RESEARCH ARTICLE

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Yield Enhancement of Pigeonpea [*Cajanus cajan* (L.) Millsp.] through Drip Irrigation and Fertigation Management

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ABSTRACT

Background: Pigeonpea an indeterminate pulse crop with profuse branching responds well to both irrigation and fertilizer. Erratic rainfall distribution pattern exposes this crop to dry spell during its vegetative stage and terminal drought at reproductive stage and the poor crop nutrition further results in to low yield. Under such circumstances it is very difficult to sustain the yield of pigeonpea. Agronomic practices like precise and timely application of drip irrigation along with judicious use of nutrients play a vital role to boost the yield of any crop. Thus the attempts were made to explore the yield potential of pigeonpea under drip irrigation and fertigation management.

Methods: The present study was conducted at the experimental farm of AICRP on Irrigation Water Management, VNMKV, Parbhani (MS) during *kharif* 2018 and 2019. The experiment was laid out in split plot design with main plots comprising of four drip irrigation levels *viz*. 0.6, 0.8, 1.0 ETc (crop evapotranspiration) and conventional method and sub plots were allotted to four fertigation levels *viz.* control (no fertilizer), 80% RDF, 100% RDF (25: 50: 25 NPK kg ha^{-1}) and 120% RDF.

Result: Drip irrigation at 0.8 ETc recorded higher seed yield, harvest index, water use efficiency, nutrient use efficiency and net returns of pigeonpea followed by 1.0 ETc except in case of water use efficiency. As regards to fertigation studies, higher values of seed yield, harvest index and water use efficiency were recorded with drip fertigation @ 25:50:25 NPK kg ha^{-1} closely followed by 20:40:20 NPK kg ha^{-1}. However higher nutrient use efficiency and net returns were obtained in drip fertigation @ 20:40:20 NPK kg ha^{-1}.

Key words: Drip fertigation, Nutrient use efficiency, Pigeonpea, Partial factor productivity, Water use efficiency.

INTRODUCTION

Performance of crop can be explored by manipulating the various agronomic practices. Among these water and nutrient are the most important production factors that play a vital role in augmenting the productivity of crop (Saritha *et al*., 2012). Major constraints limiting pigeonpea yield are dry spells during vegetative stage coupled with terminal drought during reproductive stage and poor crop nutrition which ultimately results into flower drop and formation of immature pods and this ultimately results into drastic reduction in yield (Deol *et al*., 2018). In recent years the availability of water has become a crucial factor as its demand is increasing in agricultural sector, industrial sector and for domestic use. Further the availability of water for irrigation purpose is declining abruptly while at the same time the demand for irrigation water has been increasing at the faster rate due to increased cropping intensity. In this scenario adoption of modern agronomic practices like drip irrigation and fertigation is the need of hour to augment the efficient use of water and fertilizer and enhance the yield of pigeonpea (Vimalendran, 2013). Drip is an efficient irrigation system as it wets the soil only in the root zone and maintains optimum moisture content (Ramani, 1991). The adoption of drip irrigation may increase the yield potential of crops by thrice with the same amount of water thus saving about 45 to 50 per cent of irrigation water and increasing the productivity by about 40 per cent (Vimalendran, 2013).

In drip fertigation water soluble fertilizers along with the water are applied in precise quantity as per the need of the plant directly in the active root zone of the crop where the concentration of active roots is high (Sivanappan *et al*., 1985). Hence not only water and nutrient can be saved in this technology but also helps to upsurge the crop productivity with quality farm produce as compared to conventional method. Taking into consideration these points the present field investigation was undertaken with an objectives to enhance the yield of pigeonpea through judicious use of water and nutrients.

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MATERIALS AND METHODS

The field experiments were conducted for two consecutive years during *kharif* seasons of 2018 and 2019 at the experimental farm of AICRP on Irrigation Water Management, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani.

