AJH
eISSN- 0976-724X

THE ASIAN JOURNAL OF HORTICULTURE
Volume **11** | Issue 1 | June, 2016 | 105-108
Visit us -*www.researchjournal.co.in*

RESEARCH PAPER

DOI : 10.15740/HAS/TAJH/11.1/105-108

Article history :
Received : 02.02.2016
Revised : 21.04.2016
Accepted : 01.05.2016

Nutrient uptake pattern in various growth stages of watermelon

■ **J.P. SAJITHA, R.M. VIJAYAKUMAR[1], L. PUGALENDHI[2], D. DURGA DEVI[1] AND JAGADEESWARAN[3]**

ABSTRACT : An experiment was conducted to find the effect of different levels of nutrients through water soluble fertilizers along with Azophosmet and humic acid on nutrient uptake pattern of hybrid watermelon 'Kiran'. Application of 125 per cent of water soluble fertilizers *viz.*, 250:125:125 kg/ha of NPK in addition to Azophosmet and humic acid showed the best performance in almost all the parameters studied in both seasons I and II, as it recorded the highest nitrogen uptake, phosphorus uptake and potassium uptake by plant and it showed an increasing trend from 30th to 75th DAS invariably in all the treatments during both the seasons studied. Control plots showed un-satisfactory results regarding all the parameters.

KEY WORDS : Watermelon, Fertigation and water soluble fertilizer, Azophosmet, Humic acid, Nutrients uptake

HOW TO CITE THIS ARTICLE : Sajitha, J.P., Vijayakumar, R.M., Pugalendhi, L., Devi, D. Durga and Jagadeeswaran (2016). Nutrient uptake pattern in various growth stages of watermelon. *Asian J. Hort.*, **11**(1) : 105-108, **DOI : 10.15740/HAS/TAJH/11.1/105-108.**

Members of the Research Forum

Associated Authors:
[1]Department of Fruit Crop, Horticultural College and Research Institute, Tamil Nadu Agricultural University, COIMBATORE (T.N.) INDIA

[2]Department of Vegetable Crops, Horticultural College and Research Institute, Tamil Nadu Agricultural University, COIMBATORE (T.N.) INDIA

[3]Department of Remote Sensing and GIS, Horticultural College and Research Institute, Tamil Nadu Agricultural University, COIMBATORE (T.N.) INDIA

Author for correspondence :
J.P. SAJITHA
Department of Vegetable Crops, Horticultural College and Research Institute, Tamil Nadu Agricultural University, COIMBATORE (T.N.) INDIA
Email : burserasaji@gmail.com

India is one of the important producers of watermelon in world. Watermelon has been cultivated initially in the Mississippi Valley and widespread generally in arid and semi-arid regions of the world. It is a vegetable with high water content giving the feeling of freshness and containing significant amounts of sugar, vitamin A, B and C and traces of cholesterol and in addition, it is an important source of potassium and many micronutrients (Sundia, 2007) Vegetable crops differ widely in their nutrient requirements and in the pattern of uptake over the growing season. In general, N, P and K uptake follow the same course as the rate of crop biomass accumulation. Fruiting crops such as tomato, pepper and melon require relatively little nutrition until flowering, but nutrient uptake accelerates, peaking during fruit set and early fruit bulking. As fruit mature, macronutrient requirement declines. Fertigation is one such technology where, any water soluble fertilizer or chemical can be applied in precise amounts in synchrony with the plant needs, directly into the root zone of the crop. This not only economizes the water use, but also improves nutrient use efficiency. With this background, an attempt was made to study the effect of different levels of nutrients through water soluble fertilizers on nutrient uptake pattern of watermelon.

