NPK UPTAKE OFDRIPIRRIGATIONREGIMESANDNKFERTIGATIONLEVELS FOR CUCUMBER (*Cucumissativus*L.)UNDERNATURALLYVENTILATEDPOLYHOUSE

Abstract

The present study was conducted in naturally ventilated poly house at Horticulturegarden, College of Agriculture,Rajendranagar, Hyderabad, Telanganaduring *rabi*2020-2021 tostandardize the optimum N and K fertigation levels and their effect on growth,yield and uptake of nutrients and to derive the nutrients uptake curves for cucumberunderpolyhouseduring*rabi (yasangi)*.The experiment was laid out in a split plot design with 12 treatments consist of threeirrigation regimes *viz.*,drip irrigation scheduledat 0.8 Epan (I_1), 1.0Epan(I_2) and 1.2 Epan(I_3) as main plots and four NK fertigation levels of 75% recommended dose of NK (F_1- $N_{112.5}K_{75}$), 100% recommended dose of NK (F_2- N_{150} K_{100}), 125% recommended dose of NK (F_3-$N_{187.5}$ K_{125}) and 150% recommended dose of NK (F_4- N_{225} K_{150}) as sub plots and replicatedthrice. The experimental soil was sandy clay loam with p^H of 7.9 and EC of 1.07 dS m^{-1}. Thesoil fertility status was low in organic carbon (0.26%) and medium in available nitrogen(338.69 kg ha^{-1}) and available phosphorous (48.53 kg ha^{-1}) and high in available potassium(473.52 kg ha^{-1}). The cucumber seed, variety multi star F_1 hybrid (Poly house cucumber seedsfromRijkzwaan)wassownwith aspacing40x40cm inpairedrowsystemonraised beds.NPK uptake increased with each increment in drip fertigationlevel from 75% recommended dose of NK to 150% recommended dose of NK at all stages.

Key words: Fertigation; NPK uptake; Epan; Variety; Drip irrigation; Cucumber

1. Introduction

Vegetables cultivation has lot of scope for income improvement of small and marginal farmers in India. It has vast potential to earn foreign exchange by export. Farmers are seeking innovative methods for increasing yield and quality of the vegetables. Vegetable production under protected structures is the best way to obtain higher yield and quality produce, especially cucurbits. Salad cucumber is a commercial crop. In naturally ventilated poly houses, salad cucumber can be grown round the year. Higher yield potential is obtained in poly houses than open field conditions with best management.

It is grown both under open conditions and poly house. Cucumber can be grown throughout the year in poly house condition and quality of fruit is high because of less incidence of pests and diseases and the photosynthetic activity is increased and transpiration losses reduced by which high water and nutrient efficiency is achieved.

The current problem with large scale cultivation of cucumber is that unreasonable water and fertilizer management system (high fertilizer application and inefficient irrigation) not only caused unnecessary waste of water and fertilizer resources, but also led to shallow groundwater nitrate pollution and other environmental problems (Zhang *et al*., 2010). Sustainability of any system requires optimal utilization of resources such as water, fertilizer and soil. Fertilizer management is the most important agro-technique, which controls development, yield and quality of a crop. Every attempt is therefore necessary in achieving this objective of higher water and fertilizer use efficiency. Under these circumstances, drip fertigation, which is known to be hi-tech and efficient way of applying fertilizers through irrigation system as a carrier and distributor of crop nutrients, holds bright promise (Magen, 1995). Maximization of crop yield, quality and minimization of leaching loss of nutrients below the rooting zone could be achieved by managing fertilizer concentrations in measured quantities of irrigation water using drip irrigation (Hagin and Lowengart, 1995).

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The package of practices for both irrigation and nutrient management were framed for cucumber varieties which are grown under open field conditions. Recently salad cucumber cultivation under poly houses is gaining popularity in Telangana, where farmers are relying on hybrids which require proper input management especially nutrient and irrigation management for achieving higher yields.

2.Materials and methods

The experiment entitled "Drip irrigation regimes and NK fertigation levels for cucumber (*Cucumissativus*L.) under naturally ventilated poly house" was conducted at Horticulture garden, College of Agriculture, Professor JayashankarTelangana State Agricultural University (PJTSAU), Rajendranagar, Hyderabad, Telangana during *rabi*2020-2021. It is situated at 17°19' 12.93" N latitude, 78°24' 58.13" E longitude and at an altitude of 545 m above MSL in the Southern Telangana Agro-Climatic Zone in Telangana State. It is categorized under semi- arid tropics as per the troll's classification .

