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Effect of Irrigation and Fertigation Levels on Growth and Yield of Chilli [*Capsicum annuum* L.]

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ABSTRACT

The present investigation was conducted at All India Coordinated Research Project on Vegetable Crops, Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar during summer and late kharif 2018-19. The experiment was laid out in split plot design with three replications and sixteen treatment combinations, which comprises four levels of irrigation viz., I_1-0.7ETc, I_2-0.8 ET_c, I_3-0.9 $ET_c$and I_4-1.0ETc by drip irrigation as main plot treatments and four levels of fertigation viz., F_1-125, F_2-100, F_3-75 and F_4-50 % of RDF through WSF as sub-plot treatments. The control treatment (I_5) i.e. surface irrigation with 100 % RDF through conventional fertilizers. The results indicated that the irrigation level I_2-0.8 Etc as well as fertigation level F_2-100% RDF through WSF showed significantly better growth attributes viz., plant height, number of primary branches plant^{-1}and plant spread compared to the rest of the levels of drip irrigation and fertigation as well as control, during both the season of experimentation and in pooled results. As concerned with flowering characteristics, the control treatment noticed early days to 50 % flowering than the rest of the levels of drip irrigation and fertigation. Whereas irrigation levels showed significant variation in respect days to 50 % flowering, the irrigation levelI_1-0.7ETcregistered minimum days to 50 % flowering while maximum days to 50 % flowering was observed under I_4-1.0ETcirrigation regime, while the fertigation level F_1-125% RDF through WSF recorded significantly minimum number of days to 50 % flowering during both the season under study and also reflected same trend in pooled results.

Scheduling of irrigation through drip irrigation at 0.8 ETc irrigation level along with fertigation level F_2-100 % RDF through WSF recorded significant maximum fruit length, fruit diameter, and average weight of fruit over rest of the levels of drip irrigation and fertigation as well as control, during both the season and in pooled results. Application of irrigation at 0.8Etc level coupled with fertigation level F_2-100% RDF through WSF recorded significantly maximum yield plant^{-1}(444.49, 953.67, and 699.08 g, respectively), yield plot^{-1}(14.22, 30.52 and 22.37 kg, respectively) and total yield hectare^{-1}(123.47, 264.91 and 194.19 q, respectively). However, challenges include understanding the specific needs of different chili varieties and soil types, ensuring equitable water and fertilizer distribution, and overcoming logistical barriers in remote areas.

Keywords: *Chilli, irrigation, fertigation , Kharif , nutrient uptake growth and yield.*

1. Introduction

Chilli (*Capsicum annuum*L.) is a member of the Solanaceae family, extensively cultivated throughout tropical Asia and equatorial America for their edible, pungent fruits. India is the largest producer and exporter of chilies, the major chillies producing states are Andhra Pradesh, Karnataka, Maharashtra, Orissa, Tamil Nadu, West Bengal, Madhya Pradesh, Rajasthan, Gujarat and Assam, Annual production of Andhra Pradesh is 5, 26, 171 tonnes.

Chilli is increasing in popularity for its pungent fruits and is highest in vitamins A, C, Iron and Calcium. Chilies are used in making chili vinegar, tomato sauces, rice dishes, soups and hot condiments such as samber, beans, corn, and curry powders. Chilies do well with several other spices including basil, ginger, oregano, cilantro, cinnamon, black pepper, fennel and cumin.

Water and fertilizers are the most important factors for crop production and becoming scarce and costly.

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Their efficient use is basic for the survival of agriculture, due to shrinking land: man and water: man ratios, increasing fertilizer prices, hunting energy crisis, wide spread pollution and fast degradation of natural resources. Therefore, précised agriculture in India is necessitated to produce about 300 million tonnes of food grains by 2020 to feed the ever growing population. Chilliis one of the widely grown high value vegetable crop in India as well as in the world, mostly because of its high yield potential, high income to the farmers and greater supply of vitamins and minerals in human nutrition. The extraction of alkaloids (capsaicin) can potentially generate employment opportunities. In addition, the versatilities of this vegetable contribute more to its popularity as a food product either directly or after processing.

Chilli is cultivated in all over India and maximum chilli is produced in Andhra Pradesh followed by Karnataka state. In the world scenario Asia stands at the top in producing 65.85% of world green chillies and pepper, followed by Europe, which stands 2ndcontributing 12.1% and Africa 3rdwith 9.5% of world production. In India, chilli is grown in 8,05,000 ha area with a production of 12,76,000 metric tonnes and productivity 14 metric tonnes-ha^{-1}(Anon., 2014), whereas in Maharashtra the area is 99300 ha and production is 51214 tonnes (Anon., 2014).

However, the availability of chilli per capita per day is very low looking to present scenario, there is an urgent need to increase the production of chilli by manipulating the technology. The main reasons for low productivity are water stress, unbalanced nutrient management and weed problems during the critical stages of growth and development, in such situations, the targeted and maintaining adequate water and proper weed management for efficient water and weed management fertigation along with mulching is the best option.

A drip irrigation system uses less water and can be worked with low pressure. There is high availability of water in the root zone, minimum foliage wetting and the possibility of using low quality water. It can deliver liquid fertilizers and pesticides mixed with irrigation water effectively and are not subjected to water loss through seepage and evaporation. There is saving of about 50 to 75 percent water in drip method of irrigation with an increase in yield upto 50 percent (Sivanappan, 1979). Drip irrigation is being extended from wide spaced crops to several row crops also. Applying the correct amount of water is particularly effective for high value crops like chilli, which is an important vegetable as well as a commercial spice crop in South India.

Fertigation allows nutrient placement directly into root zone around the plants through a pipe network with the help of emitters near the consumptive use of plants during critical periods of nutrient requirement. Thereby losses of water and nutrients can be minimized substantially as fertigation is economically feasible, socially and environmentally acceptable (Kanwar, 2011). Fertigation offers precise control on fertilizer application and can be adjusted to the rate of plant nutrient uptake (Tiwari, 2014). The suitable fertilizers, water soluble fertilizers such as 20-20-20 and 19-19-19 are more used by growers.

