

Original Research Article

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## Effect of Irrigation Levels, Nipping and Foliar Spray of Nutrients along with Growth Regulators on Growth Parameter of Transplanted Pigeonpea

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### ABSTRACT

The experiment was conducted in split plot design with sixteen treatments combinations with three replications during *kharif* 2016-17 and 2017-18. The experiment consisted of two levels of irrigation as main factor, eight management practices, nipping and foliar application of fertilizer along with growth regulator as sub factor. The results revealed that among the different irrigation levels, irrigation each at pre-flowering and pod filling stage recorded significantly higher growth parameter via., plant height, number of leaves per plant, leaf area, leaf area index, leaf area duration and total dry matter production at harvest. Among the management practices, nipping +1% pulse magic +1 % 19:19:19 NPK Spray at flowering at flowering and 15 days after first flowering recorded higher plant and total dry matter production, Whereas number of leaves per plant, leaf area, leaf area index and leaf area duration were higher with nipping + 1% Pulse magic spray at flowering at flowering and 15 days after first flowering.

#### Keywords

Growth parameters,  
Transplanted  
pigeonpea,  
Irrigation, Nipping  
and foliar nutrition

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### Introduction

Pigeonpea (*Cajanus cajan* (L.) Millsp.) is one of the protein rich pulse crops of the semi-arid tropics, grown predominantly under rainfed conditions. It has an important place in the farming systems adopted by dry land and rainfed farmers. People use the dry grain as dhal, the green seed as vegetable and the

stalks as fuel wood. It improves soil conditions through addition of leaf fall and its deep and strong root system breaks the plough pans and improves the soil structure.

Hence, it is often called a “biological plough” and kalpavriksha of dry lands as all plant parts are useful. The productivity of pulses in India (640 kg ha<sup>-1</sup>) is far below the average

productivity (848 kg ha<sup>-1</sup>) of the world (Anon., 2014). Per capita availability of pulses has declined from 64 g per day in 1951-56 to less than 40 g per day as against FAO/WHO's recommendation of 80 g per day (Ashtana and Chaturvedi, 2009).

In state of Karnataka pigeonpea is largely grown in Northern parts, especially in Kalaburgi, Vijayapur, Bidar and Raichur districts. In dry and rained farming areas of northern Karnataka, the rainfall is not only scanty but also erratic.

Thus, soil moisture becomes the most limiting factor in pigeonpea production (Sujatha and Babalad, 2018). Water is the most important inputs essential for the production of crops.

Plants need it continuously during their life and in huge quantities. It profoundly influences photosynthesis, respiration, absorption, translocation and utilization of mineral nutrients. Both its shortage and excess affects the growth and development of a plant directly.

Nipping is an important agronomic practice of removal of apical bud which helps to reduce the apical dominance, increases the number of branches and source-sink relationship and enhances the yield of a plant.

Foliar nutrition is designed to eliminate the problems like fixation and immobilization of nutrients.

Hence, foliar nutrition is recognized as an important method of fertilization in modern agriculture. This method provides for utilization of nutrients more efficiently and for correcting deficiencies rapidly.

Plant growth regulators are known to improve physiological efficiency including photosynthetic ability of plant and offer

significant role in realizing higher crop yields. The plant growth regulators are also known to enhance the source sink relationship and stimulate the translocation of photo assimilates, thereby increase the productivity.

Raising pigeonpea seedlings well in advance and transplanting in the field on receipt of good rains would help in reaping the benefits of early sowing.

The transplanting has some advantages like maintenance of required healthy plant population by rejecting diseased and unhealthy seedlings, promotes better penetration of roots in the soil, better development of shoot system of plants, seedlings at the right spacing so as to ensure the uniform availability of water, nutrients, sunlight to the plants.

Very little information is available regarding combined agronomic production management practices via a supplemental irrigation, nipping, and foliar nutrition of macro and micronutrients and growth regulators on growth parameter in transplanted pigeonpea. Hence the present study on "Effect of irrigation levels, nipping and foliar spray of nutrients with growth regulators on growth parameters in transplanted pigeonpea.

## **Materials and Methods**

A field experiment was conducted during *kharif*, 2016-17 and 2017-18 at the ICAR-KVK Farm, Kalaburgi, University of Agricultural Sciences, Raichur which is situated at a latitude of 17° 36' North, longitude of 76° 82' East and an altitude of 478 meters above mean sea level.