The experiment was laid out in split plot design comprising of 12 treatments with three replications. The treatments consist of three irrigation regimes as main plots viz.,Drip irrigation scheduled at 0.8 Epan , Drip irrigation scheduled at 1.0 Epan and Drip irrigation scheduled at 1.2 E Pan and four N and K fertigation levels as sub plots viz.,75% RDNK (112.5:100:75 kg N P2O5

K2O ha-1) , 100% RDNK (150:100:100 kg N P2O5 K2O ha-1) , 125% RDNK (187.5:100:125 kg N P2O5 K2O ha-1) and 150% RDNK (225:100:150 kg N P2O5 K2O ha-1).

NPK fertilizers were applied in the form of urea, single super phosphate and white MOP. Recommended dose of fertilizers 150:100:100 N, P2O5 and K2O kg ha-1 was used. A common dose of P2O5 @ 100 kg ha-1 was applied commonly to all the treatments as basal dose before sowing. Nitrogen and potassium were applied through drip fertigation with the help of venturi system at different growth stages as per treatments (75% Recommended dose of NK (N112.5 K75), 100 % recommended dose of NK (N150 K100) and 125 % recommended dose of NK (N187.5 K125) and 150 % recommended dose of NK (N225 K150). The total 19 number of fertigations were given once in four days interval starting from 15 DAS to 90 DAS.

The data was recorded on growth parameters like plant height, number of leaves plant^{-1}, dry matter production (g plant-1), yield attributes *viz*., number of fruitsvine^{-1}, fruit length (cm), diameter (cm), fruit weight (g) , length of the vine at final harvest (cm), fruit yield per vine (kg). Pounded samples of leaf and fruit at harvest were used for nitrogen content (%) estimation by the micro Kjeldhal method using Kelplus Supra LX - analyzer. The di-acid digested plant and fruit samples were analyzed for phosphorus content by Vanado-molybdo phosphoric acid. The intensity of yellow colour developed was measured by using UV-VIS spectrophotometer (Make - Systronics, Model -108) at 420 nm. Leaf and fruit potassium content in the di-acid was determined by using flame photometer (Make - Elico, Model - CL 361). The N, P and K uptake at harvest was calculated by using nutrient concentration and dry matter yield or fruit yield as follows.

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$$\text{Nutrient uptake (kg ha}^{-1}\text{)} = \frac{\text{Nutrient content (\%) x Dry matter (kg ha}^{-1}\text{)}}{100}$$

The initial and final soil NPK status was analyzed by using standard procedures. Alkaline permanganate method using KELPLUS SUPRA LX – analyser was used for available nitrogen. Available P status was analysed by Olsen's method for extraction and Ascorbic acid method for estimation by using UV-VIS spectrophotometer (Make- systronics, Model-108) at 420 nm. Neutral normal ammonium acetate method using (Make-Elico, Model- CL361), Flame photometer was adopted for analysis of available potassium status.

The collected data was statistically analyzed by analysis of variance (ANOVA) for split plot design. Op stat software used for analysis. Whenever the treatment differences were found significant, critical differences were worked out at five per cent probability level in LSD.

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Treatment differences that were nonsignificant were denoted by NS and the results were critically interpreted with proper justification with relevant literature.

3. Results and Discussion

3. 1.Dry matter production (g plant^{-1})

Dry matter production was significantly higher in drip irrigation scheduled at 1.2 Epan (10.6, 177.6 and 184.0 g plant^{-1}) than 1.0 Epan (7.2, 125.5 and 138.8 g plant^{-1}) and 0.8 Epan (5.1, 90.2 and 103.5 g plant^{-1}) at 30 DAS, 60 DAS and at harvest respectively.

Dry matter production increased significantly with increase in fertigation level from 75% recommended dose of NK to 150% recommended dose of NK. Significantly higher dry matter production was obtained at 150% recommended dose of NK (9.3, 158.1 and 166.8 g plant^{-1}) than 125% (8.2, 140.6 and 149.9 g plant-^{1}), 100% recommended dose of NK (7.3, 126.1 and 138.3 g plant^{-1}) and 75% recommended dose of NK (5.6, 99.7 and 113.3 g plant^{-1}). Dry matter production was comparable at 100% and 125% recommended dose of NK.