The soil of experimental field was dominated by higher clay content (57.80 per cent) with slightly alkaline in reaction (soil pH:7.63), normal in salt content (EC:0.36 dSm^{-1}), low in available soil nitrogen (176.66 kg ha^{-1}), medium in soil organic carbon (6.1 g kg^{-1}) and available soil phosphorus (12.43 kg ha^{-1}) and very high in soil available potassium (621.28 kg ha^{-1}).

The experiment was laid out in split plot design with four drip irrigation levels in main plots *viz.* I_1 : 0.6 ETc, I_2 : 0.8 ETc, I_3 : 1.0 ETc and I_4 : Conventional method (surface irrigation of 60 mm each at critical growth stages like bud initiation, flowering and pod formation stage as per the situation) and in sub plots four fertigation levels *viz.* F_1: Control (no application of fertilizer), F_2: 80% RDF, F_3: 100% RDF (25:50:25 NPK kg ha^{-1}) and F_4:120% RDF and replicated thrice on the same site with same randomization during both the years of investigation. The rainfall received was 781.4 mm in 21 rainy days and 970.4 mm in 53 rainy days during 2018 and 2019 as against the normal rainfall of 883.6 mm in 43.2 rainy days (Dakhore *et al*, 2020). Thus the actual rainfall received during both the years of experimentation deviated from the normal rainfall indicating deficit rainfall of 11.56 per cent during 2018 and 9.82 per cent excess rainfall during 2019.

The crop variety BDN-716 was sown at the spacing of 150 cm × 30 cm for drip treatments and at 90 cm × 50 cm for conventional method on 25/6/2018 and 25/6/2019 during first and second year of study respectively. The drip irrigation was scheduled at alternate day on the basis of crop evapotranspiration (ETc) as per the treatments. ETo (reference crop evapotranspiration) values were calculated as per the FAO Penman Monteith method (Allen *et al.,* 1998) by using "Phule Jal" mobile app developed by Gorantiwar *et al.,* (2018). The fertigation was given through water soluble fertilizers *viz.* urea (46% N), mono ammonium phosphate (12:61:0 NPK) and sulphate of potash (0:0:50 NPK) in 10 splits at an interval of ten days, out of which 20% N and 40% P in two splits at 0-30 DAS, 30% N, P and 25% K in three splits at 31-60 DAS, 30% N, P and 40% K in 3 splits at 61-90 DAS and 20% N and 35% K in two splits at 91-120 DAS through soluble fertilizers.

Data pertaining to seed yield and straw yield were further subjected to calculations on harvest index and economic analysis. Water use efficiency was calculated by dividing the yield (kg ha^{-1}) with total water use (mm). Nutrient use efficiency was assessed by two indices suggested by Rolf Hardter and Thomas Fairhurst (2004).

RESULTS AND DISCUSSION

The data pertaining to seed yield, straw yield, biological yield, nutrient use efficiency, water use efficiency and economic aspect of pigeonpea as influenced by drip irrigation and fertigation during the course of investigation were critically interpreted and results of the same with appropriate justification are presented below.

Yield and economic studies

Data related to seed yield, straw yield, biological yield and harvest index of pigeonpea as influenced by different drip irrigation and fertigation during *kharif* seasons of 2018, 2019 and pooled mean are presented in Table 1.

Effect of irrigation levels

Drip irrigation scheduled at 0.8 ETc recorded significantly

Table 1: Seed yield, straw yield, biological yield and harvest index of pigeonpea as influenced by different treatments.

