International Journal of Plant & Soil Science

Volume 36, Issue 11, Page 173-185, 2024; Article no.IJPSS.126709
ISSN: 2320-7035

Nutrient Uptake and Soil Nutrient Status as Influenced by Drip Fertigation Levels and Schedules in Broccoli

Prakash Kanwar [a++*], A.M. Sonkamble [a#] and Somendra Meena [b++]

[a] Department of Vegetable Science, Dr. P.D.K.V, Akola, Maharashtra, India.
[b] Department of Fruit Science, Dr. P.D.K.V, Akola, Maharashtra, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.9734/ijpss/2024/v36i115132

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here:
https://www.sdiarticle5.com/review-history/126709

Original Research Article

Received: 07/09/2024
Accepted: 09/11/2024
Published: 13/11/2024

ABSTRACT

The experiment was carried out to study the effect of fertigation levels and schedules on growth and yield of broccoli (*Brassica oleracea var italica*) during the rabi season of 2021-22 involving 4 levels of fertilizer (75, 100 and 125 % RDF) along with one control (100 % RDF) through soil application and three fertigation scheduling (S_1, S_2 and S_3) with three replications. The result of study revealed that higher fertigation of broccoli with balanced nutrition; better water and nutrient utilization gave significantly higher plant growth and yield and good quality of broccoli. In general, pooled mean revealed that application of 125 % RDF with fertigation schedule S_2 :15 % NPK at transplanting to

---

[++] *Ph.D. Scholar;*
[#] *Head & Professor;*
**Corresponding author: E-mail: manpriyanshi@gmail.com;*

Cite as: *Kanwar, Prakash, A.M. Sonkamble, and Somendra Meena. 2024. "Nutrient Uptake and Soil Nutrient Status As Influenced by Drip Fertigation Levels and Schedules in Broccoli". International Journal of Plant & Soil Science 36 (11):173-85. https://doi.org/10.9734/ijpss/2024/v36i115132.*

plant establishment, 1-10 DAT, 50 % NPK at curd initiation stage,11-35 DAT and 35 % NPK at curd development stage, 36-60 DAT recorded maximum NPK uptake in plant (kg/ha) and available NPK in soil (kg/ha).

Keywords: Broccoli; fertigation schedules; soil nutrient; nutrient uptake.

1. INTRODUCTION

Broccoli is a member of the Brassicaceae plant family. It is packed with nutrients and vitamins and is sometimes even called a superfood (Bhoutekar *et al*., 2017). A major portion of broccoli consumption is only in the metros. When it comes to rural India (Kale *et a*l., 2019), it is seldom consumed. Broccoli is known as the "Crown of Jewel Nutrition" as it is rich in vitamins and minerals (Singh et al., 2020), (Rawat et al 2023). It is one of the most nutritious cole crops and contains vitamin A (130 times and 22 times higher than cauliflower and cabbage, respectively), thiamin, riboflavin, niacin, vitamin C and minerals like Ca, P, K and Fe (Kumar and Sahu 2013). Eating large portion may also have additional benefits, since broccoli is also a rich source of many vitamins and minerals such as vitamin A and C, carotenoides, fiber, calcium and folic acid Assinapol *et a*l., 2017**.** Consumption of broccoli in daily diet minimizes the incidence of various types of cancers in human beings. In India, it is mainly grown in hilly areas of Himachal Pradesh, Uttarakhand and Jammu & Kashmir, Tamilnadu and Northern plains (Amala *et al*., 2016).

Broccoli requires an adequate supply of soil moisture to produce maximum yields of good quality (Baby *et al*., 2022). Earlier studies have shown that drip irrigation is the most suitable method of irrigation for vegetable crops, and it is possible to increase water use efficiency (WUE) by well scheduled irrigation programs, such as broccoli. Due to water scarcity, the available water resources should be very effectively utilized through water saving irrigation technologies (Agrawal *et a.,l* 2018). Fertigation facilitates a variety of benefits to the users like high crop productivity, resource use efficiency, environmental safety, flexibility in field operations, effective weed management and successful crop cultivation in fields with undulating topography. Regular and unbalanced use of chemical fertilizers leads in the end to a decrease in the base saturation and to acidification of soil. Hence, judicious use of fertilizers needs to be addressed. Fertigation scheduling is a critical management input to ensure optimum soil nutrients status for proper plant growth and development as well as for optimum yield and economic benefits. Appropriate fertigation scheduling is to increase fertilizer efficiencies by applying the balance amount of fertilizer needed to replenish the soil nutrients to desire level, saves nutrients resources and energy (Hari e*t al*., 2018). Therefore, it is important to develop fertigation scheduling techniques under prevailing climatic conditions in order to utilize scare nutrients resources effectively for crop production (Joshi *et al*., 2015).

2. MATERIALS AND METHODS

Field experiment: The present experiment was carried out at Instructional farm, Dr. P.D.K.V, Akola, Maharashtra, India and Agriculture Training School, Buldhana during winter Season of 2021-22. Akola is situated in the subtropical. The climate of the place is semi-arid and is characterized by three distinct seasons viz., hot and dry summer from March to May, warm and rainy monsoon from June to October and mild winter from November to February and Buldhana district lie between 19°51 to 21°17 North latitudes and 76°38 to 76°40 east longitudes. It is surrounded by Satpuda mountain ranges. The climate of the district is hot and humid. In some parts of the districts *i.e.* khamgaon, Jalgaon (Jamod) and Shegaon area the climate is very hot in summer, which reaches to 42° C in the month of May and is much cold in winter during the month of December which come down to 8°C to 10°C. Buldhana district falls in the rainfall zone between 700-800 mm per annum.

The experiment was laid out in split plot design. The first factor was different NPK fertigation levels (4) denoted by F whereas the second factor was scheduling of NPK fertigation throughout the growth period denoted by S.