3.2 Fruit yield

Fruit yield was significantly higher in drip irrigation scheduled at 1.2 Epan (83.90 tha^{-1}) than 1.0 Epan (68.80 t ha^{-1}) and 0.8 Epan (59.50 t ha^{-1}). Fruit yield was comparablebetween 0.8 Epan and 1.0 Epan. Higher fruit yield at increased drip irrigation level mightbeduetothat,theoptimummoistureinthevicinityofrootzonethroughoutthecropgrowthperiodenhancedthevegetativegrowthintheformofhigherplantheight,numberof leaves plant^{-1} , leaf area, chlorophyll content and dry matter production of the croptherebyincreaseinthephotosynthesisandefficienttranslocationofphotosynthatestowards the reproductive parts which increasedthe fruitlength,diameter,weightandfinally resulted into increased fruit yield of cucumber. Similar findings were reported byAshour*et al.* (2020), Ningaraju and Joseph (2014), Alomran*et al*. (2013) and Sahin*et al*. (2015).

Amongthefertigationlevels,fruityieldwassignificantlyhigherat150%recommended dose of NK (76.70 t ha^{-1}) than 75% recommended dose of NK (60.30 t ha^{-1})and on par with 125% (74.20t ha^{-1})and 100% recommended dose of NK (71.80t ha^{-1}).Fruit yield is a cumulative effect of yield attributes like fruit length, diameter, number offruits and individual fruit weight. Fruit yield increased gradually with increase in 150 %recommended dose of the N and K fertigation level. This might be due to the continuoussupply of nutrients in the root zone of the crop through drip fertigation, which createdfavourableconditionsforgrowthanddevelopmentbywayofincreasingmetabolicactivities in the plant system. These results are in harmony with the findings of NingarajuandJoseph(2014), Naik*et al*. (2019)andNishaand Sreelathakumary(2020).

3. 3. NPKuptake(kg ha^{-1})

3.3.1Nitrogenuptake(kg ha^{-1})

Nitrogen uptake was significantly influenced by both drip irrigation regimes andNK fertigation levels at all stages. Interaction was found non significant at all stages.

Amongdripirrigationregimessignificantlyhigherplantnitrogenuptakewasrecordedatdripirrigationscheduledat1.2Epan(1.9,14.1,32.6,50.8,13.8,64.6,86.3,119.9,106.4,65.9and172.4kgha^{-1})than1.0Epan(1.2,7.9,19.0,29.8,33.0,61.1,42.7,46.6and89.3kgha^{-1})and0.8Epan(1.0,5.2,11.6,14.7,20.7,41.9,25.4,38.7and64.1kg ha^{-1}) at 15, 30, 45, in plant at 60 DAS, 75 DAS and at harvest, in fruit 60 DAS and atharvest and total uptake at 60 DAS, 75 DAS and harvest respectively.Plant nitrogenuptakeat1.2Epanwas onparwith 1.0Epanduring60DAS,whileNuptakewascomparable between 1.0 Epan and 0.8 Epan at 15 DAS, in plant and total uptake at 60DAS,75DAS, andat harvest.Similar findingswerereportedbySrinivas*etal*. (1989).

Amongfertigationlevelsnitrogenuptakeincreasedsignificantlywithaneachincrement in drip NK fertigation level from 75% to 150% recommended dose of NKfertigation at all stages. Nitrogen uptake was significantly higher at 150% recommendeddoseofNK(1.8,13.2,29.6,44.0,15..3,59.3,63.0,36.9,80.3,64.3and144.6kgha^{-1}) than125%recommendeddoseofNK(1.5,10.4,24.2,35.2,13.1,48.2,52.8,31.4,84.2, 67.3,54.0and121.3kgha^{-1}),100%(1.2,8.1,21.3,31.3,12.0,43.3,46.2,25.0,71.2,55.1, 46.8and101.8kgha^{-1})and75%recommendeddoseofNK(0.9,4.6,9.4,16.7,7.0,23.7, 24.8, 17.3, 42.1, 30.0, 36.7 and 66.7 kg ha^{-1}) during all stages except at 45 DAS, in plantsamples and total uptake at 60 DAS and 75 DAS and in plantsamples at harvest where itwas on par between 100% and 125% recommended dose of NK while N uptake wascomparable between 150% and 125% recommended dose of NK in fruit at 60 DAS, inplant at 75 DAS and at final harvest.Similar findings were reported by Abdrabbo*et al*.(2005)and Maragal*et al*. (2018).

3.3.2 Phosphorusuptake(kgha^{-1})

Bothdripirrigationregimesandfertigationlevelssignificantlyinfluencedthephosphorus uptake at all stages. Interaction was found non significant at all stages.