Water is prime source for all biological activities and now a days water is considered more precious than gold and oil. Therefore drip irrigation is one such technology that can help to increase the irrigation potential by optimizing the use of available irrigation water, also precise management of irrigation quantity along with the rate and timing of nutrient application are of critical importance to obtain desired results in terms of productivity and nutrient use efficiency. The fertigation allows the application of right amounts of plant nutrients uniformly to the wetted root volume zone where most of the active roots are concentrated and this helps to enhance nutrient use efficiency. It improves the productivity and quality of crop produce along with improved resource use efficiency. Fertigation is considered eco-friendly as it controls leaching of nutrients especially nitrogen (N)-NO_3 and provides an excellent opportunity to maximize yield and minimize environmental pollution. However, to get the desired results knowledge of the system and efficient management are essential (Jat *et. al.,* 2011).

Keeping this aforesaid information in view, the present investigation, entitled "Fertigation and Irrigation Scheduling Studies in chilli (*Capsicum annuum* L.) was planned and conducted during the summer and *late kharif* season of 2018-19 with the following objectives.

1) To find out the effect of the application of different levels of water soluble fertilizers through drip irrigation on growth and yield of chilli.

2) To study the effect of different irrigation levels applied through drip irrigation on the growth and yield of chilli.

2. Materials and Methods

The experiment was conducted at All India Coordinated Research Project on Vegetable Crops, Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar during summer and *late kharif* 2018-19.

The experiment was laid out in split plot design with three replications and sixteen treatment combinations, which comprises four levels of irrigation *viz.,* I_1-0.7 ETc, I_2-0.8 ET_C, I_3-0.9 ET_C and I_4-1.0 Etc (Crop evapotraspiration) by drip irrigation as main plot treatments and four levels of fertigation *viz.,* F_1-125, F_2-100, F_3-75 and F_4-50 % of RDF (Recommended dose of fertilizers) through WSF (Water soluble fertilizers) as sub plot treatments. The control treatment (I_5) i.e. surface irrigation with 100 % RDF through conventional fertilizers.

Geographically, the Mahatma Phule Krishi Vidyapeeth, Rahuri is situated between 19°47' and 19°57' North latitude and 74° 19' and 74°32' East longitude. The altitude varies from 511 m to 547 m above the mean sea level. Climatologically the area falls under semi-arid and subtropical zone with annual rainfall varying from 307 to 619 mm. The average annual rainfall is 520 mm which is mostly concentrated during the monsoon months from June to September. The annual mean maximum temperature.

The seedlings of Chills (Teja-4) were raised in nursery on raised beds of 3 m x 1 m size with a height of 20 cm. Phorate 10 G @ 20 g and blitox @ 30 g per 10 m^2 were applied on the beds to avoid the soil born infestation. Seeds were treated with Imidachloprid @ 5 ml + Carbendazim @ 1 g kg^{-1} and then trichoderma @ 5 g kg^{-1} seed. Sowing was done on 6th February and 2th August during summer and *late kharif* 2018-19, respectively.

The drip irrigation system was installed in the experimental site on 12th March, 2018 and plots were laid out as per the plan. The drip unit consisted of main line of 75 mm size and submain (63 mm) made of PVC, valve, T-75 mm, elbow 63 mm, screen filter, GTO, 12 mm, end cap 12 mm which were connected in series. The laterals were laid out in between two chilli rows. Thus, the distance between the two laterals was 1.80 m. along the lateral drippers were installed at a spacing of 0.75 m. The discharge of inline emitter was 4 lit. hr^{-1}. The pressure was maintained at 1 kg cm^2. The water source for drip system was from a well located near the experimental site.

The water soluble fertilizers of grade 19:19:19 and Urea (46.4:0:0) was used for fertigation. The fertigation was given into 15 equal splits at an interval of 8 days, commencing from seven days after transplanting as per the treatments. The water soluble fertilizers were applied as per treatments through fertilizer injector pump into the drip irrigation system and surface irrigation treatment (control), 50 % recommended dose of N and 100 % recommended dose of P_2O_5 and K_2O was applied as basal dose. Whereas, remaining 50 % recommended dose of nitrogen was applied in three equal splits 30, 60 and 90 days after transplanting through urea.

3. Results and Discussion

The data was presented in table as influenced by irrigation, fertilizer levels and their interaction on growth parameters of chilli.

3.1 Plant height

The plant height was significantly influenced due to different irrigation levels during both season (Table 1). The irrigation level of I_2 – 0.8 ETc through drip to chilli exhibited higher plant height (cm) (63.92, 66.38, and 65.15, respectively for Summer, Late *Kharif* and pooled mean) at last harvest which was

significantly superior as compared to rest of the irrigation levels. Significantly minimum plant height (cm) (61.82, 62.94 and 62.38) respectively were recorded at I_1-0.7 ETc level at final harvest.

The decrease in plant height at 0.7 ETc irrigation regime was due to the development of water deficit in plant tissue resulting in decline in leaf water content as well as reduction in both cell volume and cell turgor. The increase in plant height due to 0.8 ETc irrigation regimes through drip must be due to soil moisture remaining at field capacity because of that, plant absorbs more moisture and nutrients from soil which is reflected in increase in cell turgidity and cell elongation. These results are in the line of Byari and Al-Syed (1998), Vijaykumar *et al*. (2010)and Kumar *et al*. (2016).

The fertigation level asF_2- 100% RDF through WSF recorded significant maximum plant height (cm) (66.46,69.68 and 68.07) respectively, during the summer and late kharif season 2018-19 and pooled mean basis.These result are in agreement with those reported by Ndereyimana *et al.* (2014) and Kumar *et al*. (2016).

The interaction effect between levels of irrigation and fertigation in respect of plant height were found to be non-significant during the summer 2018 and in pooled mean.While the treatment recorded the maximum plant height I_2F_2-0.8 Etc and 100 % RDF through WSF (68.72, 72.17 and 70.45).