RESEARCH METHODS

The experiment was conducted in Coimbatore

district, Tamil Nadu, during 2012-2013. The experiment was laid out in Randomized Block Design (RBD) having 9 treatments, including control and all the treatments were replicated thrice. The plot size of 8x5m was prepared and seeds of watermelon hybrid Kiran were sown on raised ridges at a spacing of 1.8x 0.6m.The nine different treatments tested were T_1 (75% - 150:75:75 NPK kg/ha), T_2 (100% - 200:100:100 NPK kg/ha), T_3 (125% - 250:125:125 NPK kg/ha), T_4 (150% - 300:150:150 NPK kg/ha), T_5 (75% - 150:75:75 NPK kg/ha + Azophosmet + humic acid), T_6 (100% - 200:100:100 NPK kg/ha + Azophosmet + humic acid), T_7 (125% - 250:125:125 NPK kg/ha + Azophosmet + humic acid), T_8 (150% -300:150 : 150 NPK kg/ha + Azophosmet + humic acid) and T_9 (100% RDF through soil application). The water soluble fertilizesr used were poly feed, mono ammonium phosphate and multi-K. In control, urea, single superphosphate and muriate of potash were used. All the fertilizers were given in split doses for 8 weeks. First dose was applied 21 days after sowing, while the remaining dose was applied in weekly interval after the first dose. All other cultural practices were adopted to raise the crop as per recommendation. The data in respect to nutrient uptake pattern in crop growth were recorded at 30th, 45th 60th and 75th day which were then statistically analyzed for the test of significance following the method of Panse and Sukhatme (1978).

RESEARCH FINDINGS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under following heads :

Nitrogen uptake :

Significant differences were noticed among the treatments in relation to nitrogen uptake at all the four stages observed (Table 1). Among the treatment combinations experimented, the highest nitrogen uptake by plant was recorded in T_7 (5.18, 25.86, 68.57 and 79.83 kg ha^{-1} during season I and 5.66, 27.56, 68.85 and 83.46 kg ha^{-1} during season II at 30th, 45th, 60th and 75th DAS, respectively). This was at par with T_8 (4.87, 25.07, 66.24 and 76.57 in season I and 5.45, 26.82, 66.27 and 80.29 kg ha^{-1} in season II at all stages mentioned above). The nitrogen uptake by plants in control was found to be less which recorded 2.75, 13.08, 41.76 and 49.62 kg ha^{-1} in season I and 3.10, 15.04, 42.06 and 51.68 kg ha^{-1} in season II at all stages mentioned above.

Phosphorus uptake :

The analytical data on P uptake recorded at 30th, 45th, 60th and 75th DAS during the two seasons of study was scrutinized (Table 2). Among the treatments T_7 recorded the highest P uptake (0.98, 3.92, 4.51, and 4.78 kg ha^{-1} in season I and 1.04, 3.96, 4.82 and 4.93 kg ha^{-1} in season II at 30th, 45th, 60th and 75th DAS, respectively). This was at par with T_8 (0.93, 3.84, 4.34, 4.58 kg ha^{-1} and 0.98, 3.82, 4.63 and 4.74 kg ha^{-1} in seasons I and II, respectively at all stages mentioned above. The control (T_9) recorded the least performance (0.41, 1.84, 2.38 and 2.33 kg ha^{-1} during season I and 0.44, 2.04, 2.46 and 2.27 kg ha^{-1} during season II at 30th, 45th, 60th and 75th DAS, respectively).

Potassium uptake :

The data recorded on potassium uptake by plant showed an increasing trend from 30th to 75th DAS invariably in all the treatments during both the seasons studied (Table 3). Among the treatments, the T_7 treatment (125 % recommended dose of nutrients along with azophosmet and humic acid) exhibited the highest potassium content at all four stages and seasons invariably (3.93, 20.26, 58.73 and 63.26 kg ha^{-1} in season I and 4.06, 20.38, 61.85 and 64.82 kg ha^{-1} in season II at 30th, 45th, 60th and 75th DAS, respectively). The control recorded the least performance (2.28, 9.43, 34.14 and 38.29 kg ha^{-1} in season I and 2.43, 11.04, 37.43 and 39.08 kg ha^{-1} in seasons I and II at 30th, 45th, 60th and 75th DAS, respectively).

The nutrient uptake which is the product of nutrient concentration and dry matter, increased significantly by drip fertigation levels at all growth stages. Among the treatments, drip fertigation with 125 per cent recommended dose of nutrients as water soluble fertilizer along with azophosmet and humic acid contributed for higher N, P and K uptake the soil application of recommended dose of fertilizers. Higher uptake was the result of significantly higher dry matter production at all the growth stages of crop. Secondly, the increase in uptake might be due to better availability of nutrients in root zone as a result of frequent application of nutrients coupled with better root activity. Further, it might also be due to reduced loss of nutrients primarily because of less leaching in fertigation system compared to soil application of recommended dose of fertilizers. Similar observations of increased uptake as a result of fertigation had been reported earlier by Hebber *et al.* (2005) and

Shyamaa *et al*. (2009).