The Krishi Vignan Kendra, Kalaburgi having semi-arid type of climate, characterized by short monsoon, mild winter and hot summer. The average rainfall in this region is 736.4

mm of which nearly 75 per cent of the rainfall occurs during South-West monsoon (June - September). The soils of the experimental site were belonging to Vertisols (medium black soils) with pH 8.16 and 0.37 % organic carbon. Soil is low in available nitrogen (231kg ha<sup>-1</sup>), medium in available phosphorus (44.5 kg ha<sup>-1</sup>) and high in available potassium (474 kg ha<sup>-1</sup>).

The experiment was laid out in split-plot design with sixteen treatment combination and three replications consisting of irrigation levels as main factor, I<sub>0</sub>- no irrigation and I<sub>1</sub>- Two irrigations at pre- flowering and pod filling stage and eight management practices as sub factor which includes M<sub>1</sub>: Control, M<sub>2</sub>:Nipping, M<sub>3</sub> :Nipping + 1% Pulse magic spray at flowering and pod filling stage, M<sub>4</sub>: Nipping + 2 % DAP spray at flowering and pod filling stage, M<sub>5</sub>: Nipping + 1 % 19 :19:19 NPK spray at flowering and pod filling stage, M<sub>6</sub>: Nipping + 1% pulse magic +2 % DAP Spray at flowering and pod filling stage, M<sub>7</sub>:Nipping +1% pulse magic +1 % 19:19:19 NPK Spray at flowering and pod filling stage and M<sub>8</sub>: Nipping +2 % DAP spray + 1 % 19:19:19 NPK Spray at flowering and pod filling stage.

The height of the plant was measured from ground level to the tip of the main shoot. The plant height was measured at 75,120, 165 DAS and at harvest. The mean of five plants in each plot was worked out and expressed in cm plant<sup>-1</sup>.

Total number of fully opened trifoliolate leaves was counted in the five plants and their average was taken as number of leaves per plant.

The leaf area was worked out by disc method on dry weight basis at 75, 120, 165 DAS and at harvest as per the procedure suggested by Vivekanandan *et al.*, (1972).

$$LA = \frac{W_a \times A}{W_d}$$

Where,

LA = Leaf area (dm<sup>2</sup> plant<sup>-1</sup>)

W<sub>a</sub> = Oven dry weight of all leaves (inclusive of 10 disc weight)

W<sub>d</sub> = Oven dry weight of 10 discs in gram

A = Area of the 10 discs (dm<sup>2</sup>)

Leaf area index (LAI) was worked out by dividing the leaf area per plant by land area occupied by the plant (Sestak *et al.*, 1971).

$$LAI = \frac{A}{P}$$

Where,

A= Leaf area per plant (dm<sup>2</sup>)

P= Land area occupied by the plant (dm<sup>2</sup>)

Leaf area duration (LAD) an integral of leaf area index over the growth period was worked out using the formula given by Power *et al.*, (1967).

$$LAD = \frac{[L_1 + L_2]}{2} \times [t_1 - t_2]$$

Where,

LAD = Leaf area duration in days

L<sub>1</sub>, L<sub>2</sub> = LAI at stage 1 and stage 2

t<sub>1</sub> and t<sub>2</sub> = Time interval in days between stage 1 and stage 2

Total dry matter was calculated by adding the dry weights of different plant parts and expressed as grams per plant.

## Results and Discussion

### Effect of irrigation levels on growth parameters of transplanted pigeonpea

At harvest, significantly taller plant (190.20 cm) was recorded in treatment I<sub>1</sub>-irrigation at pre-flowering and pod filling stage in comparison to I<sub>0</sub>- no irrigation (185.60 cm) (Table 1). This might be due to application of water at appropriate stage, which provides convenient condition for metabolic and physiological activity. This in turn caused better growth and more cell division and elongation, resulting in taller plants in irrigation treatment (I<sub>1</sub>). Similar results were obtained by Rao (1979), Sudhakar and Rao (1996), Gajera and Ahlawat (2006), Mula *et al.*, (2011) and Saritha *et al.*, (2012b).

Significant variations were also noticed with number of leaves plant<sup>-1</sup> with different irrigation levels and higher number of leaves plant<sup>-1</sup> at harvest were recorded by I<sub>1</sub>-irrigation at pre-flowering and pod filling stage (856.10) which was significant in compared to I<sub>0</sub>- no irrigation (622.45) in pooled data (Table 2).