3.2 Number of primary branches plant^{-1}

The irrigation level I_2- 0.8 ETc through drip to chilli produced the maximum number of primary branches plant^{-1}in Summer, Late *Kharif* and pooled mean (7.40, 8.42 and 7.91) respectively at last picking which was significantly superior over the rest of the irrigation regimes (Table 2).The similar results were reported by Patil (2006), and Chauhan *et al.* (2013)

The fertigation levels F_2-100 % RDF through WSF recorded a significantly maximum number of primary branches plant^{-1}(7.15,9.60 and 8.38 respectively during summer and late kharif season 2018-19 and in pooled results. The optimum supply of nutrients in the vicinity of root zone through drip resulted in rapid growth owing to maximum cell multiplication reflected in a higher number of primary branches plant^{-1}. These results are in conformity with those reported by Aminifard *et al.* (2010) and Ndereyimana *et al.* (2014).

The interaction effect between levels of irrigation and fertigation treatment recorded the maximum number of primary branches plant^{-1} I_2F_2-0.8 Etc and 100 % RDF through WSF (8.60, 9.67 and 9.13).

3.3 Days to 50% flowering

Different fertigation and irrigation levels showed statistically significant variation in respect of days to 50 % flowering (Table 3). The irrigation intensity I_1-0.7ETc through drip required a minimum number of days to 50% flowering (45.67, 46.92 and 46.29) during both the season summer and late kharif 2018-19 and in pooled results, respectively.

As the moisture stress increased from 1.0 ETc to 0.7 ETc, there was a reduction in the number of days required for days to 50 % flowering was noticed during both the season and in pooled results. The current results are in agreement to a great extent with those reported by Goswami *et al.* (2006) and Shrivastava *et al*. (2012).

The fertigation level as F_1- 125 % RDF through WSF recorded a significantly minimum number of days to 50% flowering (48.25, 49.58 and 48.92).The interaction effect between irrigation regimes and fertigation levels for days to 50% flowering of chilli were found non- significant. While the treatment recorded the minimum number of days to 50% flowering I_1F_1-0.7 Etc and 125 % RDF through WSF (44.00, 45.67 and 44.83).

The moisture stress condition affected vegetative growth and crop changed its vegetative phase into the reproductive phase quite earlier than the non-stress situation in drip irrigation at 1.0 and 0.9 ETc irrigation regimes. These findings are in accordance with the findings of Goswami *et al.* (2006), Sharp *et al*. (2009) and Shrivastava *et al*. (2012) demonstrated that flowering was promoted under water deficit treatments.

3.4 Fruits length (cm)

The mean fruit length was influenced significantly due to different irrigation regimes (Table 4). Scheduling of irrigation at I_2-0.8 ETc irrigation regime registered maximum and significantly higher length of chilli (9.85, 9.87 and 9.86, respectively). Similar results were postulated by Patil (2006) and Colak *et al.* (2015).

The fertigation level F_2-100% RDF through WSF recorded significantly maximum fruit length of chilli (10.18,10.26 and 10.22).The interaction effect between irrigation regimes and fertigation levels on fruit length of chilli was found non significant.

3.5 Fruits diameter (cm)

The different irrigation levels showed statistically significant variation in respect of fruit diameter (Table 5). The irrigation intensity I_3-0.9 ETc recorded maximum fruit diameter (1.43, 1.41 and 1.42).The results revealed that the fruit diameter was influenced significantly due to different fertigation levels, the fertigation level F_2- 100% and F_3- 75% RDF through WSF recorded significant maximum fruit diameter of chilli (1.44, 1.44 and 1.44) and (1.46, 1.42 and 1.44).

The interaction effects between irrigation regimes and fertigation levels on fruit diameter of chilli were found significant.

3.6 Average weight of fruits (g)

The average weight of fruit was differed significantly due to different irrigation regimes (Table 6). The irrigation level I_2-0.8 ETc recorded a higher average weight of fruit (2.80, 3.05 and 2.93).The fertigation level F_2-100% RDF through WSF recorded significantly higher average weight of fruit (3.16, 3.01 and 3.08).

The interaction effects between irrigation regimes and fertigation levels on average weight of fruits of chilli were found significant, recorded the maximum average weight I_2F_2-0.8 Etc and 100 % RDF through WSF (3.22, 3.43 and 3.33).

3.7 Number of fruits plant^{-1}

The irrigation level I_2-0.8 ETc recorded a maximum number of fruits plant^{-1} (127.69, 245.46 and 186.57) (Table 7). The fertigation level F_1-125 % RDF through WSF recorded maximum number of fruits pant^{-1} (122.56,268.69 and 195.62)during both the season and also in F_3-75 % RDF 122.56, 267.62 and 195.09.

The interaction effects between irrigation regimes and fertigation levels on a number of fruits plant^{-1}of chilli were found significant during summer, recorded the maximum number of fruits plant^{-1}I_2F_3-0.8 Etc and 75 % RDF through WSF (157.46, 282.09 and 219.78).

3.8 Yield plant^{-1} (g)

The irrigation level I_2-0.8 ETc produced higher yield plant^{-1}(360.08, 763.58 and 561.83), it was significantly superior to

rest of irrigation intensities during both the season and also in pooled results (Table 8). Fertigation the level of F_2-100% RDF throughWSF produced significantly higher yield plant^{-1} (349.89, 811.73 and 580.81).

The interaction effects were found significant the irrigation level I_2-0.8 ETc through drip along with fertigation level F_2-100% RDF through WSF produced significant maximum yield plant^{-1}(444.49, 953.67 and 699.08 respectively).Similar findings were reported by Nadiya *et al*.(2013), Patwardhan (2014) and Ugade *et al.* (2014).

The moisture and nutrient stress during fruiting phase of crop growth resulted in decreased rate of photosynthesis and formation of photosynthates coupled with inefficient translocation of photosynthates towards reproductive parts produced less number of fruits and there by minimum fruit yield plant^{-1}was observed. Similar results were postulated by Bhogi *et al.* (2010), Chauhan *et al.* (2013) and Colak*et al.* (2015).