Treatments	Seed yield (kg ha^{-1})			Straw yield (kg ha^{-1})			Biological yield (kg ha^{-1})			Harvest index		
	2018 -2019	2019 -2020	Pooled mean	2018 -2019	2019 -2020	Pooled mean	2018 -2019	2019 -2020	Pooled mean	2018 -2019	2019 -2020	Pooled mean
Irrigation levels												
I_1 : 0.6 ETc	2019	2144	2081	7397	8443	7920	9416	10587	10001	21.26	20.11	20.68
I_2 : 0.8 ETc	2371	2547	2459	7738	8770	8254	10110	11318	10714	23.39	22.27	22.83
I_3 : 1.0 ETc	2240	2393	2316	8056	9161	8608	10295	11553	10924	21.69	20.58	21.13
I_4 : Conv. method	1311	1599	1455	6098	8170	7134	7410	9769	8589	17.77	16.29	17.03
SEm ±	43.18	83.04	46.80	161	233	142	178	277	165	0.42	0.58	0.36
CD at 5%	105.67	203.21	101.98	395	569	308	437	677	359	1.02	1.42	0.78
Fertigation levels												
F_1 : Control	1502	1556	1529	6150	7958	7054	7652	9515	8583	19.63	16.28	17.96
F_2 : 80% RDF	2163	2395	2279	7451	8569	8010	9614	10964	10289	22.11	21.60	21.85
F_3 : 100% RDF	2207	2434	2320	7683	8831	8257	9889	11264	10577	21.99	21.42	21.70
F_4 : 120% RDF	2070	2297	2184	8006	9186	8596	10075	11483	10779	20.38	19.95	20.17
S.E. ±	42.63	62.03	37.63	203	207	145	214	237	160	0.52	0.47	0.35
CD at 5%	87.98	128.03	75.30	418	428	290	442	489	319	1.07	0.97	0.70
Interaction (I × F)												
SEm ±	85.53	135.79	75.26	386	428	290	412	495	319	0.99	1.00	0.70
CD at 5%	176.5	280.28	150.60	NS	NS	NS	NS	NS	NS	2.04	2.07	1.40

NS - Non significant.

higher seed yield harvest index, gross monetary return, net monetary return and benefit cost ratio during *kharif* seasons of 2018, 2019 and pooled mean, however it was at par with 1.0 ETc in respect of seed yield, gross monetary return and net monetary return during second year of experimentation (Table 1 and 2) and during both the years in respect of benefit cost (B:C) ratio. The probable reason for higher seed yield might be the availability of optimum moisture level that had contributed to better proliferation of roots and aeration throughout the crop growth period and helped in better translocation of assimilates from source to sink and produced higher seed yield and harvest index These results are in conformity with the earlier findings reported by Kumbhar *et al.* (2015). The higher yield might have reflected in fetching higher GMR, NMR and B:C ratio.

Significantly higher straw yield and biological yield of pigeonpea was observed in drip irrigation regime scheduled at 1.0 ETc and was comparable with 0.8 ETc during both the years of experimentation and in pooled mean. The benefit of drip irrigation over surface irrigation is that better turgid condition is maintained by the plant during day time and this might have resulted in wider opening of stomata for longer time and helped in better exchange of gases. Meanwhile leaves might have remained turgid and produced more leaf surface area and this condition favoured in more absorption of solar radiation and ultimately resulted in higher photosynthetic activity which in turn contributed in harnessing higher biological yield. These results are in close conformity with the earlier findings reported by Shirgapure *et al.* (2018).

Effect of fertigation levels

Drip fertigation @ 25:50:25 NPK kg ha^{-1} (F_3) recorded significantly higher seed yield, GMR and NMR of pigeonpea and was comparable with 20:40:40 NPK kg ha^{-1} (80% RDF) during both the years of investigation and in pooled mean (Table 1). Whereas, drip fertigation @ 20:40:20 NPK kg ha^{-1} (F_2) recorded significantly higher harvest index and B:C ratio however, it was at par with 25:50:25 NPK kg ha^{-1} (F_3). The probable reason for increased yield might be the better availability of major plant nutrients like NPK in the soil solution that proved beneficial in better translocation of assimilates from source to sink and produced higher seed yield which in turn reflected in realizing higher harvest index. These findings are in conformity with the earlier findings reported by Vanishree *et al.* (2019).