Development of adequate leaf area is important in pigeonpea and has been shown to be closely related to final seed yield (Baligar and Fageria, 2007). Water stress reduces expansive growth of leaves and results in lower LAI (Bennett and Hammond, 1983).

The leaf area indicates the photosynthetic area available for synthesis of food. Higher the leaf area higher is the dry matter thus increasing the growth attribute like plant height and in turn higher transport to sink. In the present investigation, higher leaf area at harvest, in the pooled data was recorded with treatment I<sub>1</sub>-irrigation at pre-flowering and pod filling stage (104.74 dm<sup>2</sup> plant<sup>-1</sup>) compared to I<sub>0</sub>- no irrigation (76.23) in pooled data (Table 3). The leaf area index also significantly differed

due to different irrigation levels. The pooled data revealed that the significantly higher leaf area index was noticed in I<sub>1</sub>-irrigation at pre-flowering and pod filling stage (0.932 plant<sup>-1</sup>) when compared to I<sub>0</sub>- no irrigation (0.678 plant<sup>-1</sup>) (Table 4).

Among the irrigation levels, significantly higher leaf area duration at (165- harvest) was recorded in I<sub>1</sub>- two irrigations at pre-flowering and pod filling stage (128.19) (Table 5) in comparison with I<sub>0</sub> - no irrigation (115.41). These results corroborate with the findings of Sondge *et al.*, (1993), Reddy *et al.*, (1998), Singh *et al.*, (2004), Pothalkar (2007), Meena *et al.*, (2011), Saritha *et al.*, (2012b).

Transplanted pigeonpea with treatment two (I<sub>1</sub>) irrigations one at pre- flowering and another at pod filling stage recorded significantly higher total dry matter production (812.71 g plant<sup>-1</sup>) over I<sub>0</sub> -no irrigation (589.22 g plant<sup>-1</sup>) (Table 6). Similar trend was observed during both the years of experimentation.

This might be due to availability of higher moisture and consequently photosynthates. Increase in the total biomass, total dry matter with increase in soil moisture was observed by other researchers (Sondge *et al.*, (1993) Sudhakar and Praveen Rao (1996) and Reddy *et al.*, (1998), Saritha *et al.*, (2012b).

### Effect of management practices on growth parameters of transplanted pigeonpea

At harvest, significantly higher plant height of transplanted pigeonpea (189.44 cm) was recorded with the treatment M<sub>7</sub> - nipping + 1 % pulse magic + 1 % 19:19:19 NPK spray at flowering and 15 days after first spray, which was found at par with M<sub>3</sub> -nipping + 1% pulse magic spray at flowering and 15 days then after (189.21 cm), M<sub>5</sub>-nipping+1 % 19:19:19 NPK spray at flowering and 15 days then after

(188.76 cm) and M<sub>1</sub> -control-without nipping (188.46 cm). Significantly lower plant height was noticed in M<sub>2</sub>-nipping (185.87 cm) in pooled data (Table 1).

Significantly higher number of leaves per plant (785.87) was recorded with nipping + pulse magic spray at flowering and 15 days after first spray over rest of the treatments in pooled data at harvesting stage (Table 2).

At harvest in pooled data, significantly higher leaf area (95.74 dm<sup>2</sup> plant<sup>-1</sup>) was recorded with M<sub>3</sub>- nipping+ 1 % pulse magic spray at flowering and 15 days after first spray-nipping + 1% pulse magic spray at flowering and 15 day after first spray over treatments M<sub>1</sub>-control (75.29) and at par results were found with treatment M<sub>6</sub> - nipping +1 % pulse magic + 2 % DAP spray at flowering and 15 days after first spray (94.20) and M<sub>5</sub> -nipping+1 % 19:19:19 NPK spray at flowering and 15 days after first spray (94.64) (Table 3).

Pooled data on LAI of transplanted pigeonpea at harvest was varied significantly. Treatment M<sub>3</sub>-nipping +1% pulse magic spray at flowering and fifteen days thereafter recorded significantly higher LAI (0.852) over the treatment M<sub>1</sub>-control (0.668), which was found at par with treatment M<sub>5</sub>(0.842) and M<sub>6</sub>-nipping +1 % pulse magic + 2 % DAP spray at flowering at flowering and 15 days after first spray (0.840) (Table 4).