3.9 Yield plot^{-1} (kg)

The irrigation level I_2-0.8 ETc produce higher yield plot^{-1}(11.52, 24.43and 17.98) it was significantly superior to rest of irrigation (Table 9).The level of fertigation F_2-100% RDF throughWSF produced significantly higher yield plot^{-1} (11.20, 25.98 and 18.59). The interaction effects were found significant the irrigation level I_2-0.8 ETc through drip along with fertigation level F_2-100% RDF through WSF produced significantly maximum yield plot^{-1} (14.22, 30.52 and 22.37 respectively) as compared to the irrigation levels.

3.10 Total yield hectare^{-1} (q)

The irrigation level I_2-0.8 ETc recorded maximum yield hectare^{-1}(100.02, 212.10 and 156.06), it was significantly superior to rest of irrigation (Table 10). The level of fertigation F_2-100% RDF throughWSF produced significantly higher total yield.

The interaction effects between irrigation regimes and fertigation levels onyield hectare^{-1}of chilli were found significant.

The irrigation level I_2-0.8 ETc through drip along with fertigation level F_2-100% RDF through WSF produced significantly higher yield hectare^{-1}(123.47, 264.91 and 194.19, respectively) as compared to the irrigation levels.Similar results were reported by Tumbare and Bhoite (2002), Imamsaheb *et al.* (2011), Chauhan *et al.* (2013), Feleafel and Mirdad (2013) and Kumar *et al*, (2016).

4. Conclusion

1. Amongst the various irrigation levels the scheduling of irrigation through drip at 0.8 ETc showed better growth, yield and nutrient uptake during summer and *late kharif* 2018-19. Thus, the I_2-0.8 ETc is found optimum irrigation level through drip for chilli.

2. Application of 100 % of RDF through water soluble fertilizer through drip irrigation to chilli recorded the maximum growth, yield and nutrient uptake during summer and *late kharif* 2018-19. Hence, the fertigation level F_2-100 % RDF through WSF through drip is found optimum to chilli.

3. Scheduling of irrigation through drip at I_2-0.8 ETc along with fertigation level F_2-100 % RDF through WSF obtained the highest yield during both the seasons under study, thus I_2F_2 isthe best treatment combination to chilli.

Table 1. Plant height (cm) of chilli as influenced by different levels of irrigation and fertigation

Treatment	Summer 2018	*Late Kharif*2018-19	Pooled Mean
I_1 - 0.7 Etc	61.82	62.94	62.38
I_2 - 0.8 Etc	63.92	66.38	65.15
I_3 - 0.9 Etc	62.45	64.94	63.70
I_4 - 1.0 Etc	61.15	64.23	62.69
SE (m) ±	0.36	0.71	0.69
CD at 5%	1.23	NS	NS
F_1 - 125 % RD Through WSF	64.74	67.46	66.10
F_2 - 100 % RD Through WSF	66.46	69.68	68.07
F_3 - 75 % RD Through WSF	62.77	66.12	64.45
F_4 – 50 % RD Through WSF	55.37	55.24	55.30
SE (m) ±	0.89	0.92	1.11
CD at 5%	2.55	2.64	3.17
I_1F_1- Irrigating at 0.7 ETC and 125 % RDF	64.61	67.45	66.03
I_1F_2 -Irrigating at 0.7 ETC and 100 % RDF	62.54	63.57	63.06
I_1F_3- Irrigating at 0.7 ETC and 75 % RDF	62.22	63.78	63.00
I_1F_4- Irrigating at 0.7 ETC and 50 % RDF	57.92	56.96	57.44
I_2F_1- Irrigating at 0.8 ETC and 125 % RDF	64.30	67.22	65.76
I_2F_2- Irrigating at 0.8 ETC and 100 % RDF	68.72	72.17	70.45
I_2F_3- Irrigating at 0.8 ETC and 75 % RDF	67.76	72.09	69.92
I_2F_4- Irrigating at 0.8 ETC and 50 % RDF	54.90	54.05	54.48
I_3F_1- Irrigating at 0.9 ETC and 125 % RDF	64.95	67.70	66.33
I_3F_2- Irrigating at 0.9 ETC and 100 % RDF	66.96	71.87	69.42
I_3F_3- Irrigating at 0.9 ETC and 75 % RDF	61.69	63.96	62.83
I_3F_4- Irrigating at 0.9 ETC and 50 % RDF	56.21	56.23	56.22
I_4F_1- Irrigating at 1.0 ETC and 125 % RDF	65.09	67.46	66.28
I_4F_2- Irrigating at 1.0 ETC and 100 % RDF	67.63	71.11	69.37
I_4F_3- Irrigating at 1.0 ETC and 75 % RDF	59.43	64.65	62.04
I_4F_4- Irrigating at 1.0 ETC and 50 % RDF	52.43	53.71	53.07
SE (m) ±	1.78	1.84	2.22
CD at 5%	NS	5.38	NS
I_5 - Surface irrigation with 100% RDF	50.57	48.02	49.29
SE (m) ±	1.58	1.75	2.04
CD at 5%	NS	5.26	NS

Table 2.Number of primary branches per plant of chilli as influenced by different levels of irrigation and fertigation