Drip fertigation @ 30:60:30 NPK kg ha^{-1} (F_4) produced significantly higher straw yield and biological yield of pigeonpea closely followed by 25:50:25 NPK kg ha^{-1} (F_3) during both the years of investigation and in pooled mean. This might be due to beneficial effect of split application of water soluble fertilizers in higher amount that helped in better uptake of nutrients and resulted in higher vegetative and reproductive growth of plant, which in turn contributed towards higher straw and biological yield. These results are

Table 1A: Seed yield of pigeonpea as influenced by interaction of irrigation and fertigation levels.

Treatments	Seed yield (kg ha^{-1})											
	Fertigation levels											
	2018				2019				Pooled mean			
	F_1	F_2	F_3	F_4	F_1	F_2	F_3	F_4	F_1	F_2	F_3	F_4
Irrigation levels												
I_1 : 0.6 ETc	1366	2207	2242	2260	1572	2270	2365	2369	1469	2238	2304	2315
I_2 : 0.8 ETc	1748	2601	2658	2478	1678	2893	2951	2667	1713	2747	2804	2573
I_3 : 1.0 ETc	1780	2553	2547	2079	1766	2814	2705	2285	1773	2683	2626	2182
I_4 : Conv. method	1115	1290	1379	1462	1210	1605	1714	1868	1162	1448	1546	1665
SEm ±	85.53				135.79				75.26			
CD at 5%	176.50				280.28				150.60			

Table 1B: Harvest index of pigeonpea as influenced by interaction of irrigation and fertigation levels.

Treatments	Harvest index											
	Fertigation levels											
	2018				2019				Pooled mean			
	F_1	F_2	F_3	F_4	F_1	F_2	F_3	F_4	F_1	F_2	F_3	F_4
Irrigation levels												
I_1 : 0.6 ETc	18.76	22.13	22.10	22.04	17.09	21.44	21.15	20.77	17.92	21.79	21.62	21.40
I_2 : 0.8 ETc	20.51	25.13	24.90	23.03	17.16	24.85	24.71	22.36	18.83	24.99	24.81	22.70
I_3 : 1.0 ETc	20.18	24.18	23.27	19.12	17.39	23.40	22.64	18.87	18.79	23.79	22.96	19.00
I_4 : Conv. method	19.06	17.01	17.67	17.35	13.50	16.69	17.17	17.78	16.28	16.85	17.42	17.57
SEm ±	0.99				1.00				0.70			
CD at 5%	2.04				2.07				1.40			

in agreement with the earlier findings reported by Chandrasekhar (2013).

Interaction effects

Treatment combination of drip irrigation at 0.8 ETc and 100% RDF (I_2F_3) recorded significantly higher seed yield, GMR and NMR of pigeonpea during *kharif* seasons of 2018, 2019 and pooled mean, however it was comparable with treatment combination of 0.8 ETc and 80% RDF (I_2F_2), 1.0 ETc and 80% RDF (I_3F_2) and 1.0 ETc and 100% RDF (I_3F_3) (Table 1A, 2A and 2B). The higher seed yield might be due to the beneficial effect of scheduling of drip irrigation at alternate day along with split application of water soluble fertilizers which helped to maintain the optimum soil moisture in the root zone and readily increased the availability of major plant nutrients like NPK directly in the rhizosphere. This synergistic effect helped in better translocation of assimilates from source to sink and produced higher seed yield. These results are parallel to the earlier findings reported by Shruti and Aladakatti (2017). Whereas treatment combination of drip irrigation at 0.8 ETc and 80% RDF (I_2F_2) recorded significantly higher harvest index and B:C ratio, however it was at par with treatment combination of 0.8 ETc and 100% RDF (I_2F_3) 1.0 ETc and 80% RDF (I_3F_2) and 1.0 ETc and 100% RDF (I_3F_3) (Table 1B and 2C).