Factor A – Fertigation levels: (Main Plot factor)

1. F_1: 100% RDF (100: 50 : 50 NPK Kg ha^{-1}) – through conventional method
2. F_2: 75% RDF (75: 37: 37 NPK Kg ha^{-1})
3. F_3: 100% RDF (100: 50: 50 NPK Kg h^{-1})
4. F_4: 125% RDF (125: 62.5: 62.5 NPK Kg ha^{-1})

List 1. Factor B – Fertigation Schedules: 03 (Sub plot factor) – 12 splits at 5 days interval

Sr. No.	Fertigation Schedules	Transplanting to plant establishment (1-10 DAT)	Curd initiation stage (11-35 DAT)	Curd development stage (36-60 DAT)
1	Schedule-1	10% NPK	40% NPK	50%NPK
2	Schedule-2	15% NPK	50% NPK	35%NPK
3	Schedule-3	20% NPK	45%NPK	35%NPK

Four week old seedlings of broccoli cv. Palam samridhi were transplanted in second week of October in the plot size 450m^2 in the experimental season. Transplanting was done in the early morning hours. Light irrigation was applied just after the transplanting and the gap filling was done seven days after transplanting.

Statistical Analysis: The data on various parameters collected from the experiment were statistically analysed by analysis of variance (ANOVA) for split plot design. Critical difference was worked out at five per cent probability level when the treatment differences were found significant and the values were furnished. The treatment differences that were not significant were denoted by non- significant.

3. RESULTS AND DISCUSSION

3.1 Plant Uptake

3.1.1 Effect of fertigation levels and schedules on NPK uptake in plant

The data regarding NPK uptake (Kg/ha) of broccoli (Table 1) and (Figs. 1, 2 and 3) was significantly influenced by the fertigation level. The data clearly indicated that, the maximum NPK uptake (kg/ha) of broccoli was found (107.08 kg, 22.44 kg and 85.31 kg) in the fertigation level F_4 (125 % of RDF) and similarly the minimum NPK uptake (kg/ha) (77.52 kg, 17.62 kg and 69.74 kg) was found in the F_1 (100 % RDF- through soil application).The higher NPK uptake (kg/ha) by plant with fertigation at 125 per cent of RDF was the result of significantly higher dry matter production. Besides higher NPK uptake (kg/ha) at higher fertigation level might be due to increased availability of NPK in soil with higher rate of application and reduction in losses through leaching and volatilization which ultimately increases the NPK uptake in plant. These results are in confirmation with the findings of Singh et al*.* (2017) in tomato and Murthy et al. (2020) in ridge gourd.

The data presented in Table 1 and depicted in (Figs. 4, 5 and 6) revealed that, NPK uptake (kg/ha) in plant of broccoli was influenced due to different fertigation schedules and was increased significantly at all the growth stages days after transplanting at both the locations of experimentation. The data clearly indicated that, the maximum nutrient uptake (kg/ha) of broccoli was found (92.69 kg, 20.48 kg and 78.51 kg) in the fertigation level schedule S_2 and similarly the minimum NPK uptake (kg/ha) (77.32 kg, 17.56 kg and 68.47 kg) was found in the S_1. Higher uptake of nitrogen observed under scheduling S_2 could be attributed to the increased dry matter production which could be due to balanced application of nutrients particularly phosphorus at the head initiation and development stage which imposed the synergistic effect on other nutrients like nitrogen and potassium and increased its uptake by the plant. These results are in agreement with Venkadeswaram and Sundaram (2016) in okra, Nikzad et al (2020) in cabbage, Murthy et al. (2020) in ridge gourd and Rani et al*.* (2020) in onion, Verma et al (2020) in cauliflower.

The data regarding NPK uptake in plant (Kg/ha) of broccoli at was significantly influenced by both the fertigation level and schedules. The data clearly indicated that, the maximum interaction effect of broccoli (119.71 kg, 24.28 kg and 91.99 kg) was found in the fertigation level F_4 with schedule S_2 (F_4S_2) and minimum interaction effect (74.96 kg, 16.27kg and 66.66 kg) was found in fertigation level F_1 with schedule S_1 (F_1S_1). Higher uptake of NPK 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. The recommended dose of NPK was applied in more number of splits along with irrigation water created favourable conditions for uptake of nutrients by the plant. These results are in confirmation with the results of Singh et al*.* (2022) In cucumber, Patil et al (2016) in cucumber.

Table 1. Effect of fertigation levels and schedules on NPK uptake in plant of broccoli

Treatments	Akola				Buldhana				Pooled			
	Nitrogen (Kg/ha)				Nitrogen (Kg/ha)				Pooled			
Fertigation levels	**S1**	**S2**	**S3**	**Mean**	**S1**	**S2**	**S3**	**Mean**	**S1**	**S2**	**S3**	**Mean**
F1	76.85	75.97	81.11	77.97	73.96	80.75	76.45	77.05	74.96	80.93	76.65	77.52
F2	59.16	63.61	63.02	61.93	56.76	60.89	60.60	59.42	57.96	62.26	61.81	60.68
F3	82.07	105.13	86.36	91.18	74.61	108.57	78.44	87.20	76.76	107.89	80.26	88.30
F4	100.68	122.04	104.56	109.09	99.21	112.67	102.29	104.72	99.60	119.71	101.95	107.08
Mean	79.69	91.68	83.76		76.13	90.72	79.44		77.32	92.69	80.16	
F-test	79.69	91.68	83.76		76.13	90.72	79.44		77.32	92.69	80.16	
SE(m)±	A	B	AXB		A	B	AXB		A	B	AXB	
CD at 5 %	Sig	Sig	Sig		Sig	Sig	Sig		Sig	Sig	Sig	
	Phosphorus (Kg/ha)				Phosphorus (Kg/ha)				Pooled			
Fertigation levels	**S1**	**S2**	**S3**	**Mean**	**S1**	**S2**	**S3**	**Mean**	**S1**	**S2**	**S3**	**Mean**
F1	16.88	19.57	17.86	18.10	15.67	18.73	17.01	17.13	16.27	19.15	17.43	17.62
F2	14.32	16.43	15.69	15.48	13.46	16.29	14.80	14.85	13.89	16.36	15.24	15.17
F3	19.25	23.45	19.81	20.83	17.06	22.01	20.39	19.82	18.15	22.13	20.10	20.12
F4	22.24	25.67	23.56	23.82	20.37	22.88	20.02	21.09	21.91	24.28	21.13	22.44
Mean	18.17	21.28	19.23		16.64	19.97	18.05		17.56	20.48	18.47	
F-test	A	B	AXB		A	B	AXB		A	B	AXB	
SE(m)±	Sig	Sig	Sig		Sig	Sig	Sig		Sig	Sig	Sig	
CD at 5 %	0.42	0.40	0.78		0.31	0.39	0.71		0.31	0.28	0.55	
	Potassium (Kg/ha)				Potassium (Kg/ha)				Pooled			
Fertigation levels	**S1**	**S2**	**S3**	**Mean**	**S1**	**S2**	**S3**	**Mean**	**S1**	**S2**	**S3**	**Mean**
F1	68.04	73.77	70.95	70.92	65.29	71.56	68.83	68.56	66.66	72.67	69.89	69.74
F2	58.11	62.02	61.17	60.43	55.49	59.41	59.04	57.98	56.80	60.71	60.10	59.21
F3	74.20	89.06	78.30	80.52	70.30	88.28	74.51	77.69	72.25	88.67	76.41	79.11
F4	79.53	93.82	87.89	87.08	76.87	90.16	83.59	83.54	78.20	91.99	85.74	85.31
Mean	69.97	79.66	74.57		66.98	77.35	71.49		68.47	78.51	73.28	
F-test	A	B	AXB		A	B	AXB		A	B	AXB	
SE(m)±	Sig	Sig	Sig		Sig	Sig	Sig		Sig	Sig	Sig	
CD at 5 %	0.74	0.91	1.66		1.07	1.08	2.05		0.66	0.77	1.42	