Among dripirrigation levels, phosphorous uptake was significantly higher in dripirrigationscheduled at1.2Epan(0.6,5.8,14.1,50.3,13.2,63.6,57.0,40.0,97.1,60.3,46.8 and107.1kg ha^{-1})than1.0Epan(0.4,2.8,6.8,25.1,10.3,35.3,27.5,31.5,59.0,28.8,36.3 and65.1kgha^{-1})and0.8Epan(0.3,1.6,3.9,14.4,6.1,20.5,15.9,19.4,35.3,16.6,21.9 and 38.5 kg ha^{-1}) at 15, 30, 45, in plant, fruit and total uptake at 60 DAS, 75 DAS and atharvestrespectively. Similar findingswere reported bySrinivas*et al.*(1989).

Among fertigation levels, phosphorous uptake was significantly higher at 150 %recommendeddoseofNK(0.5,4.8,11.6,41.7,11.6,53.3,47.0,35.3,30.3,65.8,49.7, 41.0and90.7kgha^{-1})than125%(0.4,3.6,8.7,31.7,9.8,41.5,35.5,30.3,65.8,37.4,35.0and72.5kgha^{-1})and100%(0.4,3.1,7.6,27.6,9.5,37.0,30.5,29.1,59.6,31.8,33.6 and65.4kgha^{-1})and75%recommendeddoseofNK(0.3,2.1,5.1,18.8,8.6,27.3,20.9, 26.5, 47.4, 22.1,30.4 and 52.4 kg ha^{-1})at 15, 30, 45, in plant, fruit and total uptake at 60 ,75 DAS and at harvest respectively except fruit uptake 75 DAS at 150 % recommendeddose of NK was on par with 125 % recommended dose of NK at. Phosphorous uptake wascomparable between 125% and 100% recommended dose of NK during all stages. Similarfindingswerereported byAbdrabbo*et al.*(2005)and Maragal*et al*. (2018).

3.3.3 Potassiumuptake(kg ha^{-1})

Both drip irrigation regimes and NK fertigation levels significantly influenced thepotassium uptake at all stages. Interaction was found to be non significant at all stages.

Among drip irrigation regimes, potassium uptake was significantly higher in dripirrigationscheduledat1.2Epan(0.053,10.8,36.8,104.6,34.3,138.9,167.0,106.5,273.4,189.6,125.5and315.0kgha^{-1})than1.0Epan(0.035,5.9,20.5,59.1,30.5,89.6,91.4, 94.6,186.0,103.4,111.5and214.9kgha^{-1})and0.8Epan(0.033,4.1,14.1,40.2,23.4, 63.7, 63.4, 72.6, 136.0, 71.8, 85.6 and 157.4 kg ha^{-1}) at all the growth stages respectively.Potassium uptake was comparable in plant between 1.0 Epan and 0.8 Epan at 15 DAS, inplantat75 DASandfinal harvest.Similarfindings werereported bySrinivas*et al.*(1989).

Potassiumuptakewassignificantlyhigherat150%recommendeddoseofNK(0.048,9.3,31.6,90.5,33.4,123.9,143.2,103.4,246.6,162.7,121.8and284.5kgha^{-1}) followedby125%recommendeddoseofNK(0.043,7.5,26.0,74.5,30.4,104.9,117.4, 94.4,211.8,133.5,111.3and244.7kgha^{-1}),100%(0.038,6.6,23.1,65.7,28.7,94.4 103.3,89.1,192.4,116.3,105.0and221.4kgha^{-1})and75%recommendeddoseofNK (0.033, 4.3, 14.4, 41.3, 25.2, 66.5, 65.2, 78.1,143.2, 73.9, 91.9 and165.9kgha^{-1})atallthe growth stages respectively. Potassium uptake in plant was on par between 150% and125% recommended dose of NK and also between 125% and 100% RDNK at all stages.Similarfindingswerereported byAbdrabbo*et al*.(2005)and Maragal*etal*. (2018).

4. CONCLUSION

Cucumber crop grown under naturally ventilated poly house during rabi season under drip irrigation in sandy clay loam soils of Southern Telangana Zone, application of 1.2 Epan irrigation and 150 kg N, 100 kg K2O ha-1 by fertigation in 19 number of split doses at four days interval is recommended for maximization of yield and nutrient uptake.

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Table 1.Dry matter production (g plant^{-1}) of cucumber at different days aftersowing as influenced by varied drip irrigation and fertigation levels under naturallyventilatedpoly house.

