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## Impact of drip irrigation levels and weed management practices on different growth parameters and yield of turmeric (*Curcuma longa* L.) under mango orchard

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### Abstract

A field experiment, aimed to study the performance of drip irrigation levels and weed management methods on growth and productivity of turmeric (*Curcuma longa* L.) in mango orchard was conducted at Pt. Kishori Lal Shukla College of Horticulture and Research Station, Rajnandgaon (Chhattisgarh) during 2019-20 and 2020-21. The results indicated that all the growth parameters like plant height, number of leaves and tillers and dry matter production were significantly higher values were observed under drip irrigation at 1.0 Epan and hand weeding thrice at 25, 50 and 75 DAP while, flood irrigation at 1.0 Epan and unweeded control recorded the lowest values of these parameters during 2019-20 and 2020-21. The combination of drip irrigation at 1.0 Epan with hand weeding thrice at 25, 50 and 75 DAP recorded significantly the highest fresh rhizomes yield (29.10, 32.40 and 30.75 t ha<sup>-1</sup>) and cured rhizomes yield (6.58, 6.93 and 6.76 t ha<sup>-1</sup>) during 2019-20, 2020-21 and on mean basis, respectively.

**Keywords:** Drip irrigation levels, growth, turmeric and yield

### Introduction

Turmeric (*Curcuma longa* L.) is also known as the “Golden spice” belong to member of *Zingiberaceae*, which is native of India. Turmeric can be cultivated under partial shaded conditions as an intercrop to the wide spacing crops *viz.* mango, guava as reported by Vishwakarma *et al.* (2006) <sup>[12]</sup> and Reddy *et al.* (2017) <sup>[5]</sup>. Weeds and water are one of the major constrain in turmeric cultivation and cause highly reduction in rhizomes yield in the absence of suitable and effective weed and water management approaches. Therefore, it is essential to find out different weed management practices and drip irrigation levels considering the availability and scarcity of labours as well as water, cost of weed and water management under Chhattisgarh plains agro-climatic conditions for effective weed control and prices application of water in turmeric cultivation.

### Materials and Methods

A field trial was carried out at Pt. K. L. S. College of Horticulture and Research Station, Rajnandgaon (Chhattisgarh) during 2019-20 and 2020-21. The soil of experimental plot was sandy loam in texture, neutral in soil reaction, low in available of N, medium in P and high in K status. The climate of region is normal tropical moist sub-humid and dry with an average annual rainfall of 1050-1100 mm comes under rain shadow zone. The crop received 721.28 and 863.80 mm rainfall during growing period in 2019-20 and 2020-21, respectively. The experiment was frame out with four irrigation levels which comprised i.e. drip irrigation at 1.0 Epan, drip irrigation at 0.8 Epan, drip irrigation at 0.6 Epan and flood irrigation at 1.0 Epan as control in horizontal plot and six weed management practices *viz.*, green leaf mulch 12 t ha<sup>-1</sup> *fb* hoeing at 75 DAP, straw mulch 10 t ha<sup>-1</sup> *fb* hoeing at 75 DAP, metribuzin 0.7 kg ha<sup>-1</sup>, PE *fb* straw mulch 10 t ha<sup>-1</sup> *fb* hoeing at 75 DAP, oxadiargyl 0.25 kg ha<sup>-1</sup>, PE *fb* metsulfuron 0.004 kg ha<sup>-1</sup>, PoE *fb* hoeing at 75 DAP, hand weeding thrice at 25, 50 and 75 DAP and unweeded control in vertical plot in strip plot design with three replications. After ploughing, field plot was divided having 4.6x1.35 m<sup>2</sup> of four bed represented a single treatment. Chhattisgarh haldi<sup>-1</sup> varieties weighing about 25g were chosen for planting. A dosage of 120:100:120 kg NPK ha<sup>-1</sup> was taken for the crop cultivation. Planting and harvesting was done in the month of June and February 2020 and 2021, respectively. The irrigation schedules for drip irrigation were done on cumulative pan evaporation reading from pan evaporimeter.