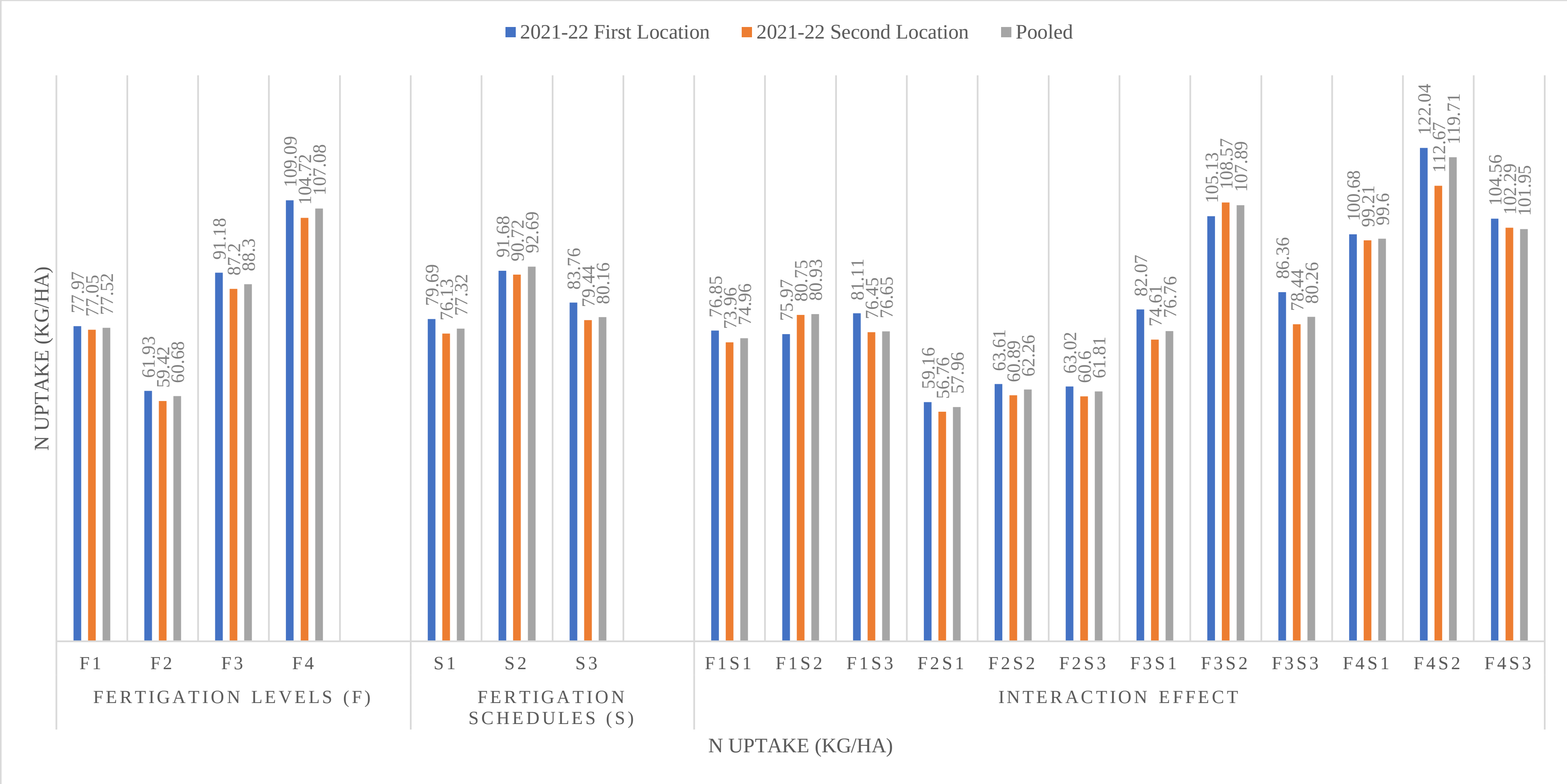

Fig. 1. Effect of fertigation levels and schedules on nitrogen (N) uptake in broccoli plant (kg/ha)