Treatments	10DAS	30DAS	60DAS	Harvest
Main plots-Irrigationlevels				
I_1:Dripirrigationat0.8 Epan	1.0	5.1	90.2	103.5
I_2:Dripirrigationat1.0 Epan	1.1	7.2	125.5	138.8
I_3:Dripirrigationat1.2 Epan	1.3	10.6	177.6	184.0
SEm±	0.07	0.2	3.7	4.0
C.D(P=0.05)	NS	0.8	14.6	15.8
Subplots-Fertigation levels				
F_1:75% Recommendeddose($N_{112.5}K_{75}$)	1.1	5.6	99.7	113.3
F_2:100% Recommendeddose ($N_{150}K_{100}$)	1.1	7.3	126.1	138.3
F_3:125%Recommendeddose($N_{187.5}$ K_{125})	1.2	8.2	140.6	149.9
F_4:150%Recommendeddose($N_{225}K_{150}$)	1.2	9.3	158.1	166.8
SEm±	0.08	0.3	4.6	3.9
C.D(P=0.05)	NS	0.9	13.5	11.5
Fertigation atsamelevelof irrigation				
SEm±	0.14	0.5	8.0	6.7
C.D(P=0.05)	NS	NS	NS	NS
Irrigationatsameordifferentfertigation levels				
SEm±	0.15	0.5	7.9	7.1
C.D(P=0.05)	NS	NS	NS	NS

Table2.Nitrogencontent(%)ofcucumberatdifferentdaysaftersowingasinfluencedbyvarieddripirrigationandfertigationlevelsundernaturally ventilated poly house.

Treatments	15DAS	30DAS	45DAS	60DAS		75DAS		Harvest	
				Plant	Fruit	Plant	Fruit	Plant	Fruit
Main plots-Irrigationlevels									
I_1:Dripirrigationat0.8 Epan	2.35	2.40	1.72	0.86	0.70	0.90	0.81	0.95	0.95
I_2:Dripirrigationat1.0 Epan	2.54	2.66	2.02	1.34	0.76	1.07	0.88	1.18	0.93
I_3:Dripirrigationat1.2 Epan	2.73	2.78	2.05	1.38	0.81	1.55	0.99	1.67	1.26
SEm±	0.03	0.03	0.23	0.14	0.04	0.12	0.08	0.13	0.01
C.D(P=0.05)	0.13	0.10	NS	NS	NS	0.48	NS	0.50	0.04
Subplots-Fertigation levels									
F_1:75%Recommendeddose($N_{112.5}K_{75}$)	2.12	2.12	1.40	0.96	0.50	0.81	0.61	0.93	0.82
F_2:100% Recommendeddose ($N_{150}K_{100}$)	2.46	2.50	1.99	1.21	0.78	1.28	0.82	1.32	0.98
F_3:125%Recommendeddose($N_{187.5}$ K_{125})	2.67	2.80	2.10	1.26	0.82	1.29	1.01	1.37	1.12
F_4:150%Recommendeddose($N_{225}K_{150}$)	2.91	3.03	2.22	1.34	0.92	1.33	1.12	1.43	1.26
SEm±	0.05	0.06	0.08	0.05	0.03	0.05	0.05	0.07	0.06
C.D(P=0.05)	0.15	0.18	0.23	0.15	0.08	0.16	0.14	0.20	0.17
Fertigationatsamelevelofirrigation									
SEm±	0.09	0.10	0.13	0.09	0.05	0.10	0.08	0.12	0.10
C.D(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS
Irrigationatsameordifferentfertigation levels									
SEm±	0.08	0.09	0.26	0.16	0.06	0.15	0.11	0.16	0.08
C.D(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table3 Phosphoruscontent(%)ofcucumberatdifferentdaysaftersowingasinfluencedbyvarieddripirrigationandfertigation levels undernaturally ventilated poly house.

