribed to increased production of carbohydrates during photosynthesis. Similarly total soluble solids in onion bulbs increased with increasing levels of sulphur application. Application of S @ 30 kg ha^{-1} recorded the highest total soluble solids which was at par with the treatments receiving S @ 15 kg ha^{-1}. This might be due to increased synthesis of primary flavour compounds with S containing amino acids whose production increase with increase in S levels. The interaction effects of K and S on total soluble solids of onion was non-significant.

A significantly higher pyruvic acid content in onion was observed with the application of potassium @ 100

Table 1 : Effect of potassium and sulphur on total soluble solids, pyruvic acid and total weight loss of onion bulbs

Potassium levels	Sulphur levels											
	TSS (%)				Pyruvic acid (µ mol/g)				Total weight loss (%)			
	S_0	S_1	S_2	Mean	S_0	S_1	S_2	Mean	S_0	S_1	S_2	Mean
K_0	8.90	9.39	10.05	9.44	0.43	1.67	2.31	1.47	46.07	45.23	44.23	45.17
K_1	9.69	10.38	10.99	10.35	0.70	1.81	2.63	1.71	43.29	42.07	41.28	42.21
K_2	10.59	11.12	11.84	11.18	1.07	2.30	2.93	2.10	40.05	39.12	37.86	39.97
K_3	11.36	11.88	13.04	12.09	1.39	2.61	3.33	2.44	36.93	36.12	34.86	35.97
Mean	10.14	10.69	11.48	10.77	0.90	2.10	2.80	1.97	41.59	40.64	39.57	40.6
	S.E.±		C.D. (P=0.05)		S.E.±		C.D. (P=0.05)		S.E.±		C.D. (P=0.05)	
Potassium	0.27		0.92		0.08		0.28		0.98		2.96	
Sulphur	0.32		0.98		0.07		0.22		0.17		0.51	
Potassium x Sulphur	0.60		NS		0.14		NS		1.22		NS	

K_0-No potassium, K_1-50 kg K_2O/ha, K_2- 75 kg K_2O / ha, K_3- 100 kg K_2O /ha
S_0 –No sulphur, S_1 -15 kg S /ha, S_2 -30 kg S /ha NS – Non significant

Table 2 : Effect of potassium and sulphur on quality parameters of sun dried red chilli fruits

Potassium levels	Sulphur levels							
	Ascorbic acid (mg/100 g) in green chillies				Colour value (ASTA Value)			
	S_0	S_1	S_2	Mean	S_0	S_1	S_2	Mean
K_0	90.85	100.85	115.28	102.33	96.62	109.32	116.63	107.52
K_1	122.6	133.49	145.64	133.91	128.82	140.12	156.22	141.72
K_2	142.79	160.61	178.65	160.68	167.76	180.09	195.68	181.17
K_3	189.68	200.46	206.23	198.79	213.29	225.64	243.42	227.45
Mean	136.48	148.85	161.45	148.92	151.62	163.79	177.99	164.46
	S.E.±		C.D. (P=0.05)		S.E.±		C.D. (P=0.05)	
Potassium	2.76		9.53		2.88		8.93	
Sulphur	2.90		8.68		2.58		7.72	
Potassium x Sulphur	5.47		NS		4.93		NS	

K_0 : No potassium K_1 : 50 kg K_2O / ha K_2 : 75 kg K_2O / ha K_3 : 100 kg K_2O / ha
S_0 : No sulphur S_1 : 15 kg S / ha S_2 : 30 kg S / ha NS=Non-significant

kg ha^{-1} compared to control and other treatments except K_2O @ 75 kg ha^{-1}. Sulphur application @ 30 kg S ha^{-1} significantly increased the pyruvic acid content in onion bulb and the lowest pyruvic acid content was recorded in control where no sulphur was applied. This might be due to increased uptake of S by crop due to its application to soil resulting in the increased synthesis of volatile sulphur compounds and production of more pungency in onion. The interaction effects of K and S was non-significant with respect to pyruvic acid.

Application of potassium significantly reduced the total weight loss of onion bulb during storage. Total weight loss reduced significantly with increased level of potassium (100 kg K_2O ha^{-1}) was 25.57 per cent lower than control. A significantly lower total weight loss of onion bulb was also recorded due to sulphur application. The lowest total weight was observed with the application of 30 kg S ha^{-1} compared to control. The lower total weight loss of onion due to higher levels of K and S was attributed to lower moisture loss from bulbs due to thickening of cell wall and reduced microbial infection. The interaction effects of K and S on keeping quality was non-significant. The results obtained on the present study are in conformity with findings of Hariyappa (2003).