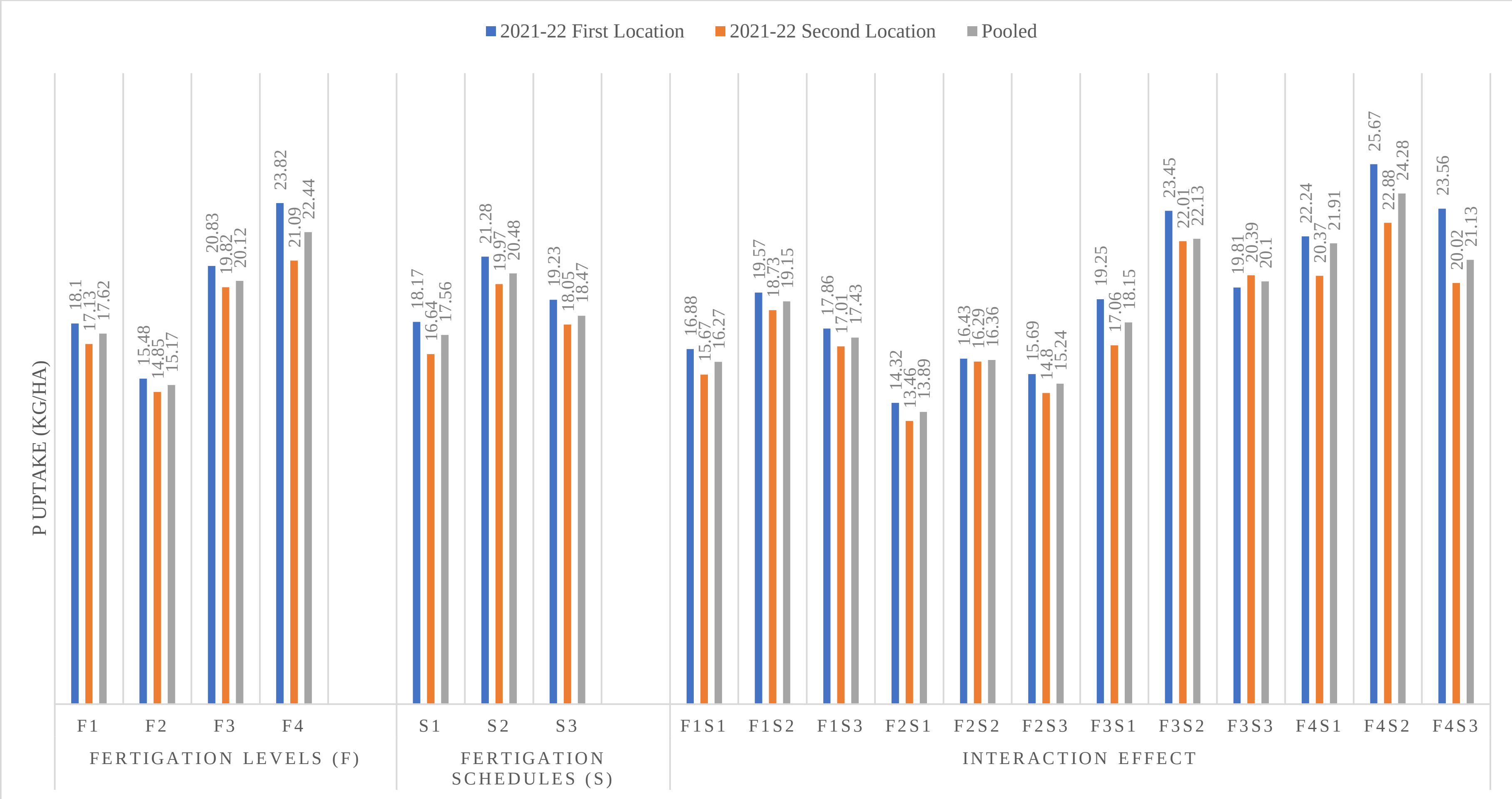

Fig. 2. Effect of fertigation levels and schedules on phosphorus (P) uptake in broccoli plant (kg/ha)

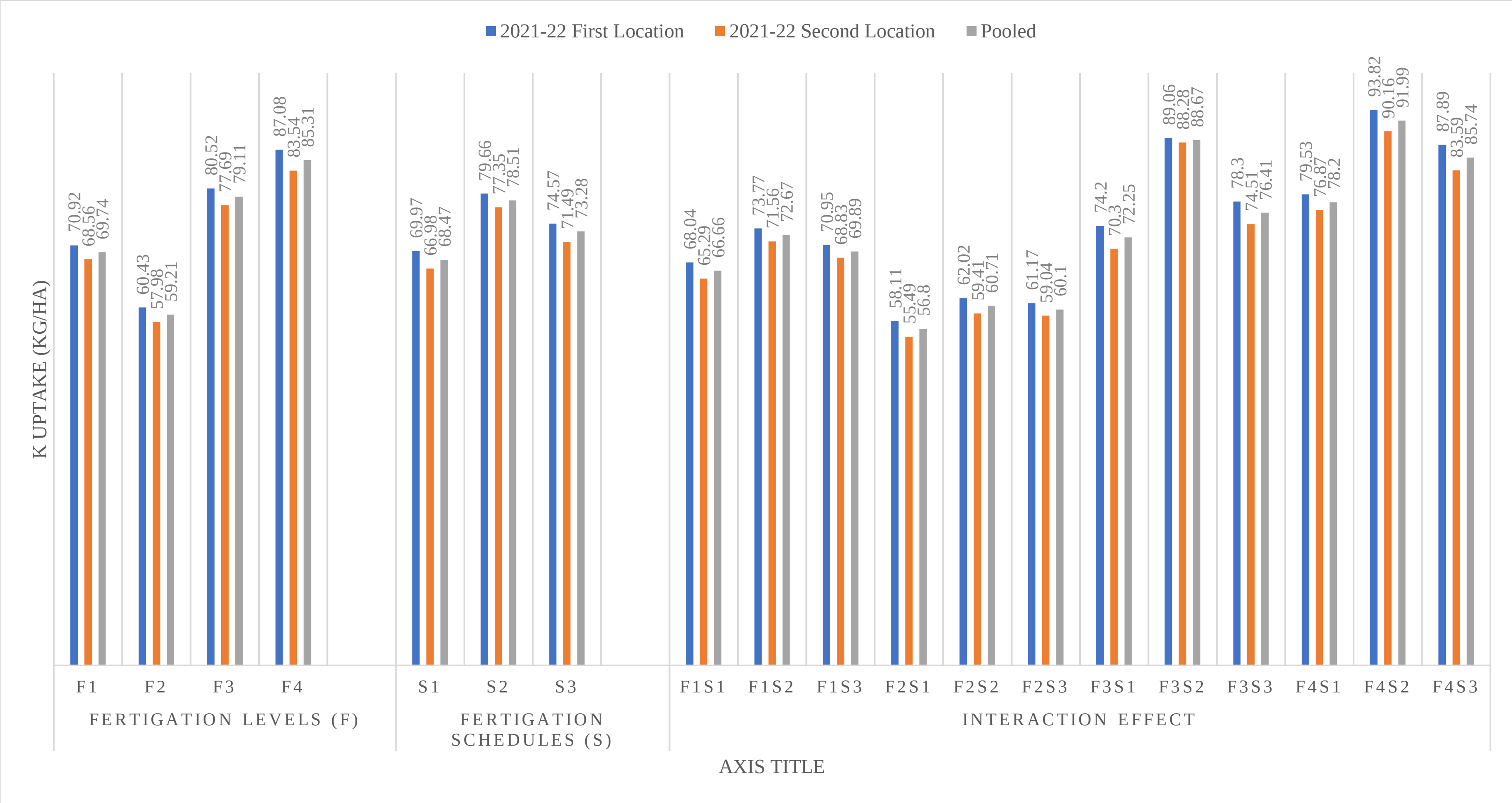

Fig. 3. Effect of fertigation levels and schedules on Potassium (K) uptake in plant (kg/ha)