Significantly higher leaf area duration (126.42 days) was recorded with M<sub>3</sub>- nipping+ 1 % pulse magic spray at flowering and 15 days after first spray-nipping +1% pulse magic spray over M<sub>1</sub>-control (98.34 days) and on par with treatments M<sub>5</sub>-nipping+1 % 19:19:19 NPK spray at flowering and 15 days after first spray (126.25 days), M<sub>6</sub>- nipping +1 % pulse magic + 2 % DAP spray at flowering and 15 days after first spray (94.20) (125.93 days) and M<sub>7</sub> -nipping +1% pulse magic + 1%

19:19:19 NPK spray at flowering and 15 days then after (124.97days) (Table 5). Similar increase in growth parameter due to nipping was reported by Sharma *et al.*, (2003).

Total dry matter production plant<sup>-1</sup> was significantly higher in M<sub>7</sub>-nipping +1% pulse magic +1% 19:19:19 NPK spray at flowering and 15 days after first spray (794.39 g plant<sup>-1</sup>) which was found at par with M<sub>3</sub>- nipping+ 1 % pulse magic spray at flowering and 15 days after first spray(776.93), M<sub>5</sub>-nipping+1 % 19:19:19 NPK spray at flowering and 15 days after first spray (740.13), M<sub>6</sub>- nipping +1 % pulse magic + 2 % DAP spray at flowering and 15 days after first spray (758.94) (Table 6). Significantly lower dry matter was recorded with M<sub>1</sub>-control without nipping (534.17).

These results are in conformity with of Manivannan *et al.*, (2002) in blackgram, Jayarani Reddy *et al.*, (2004) and Saravanan *et al.*, (2012) they reported increase in growth parameter due to foliar nutrition and growth regulator application.

### **Interaction effect of irrigation levels and management practices on growth parameter**

Interaction effect due to irrigation levels and management practices on plant height of transplanted pigeonpea was found to be non significant.

However, higher plant height (193.08 cm) was noticed with combination of I<sub>1</sub> X M<sub>7</sub> (two irrigations at pre-flowering and pod filling stage with nipping + 1 % pulse magic + 1 % 19:19:19 NPK spray at flowering and 15 days after first spray) (Table 1).

Pooled data on the interaction effect due to irrigation levels and management practices was found to be significant.

**Table.1** Plant height of transplanted pigeonpea at different stages as influenced by irrigation levels, nipping and foliar nutrition management practices

Treatments	Plant height (cm)											
	At 75 DAS			At 120 DAS			At 165 DAS			At harvest		
	2016	2017	Pooled	2016	2017	Pooled	2016	2017	Pooled	2016	2017	Pooled
<b>Irrigation (I)</b>												
<b>I<sub>0</sub>-No Irrigation</b>	63.09	63.31	63.20	127.28	135.22	131.25	166.42	198.86	182.64	171.27	199.93	<b>185.60</b>
<b>I<sub>1</sub>-Two irrigations at pre-flowering and pod filling stage</b>	62.49	63.66	63.08	127.46	134.86	131.16	166.41	198.63	182.52	176.11	204.29	<b>190.20</b>
<b>S.Em.±</b>	0.013	0.22	0.08	0.05	0.36	0.17	0.14	0.06	0.11	0.70	0.35	<b>0.52</b>
<b>CD at 5%</b>	NS	NS	NS	NS	NS	NS	NS	NS	NS	4.58	2.29	<b>3.38</b>
<b>Management practices (M)</b>												
<b>M<sub>1</sub>-Control-Without nipping</b>	63.77	65.39	64.58	131.51	138.10	134.81	169.82	199.03	184.43	174.73	202.19	<b>188.46</b>
<b>M<sub>2</sub>-Nipping</b>	62.60	63.20	62.90	126.87	133.98	130.43	165.74	197.83	181.79	171.07	200.66	<b>185.87</b>
<b>M<sub>3</sub>-Nipping + 1% Pulse magic* spray **</b>	62.07	63.13	62.60	126.43	135.23	130.84	166.53	198.63	182.58	175.83	202.58	<b>189.21</b>
<b>M<sub>4</sub>-Nipping + 2 % DAP spray **</b>	62.98	63.33	63.16	125.99	134.50	130.25	165.15	198.00	181.58	172.60	201.38	<b>186.99</b>
<b>M<sub>5</sub>-Nipping + 1 % 19 :19:19 NPK spray **</b>	62.83	63.47	63.15	126.75	134.23	130.50	166.32	198.74	182.53	175.25	202.27	<b>188.76</b>
<b>M<sub>6</sub>-Nipping + 1% pulse magic* +2 % DAP Spray**</b>	61.98	63.02	62.50	127.38	134.55	130.97	165.81	198.95	182.38	172.21	202.16	<b>187.19</b>
<b>M<sub>7</sub>-Nipping +1% pulse magic* +1 % 19:19:19 NPK Spray**</b>	63.12	63.29	63.21	127.31	134.92	131.12	166.05	200.06	183.06	174.97	203.90	<b>189.44</b>
<b>M<sub>8</sub>- Nipping +2 % DAP spray + 1 % 19:19:19 NPK Spray**</b>	62.95	63.07	63.01	126.70	134.80	130.76	165.92	198.69	182.30	172.88	201.76	<b>187.32</b>
<b>S.Em.±</b>	0.46	0.16	0.25	0.09	0.50	0.26	0.39	0.21	0.24	0.88	0.38	<b>0.45</b>
<b>CD at 5%</b>	NS	0.47	0.73	0.18	1.45	0.75	1.13	0.62	0.70	4.58	1.10	<b>1.30</b>
<b>Interactions (I X M)</b>												
<b>I<sub>0</sub> x M<sub>1</sub></b>	63.52	65.30	64.41	131.06	138.57	134.81	169.72	198.93	184.33	172.21	199.91	<b>186.06</b>
<b>I<sub>0</sub> x M<sub>2</sub></b>	62.94	63.63	63.29	127.01	133.87	130.44	165.85	197.90	181.87	169.29	198.99	<b>184.14</b>