In general, nutrient uptake was higher after flowering and extended up to harvesting stage. Drip fertigation of 125 per cent recommended dose of nutrients as water soluble fertilizers as water soluble fertilizer increased NPK uptake at all the growth stages as compared to soil application of recommended dose of fertilizers which might be due to greater solubility and mobility of nutrients in active root zone facilitating higher absorption by roots. Water soluble fertilizers are highly soluble in nature and are easily available form as such, the plants are able to absorb the nutrients more efficiently. The present studies corroborate the findings of Vasane *et al*. (1996) who reported significant increase in NPK uptake through fertigation with water soluble fertilizers.

Further the present study, uptake of nitrogen, phosphorus and potassium was found to be high due to inoculation of *Azospirillum* and phosphobacteria along

Table 1 : Influence of different levels of nutrients on nitrogen uptake at different growth stages in watermelon hybrid Kiran

Treatments	Nitrogen uptake (kg ha^{-1})							
	30th day		45th day		60th day		75th day	
	Season I	Season II	Season I	Season II	Season I	Season II	Season I	Season II
T_1	3.14	3.49	15.95	16.35	45.35	45.26	53.84	55.95
T_2	3.50	3.90	17.55	19.07	49.29	49.74	59.75	60.14
T_3	3.89	4.42	19.94	22.16	55.62	56.67	66.45	68.97
T_4	4.49	5.06	22.67	25.28	61.58	63.08	72.61	75.81
T_5	3.52	3.97	18.36	20.13	51.85	52.42	61.47	63.13
T_6	4.14	4.62	21.13	23.22	57.64	58.61	68.26	71.84
T_7	5.18	5.66	25.86	27.56	68.57	68.85	79.83	83.46
T_8	4.87	5.45	25.07	26.82	66.24	66.27	76.57	80.29
T_9	2.75	3.10	13.08	15.04	41.76	42.06	49.62	51.68

Table 2 : Influence of different levels of nutrients on phosphorus uptake at different growth stages in watermelon hybrid Kiran

Treatments	Phosphorus uptake (kg ha^{-1})							
	30th day		45th day		60th day		75th day	
	Season I	Season II	Season I	Season II	Season I	Season II	Season I	Season II
T_1	0.47	0.49	2.18	2.25	2.68	2.69	2.76	2.61
T_2	0.56	0.53	2.51	2.52	2.93	3.11	3.18	3.18
T_3	0.72	0.67	2.98	2.86	3.44	3.67	3.78	3.82
T_4	0.84	0.78	3.38	3.4	3.95	4.21	4.32	4.32
T_5	0.62	0.55	2.61	2.61	3.14	3.28	3.46	3.32
T_6	0.76	0.68	3.09	2.96	3.62	3.87	3.97	3.99
T_7	0.98	1.04	3.92	3.96	4.51	4.82	4.78	4.93
T_8	0.93	0.98	3.84	3.82	4.34	4.63	4.58	4.74
T_9	0.41	0.44	1.84	2.04	2.38	2.46	2.33	2.27

Table 3 : Influence of different levels of nutrients on potassium uptake at different growth stages in watermelon hybrid Kiran

Treatments	Potassium uptake (kg ha^{-1})							
	30th day		45th day		60th day		75th day	
	Season I	Season II	Season I	Season II	Season I	Season II	Season I	Season II
T_1	2.48	2.72	11.02	12.82	36.62	40.14	42.46	41.74
T_2	2.65	2.91	12.04	14.38	42.28	43.84	47.02	46.27
T_3	3.02	3.31	15.89	16.67	47.97	50.48	52.43	53.58
T_4	3.42	3.72	18.42	18.56	53.16	56.13	58.21	59.42
T_5	2.76	3.02	13.18	15.03	43.92	46.23	48.87	48.68
T_6	3.16	3.41	16.45	17.25	49.84	52.79	54.12	55.94
T_7	3.93	4.06	20.26	20.38	58.73	61.85	63.26	64.82
T_8	3.78	3.92	19.67	19.72	56.78	59.57	61.09	62.56
T_9	2.28	2.43	9.43	11.04	34.14	37.43	38.29	39.08

with 125 per cent recommended dose of nutrients as water soluble fertilizers and humic acid. *Azospirillum* inoculation would have promoted the availability of ions in the soil by helping to scavenge the limiting nutrients (Lin *et al*., 1993). The results showed that *Azospirillum* improved the nitrogen availability in the rhizosphere and thereby facilitated better uptake of nitrogen as reported earlier in bhendi (Subbiah, 1991) and chilli and bellary onion (Subbiah, 1994).