Table 2. Effect of fertigation levels and schedules on available NPK in soil (Kg/ha) Treatments

	2021-22				2021-22				Pooled			
	Available N (kg/ha)				Available N (kg/ha)				Pooled			
Fertigation levels	**S1**	**S2**	**S3**	**Mean**	**S1**	**S2**	**S3**	**Mean**	**S1**	**S2**	**S3**	**Mean**
F1		242.52	229.97	231.37	179.80	200.70	183.98	188.16	200.70	221.61	206.98	209.76
F2	217.43	238.34	225.79	227.18	175.62	196.52	183.98	185.37	196.52	217.43	204.88	206.28
F3	225.79	238.34	234.15	232.76	183.98	203.56	188.16	191.90	204.89	221.61	211.16	212.55
F4	234.16	246.70	238.33	239.73	192.34	204.88	196.52	197.92	213.25	225.79	217.43	218.82
Mean	224.75	241.47	232.06		182.93	201.41	188.16		203.84	221.61	210.11	
F-test	A	B	AXB		A	B	AXB		A	B	AXB	
SE(m)±	Sig	Sig	Sig		Sig	Sig	Sig		Sig	Sig	Sig	
CD at 5 %	4.41	5.57	8.63		4.90	5.50	8.48		3.55	4.05	7.52	
	Available P (kg/ha)				Available P (kg/ha)				Pooled			
Fertigation levels	**S1**	**S2**	**S3**	**Mean**	**S1**	**S2**	**S3**	**Mean**	**S1**	**S2**	**S3**	**Mean**
F1	26.77	29.70	27.54	28.00	21.60	23.92	22.18	22.57	24.15	26.43	24.10	24.89
F2	25.39	29.08	26.16	26.88	20.88	22.62	21.31	21.60	23.83	26.16	24.43	24.80
F3	27.24	31.70	28.47	29.13	22.91	24.50	22.04	23.15	24.42	28.26	25.33	26.00
F4	30.47	32.01	29.39	30.62	23.34	25.08	23.78	24.06	26.91	28.39	27.35	27.55
Mean	27.47	30.62	27.89		22.18	24.03	22.32		24.83	27.31	25.30	
F-test	A	B	AXB		A	B	AXB		A	B	AXB	
SE(m)±	Sig	Sig	Sig		Sig	Sig	Sig		Sig	Sig	Sig	
CD at 5 %	0.40	0.58	1.03		0.44	0.72	1.72		0.15	0.49	0.81	
	Available K (kg/ha)				Available K (kg/ha)				Pooled			
Fertigation levels	**S1**	**S2**	**S3**	**Mean**	**S1**	**S2**	**S3**	**Mean**	**S1**	**S2**	**S3**	**Mean**
F1	355.00	360.30	355.45	356.92	294.45	301.50	297.10	297.68	324.73	330.90	326.27	327.30
F2	350.37	358.89	354.70	354.65	292.13	301.95	291.61	295.23	321.25	330.42	323.16	324.95
F3	355.38	365.27	358.03	359.56	295.60	304.90	300.49	300.33	325.49	335.09	329.26	329.95
F4	358.40	368.41	361.98	362.93	295.38	305.20	301.20	300.60	326.89	336.80	331.59	331.76
Mean	354.79	363.22	357.54		294.39	303.39	297.60		324.59	333.30	327.57	
F-test	A	B	AXB		A	B	AXB		A	B	AXB	
SE(m)±	Sig	Sig	Sig		Sig	Sig	Sig		Sig	Sig	Sig	
CD at 5 %	3.22	4.03	7.32		2.45	4.18	7.25		1.75	3.45	5.91	