Treatments	15DAS	30DAS	45DAS	60DAS		75DAS		Harvest	
				Plant	Fruit	Plant	Fruit	Plant	Fruit
Main plots-Irrigationlevels									
I_1:Dripirrigationat0.8 Epan	0.58	0.74	0.56	0.86	0.46	0.70	0.74	0.61	0.54
I_2:Dripirrigationat1.0 Epan	0.77	0.98	0.75	1.13	0.63	0.92	0.98	0.82	0.72
I_3:Dripirrigationat1.2 Epan	0.95	1.17	0.93	1.36	0.78	1.12	1.19	1.00	0.89
SEm±	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.02	0.02
C.D(P=0.05)	0.06	0.08	0.06	0.08	0.13	0.10	0.07	0.06	0.08
Subplots-Fertigation levels									
F_1:75%Recommendeddose($N_{112.5}K_{75}$)	0.71	0.88	0.69	1.04	0.57	0.85	0.90	0.75	0.66
F_2:100% Recommendeddose ($N_{150}K_{100}$)	0.75	0.94	0.73	1.09	0.61	0.89	0.94	0.79	0.70
F_3:125%Recommendeddose($N_{187.5}$ K_{125})	0.76	0.96	0.74	1.11	0.62	0.91	0.96	0.81	0.71
F_4:150%Recommendeddose($N_{225}K_{150}$)	0.85	1.07	0.83	1.23	0.69	1.01	1.07	0.90	0.80
SEm±	0.04	0.04	0.04	0.05	0.04	0.04	0.05	0.04	0.03
C.D(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS
Fertigationatsamelevelofirrigation									
SEm±	0.06	0.07	0.06	0.09	0.06	0.07	0.08	0.07	0.06
C.D(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS
Irrigationatsameordifferentfertigation levels									
SEm±	0.06	0.06	0.06	0.08	0.07	0.07	0.07	0.06	0.06
C.D(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table4.Potassiumcontent(%) of cucumberatdifferentdaysaftersowingasinfluencedbyvarieddrip irrigationandfertigationlevelsundernaturally ventilated poly house.

Treatments	15DAS	30DAS	45DAS	60DAS		75DAS		Harvest	
				Plant	Fruit	Plant	Fruit	Plant	Fruit
Main plots-Irrigationlevels									
I_1:Dripirrigationat0.8 Epan	0.075	1.913	2.104	2.487	1.791	2.870	2.784	2.755	2.094
I_2:Dripirrigationat1.0 Epan	0.077	1.994	2.195	2.594	1.868	2.993	2.903	2.874	2.184
I_3:Dripirrigationat1.2 Epan	0.077	2.199	2.362	2.791	2.009	3.220	3.124	3.091	2.349
SEm±	0.001	0.055	0.035	0.041	0.030	0.048	0.046	0.046	0.035
C.D(P=0.05)	NS	0.217	0.137	0.162	0.116	0.187	0.181	0.179	0.136
Subplots-Fertigation levels									
F_1:75%Recommendeddose($N_{112.5}K_{75}$)	0.074	1.951	2.073	2.450	1.764	2.827	2.742	2.714	2.063
F_2:100% Recommendeddose ($N_{150}K_{100}$)	0.076	2.003	2.200	2.599	1.872	2.999	2.909	2.879	2.188
F_3:125%Recommendeddose($N_{187.5}$ K_{125})	0.078	2.022	2.258	2.668	1.921	3.079	2.986	2.955	2.246
F_4:150%Recommendeddose($N_{225}K_{150}$)	0.078	2.166	2.351	2.779	2.001	3.206	3.110	3.078	2.339
SEm±	0.001	0.030	0.041	0.048	0.034	0.055	0.054	0.053	0.040
C.D(P=0.05)	0.002	0.090	0.120	0.142	0.102	0.164	0.159	0.158	0.120
Fertigationatsamelevelofirrigation									
SEm±	0.001	0.053	0.070	0.083	0.060	0.096	0.093	0.092	0.070
C.D(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS
Irrigationatsameordifferentfertigation levels									
SEm±	0.001	0.072	0.070	0.083	0.060	0.096	0.093	0.092	0.070
C.D(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table5.Nitrogenuptake(kgha^{-1})ofcucumberatdifferentdaysaftersowingasinfluencedbyvarieddripirrigationandfertigation levels undernaturally ventilatedpoly house.