Treatment	Summer 2018	*Late Kharif*2018-19	Pooled Mean
I_1 - 0.7 ETc	6.70	7.97	7.33
I_2 - 0.8 ETc	7.40	8.42	7.91
I_3 - 0.9 ETc	5.80	8.00	6.90
I_4 - 1.0 ETc	6.27	7.45	6.86
SE (m) ±	0.15	0.15	0.18
CD at 5%	0.51	0.53	0.63
F_1 - 125 % RD Through WSF	7.03	9.17	8.10
F_2 - 100 % RD Through WSF	7.15	9.60	8.38
F_3 - 75 % RD Through WSF	6.80	8.07	7.43
F_4 – 50 % RD Through WSF	5.18	5.00	5.09
SE (m) ±	0.24	0.15	0.25
CD at 5%	0.70	0.42	0.70
I_1F_1- Irrigating at 0.7 ETC and 125 % RDF	7.53	9.33	8.43
I_1F_2 -Irrigating at 0.7 ETC and 100 % RDF	6.93	9.87	8.40
I_1F_3- Irrigating at 0.7 ETC and 75 % RDF	7.07	7.53	7.30
I_1F_4- Irrigating at 0.7 ETC and 50 % RDF	5.27	5.13	5.20
I_2F_1- Irrigating at 0.8 ETC and 125 % RDF	7.47	9.20	8.33
I_2F_2- Irrigating at 0.8 ETC and 100 % RDF	8.60	9.67	9.13
I_2F_3- Irrigating at 0.8 ETC and 75 % RDF	8.33	9.60	8.97
I_2F_4- Irrigating at 0.8 ETC and 50 % RDF	5.20	5.20	5.20
I_3F_1- Irrigating at 0.9 ETC and 125 % RDF	6.93	9.33	8.13
I_3F_2- Irrigating at 0.9 ETC and 100 % RDF	4.93	10.40	7.67
I_3F_3- Irrigating at 0.9 ETC and 75 % RDF	5.53	7.33	6.43
I_3F_4- Irrigating at 0.9 ETC and 50 % RDF	5.80	4.93	5.37
I_4F_1- Irrigating at 1.0 ETC and 125 % RDF	6.20	8.80	7.50
I_4F_2- Irrigating at 1.0 ETC and 100 % RDF	8.13	8.47	8.30
I_4F_3- Irrigating at 1.0 ETC and 75 % RDF	6.27	7.80	7.03
I_4F_4- Irrigating at 1.0 ETC and 50 % RDF	4.47	4.73	4.60
SE (m) ±	0.49	0.29	0.49
CD at 5%	1.43	0.85	NS
I_5 - Surface irrigation with 100% RDF	4.07	4.13	4.10
SE (m) ±	0.45	0.29	0.46
CD at 5%	1.33	0.90	NS

Table.3. Days to 50% flowering of chilli as influenced by different levels of irrigation and fertigation

Treatment	Summer 2018	*Late Kharif*2018-19	Pooled Mean
I_1 - 0.7 ETc	45.67	46.92	46.29
I_2 - 0.8 ETc	49.08	50.50	49.79
I_3 - 0.9 ETc	48.83	50.58	49.71
I_4 - 1.0 ETc	50.58	51.83	51.21
SE (m) ±	0.43	0.65	0.67
CD at 5%	1.49	2.24	2.33
F_1 - 125 % RD Through WSF	48.25	49.58	48.92
F_2 - 100 % RD Through WSF	48.50	49.67	49.08
F_3 - 75 % RD Through WSF	48.92	49.75	49.33
F_4 – 50 % RD Through WSF	48.50	50.83	49.67
SE (m) ±	0.40	0.57	0.61
CD at 5%	NS	NS	NS
I_1F_1- Irrigating at 0.7 ETC and 125 % RDF	44.00	45.67	44.83
I_1F_2 -Irrigating at 0.7 ETC and 100 % RDF	45.67	46.00	45.83
I_1F_3- Irrigating at 0.7 ETC and 75 % RDF	46.33	46.00	46.17
I_1F_4- Irrigating at 0.7 ETC and 50 % RDF	46.67	50.00	48.33
I_2F_1- Irrigating at 0.8 ETC and 125 % RDF	48.00	49.33	48.67
I_2F_2- Irrigating at 0.8 ETC and 100 % RDF	48.67	50.00	49.33
I_2F_3- Irrigating at 0.8 ETC and 75 % RDF	50.00	51.33	50.67
I_2F_4- Irrigating at 0.8 ETC and 50 % RDF	49.67	51.33	50.50
I_3F_1- Irrigating at 0.9 ETC and 125 % RDF	50.00	51.67	50.83
I_3F_2- Irrigating at 0.9 ETC and 100 % RDF	49.67	51.33	50.50
I_3F_3- Irrigating at 0.9 ETC and 75 % RDF	48.67	50.00	49.33
I_3F_4- Irrigating at 0.9 ETC and 50 % RDF	47.00	49.33	48.17
I_4F_1- Irrigating at 1.0 ETC and 125 % RDF	51.00	51.67	51.33
I_4F_2- Irrigating at 1.0 ETC and 100 % RDF	50.00	51.33	50.67
I_4F_3- Irrigating at 1.0 ETC and 75 % RDF	50.67	51.67	51.17
I_4F_4- Irrigating at 1.0 ETC and 50 % RDF	50.67	52.67	51.67
SE (m) ±	0.81	1.14	1.21
CD at 5%	NS	NS	NS
I_5 - Surface irrigation with 100% RDF	58.33	59.67	59.00
SE (m) ±	0.82	1.18	1.25
CD at 5%	NS	NS	NS

Table 4. Fruit length (cm) of chilli as influenced by different levels of irrigation and fertigation

Treatment	Summer 2018	*Late Kharif* 2018-19	Pooled Mean
I_1 - 0.7 ETc	9.72	9.34	9.53
I_2 - 0.8 ETc	9.85	9.87	9.86
I_3 - 0.9 ETc	9.94	9.64	9.79
I_4 - 1.0 ETc	9.01	9.48	9.24
SE (m) ±	0.14	0.14	0.17
CD at 5%	0.48	NS	NS
F_1 - 125 % RD Through WSF	9.67	9.92	9.79
F_2 - 100 % RD Through WSF	10.18	10.26	10.22
F_3 - 75 % RD Through WSF	9.64	9.61	9.62
F_4 – 50 % RD Through WSF	9.03	8.55	8.79
SE (m) ±	0.14	0.14	0.18
CD at 5%	0.41	0.41	0.50
I_1F_1- Irrigating at 0.7 ETC and 125 % RDF	9.55	9.89	9.72
I_1F_2 -Irrigating at 0.7 ETC and 100 % RDF	10.30	10.28	10.29
I_1F_3- Irrigating at 0.7 ETC and 75 % RDF	9.42	9.44	9.43
I_1F_4- Irrigating at 0.7 ETC and 50 % RDF	9.60	7.74	8.67
I_2F_1- Irrigating at 0.8 ETC and 125 % RDF	9.15	9.29	9.22
I_2F_2- Irrigating at 0.8 ETC and 100 % RDF	10.53	10.63	10.58
I_2F_3- Irrigating at 0.8 ETC and 75 % RDF	10.51	10.59	10.55
I_2F_4- Irrigating at 0.8 ETC and 50 % RDF	9.21	8.97	9.09
I_3F_1- Irrigating at 0.9 ETC and 125 % RDF	10.47	10.21	10.34
I_3F_2- Irrigating at 0.9 ETC and 100 % RDF	10.47	10.33	10.40
I_3F_3- Irrigating at 0.9 ETC and 75 % RDF	9.63	9.77	9.70
I_3F_4- Irrigating at 0.9 ETC and 50 % RDF	9.20	8.25	8.73
I_4F_1- Irrigating at 1.0 ETC and 125 % RDF	9.51	10.28	9.89
I_4F_2- Irrigating at 1.0 ETC and 100 % RDF	9.42	9.79	9.61
I_4F_3- Irrigating at 1.0 ETC and 75 % RDF	8.99	8.63	8.81
I_4F_4- Irrigating at 1.0 ETC and 50 % RDF	8.10	9.23	8.66
SE (m) ±	0.29	0.29	0.35
CD at 5%	0.84	0.83	NS
I_5 - Surface irrigation with 100% RDF	7.45	9.36	8.40
SE (m) ±	0.28	0.28	0.35
CD at 5%	0.87	0.87	NS