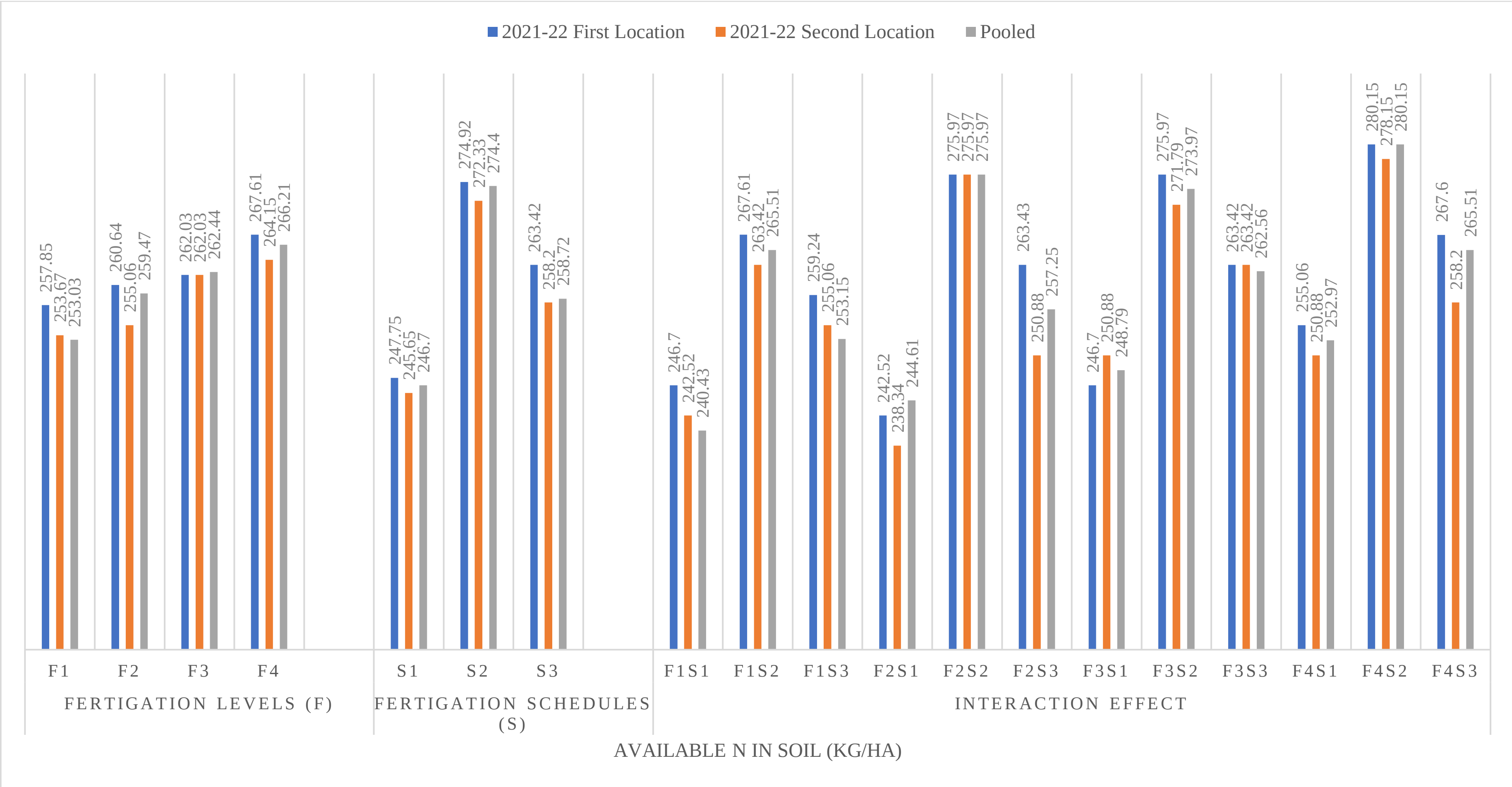

Fig. 4. Effect of fertigation levels and schedules on available N in soil (Kg/ha)

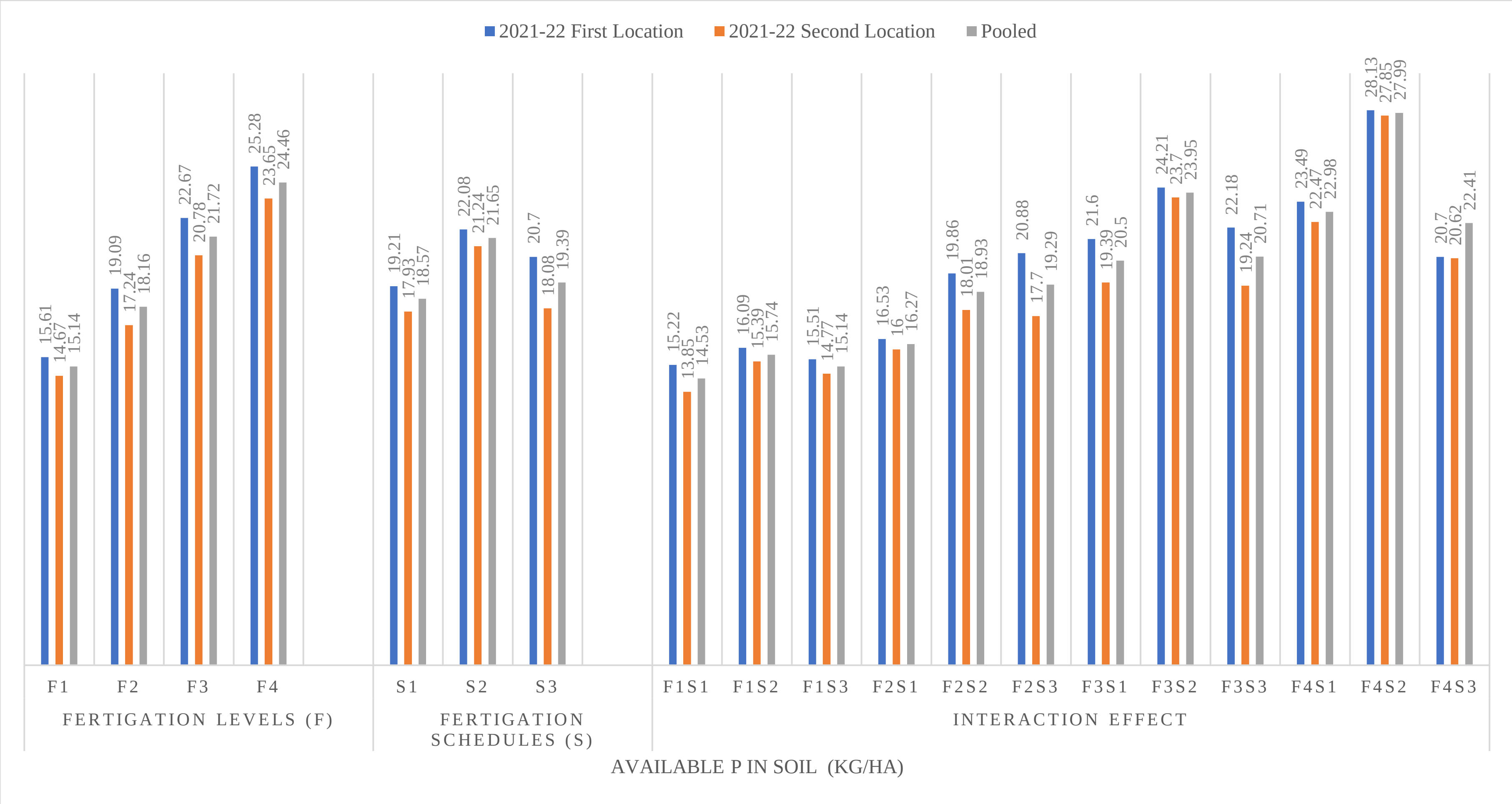

Fig. 5. Effect of fertigation levels and schedules on available P in soil (Kg/ha)