In case of flood irrigation, irrigation was scheduled at 10 days interval. The water received through rainfall was adjusted in successive days. Drip irrigation was applied at 20 mm CPE keeping depth of irrigation equal to sum of corresponding CPE as per treatments. Daily Epan was calculated from location specific weather station. Each plot was dripping with a lateral pipe having inbuilt dripper at spacing of 20 cm with discharge of 2 lph, placed between two rows of turmeric. The whole recommended package and practices of turmeric cultivation was adopted. Herbicides were sprayed through knapsack sprayer with flat fan nozzle. Paddy straw mulch and banana green leaves @ 10 and 12 t ha<sup>-1</sup>, respectively was spread 5 days after application of pre emergence herbicide. The plant height, number of leaves and tillers, dry matter production, fresh and cured rhizomes yield were observed during experiment at different stages of crop. After harvesting, the rhizomes were split from mother and fresh weight was recorded. Rhizomes was washed clean water and then boiled in pressure cooker for 50 minutes and dry weight was recorded.

### Results and Discussion

The data on plant height, number of leaves and tillers were significantly affected by various drip irrigation levels and weed management practices during both the years and presented in Table 1, 2 and 3.

The maximum plant height, number of leaves and tillers of turmeric were observed in drip irrigation applied at 1.0 Epan during both the years. However, it was at par to drip irrigation at 0.8 Epan at different period of observations. While, the lowest plant height, number of leaves and tillers of turmeric was recorded in flood irrigation applied at 1.0 Epan.

Pertaining to weed management practices, significantly higher plant height, number of leaves and tillers were recorded in hand weeding thrice performed at 25, 50 and 75 DAP during both the years. However, it was at par to metribuzin 0.7 kg ha<sup>-1</sup>, PE fb straw mulch 10 t ha<sup>-1</sup> fb hoeing at 75 DAP at all intervals of observations. On the contrary, the lowest plant height, number of leaves and tillers were registered in unweeded control during both the years and on mean basis. Interaction between drip irrigation levels and weed management practices did not showed significant response towards plant height, number of leaves and tillers of turmeric during all the observational stages of crop during both the years.

The data illustrate in the Table 4 showed that statistically significant higher dry matter production of turmeric was recorded in drip irrigation at 1.0 Epan (6.19, 25.68, 64.82, 117.87 and 138.70 g plant<sup>-1</sup> during 2019-20 and 8.27, 28.31, 71.24, 122.62 and 147.20 g plant<sup>-1</sup> during 2020-21 and 7.23, 26.99, 68.03, 120.25 and 142.75 g plant<sup>-1</sup> on mean basis at 90, 120, 150, 180, 210 DAP, respectively) which was significantly higher over all the other irrigation levels. However, the lowest value of dry matter production was recorded in flood irrigation at 1.0 Epan during both the years and on mean basis.

Concerning to weed management practices, manual weeded at 25, 50 and 75 DAP evaluated significantly higher dry matter accumulation (6.46, 24.19, 64.82, 117.76 and 139.73 g plant<sup>-1</sup> during 2019-20 and 8.34, 28.65, 72.65, 126.04 and 149.91 g plant<sup>-1</sup> during 2020-21 and 7.40, 26.42, 68.73, 121.90 and 144.42 g plant<sup>-1</sup> on mean basis at 60, 90, 120, 150, 180, 210 DAP, respectively) over rest of the weed management treatments. While the lowest dry matter accumulation was

recorded under unweeded plots in all observations during both the years. No significant difference was found due to combination of irrigation levels and weed management operations towards dry matter production at all observation during both the years of studies.