Table 5. Fruit diameter (cm) of chilli as influenced by different levels of irrigation and fertigation

Treatment	Summer 2018	*Late Kharif* 2018-19	Pooled Mean
I_1 - 0.7 ETc	1.40	1.38	1.39
I_2 - 0.8 ETc	1.39	1.39	1.39
I_3 - 0.9 ETc	1.43	1.41	1.42
I_4 - 1.0 ETc	1.41	1.41	1.41
SE (m) ±	0.02	0.01	0.02
CD at 5%	NS	NS	NS
F_1 - 125 % RD Through WSF	1.39	1.35	1.37
F_2 - 100 % RD Through WSF	1.44	1.44	1.44
F_3 - 75 % RD Through WSF	1.46	1.42	1.44
F_4 – 50 % RD Through WSF	1.35	1.38	1.36
SE (m) ±	0.02	0.02	0.02
CD at 5%	0.04	0.04	0.05
I_1F_1- Irrigating at 0.7 ETC and 125 % RDF	1.39	1.32	1.35
I_1F_2 -Irrigating at 0.7 ETC and 100 % RDF	1.43	1.42	1.43
I_1F_3- Irrigating at 0.7 ETC and 75 % RDF	1.48	1.41	1.45
I_1F_4- Irrigating at 0.7 ETC and 50 % RDF	1.29	1.36	1.33
I_2F_1- Irrigating at 0.8 ETC and 125 % RDF	1.22	1.23	1.22
I_2F_2- Irrigating at 0.8 ETC and 100 % RDF	1.51	1.51	1.51
I_2F_3- Irrigating at 0.8 ETC and 75 % RDF	1.49	1.47	1.48
I_2F_4- Irrigating at 0.8 ETC and 50 % RDF	1.34	1.36	1.35
I_3F_1- Irrigating at 0.9 ETC and 125 % RDF	1.48	1.39	1.44
I_3F_2- Irrigating at 0.9 ETC and 100 % RDF	1.40	1.44	1.42
I_3F_3- Irrigating at 0.9 ETC and 75 % RDF	1.43	1.43	1.43
I_3F_4- Irrigating at 0.9 ETC and 50 % RDF	1.42	1.37	1.40
I_4F_1- Irrigating at 1.0 ETC and 125 % RDF	1.46	1.45	1.45
I_4F_2- Irrigating at 1.0 ETC and 100 % RDF	1.40	1.38	1.39
I_4F_3- Irrigating at 1.0 ETC and 75 % RDF	1.42	1.37	1.40
I_4F_4- Irrigating at 1.0 ETC and 50 % RDF	1.35	1.43	1.39
SE (m) ±	0.03	0.03	0.04
CD at 5%	0.09	0.09	0.11
I_5 - Surface irrigation with 100% RDF	1.13	1.27	1.20
SE (m) ±	0.03	0.03	0.04
CD at 5%	0.11	0.09	0.11

Table 6. Average weight of fruit (g) of chilli as influenced by different levels of irrigation and fertigation

Treatment	Summer 2018	*Late Kharif*2018-19	Pooled Mean
I_1 - 0.7 ETc	2.79	2.72	2.75
I_2 - 0.8 ETc	2.80	3.05	2.93
I_3 - 0.9 ETc	2.78	2.84	2.81
I_4 - 1.0 ETc	2.68	2.75	2.72
SE (m) ±	0.03	0.03	0.04
CD at 5%	NS	0.11	0.14
F_1 - 125 % RD Through WSF	2.75	2.92	2.84
F_2 - 100 % RD Through WSF	3.16	3.01	3.08
F_3 - 75 % RD Through WSF	2.63	2.84	2.73
F_4 – 50 % RD Through WSF	2.51	2.59	2.55
SE (m) ±	0.03	0.02	0.03
CD at 5%	0.08	0.06	0.09
I_1F_1- Irrigating at 0.7 ETC and 125 % RDF	2.74	2.93	2.84
I_1F_2 -Irrigating at 0.7 ETC and 100 % RDF	3.37	2.73	3.05
I_1F_3- Irrigating at 0.7 ETC and 75 % RDF	2.50	2.63	2.56
I_1F_4- Irrigating at 0.7 ETC and 50 % RDF	2.54	2.60	2.57
I_2F_1- Irrigating at 0.8 ETC and 125 % RDF	2.82	2.93	2.88
I_2F_2- Irrigating at 0.8 ETC and 100 % RDF	3.22	3.43	3.33
I_2F_3- Irrigating at 0.8 ETC and 75 % RDF	2.67	3.24	2.96
I_2F_4- Irrigating at 0.8 ETC and 50 % RDF	2.48	2.61	2.55
I_3F_1- Irrigating at 0.9 ETC and 125 % RDF	2.76	2.81	2.79
I_3F_2- Irrigating at 0.9 ETC and 100 % RDF	3.09	3.13	3.11
I_3F_3- Irrigating at 0.9 ETC and 75 % RDF	2.69	2.80	2.75
I_3F_4- Irrigating at 0.9 ETC and 50 % RDF	2.57	2.63	2.60
I_4F_1- Irrigating at 1.0 ETC and 125 % RDF	2.68	3.02	2.85
I_4F_2- Irrigating at 1.0 ETC and 100 % RDF	2.96	2.74	2.85
I_4F_3- Irrigating at 1.0 ETC and 75 % RDF	2.64	2.70	2.67
I_4F_4- Irrigating at 1.0 ETC and 50 % RDF	2.45	2.54	2.50
SE (m) ±	0.06	0.04	0.06
CD at 5%	0.17	0.13	0.18
I_5 - Surface irrigation with 100% RDF	2.41	2.44	2.43
SE (m) ±	0.06	0.05	0.07
CD at 5%	0.19	0.16	0.20