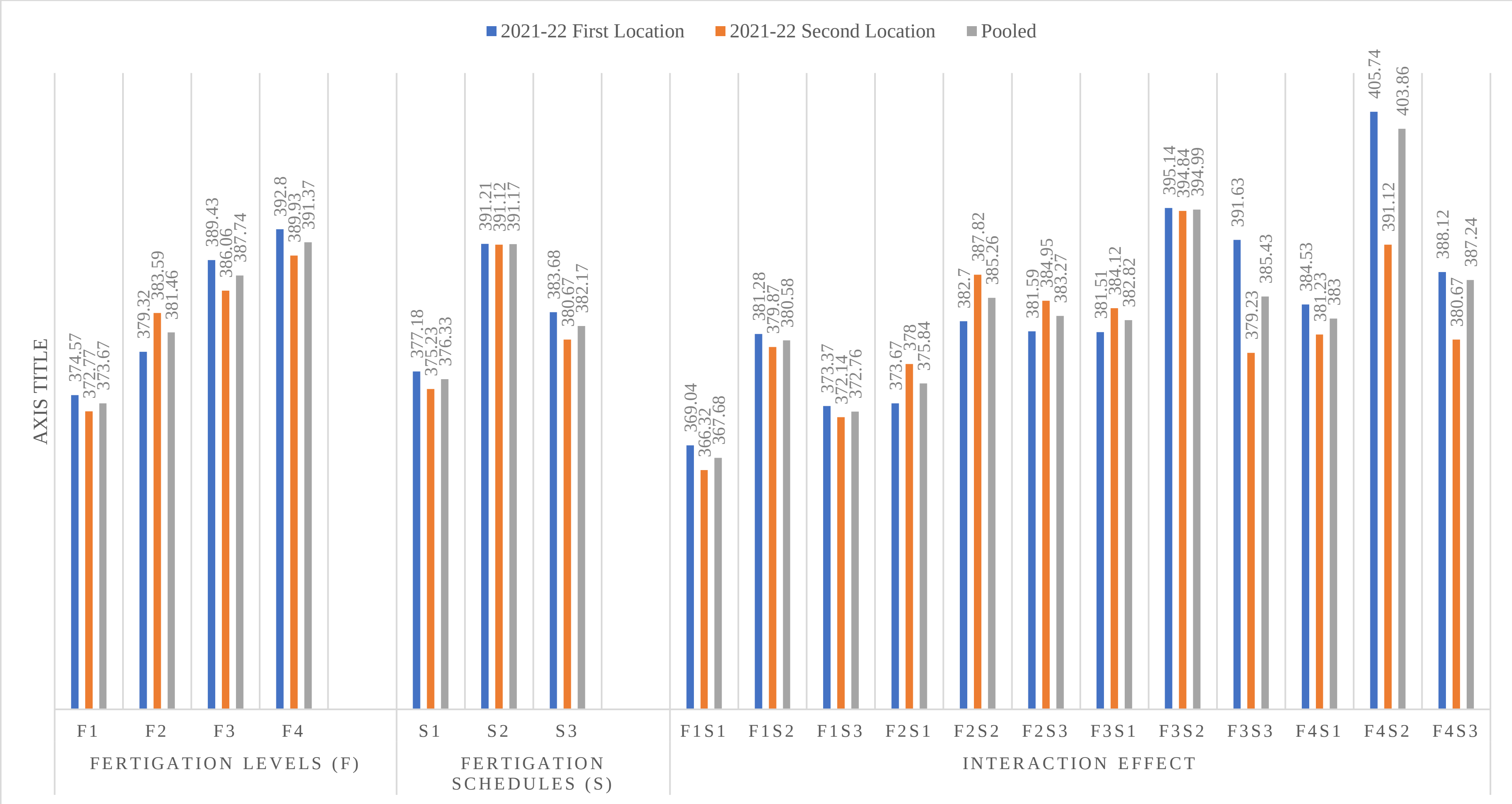

Fig. 6. Effect of fertigation levels and schedules on available K in soil (Kg/ha)

3.1.2 Effect of fertigation levels and schedules on available NPK in soil

The data regarding available NPK (Kg/ha) in soil (Table 2) and (Figs. 4, 5 and 6) was significantly influenced by the fertigation level. The data clearly indicated that, the maximum available NPK (kg/ha) in soil was found (218.82 kg, 27.55 kg and 331.76 kg) in the fertigation level F_4 (125 % of RDF) and similarly the minimum available NPK (kg/ha) in soil (209.76 kg, 24.89 kg and 327.30 kg) was found in the F_1 (100 % RDF- through soil application). Significantly higher available NPK in soil under fertigation treatments as compared to soil application of fertilizers may be due to the lower solubility of nutrients and application of frequent and small fraction applied through drip system directly at the root zone which minimizes the leaching losses and fixation of nutrients. Under traditional method of fertilizer application most of the applied nutrients is either fixed in soil profile or subjected to leaching losses due to flooding method of irrigation. These results are also in consonance with those of Kamble and Kathmale (2015) in onion, Mane et al*.* (2015) in tomato, Murthy et al. (2020) in ridge gourd and Kumar et al. (2022) in bottle gourd.

The data presented in Table 2 and depicted in (Figs. 4, 5 and 6) revealed that, available NPK in soil of broccoli was influenced due to different fertigation schedules and was increased significantly at all the growth stages days after transplanting at both the locations of experimentation. The data clearly indicated that, the maximum available NPK (kg/ha) in soil was found (221.61 kg, 27.31 kg and 333.30 kg) in the fertigation schedule S_2 and similarly the minimum available NPK in soil (kg/ha), (203.84 kg, 24.83 kg and 324.59 kg) was found in the S_1. Available NPK in soil after harvesting found maximum in schedule S_2 as compared to S_1 and S_3. Fertigation treatment increased the available NPK by compared to control in first and second year, respectively.