Drip irrigation at 1.0 Epan observed significantly higher fresh rhizomes yield (24.50, 26.53 and 25.51 t ha<sup>-1</sup> during 2019-20, 2020-21 and on mean basis, respectively). However, flood irrigation at 1.0 Epan recorded the lowest fresh rhizomes yield (18.12, 19.94 and 19.03 t ha<sup>-1</sup> during 2019-20, 2020-21 and on mean basis, respectively). Regarding weed control practices, hand weeding thrice carried out at 25, 50 and 75 DAP was recorded significantly higher fresh rhizomes yield (25.11, 28.14 and 26.62 t ha<sup>-1</sup> during 2019-20, 2020-21 and on mean basis, respectively). However, unweeded control was obtained the lowest fresh rhizomes yield (16.56, 17.02 and 16.79 t ha<sup>-1</sup> during 2019-20, 2020-21 and on mean basis, respectively). The data on interaction between drip irrigation at 1.0 Epan and hand weeding thrice at 25, 50 and 75 DAP are presented in Table 4. Significantly higher fresh rhizomes yield viz. 29.10, 32.40 and 30.75 t ha<sup>-1</sup> during 2019-20, 2020-21 and on on mean basis, respectively. This treatment was at par to drip irrigation at 1.0 Epan and metribuzin 0.7 kg ha<sup>-1</sup>, PE fb straw mulch 10 t ha<sup>-1</sup> fb hoeing at 75 DAP during both the years. However, interaction between surface irrigation at 1.0 Epan and weedy check evaluated the lowest fresh rhizomes yield (13.39, 13.41 and 13.40 t ha<sup>-1</sup> during 2019-20, 2020-21 and on mean basis, respectively).

Significantly higher cured rhizomes yield was obtained in drip irrigation at 1.0 Epan (5.18, 5.67 and 5.48 t ha<sup>-1</sup> during 2019-20, 2020-21 and mean basis, respectively) which was significantly higher over rest of the drip irrigation and flood irrigation levels at 1.0 Epan. On the other hand, the lowest cured rhizomes yield was found in flood irrigation at 1.0 Epan (3.76, 4.21 and 3.98 t ha<sup>-1</sup> during 2019-20, 2020-21 and on mean basis, respectively). As regards to weed management practices, significantly higher cured rhizomes yield of turmeric was recorded under hand weeding thrice performed at 25, 50 and 75 DAP (5.64, 6.08 and 5.86 t ha<sup>-1</sup> during 2019-20, 2020-21 and mean basis, respectively). However, weedy check was found the lowest in respect of cured rhizomes yield viz. 6.27, 3.37 and 3.32 t ha<sup>-1</sup> during 2019-20, 2020-21 and on mean basis, respectively over rest of the weed management practices. The interaction among different drip irrigation levels and weed management practices was significant affected towards cured rhizomes yield. The data presented in Table 4 revealed that combination of drip irrigation at 1.0 Epan and manual weeded at 25, 50 and 75 DAP observed the highest cured rhizomes yield (6.58, 6.93 and 6.76 t ha<sup>-1</sup> during 2019-20, 2020-21 and on mean basis, respectively) which was significantly higher over rest of the drip irrigation and flood irrigation levels at 1.0 Epan. Gill *et al.* (2000) [2] registered that 6 t ha<sup>-1</sup> straw mulch treatment increased fresh rhizomes yield resulted from quick emergence and rapid germination. Further, Tadesse *et al.* (2015) [9] reported that when the first manual weeding was delayed up to 60 days from planting yield of turmeric was reduced tremendously. Satyareddi and Angadi (2014) [8] evaluated that drip irrigation increased growth attributes like leaf area and LAD might have been positively correlation to conversion and translocation of photosynthates in rhizomes. Similar findings were also observed by Thiyagarajan *et al.* (2011) [10], Thiripathi *et al.* (2014) [11] and (Chitra *et al.* 2017) [11] in turmeric.