Table 7. Number of fruit per plant of chilli as influenced by different levels of irrigation and fertigation

Treatment	Summer 2018	*Late Kharif*2018-19	Pooled Mean
I_1 - 0.7 ETc	92.97	217.72	155.35
I_2 - 0.8 ETc	127.69	245.46	186.57
I_3 - 0.9 ETc	113.90	250.63	182.27
I_4 - 1.0 ETc	112.92	250.45	181.68
SE (m) ±	5.61	5.00	6.51
CD at 5%	19.42	17.31	22.53
F_1 - 125 % RD Through WSF	122.56	268.69	195.62
F_2 - 100 % RD Through WSF	110.89	269.22	190.05
F_3 - 75 % RD Through WSF	122.56	267.62	195.09
F_4 – 50 % RD Through WSF	91.47	158.73	125.10
SE (m) ±	3.97	5.44	5.83
CD at 5%	11.34	15.54	16.66
I_1F_1- Irrigating at 0.7 ETC and 125 % RDF	97.37	222.62	160.00
I_1F_2 -Irrigating at 0.7 ETC and 100 % RDF	85.40	270.34	177.87
I_1F_3- Irrigating at 0.7 ETC and 75 % RDF	101.45	239.81	170.63
I_1F_4- Irrigating at 0.7 ETC and 50 % RDF	87.68	138.11	112.89
I_2F_1- Irrigating at 0.8 ETC and 125 % RDF	123.14	271.83	197.49
I_2F_2- Irrigating at 0.8 ETC and 100 % RDF	138.02	278.37	208.19
I_2F_3- Irrigating at 0.8 ETC and 75 % RDF	157.46	282.09	219.78
I_2F_4- Irrigating at 0.8 ETC and 50 % RDF	92.12	149.54	120.83
I_3F_1- Irrigating at 0.9 ETC and 125 % RDF	127.39	299.59	213.49
I_3F_2- Irrigating at 0.9 ETC and 100 % RDF	126.31	280.33	203.32
I_3F_3- Irrigating at 0.9 ETC and 75 % RDF	111.62	266.47	189.04
I_3F_4- Irrigating at 0.9 ETC and 50 % RDF	90.29	156.13	123.21
I_4F_1- Irrigating at 1.0 ETC and 125 % RDF	142.32	280.71	211.51
I_4F_2- Irrigating at 1.0 ETC and 100 % RDF	93.83	247.82	170.83
I_4F_3- Irrigating at 1.0 ETC and 75 % RDF	119.72	282.12	200.92
I_4F_4- Irrigating at 1.0 ETC and 50 % RDF	95.79	191.16	143.47
SE (m) ±	7.94	10.87	11.66
CD at 5%	23.17	31.73	NS
I_5 - Surface irrigation with 100% RDF	102.01	206.21	154.11
SE (m) ±	8.87	10.66	12.01
CD at 5%	27.82	32.39	NS

Table 8. Yield per plant (g) of chilli as influenced by different levels of irrigation and fertigation

Treatment	Summer 2018	*Late Kharif*2018-19	Pooled Mean
I_1 - 0.7 ETc	257.35	594.83	426.09
I_2 - 0.8 ETc	360.08	763.58	561.83
I_3 - 0.9 ETc	318.08	718.75	518.42
I_4 - 1.0 ETc	301.58	692.96	497.27
SE (m) ±	12.43	12.94	15.54
CD at 5%	43.02	44.79	53.78
F_1 - 125 % RD Through WSF	335.47	784.03	559.75
F_2 - 100 % RD Through WSF	349.89	811.73	580.81
F_3 - 75 % RD Through WSF	322.53	763.19	542.86
F_4 – 50 % RD Through WSF	229.20	411.16	320.18
SE (m) ±	10.19	14.98	15.69
CD at 5%	29.12	42.82	44.84
I_1F_1- Irrigating at 0.7 ETC and 125 % RDF	266.01	652.83	459.42
I_1F_2 -Irrigating at 0.7 ETC and 100 % RDF	288.25	737.52	512.89
I_1F_3- Irrigating at 0.7 ETC and 75 % RDF	253.24	629.40	441.32
I_1F_4- Irrigating at 0.7 ETC and 50 % RDF	221.91	359.58	290.74
I_2F_1- Irrigating at 0.8 ETC and 125 % RDF	346.95	796.14	571.54
I_2F_2- Irrigating at 0.8 ETC and 100 % RDF	444.49	953.67	699.08
I_2F_3- Irrigating at 0.8 ETC and 75 % RDF	420.39	914.21	667.30
I_2F_4- Irrigating at 0.8 ETC and 50 % RDF	228.51	390.29	309.40
I_3F_1- Irrigating at 0.9 ETC and 125 % RDF	350.75	839.92	595.33
I_3F_2- Irrigating at 0.9 ETC and 100 % RDF	389.81	878.20	634.01
I_3F_3- Irrigating at 0.9 ETC and 75 % RDF	300.14	746.69	523.41
I_3F_4- Irrigating at 0.9 ETC and 50 % RDF	231.62	410.20	320.91
I_4F_1- Irrigating at 1.0 ETC and 125 % RDF	378.18	847.25	612.71
I_4F_2- Irrigating at 1.0 ETC and 100 % RDF	277.00	677.53	477.27
I_4F_3- Irrigating at 1.0 ETC and 75 % RDF	316.37	762.46	539.42
I_4F_4- Irrigating at 1.0 ETC and 50 % RDF	234.77	484.58	359.68
SE (m) ±	20.38	29.96	31.38
CD at 5%	59.48	87.45	89.23
I_5 - Surface irrigation with 100% RDF	245.45	503.16	374.30
SE (m) ±	21.59	29.00	31.31
CD at 5%	66.88	87.76	90.85