The data regarding available NPK (Kg/ha) in soil of broccoli presented in Table 2 and (Figs. 4, 5 and 6) was significantly influenced by both the fertigation level and schedules. The data clearly indicated that, the maximum interaction effect of available NPK (kg/ha) in soil (225.79 kg, 28.39 kg and 336.80 kg) found in the fertigation level F_4 with schedule S_2 (F_4S_2) and minimum available NPK in soil (kg/ha) (200.70 kg, 24.15 kg and 324.73 kg) was found in F_1S_1. Higher uptake of NPK 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. The recommended dose of NPK was applied in more number of splits along with irrigation water created favourable conditions for uptake of nutrients by the plant. These results are in confirmation with the results of Singh et al*.* (2022) In cucumber.

4. CONCLUSION

This study has shown that fertigation treatments increased the NPK uptake of plant (kg/ha) and available NPK in soil (kg/ha) over conventional method of fertilization. As far as NPK uptake (kg/ha) and available NPK in soil (kg/ha) is concerned fertigation 125 % of RDF through scheduling S_2 was the best with respect to NPK uptake (kg/ha) and available NPK (kg/ha) in soil. Based on the overall performance, it could be concluded that at Akola conditions of Maharashtra, fertigation of broccoli at 125: 62.5:62.5 kg N, P_2O_5 and K_2O per ha through scheduling S_2 -10 % NPK at (Transplanting to plant establishment, 1-10 DAT),45 % NPK at (Curd initiation stage,11-36 DAT) and 40 % at (Curd development stage, 36 to 60 DAT, respectively) is the best and most economical for cultivation of broccoli. Hence, the same is recommended for commercial cultivation.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

Agrawal N, Tamrakar SK, Tiwari RB. Impact of Fertigation through Drip on the Cultivation of Tomato. *Int J Curr Microbiol Appl Sci*; c2018. Special Issue-7:4528-4535.

Amala J, Syriac EK. Standardization of fertigation schedule for tomato (*Solanum lycopersicum* L) under open precision farming. J Crop Weed. 2016;12(2):82-85.

Assinapol N, Praneetha S, Rajasree V. Performance of grafted brinjal (*Solanum melongena* L.) under different spacing and fertigation levels. *J Pharmacogn Phytochem*. 2017;6(2):307-311.

Baby M, Krishna GM, Kumar HVH, Raju JT. Effect of different fertigation levels on growth and yield parameters of onion crop in Red loamy soils Anantapuramu District. Ecol Environ Conserv, 2022, 28(i06s.025).

Bhoutekar S, Saikia L, Gogoi B, Chack C. Fertigation level and mulching in Cauliflower (*Brassica oleracea* L. Var. Botrytis) cv. Snowball White. *Int J Agric Sci*. 2017;9.21:4226-4228.

Hari AA, Girija DL. Studies on fertigation in bitter gourd (*Momordica charantia* L.). J Crop Weed. 2016;12(2):91-95.

Joshi YK, Mittal HK, Bhakar SR, Lakhawat SS. Irrigation and fertigation study under gravity fed drip irrigation for okra (*Abelmoschus esculentus*) crop. *Indian J Agric Sci*. 2015;8(18):112-113.

Kale KD, Pawar D, Shinde MG. Effect of fertigation on yield, water use, economics and storability of onion (*Allium cepa*) cultivated in Inceptisols. J Agroped; c2019. DOI: 10.47114/Journal of agroped.dec7.

Kamble B.M., and Kathmale D.K. 2015. Effect of different levels of customized fertilizer on soil nutrient availability, yield and economics of onion. *Journal of Applied and Natural Science* 7 (2) : 817 – 821.

Kumar, P. and Sahu, R.L. 2013. Effect of irrigation and fertigation levels on cabbage. *An Asian Journal of Soil Science.* 8.2: 270-274.

Kumar P., Hadole S.S., Ramteke P.R. and Bharti P. 2022. Effect of fertigation and foliar spray of nutrients on soil fertility and yield of bottle gourd (*Lagenaria siceraria* L). *Emergent life Science Research* 8(1):146-151. ISSN :2395-6658.

Mane, R.N., Jaybhay, S.A., Bhalerao, G.A. and Chavan, C.D. 2015. Effect of fertigation on yield and economics of Tomato (*Lycopersicon esculentum* Mill.). *International Journal of Advanced Research.,* 433- 435.

Murthy AHC, Nair AK, Kalaivanan D, Anjanappa M, Hebbar SS, Laxman RH, et al. Effect of NPK fertigation on post-harvest soil nutrient status, nutrient uptake and yield of hybrid ridge gourd [*Luffa acutangula* (L.) Roxb] Arka Vikram. *Int J Chem Stud*. 2020;8(4):3064-3069.

Nikzad M, Arvind Kumar JS, Anjanappa M, Amarananjundewara H. Effect of fertigation levels on growth and yield of cabbage (*Brassica oleracea* L. var. capitata). *Int J Curr Microbiol Appl Sci*. 2020;9(1):1240- 1247.

Rani P., Batra V.K., Bhatia A.K. and Sain V. 2020. Effect of water deficit and fertigation on nutrient uptake and soil fertility of drip irrigated onion (*Allium cepa* L.) in semi arid region of *India. Journal of Plant Nutrition* 44(37):1-8.

Patil M, Gadge SB. Yield response of cucumber (*Cucumis sativus* L.) to different fertigation levels. Int J Agric Eng. 2016;9(2):01-05.

Rawat S, Bhatt L, Singh PK, Gautam P, Maurya SK, Sabatino PL, Kumar P. Combination effect of fertigation rate and scheduling on tomato performance under naturally ventilated polyhouse in Indian Humid Sub-Tropics. Humid Sub-Tropics, Agronomy. 2023;13:665.

Singh A., Sharma S.K., Chopra R. 2017 Effect of drip irrigation and fertigation on the nutrient content and nutrient use efficiency of chilli (*Capsicum annum* L.) Asstt. *Green Farming Vol.* 8 (2):454-457.

Singh A. 2020. Effect of fertigation and scheduling on growth attributes of cucumber under polyhouse. *Journal of Agricultural Science*. 11(3):1718-1723.

Venkadeswaran E. and Sundaram V., 2016. Nutrient uptake of hybrid okra (*Abelmoschus esculentus* (L.) Moench under drip fertigation. *Indian Journal of Agriculture Research*, 50 (3): 226-231.

Verma A, Tripathi D, Sharma U, Devi M. Influence of drip fertigation on yield and economics of cauliflower cv. PSBK-1. Int J Chem Stud. 2020;8(1):1144-1146.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/126709