**Table 1:** Plant height of turmeric as influenced by different drip irrigation levels and weed management practices

Treatment	Plant height (cm)																				
	60 DAS			90 DAS			120 DAS			150 DAS			180 DAS			210 DAS			at harvest		
Irrigation levels	2019-20	2020-21	Mean	2019-20	2020-21	Mean	2019-20	2020-21	Mean	2019-20	2020-21	Mean	2019-20	2020-21	Mean	2019-20	2020-21	Mean	2019-20	2020-21	Mean
I <sub>1</sub>	27.47	28.08	27.77	56.12	57.25	56.68	94.83	97.82	96.33	110.11	112.80	111.45	119.34	120.08	119.71	133.48	135.60	134.54	142.25	143.33	142.79
I <sub>2</sub>	26.20	27.93	26.94	53.39	54.88	54.14	92.47	96.06	94.26	107.24	108.46	108.15	118.85	119.04	118.95	131.02	132.50	131.93	140.04	141.62	140.93
I <sub>3</sub>	25.17	26.69	26.54	52.62	53.71	53.16	91.15	94.24	92.70	104.85	105.25	105.05	114.34	118.98	116.66	128.76	130.32	129.54	137.74	139.50	138.62
I <sub>4</sub>	23.79	26.07	24.93	50.77	51.91	51.34	90.11	90.98	90.55	100.09	101.62	100.85	112.72	112.79	112.76	126.70	128.48	127.59	134.22	135.64	134.93
SEm±	0.36	0.39	0.27	0.50	0.58	0.38	0.59	0.46	0.52	0.81	1.02	0.93	0.92	0.96	0.94	0.70	0.63	0.67	0.64	0.11	0.32
CD (P=0.05)	1.26	1.38	0.84	1.70	2.01	1.17	2.04	1.59	1.82	2.84	3.07	2.68	3.20	3.34	3.31	2.43	2.18	2.31	2.20	0.39	1.00
Weed management practices																					
W <sub>1</sub>	24.22	25.67	25.19	51.86	53.79	52.82	90.87	93.18	92.02	104.18	105.26	104.72	115.08	115.99	115.53	130.65	131.64	131.14	138.63	139.49	139.06
W <sub>2</sub>	25.27	26.71	26.59	53.29	56.40	54.90	92.58	95.01	94.19	107.02	107.37	107.98	117.77	118.32	118.05	132.29	134.34	133.31	140.18	141.87	141.02
W <sub>3</sub>	27.07	28.39	27.73	56.23	57.29	56.76	94.66	97.29	95.98	109.88	111.11	110.49	119.33	121.59	120.42	133.85	135.55	134.70	141.48	142.88	142.68
W <sub>4</sub>	24.75	26.29	25.52	50.58	51.12	50.85	90.61	93.03	91.82	102.61	103.63	103.12	114.20	114.55	114.38	125.49	126.54	126.01	135.67	136.85	136.26
W <sub>5</sub>	27.29	28.61	27.95	57.62	57.68	57.65	96.38	98.41	97.39	110.50	112.06	111.28	120.51	123.81	122.16	134.80	136.89	135.85	142.85	144.91	143.88
W <sub>6</sub>	24.10	25.66	24.88	49.78	50.22	50.00	87.75	90.94	89.35	99.78	101.53	100.66	110.99	112.16	111.57	123.38	125.38	124.38	132.86	134.12	133.49
SEm±	0.63	0.60	0.49	0.96	0.40	0.52	0.99	1.06	0.57	1.10	1.48	0.98	0.69	0.71	0.70	1.14	1.59	1.03	0.54	0.5	0.43
CD (P=0.05)	1.99	1.88	1.30	3.03	1.27	1.54	3.12	3.35	1.68	3.46	4.66	2.90	2.18	2.23	2.20	3.58	5.01	2.57	1.71	1.52	1.27

I<sub>1</sub>: Drip irrigation at 1.0 Epan, I<sub>2</sub>: Drip irrigation at 0.8 Epan, I<sub>3</sub>: Drip irrigation at 0.6 Epan, I<sub>4</sub>: Flood irrigation at 1.0 Epan, W<sub>1</sub>: Green leaf mulch 12 t ha<sup>-1</sup> fb hoeing at 75 DAP, W<sub>2</sub>: Straw mulch 10 t ha<sup>-1</sup> fb hoeing at 75 DAP, W<sub>3</sub>: Metribuzin 0.7 kg ha<sup>-1</sup>, PE fb straw mulch 10 t ha<sup>-1</sup> fb hoeing at 75 DAP W<sub>4</sub>: Oxadiargyl 0.25 kg ha<sup>-1</sup>, PE fb metsulfuron 0.004 kg ha<sup>-1</sup>, PoE fb hoeing at 75 DAP W<sub>5</sub>: Hand weeding thrice at 25, 50 and 75 DAP and W<sub>6</sub>: Unweeded control

**Table 2:** Number of leaves plant<sup>-1</sup> of turmeric as influenced by different drip irrigation levels and weed management practices