Water use efficiency (WUE)

The data related to mean water use efficiency as influenced by different drip irrigation and fertigation levels during *kharif* seasons of 2018 and 2019 is presented in Table 3.

Effect of irrigation levels

The water use efficiency in all drip irrigated treatments were higher as compared to conventional method of irrigation

Table 2: Gross monetary return, net monetary return and benefit cost ratio of pigeonpea as influenced by different treatments.

Treatments	Cost of cultivation (₹ ha^{-1})			Gross monetary return (₹ ha^{-1})			Net monetary return (₹ ha^{-1})			Benefit : Cost ratio		
	2018	2019	Mean	2018	2019	Pooled mean	2018	2019	Pooled mean	2018	2019	Pooled mean
Irrigation levels												
I_1 : 0.6 ETc	57019	60056	58537	110022	124342	117182	53003	64286	58645	1.91	2.06	1.99
I_2 : 0.8 ETc	57018	60056	58537	129242	147744	138493	72224	87688	79956	2.26	2.44	2.35
I_3 : 1.0 ETc	57018	60056	58537	122057	138767	130412	65039	78711	71875	2.14	2.30	2.22
I_4 : Conv. method	38774	41812	40293	71468	92760	82114	32694	50948	41821	1.84	2.21	2.02
SEm ±	-	-	-	2353	4816	2680	2353	4816	2680	0.05	0.08	0.05
CD at 5%	-	-	-	5759	11784	5840	5759	11784	5840	0.12	0.21	0.11
Fertigation levels												
F_1 : Control	43480	46519	44999	81868	90276	86072	38388	43757	41073	1.87	1.93	1.90
F_2 : 80% RDF	53398	56436	54917	117865	138931	128398	64467	82495	73481	2.17	2.44	2.31
F_3 : 100% RDF	55449	58488	56969	120254	141157	130706	64805	82669	73737	2.14	2.41	2.27
F_4 : 120% RDF	57501	60540	59020	112801	133251	123026	55300	72711	64006	1.96	2.22	2.09
SEm ±	-	-	-	2323	3599	2142	2323	3599	2142	0.04	0.06	0.04
CD at 5%	-	-	-	4795	7428	4286	4795	7428	4286	0.09	0.13	0.08
Interaction (I × F)												
SEm ±	-	-	-	4661	7877	4284	4661	7877	4284	0.09	0.14	0.08
CD at 5%	-	-	-	9621	16258	8572	9621	16258	8572	0.19	0.28	0.15

Table 2A: Gross monetary return of pigeonpea as influenced by interaction of irrigation and fertigation levels.

Treatments	Gross monetary return (₹ ha^{-1}) — Fertigation levels											
	2018				2019				Pooled mean			
	F_1	F_2	F_3	F_4	F_1	F_2	F_3	F_4	F_1	F_2	F_3	F_4
Irrigation levels												
I_1 : 0.6 ETc	74429	120263	122207	123188	91183	131641	137151	137394	82806	125952	129679	130291
I_2 : 0.8 ETc	95284	141773	144843	135069	97353	167775	171158	154692	96318	154774	158000	144881
I_3 : 1.0 ETc	96992	139120	138830	113287	102406	163206	156907	132549	99699	151163	147868	122918
I_4 : Conv. method	60768	70305	75137	79661	70161	93101	99412	108368	65464	81703	87275	94014
SEm ±	4661				7877				4284			
CD at 5%	9621				16258				8572			

(surface irrigation), which might be due to better increase in yield of pigeonpea and higher nutrient use efficiency. The drip irrigation scheduled at 0.8 ETc recorded higher WUE followed by 0.6 ETc during both the years of investigation. Combination of drip irrigation at 0.8 ETc and 100% RDF (I_2F_3) recorded higher WUE followed by 0.8 ETc and 80% RDF (I_2F_2). The probable reason for this might be the synergistic effect of drip irrigation and fertigation which resulted in significant saving of irrigation water, increased yield and higher nutrient use efficiency under these combinations which eventually contributed in higher WUE. Similar trend was reported by Singh *et al.* (2018a) in Bt.cotton.