The quality parameters like ascorbic acid content in green chillies increased substantially with the application of different levels of potassium. The highest ascorbic acid (198.79 mg 100 g^{-1}) was recorded in K_3 (100 kg K_2O ha^{-1}) compared to control (102.33 mg 100 g^{-1}) (Table 2). Increase the ascorbic acid with increasing K supply was due to the close relationship between the carbohydrates metabolism and the formation of ascorbic acid. Similar results were also reported by Majumdar *et al*. (2000).

A significantly higher ascorbic acid content in green chillies was also noticed in S_2 levels (30 kg S/ha) over control. Such an increase in ascorbic acid content was attributed to the production of several S containing amino acids such as methionine, cysteine and tryptophan. Similar results were also reported by Thakre *et al*. (2005) in brinjal.

Potassium application @ 100 kg K_2O ha^{-1} significantly increased the total extractable colour of red chilli. The lowest colour value was recorded in control. From the correlation studies it was evident that K uptake was positively and significantly correlated with colour value (r=0.994**). Potassium might have brought equilibrium between acids and sugars in fruits due to increased translocation of photosynthates resulting in good ripening and development of red colour (Subhani *et al*., 1990).

Sulphur application also significantly increased the total extractable colour over control. This might be due to the higher and balanced uptake of nutrients in presence of S resulting in the increased concentration of nutrients in plant. Similar results were also reported by Chandrasekharan (1983) in carrot. The interaction effect of K and S on quality parameters of chilli were non-significant.

The above study indicated that application of 100 kg K_2O ha and sulphur @ 30 kg ha^{-1} are beneficial to obtain higher quality produce of both onion and chilli intercrops in a vertisol. However, combined application of 100 kg K_2O + 30 kg S ha^{-1} is still better to get higher good quality produce of onion and chilli intercrops.

Acknowledgement:

The authors are very much thankful to the Department of Soil Science and Agricultural Chemistry, College of Agriculture, Dharwad, University of Agricultural Sciences, Dharwad for providing the necessary facilities for carrying out this work.

LITERATURE CITED

Chandrasekharan, S. (1983). Effect of application of sulphur and potassium on the yield and quality of radish (*Raphanus sativa* L.) and Carrot (*Dalicus carrota* L.). M.Sc. (Ag.) Thesis. University of Agricultural Sciences, Bangalore, KARNATAKA (INDIA).

Elangovan, M., Suthatirapandian, I. R. and Sayed, M. S. (1982). Intercropping of onion in chilli. *South Indian J. Hort.*, **30** : 48 – 50.

Hariyappa, N. (2003). Effect of potassium and sulphur on growth, yield and quality parameters of onion (*Allium cepa* L.). M. Sc. (Agri.) Thesis, University of Agricultural Sciences, Dharwad, KARNATAKA (INDIA)..

Majumdar, S.D., Meena, R.L. and Baghel, G. D.S. (2000). Effect of levels of compaction and potassium on yield and quality of tomato and chilli crops grown on highly permeable soil. *J. Indian Soc. Soil Sci.*, **48**(2):215–220.

Sadasivam, S. and Manikam, A. (1992). *Biochemical methods for agricultural sciences*, Wiley Eastern Limited, NEW DELHI, pp. 178-192.

Subhani, P. M., Ravishankar, C. and Narayan, N. (1990). Effect of graded level and time of application of N and K_2O on

flowering, fruiting and yield in irrigated chilli. *Indian Cocoa, Arecanut & Spices J.*, **14** : 70 – 73.

Thakre, C.M., Badole, W.P., Tiwari, T.K. and Sarode, P.B. (2005). Effect of different levels of sulphur, phosphorus and potassium on yield and quality of brinjal. *J. Maharashtra Agric. Univ.*, **30**(3) : 352 – 353.

Woodbury, J.E. (1977). Extractable colour of capsicum and oleoresin paprika. *J. Association Official Analytical Chem.*, **60**(1): 1-4.

Yov, K.S., Pike, L.M. and Hamilton, B.K. (1995). A simplified pyruvic acid analysis suitable for onion breeding programs. *Hort. Sci*., **30**(6): 1306.