Treatment	Number of leaves plant <sup>-1</sup>																				
	60 DAS			90 DAS			120 DAS			150 DAS			180 DAS			210 DAS			at harvest		
Irrigation levels	2019-20	2020-21	Mean	2019-20	2020-21	Mean	2019-20	2020-21	Mean	2019-20	2020-21	Mean	2019-20	2020-21	Mean	2019-20	2020-21	Mean	2019-20	2020-21	Mean
I <sub>1</sub>	4.86	4.97	4.91	6.10	6.23	6.17	6.72	6.84	6.78	6.80	6.88	6.84	7.49	7.58	7.53	8.42	8.52	8.46	7.51	7.56	7.54
I <sub>2</sub>	4.79	4.87	4.83	6.05	6.18	6.11	6.63	6.74	6.69	6.70	6.79	6.78	7.40	7.48	7.44	7.33	7.41	7.39	7.41	7.52	7.46
I <sub>3</sub>	4.73	4.83	4.78	5.93	6.00	5.97	6.57	6.64	6.61	6.50	6.58	6.54	7.36	7.43	7.39	7.29	7.36	7.32	7.37	7.45	7.41
I <sub>4</sub>	4.67	4.76	4.71	5.83	5.89	5.86	6.44	6.52	6.48	5.38	5.52	5.45	6.40	6.49	6.45	6.33	6.43	6.38	6.41	6.51	6.46
SEm±	0.04	0.04	0.03	0.02	0.03	0.02	0.02	0.02	0.02	0.03	0.03	0.02	0.03	0.03	0.02	0.03	0.03	0.02	0.02	0.03	0.02
CD (P=0.05)	0.15	0.13	0.09	0.07	0.10	0.05	0.08	0.08	0.05	0.11	0.10	0.07	0.09	0.12	0.07	0.09	0.11	0.08	0.09	0.10	0.06
Weed management practices																					
W <sub>1</sub>	4.65	4.87	4.82	5.92	6.02	5.97	6.42	6.50	6.46	6.43	6.50	6.47	6.95	7.04	7.00	6.88	6.98	6.93	6.97	7.08	7.02
W <sub>2</sub>	4.77	4.85	4.81	5.98	6.08	6.03	6.62	6.68	6.65	6.62	6.70	6.66	7.07	7.12	7.09	7.00	7.05	7.03	7.07	7.13	7.10
W <sub>3</sub>	4.98	5.05	5.01	6.19	6.25	6.22	6.90	7.02	6.96	6.90	6.98	6.94	7.63	7.71	7.67	8.57	8.65	8.61	7.65	7.73	7.69
W <sub>4</sub>	4.56	4.68	4.63	5.80	5.92	5.86	6.32	6.42	6.37	6.32	6.42	6.37	6.83	6.91	6.87	6.77	6.85	6.81	6.85	6.92	6.88
W <sub>5</sub>	5.03	5.13	5.08	6.25	6.32	6.28	6.95	7.08	7.02	7.21	7.05	7.00	7.70	7.80	7.75	8.63	8.70	8.67	7.71	7.81	7.76
W <sub>6</sub>	4.47	4.55	4.51	5.73	5.87	5.80	6.35	6.43	6.39	6.35	6.43	6.39	6.78	6.90	6.84	6.72	6.85	6.78	6.97	7.08	7.02
SEm±	0.03	0.03	0.03	0.04	0.04	0.03	0.04	0.05	0.02	0.04	0.03	0.02	0.04	0.04	0.03	0.03	0.03	0.02	0.04	0.04	0.03
CD (P=0.05)	0.09	0.11	0.09	0.12	0.14	0.08	0.11	0.16	0.06	0.12	0.09	0.06	0.12	0.13	0.10	0.11	0.10	0.07	0.12	0.13	0.09

**Table 3:** Number of tillers plant<sup>-1</sup> and leaf area index of turmeric as influenced by different drip irrigation levels and weed management practices