Treatments	15DAS (kgha^{-1})	30DAS (kgha^{-1})	45DAS (kgha^{-1})	60DAS(kg ha^{-1})			75DAS(kg ha^{-1})			Harvest(kg ha^{-1})		
				Plant	Fruit	Total	Plant	Fruit	Total	Plant	Fruit	Total
Main plots-Irrigationlevels												
I_1:Dripirrigationat0.8Epan	1.0	5.2	11.6	14.7	9.3	24.0	20.7	21.2	41.9	25.4	38.7	64.1
I_2:Dripirrigationat1.0 Epan	1.2	7.9	19.0	29.8	12.4	42.2	33.0	28.1	61.1	42.7	46.6	89.3
I_3:Dripirrigationat1.2 Epan	1.9	14.1	32.6	50.8	13.8	64.6	86.3	33.6	119.9	106.4	65.9	172.4
SEm±	0.1	0.6	2.7	6.3	0.3	5.1	4.9	2.5	6.3	10.0	0.6	14.5
C.D(P=0.05)	0.3	2.4	10.5	24.6	1.3	20.2	19.4	NS	24.7	39.3	2.3	56.9
Subplots-Fertigation levels												
F_1:75%Recommendeddose($N_{112.5}K_{75}$)	0.9	4.6	9.4	16.7	7.0	23.7	24.8	17.3	42.1	30.0	36.7	66.7
F_2:100% Recommendeddose ($N_{150}K_{100}$)	1.2	8.1	21.3	31.3	12.0	43.3	46.2	25.0	71.2	55.1	46.8	101.8
F_3:125%Recommendeddose($N_{187.5}$ K_{125})	1.5	10.4	24.2	35.2	13.1	48.2	52.8	31.4	84.2	67.3	54.0	121.3
F_4:150%Recommendeddose($N_{225}K_{150}$)	1.8	13.2	29.6	44.0	15.3	59.3	63.0	36.9	99.8	80.3	64.3	144.6
SEm±	0.1	0.7	1.7	2.8	0.5	3.9	4.2	1.4	4.5	5.3	2.4	6.2
C.D(P=0.05)	0.3	2.1	5.0	8.2	1.6	11.7	12.4	4.1	13.4	15.7	7.2	18.3
Fertigationatsamelevelofirrigation												
SEm±	0.2	1.2	2.9	4.8	0.9	6.8	7.2	2.4	7.8	9.2	4.2	10.7
C.D(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Irrigationatsameordifferentfertigation levels												
SEm±	0.2	1.2	3.7	7.5	0.9	7.8	8.0	3.3	9.2	12.8	3.7	17.2
C.D(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 6.Phosphorusuptake(kgha^{-1})ofcucumberatdifferentdaysaftersowingasinfluencedbyvarieddripirrigationandfertigation levels undernaturally ventilated poly house.

Treatments	15DAS (kgha^{-1})	30DAS (kgha^{-1})	45DAS (kgha^{-1})	60DAS(kg ha^{-1})			75DAS(kg ha^{-1})			Harvest(kg ha^{-1})		
				Plant	Fruit	Total	Plant	Fruit	Total	Plant	Fruit	Total
Main plots-Irrigationlevels												
I_1:Dripirrigationat0.8 Epan	0.3	1.6	3.9	14.4	6.1	20.5	15.9	19.4	35.3	16.6	21.9	38.5
I_2:Dripirrigationat1.0 Epan	0.4	2.8	6.8	25.1	10.3	35.3	27.5	31.5	59.0	28.8	36.3	65.1
I_3:Dripirrigationat 1.2 Epan	0.6	5.8	14.1	50.3	13.2	63.6	57.0	40.0	97.1	60.3	46.8	107.1
SEm±	0.02	0.2	0.3	1.6	0.2	1.7	2.7	0.6	3.3	3.3	1.1	3.3
C.D(P=0.05)	0.1	0.7	1.3	6.1	0.7	6.6	10.6	2.5	12.9	13.0	4.4	13.0
Subplots-Fertigation levels												
F_1:75%Recommendeddose($N_{112.5}K_{75}$)	0.3	2.1	5.1	18.8	8.6	27.3	20.9	26.5	47.4	22.1	30.4	52.4
F_2:100% Recommendeddose ($N_{150}K_{100}$)	0.4	3.1	7.6	27.6	9.5	37.0	30.5	29.1	59.6	31.8	33.6	65.4
F_3:125%Recommendeddose($N_{187.5}$ K_{125})	0.4	3.6	8.7	31.7	9.8	41.5	35.5	30.3	65.8	37.4	35.0	72.5
F_4:150%Recommendeddose($N_{225}K_{150}$)	0.5	4.8	11.6	41.7	11.6	53.3	47.0	35.3	82.3	49.7	41.0	90.7
SEm±	0.02	0.2	0.5	1.8	0.5	2.0	2.3	1.8	3.0	2.5	1.8	2.8
C.D(P=0.05)	0.1	0.6	1.5	5.5	1.5	5.8	6.9	5.2	9.0	7.5	5.3	8.4
Fertigationatsamelevelofirrigation												
SEm±	0.04	0.4	0.9	3.2	0.9	3.4	4.0	3.0	5.2	4.4	3.1	4.9
C.D(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Irrigationatsameordifferentfertigation levels												
SEm±	0.04	0.4	0.8	3.2	0.8	3.4	4.4	2.7	5.6	5.0	2.9	5.4
C.D(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 7 . Potassiumuptake(kgha^{-1})ofcucumberatdifferentdaysaftersowingasinfluencedbyvarieddripirrigationandfertigation levels undernaturally ventilated poly house.