Effect of fertigation levels

With increase in fertigation level, WUE increased up to certain level and thereafter it showed declining trend. Thus higher WUE was noticed with application of 25:50:25 NPK kg ha^{-1} (F_3) followed by drip fertigation @ 20:40:40 NPK kg ha^{-1} (F_2) during both the years of study. This might be due to beneficial effect of split application of plant nutrients that helped in better nutrient uptake and finally resulted in higher yield which in turn reflected in higher water use efficiency in drip fertigation at 100% RDF followed by 80% RDF. These findings are in conformity with the earlier findings reported by Singh *et al.* (2018).

Nutrient use efficiency

The data pertaining to nutrient use efficiency *viz.*, partial factor productivity and nutrient use efficiency/agronomic efficiency as influenced by different drip irrigation and fertigation levels during *kharif* seasons of 2018 and 2019 are furnished in Table 4 and 5.

Effect of irrigation levels

Drip irrigation at 0.8 ETc recorded higher values of partial factor productivity during both the years of investigation (Table 4). Drip irrigation scheduled at alternate day might have prevailed optimum soil moisture condition at 0.8 ETc and that have helped in better uptake of nutrient and resulted in increased yield and ultimately contributed in higher partial factor productivity. It is clear from Table 5 that higher value of agronomic efficiency/nutrient use efficiency was observed in drip irrigation at 0.6 ETc (8.91 kg kg^{-1} nutrient) followed by 0.8 ETc (8.91 kg kg^{-1} nutrient) during first year and at 0.8 ETc (12.05 kg kg^{-1} nutrient) during second year of study.

Effect of fertigation levels

Higher values of partial factor productivity of nutrient were observed in drip fertigation with 20:40:20 NPK kg ha^{-1} (F_2) during both the years of investigation (Table 4). Similar trend was observed in case of nutrient use efficiency/agronomic efficiency (Table 5). Thus with increase in the fertigation

Table 2B: Net monetary return of pigeonpea as influenced by interaction of irrigation and fertigation levels.

Treatments	Net monetary return (₹ ha^{-1})											
	Fertigation levels											
	2018				2019				Pooled mean			
	F_1	F_2	F_3	F_4	F_1	F_2	F_3	F_4	F_1	F_2	F_3	F_4
Irrigation levels												
I_1 : 0.6 ETc	28150	62169	61609	60086	41866	70508	73515	71254	35008	66339	67562	65670
I_2 : 0.8 ETc	49005	83678	84245	71967	48035	106642	107522	88552	48520	95160	95883	80260
I_3 : 1.0 ETc	50713	81026	78231	50185	53089	102074	93271	66409	51901	91550	85751	58297
I_4 : Conv. method	25684	30997	35133	38961	32038	50754	56370	64629	28861	40876	45752	51795
SEm ±	4661				7877				4284			
CD at 5%	9621				16258				8572			

Table 2C: Benefit cost ratio of pigeonpea as influenced by interaction of irrigation and fertigation levels.

Treatments	Benefit cost ratio											
	Fertigation levels											
	2018				2019				Pooled mean			
	F_1	F_2	F_3	F_4	F_1	F_2	F_3	F_4	F_1	F_2	F_3	F_4
Irrigation levels												
I_1 : 0.6 ETc	1.61	2.07	2.02	1.95	1.73	2.11	2.09	2.01	1.73	2.11	2.09	2.01
I_2 : 0.8 ETc	2.06	2.44	2.39	2.14	2.02	2.59	2.54	2.24	2.02	2.59	2.54	2.24
I_3 : 1.0 ETc	2.10	2.39	2.29	1.80	2.09	2.53	2.38	1.90	2.09	2.53	2.38	1.90
I_4 : Conv. method	1.73	1.79	1.88	1.96	1.79	1.99	2.09	2.22	1.79	1.99	2.09	2.22
SEm ±	0.09				0.08				0.08			
CD at 5%	0.19				0.15				0.15			

Table 3: Water use efficiency of pigeonpea as influenced by interaction of irrigation and fertigation levels.