Phosphobacteria dissolve insoluble phosphotic compounds present in soil and make them available to plants (Subba Rao, 1982). Further, increased dry matter production in the treatment resulted in higher uptake of phosphorus. Increased uptake of P due to phosphobacteria encloses in the present study confirmed the earlier findings of Kundu and Gaur (1980) and Gaur (1985) in potato and Samuel (1984) in chilli, brinjal and bitter gourd.

In general, nutrient uptake was higher after flowering, which extended up to 30 days. Fertigation with 125 per cent recommended dose of nutrients as water soluble fertilizers along with Azophosmet and humic acid increased NPK uptake compared to straight fertilizers due to greater solubility and mobility of nutrients in active root zone facilitating higher absorption by roots. The positive influence of fertigation on growth and yield might be the result of higher nutrient uptake by the fertigated crop. The mechanism causing higher uptake through drip fertigation may perhaps be the combined influence of optimal soil moisture availability in the root zone and reduction in loss of applied nutrients due to application of small quantities in regular intervals to match crop uptake. The present results corroborate was the findings of Hebber *et al*. (2004) who also reported significant improvement in root growth and NPK uptake through fertigation with water soluble fertilizers.

REFERENCES

Gaur, A.C. (1985). Phosphate solubilizing micro organisms and their role in plant growth and crop yields. Proc. National Symbosium on soil Biology, Hissar, pp.125-133.

Hebber, S.S., Ramachandrappa, B.K., Nanjappa, H.V. and Prabhakar, M. (2004). Studies on NPK determined by nuclear and traditional techniques. *Nutr. Cycl. Agroecosyst.*, **68** : 1-11.

Hebber, S.S., Ramachandrappa, B.K., Nanjappa, H.V. and Prabhakar, M. (2005). Studies on NPK drip fertigationin in tomato. *European J. Agron*., **23** : 1-11.

Kundu, B.S. and Gaur, A.C. (1980). Effect of phosphobacteria on the yield and phosphate uptake of potato crop. *Curr. Sci.*, **49** : 159.

Lin, W.Y., Okon, Y. and Harely, R.W.F. (1993). Enhanced mineral uptake by *Zea mays* and *Sorghum bicolor* roots inoculated with *Azospirillum brasilense*. *Appl. Environ. Microbiol. Fertil. Soils*, **4** : 103-108.

Panse, V.G. and Sukhatme, P.V. (1978). *Statistical methods for agricultural workers*, II Edn. ICAR, New Delhi. pp.134-192.

Samuel, G.M. (1984). Interaction between VAM and phosphobacteria in certain vegetable crop plnats. M.Sc. (Ag.) Thesis, Tamil Nadu Agriculture University, Coimbatore, T.N. (INDIA).

Shyamaa, I.S., Sahar, M.Z. and Yassen, A.A. (2009). Effect of method and rate of fertilizer application under drip irrigation on yield and nutrient uptake by tomato. *Ocean J. Appl. Sci.*, **2** (2) : 130-147.

Subba-Rao, N.S. (1982). Response of crops to *Azospirillum* inoculants in India. In: *Associative N fixation* Vol.1. (ed.P.B. Vose and A.P. Ruschel) pp. 137-143. CKC Press, Boca Raton, F. L.

Subbiah, K. (1991). Studies on the effect of nitrogen and *Azospirillum* on okra. *South Indian J. Hort.*, **39** (1) : 37-44.

Subbiah, K. (1994). Effect of N, P and biofertilizers on yield and nutrient utake in chilli and bellary onion. *Madras Agric. J.*, **81**(5) : 227-279.

Sundia (2007). Watermelon production and consumption demographics. Sundra Corp, pp: 35-40.

Vasane, S.R., Bhoi, P.F. and Tumbare, A.D. (1996). Effect of liquid fertilizer through drip irrigation on yield and NPK uptake of tomato. *J. Maharastra agric. Univ.*, **21**(3): 488-489.