Treatments	15DAS (kgha^{-1})	30DAS (kgha^{-1})	45DAS (kgha^{-1})	60DAS(kg ha^{-1})			75DAS(kg ha^{-1})			Harvest(kg ha^{-1})		
				Plant	**Fruit**	**Total**	**Plant**	**Fruit**	**Total**	**Plant**	**Fruit**	**Total**
Main plots-Irrigationlevels												
I_1:Dripirrigationat0.8 Epan	0.033	4.1	14.1	40.2	23.4	63.7	63.4	72.6	136.0	71.8	85.6	157.4
I_2:Dripirrigationat1.0 Epan	0.035	5.9	20.5	59.1	30.5	89.6	91.4	94.6	186.0	103.4	111.5	214.9
I_3:Dripirrigationat1.2 Epan	0.053	10.8	36.8	104.6	34.3	138.9	167.0	106.5	273.4	189.6	125.5	315.0
SEm±	0.003	0.4	1.5	3.5	0.6	4.0	8.9	2.4	10.4	10.7	3.6	12.4
C.D(P=0.05)	0.011	1.7	5.8	13.8	2.4	15.6	34.7	9.2	41.0	41.8	14.1	48.5
Subplots-Fertigation levels												
F_1:75%Recommendeddose($N_{112.5}K_{75}$)	0.033	4.3	14.4	41.3	25.2	66.5	65.2	78.1	143.2	73.9	91.9	165.9
F_2:100% Recommendeddose ($N_{150}K_{100}$)	0.038	6.6	23.1	65.7	28.7	94.4	103.3	89.1	192.4	116.3	105.0	221.4
F_3:125%Recommendeddose($N_{187.5}$ K_{125})	0.043	7.5	26.0	74.5	30.4	104.9	117.4	94.4	211.8	133.5	111.3	244.7
F_4:150%Recommendeddose($N_{225}K_{150}$)	0.048	9.3	31.6	90.5	33.4	123.9	143.2	103.4	246.6	162.7	121.8	284.5
SEm±	0.003	0.5	2.0	5.7	0.8	6.0	9.3	1.9	10.4	10.4	2.4	11.7
C.D(P=0.05)	0.008	1.6	6.0	16.8	1.7	17.7	27.5	5.6	30.8	30.9	7.1	34.7
Fertigationatsamelevelofirrigation												
SEm±	0.004	0.9	3.5	9.8	1.0	10.3	16.0	3.3	17.9	18.0	4.1	20.2
C.D(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Irrigationatsameordifferentfertigation levels												
SEm±	0.005	0.9	3.4	9.2	1.1	0.1	16.5	3.7	18.7	18.9	5.1	21.4
C.D(P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 8. Post - harvest soil nutrient status ofcucumber as influenced by varieddrip irrigationandfertigation levels undernaturally ventilatedpoly house.

Treatments	Soilstatusafterharvest(kg ha^{-1})		
	N	**P_2O_5**	**K_2O**
Main plots-Irrigationlevels			
I_1:Dripirrigationat0.8 Epan	332.4	54.4	496.6
I_2:Dripirrigationat1.0 Epan	307.3	54.4	475.1
I_3:Dripirrigationat1.2 Epan	264.5	49.8	457.1
SEm±	10.8	1.6	2.5
C.D(P=0.05)	42.5	NS	9.9
Subplots-Fertigation levels			
F_1:75% Recommendeddose($N_{112.5}K_{75}$)	274.6	48.2	455.5
F_2:100% Recommendeddose ($N_{150}K_{100}$)	288.5	49.0	453.0
F_3:125%Recommendeddose($N_{187.5}$ K_{125})	306.6	53.8	493.4
F_4:150%Recommendeddose($N_{225}K_{150}$)	335.9	60.3	503.1
SEm±	9.7	4.2	11.6
C.D(P=0.05)	28.9	NS	34.6
Fertigation atsamelevelof irrigation			
SEm±	16.9	7.3	20.2
C.D(P=0.05)	NS	NS	NS
Irrigationatsameordifferentfertigation levels			
SEm±	18.2	6.6	17.6
C.D(P=0.05)	NS	NS	NS
Initial soilnutrient status (kg ha^{-1})	**N**	**P_2O_5**	**K_2O**
	338.7	**48.5**	**473.5**