Table 9. Yield per plot (kg) of green chilli as influenced by different levels of irrigation and fertigation

Treatment	Summer 2018	*Late Kharif*2018-19	Pooled Mean
I_1 - 0.7 ETc	8.24	19.03	13.63
I_2 - 0.8 ETc	11.52	24.43	17.98
I_3 - 0.9 ETc	10.18	23.00	16.59
I_4 - 1.0 ETc	9.65	22.17	15.91
SE (m) ±	0.40	0.41	0.50
CD at 5%	1.38	1.43	1.72
F_1 - 125 % RD Through WSF	10.74	25.09	17.91
F_2 - 100 % RD Through WSF	11.20	25.98	18.59
F_3 - 75 % RD Through WSF	10.32	24.42	17.37
F_4 – 50 % RD Through WSF	7.33	13.16	10.25
SE (m) ±	0.33	0.48	0.50
CD at 5%	0.93	1.37	1.43
I_1F_1- Irrigating at 0.7 ETC and 125 % RDF	8.51	20.89	14.70
I_1F_2 -Irrigating at 0.7 ETC and 100 % RDF	9.22	23.60	16.41
I_1F_3- Irrigating at 0.7 ETC and 75 % RDF	8.10	20.14	14.12
I_1F_4- Irrigating at 0.7 ETC and 50 % RDF	7.10	11.51	9.30
I_2F_1- Irrigating at 0.8 ETC and 125 % RDF	11.10	25.48	18.29
I_2F_2- Irrigating at 0.8 ETC and 100 % RDF	14.22	30.52	22.37
I_2F_3- Irrigating at 0.8 ETC and 75 % RDF	13.45	29.25	21.35
I_2F_4- Irrigating at 0.8 ETC and 50 % RDF	7.31	12.49	9.90
I_3F_1- Irrigating at 0.9 ETC and 125 % RDF	11.22	26.88	19.05
I_3F_2- Irrigating at 0.9 ETC and 100 % RDF	12.47	28.10	20.29
I_3F_3- Irrigating at 0.9 ETC and 75 % RDF	9.60	23.89	16.75
I_3F_4- Irrigating at 0.9 ETC and 50 % RDF	7.41	13.13	10.27
I_4F_1- Irrigating at 1.0 ETC and 125 % RDF	12.10	27.11	19.61
I_4F_2- Irrigating at 1.0 ETC and 100 % RDF	8.86	21.68	15.27
I_4F_3- Irrigating at 1.0 ETC and 75 % RDF	10.12	24.40	17.26
I_4F_4- Irrigating at 1.0 ETC and 50 % RDF	7.51	15.51	11.51
SE (m) ±	0.65	0.96	1.00
CD at 5%	1.90	2.80	2.86
I_5 - Surface irrigation with 100% RDF	7.85	16.10	11.98
SE (m) ±	0.69	0.93	1.00
CD at 5%	2.14	2.81	2.91

Table 10. Yield per hectare (q) of green chilli as influenced by different levels of irrigation and fertigation

Treatment	Summer 2018	*Late Kharif* 2018-19	Pooled Mean
I_1 - 0.7 ETc	71.49	165.23	118.36
I_2 - 0.8 ETc	100.02	212.10	156.06
I_3 - 0.9 ETc	88.36	199.65	144.00
I_4 - 1.0 ETc	83.77	192.49	138.13
SE (m) ±	3.45	3.60	4.32
CD at 5%	11.95	12.44	14.94
F_1 - 125 % RD Through WSF	93.19	217.79	155.49
F_2 - 100 % RD Through WSF	97.19	225.48	161.34
F_3 - 75 % RD Through WSF	89.59	212.00	150.79
F_4 – 50 % RD Through WSF	63.67	114.21	88.94
SE (m) ±	2.83	4.16	4.36
CD at 5%	8.09	11.89	12.46
I_1F_1- Irrigating at 0.7 ETC and 125 % RDF	73.89	181.34	127.62
I_1F_2 -Irrigating at 0.7 ETC and 100 % RDF	80.07	204.87	142.47
I_1F_3- Irrigating at 0.7 ETC and 75 % RDF	70.34	174.83	122.59
I_1F_4- Irrigating at 0.7 ETC and 50 % RDF	61.64	99.88	80.76
I_2F_1- Irrigating at 0.8 ETC and 125 % RDF	96.37	221.15	158.76
I_2F_2- Irrigating at 0.8 ETC and 100 % RDF	123.47	264.91	194.19
I_2F_3- Irrigating at 0.8 ETC and 75 % RDF	116.77	253.95	185.36
I_2F_4- Irrigating at 0.8 ETC and 50 % RDF	63.48	108.41	85.94
I_3F_1- Irrigating at 0.9 ETC and 125 % RDF	97.43	233.31	165.37
I_3F_2- Irrigating at 0.9 ETC and 100 % RDF	108.28	243.94	176.11
I_3F_3- Irrigating at 0.9 ETC and 75 % RDF	83.37	207.41	145.39
I_3F_4- Irrigating at 0.9 ETC and 50 % RDF	64.34	113.94	89.14
I_4F_1- Irrigating at 1.0 ETC and 125 % RDF	105.05	235.35	170.20
I_4F_2- Irrigating at 1.0 ETC and 100 % RDF	76.94	188.20	132.57
I_4F_3- Irrigating at 1.0 ETC and 75 % RDF	87.88	211.79	149.84
I_4F_4- Irrigating at 1.0 ETC and 50 % RDF	65.21	134.61	99.91
SE (m) ±	5.66	8.32	8.72
CD at 5%	16.52	24.29	24.79
I_5 - Surface irrigation with 100% RDF	68.18	139.77	103.97
SE (m) ±	6.00	8.05	8.70
CD at 5%	18.58	24.38	25.24

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