Treatment	Number of tillers plant <sup>-1</sup>									Leaf area index											
	60 DAS			90 DAS			120 DAS			60 DAS			120 DAS			180 DAS			240 DAS		
Irrigation levels	2019-20	2020-21	Mean	2019-20	2020-21	Mean	2019-20	2020-21	Mean	2019-20	2020-21	Mean	2019-20	2020-21	Mean	2019-20	2020-21	Mean	2019-20	2020-21	Mean
I <sub>1</sub>	1.92	2.36	2.14	2.57	2.63	2.60	3.56	3.63	3.60	0.72	1.05	0.88	1.12	1.40	1.26	2.04	2.77	2.41	3.74	4.32	4.03
I <sub>2</sub>	1.76	2.03	1.93	2.49	2.56	2.52	3.38	3.47	3.43	0.50	0.74	0.62	0.92	1.20	1.06	1.91	2.57	2.20	3.54	4.07	3.80
I <sub>3</sub>	1.52	1.73	1.63	2.12	2.19	2.16	2.77	2.83	2.80	0.49	0.69	0.59	0.77	1.03	0.90	1.74	2.41	2.05	3.38	3.89	3.63
I <sub>4</sub>	1.37	1.51	1.44	1.88	1.96	1.92	2.53	2.60	2.57	0.41	0.61	0.51	0.60	0.86	0.73	1.51	2.24	1.87	3.20	3.70	3.45
SEm±	0.04	0.03	0.02	0.01	0.02	0.01	0.05	0.05	0.04	0.01	0.05	0.02	0.03	0.03	0.02	0.02	0.03	0.02	0.03	0.04	0.02
CD (P=0.05)	0.14	0.09	0.07	0.05	0.05	0.03	0.18	0.15	0.11	0.04	0.16	0.07	0.11	0.09	0.06	0.06	0.09	0.05	0.09	0.14	0.07
Weed management practices																					
W <sub>1</sub>	1.52	1.77	1.64	2.30	2.37	2.33	2.73	2.80	2.77	0.39	0.64	0.51	0.72	1.00	0.86	1.64	2.37	2.01	3.34	3.86	3.60
W <sub>2</sub>	1.58	2.03	1.80	2.35	2.43	2.39	3.42	3.48	3.45	0.62	0.86	0.74	1.00	1.28	1.14	1.93	2.66	2.29	3.62	4.14	3.88
W <sub>3</sub>	2.00	2.48	2.24	2.58	2.65	2.62	3.63	3.72	3.68	0.77	1.01	0.89	1.15	1.43	1.29	2.08	2.81	2.44	3.77	4.29	4.03

W <sub>4</sub>	1.38	1.43	1.41	1.87	1.93	1.90	2.72	2.78	2.75	0.32	0.59	0.45	0.49	0.73	0.61	1.38	2.11	1.74	3.07	3.66	3.37
W <sub>5</sub>	2.05	2.50	2.28	2.77	2.83	2.80	3.95	4.02	3.98	0.81	1.05	0.93	1.27	1.55	1.41	2.19	2.92	2.56	3.89	4.41	4.15
W <sub>6</sub>	1.43	1.23	1.33	1.72	1.78	1.75	1.93	2.00	1.97	2.05	2.12	2.08	1.43	1.23	1.33	6.72	6.85	6.78	6.97	7.08	7.02
SEm±	0.05	0.06	0.03	0.04	0.05	0.03	0.05	0.05	0.03	0.05	0.05	0.04	0.05	0.06	0.03	0.03	0.03	0.02	0.04	0.04	0.03
CD (P=0.05)	0.15	0.19	0.10	0.13	0.16	0.08	0.17	0.16	0.09	0.15	0.14	0.11	0.15	0.19	0.10	0.11	0.10	0.07	0.12	0.13	0.09

**Table 4:** Dry matter production, fresh and cured rhizomes yield of turmeric as influenced by drip irrigation levels and weed management practices