Treatments	Water use efficiency (kg ha^{-1} - mm^{-1})									
	Fertigation levels									
	2018					2019				
	F_1	F_2	F_3	F_4	Mean	F_1	F_2	F_3	F_4	Mean
Irrigation levels										
I_1 : 0.6 ETc	2.20	3.56	3.61	3.64	3.25	2.01	2.89	3.02	3.02	2.74
I_2 : 0.8 ETc	2.45	3.65	3.73	3.48	3.33	2.02	3.48	3.55	3.21	3.07
I_3 : 1.0 ETc	2.21	3.17	3.16	2.58	2.78	2.01	3.21	3.08	2.61	2.73
I_4 : Conv. method	2.13	2.47	2.64	2.80	2.51	1.47	1.95	2.08	2.27	1.94
Mean	2.25	3.21	3.29	3.13	2.97	1.88	2.88	2.93	2.78	2.62

Table 4: Partial factor productivity of pigeonpea as influenced by different treatments.

Treatments	Partial factor productivity (kg kg^{-1} nutrient)							
	Fertigation levels							
	2018				2019			
	F_2	F_3	F_4	Mean	F_2	F_3	F_4	Mean
Irrigation levels								
I_1 : 0.6 ETc	27.58	22.42	18.84	22.95	28.37	23.65	19.74	23.92
I_2 : 0.8 ETc	32.52	26.58	20.65	26.58	36.16	29.51	22.23	29.30
I_3 : 1.0 ETc	31.91	25.47	17.32	24.90	35.17	27.05	19.04	27.09
I_4 : Conv. method	16.13	13.79	12.18	14.03	20.06	17.14	15.57	17.59
Mean	36.05	29.42	23.00	22.12	39.92	32.45	25.53	24.47

Table 5: Agronomic efficiency/nutrient use efficiency of pigeonpea as influenced by different treatments.

Treatments	Agronomic efficiency/Nutrient use efficiency (kg kg^{-1} nutrient)							
	Fertigation levels							
	2018				2019			
	F_2	F_3	F_4	Mean	F_2	F_3	F_4	Mean
Irrigation levels								
I_1 : 0.6 ETc	10.51	8.77	7.46	8.91	8.72	7.93	6.64	7.76
I_2 : 0.8 ETc	10.66	9.09	6.08	8.61	15.18	12.73	8.24	12.05
I_3 : 1.0 ETc	9.66	7.68	2.49	6.61	13.1	9.4	4.33	8.94
I_4 : Conv. method	2.19	2.64	2.89	2.57	4.94	5.04	5.49	5.16
Mean	11.01	9.39	6.31	6.68	13.98	11.70	8.23	8.48

levels the partial factor productivity of nutrient and nutrient use efficiency/ agronomic efficiency decreased indicating that drip fertigation with 20:40:20 NPK kg ha^{-1} (F_2) was found optimum in realizing the economical yield. These findings are in accordance with the views of Deolankar and Berard (1999).

CONCLUSION

From the present investigation, it can be concluded that drip irrigation at 0.8 ETc scheduled at alternate day along with 20:40:20 NPK kg ha^{-1} in ten splits through water soluble fertilizers out of which 20% N and 40% P in two splits at 0-30 DAS, 30% N, P and 25% K in three splits at 31-60 DAS, 30% N, P and 40% K in 3 splits at 61-90 DAS and 20% N and 35% K in two splits at 91-120 DAS was found promising for realizing higher productivity and profitability of pigeonpea.

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