Treatment	Dry matter production (g plant <sup>-1</sup> )															Fresh rhizomes yield (t ha <sup>-1</sup> )			Cured rhizomes yield (t ha <sup>-1</sup> )		
	90 DAS			120 DAS			150 DAS			180 DAS			210 DAS			2019-20	2020-21	Mean	2019-20	2020-21	Mean
Irrigation levels	2019-20	2020-21	Mean	2019-20	2020-21	Mean	2019-20	2020-21	Mean	2019-20	2020-21	Mean	2019-20	2020-21	Mean						
I <sub>1</sub>	6.19	8.27	7.23	25.68	28.31	26.99	64.82	71.24	68.03	117.87	122.62	120.25	138.30	147.20	142.75	24.50	26.53	25.51	5.29	5.67	5.48
I <sub>2</sub>	5.60	6.49	6.04	22.47	25.78	24.13	62.76	68.76	65.76	114.78	120.57	117.67	133.93	143.31	138.62	21.41	24.14	22.77	4.59	4.96	4.77
I <sub>3</sub>	5.37	5.59	5.48	20.47	23.39	21.93	60.70	65.76	63.23	107.77	118.68	113.22	133.53	143.27	138.40	20.01	21.38	20.69	4.22	4.65	4.44
I <sub>4</sub>	4.95	5.18	5.07	18.41	20.09	19.25	56.88	63.36	60.12	101.43	116.07	108.75	124.35	134.60	129.48	18.12	19.94	19.03	3.76	4.21	3.98
SEm±	0.05	0.18	0.09	0.24	0.19	0.15	0.18	0.42	0.23	0.41	0.76	0.43	1.16	1.22	0.84	0.44	0.45	0.31	0.03	0.02	0.02
CD (P=0.05)	0.19	0.62	0.29	0.83	0.64	0.47	0.61	1.46	0.71	1.43	2.65	1.34	4.02	4.23	2.60	1.51	1.55	0.96	0.10	0.08	0.05
Weed management practices																					
W <sub>1</sub>	5.33	5.99	5.66	21.17	23.53	22.35	60.82	66.56	63.69	109.88	118.01	113.94	131.15	140.25	135.70	19.98	22.26	21.12	4.20	4.71	4.45
W <sub>2</sub>	5.52	6.47	6.00	22.07	25.58	23.82	62.18	68.33	65.26	111.38	120.29	115.83	133.50	142.96	138.23	21.50	24.36	22.93	4.62	5.28	4.95
W <sub>3</sub>	5.90	6.97	6.44	23.58	27.04	25.31	62.82	70.60	66.71	113.49	125.38	119.43	138.84	148.67	143.76	24.26	26.08	25.17	5.25	5.79	5.52
W <sub>4</sub>	5.10	5.54	5.32	20.48	21.68	21.08	59.52	63.38	61.45	107.14	114.31	110.73	127.00	136.25	131.62	18.66	20.11	19.38	3.81	4.01	3.91
W <sub>5</sub>	6.46	8.34	7.40	24.19	28.65	26.42	64.82	72.65	68.73	117.76	126.04	121.90	139.73	149.91	144.82	25.11	28.14	26.62	5.64	6.08	5.86
W <sub>6</sub>	4.88	4.99	4.93	19.04	19.87	19.46	57.57	62.14	59.86	103.12	112.87	108.00	124.93	134.54	129.74	16.56	17.02	16.79	3.27	3.37	3.32
SEm±	0.09	0.23	0.14	0.33	0.27	0.27	0.26	0.41	0.24	0.55	1.30	0.49	1.53	1.44	1.13	0.27	0.26	0.27	0.03	0.07	0.02
CD (P=0.05)	0.29	0.71	0.41	1.04	0.85	0.81	0.83	1.30	0.72	1.73	4.11	1.44	4.83	4.53	3.32	0.85	0.81	0.79	0.09	0.23	0.07

## Conclusion

The results and findings concluded that all the growth parameters like plant height, number of leaves and number of tillers, and dry matter production were significantly higher values were observed under drip irrigation at 1.0 Epan and hand weeding thrice. The combination of drip irrigation at 1.0 Epan with manual weeding at 25, 50 and 75 DAP noticed significantly the highest turmeric fresh rhizomes yield (29.10, 32.40 and 30.75 t ha<sup>-1</sup>) and cured rhizomes yield (6.58, 6.93 and 6.76 t ha<sup>-1</sup>) during 2019-20, 2020-21 and on mean basis, respectively.

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