<b>I<sub>0</sub> x M<sub>3</sub></b>	62.86	62.86	62.86	126.44	135.50	130.97	166.59	199.24	182.92	173.08	200.27	<b>186.67</b>
<b>I<sub>0</sub> x M<sub>4</sub></b>	63.51	62.93	63.22	125.69	135.67	130.67	164.98	197.73	181.36	171.02	198.86	<b>184.94</b>
<b>I<sub>0</sub> x M<sub>5</sub></b>	62.40	63.29	62.85	127.00	134.33	130.68	166.43	198.84	182.63	173.99	199.99	<b>186.99</b>
<b>I<sub>0</sub> x M<sub>6</sub></b>	62.46	62.71	62.59	127.27	134.07	130.66	165.50	198.85	182.18	170.54	199.92	<b>185.23</b>
<b>I<sub>0</sub> x M<sub>7</sub></b>	63.66	63.02	63.34	127.33	134.87	131.10	166.19	200.13	183.16	170.39	201.20	<b>185.79</b>
<b>I<sub>0</sub> x M<sub>8</sub></b>	63.37	62.75	63.06	126.47	134.90	130.69	166.11	199.21	182.66	169.67	200.33	<b>185.00</b>
<b>I<sub>1</sub> x M<sub>1</sub></b>	64.02	65.47	64.75	131.96	137.63	134.81	169.93	199.13	184.53	177.25	204.47	<b>190.86</b>
<b>I<sub>1</sub> x M<sub>2</sub></b>	62.25	62.77	62.51	126.73	134.10	130.41	165.63	197.77	181.70	172.85	202.33	<b>187.59</b>
<b>I<sub>1</sub> x M<sub>3</sub></b>	61.29	63.40	62.34	126.42	134.97	130.70	166.46	198.02	182.24	178.57	204.90	<b>191.74</b>
<b>I<sub>1</sub> x M<sub>4</sub></b>	62.46	63.73	63.10	126.29	133.33	129.82	165.32	198.27	181.79	174.19	203.89	<b>189.04</b>
<b>I<sub>1</sub> x M<sub>5</sub></b>	63.27	63.65	63.46	126.51	134.13	130.32	166.21	198.64	182.43	176.50	204.55	<b>190.53</b>
<b>I<sub>1</sub> x M<sub>6</sub></b>	61.49	63.33	62.41	127.50	135.03	131.28	166.13	199.05	182.59	173.87	204.41	<b>189.14</b>
<b>I<sub>1</sub> x M<sub>7</sub></b>	62.58	63.56	63.07	127.29	134.97	131.14	165.91	199.99	182.95	179.56	206.59	<b>193.08</b>
<b>I<sub>1</sub> x M<sub>8</sub></b>	62.53	63.38	62.96	126.94	134.70	130.82	165.72	198.16	181.94	176.09	203.20	<b>189.64</b>
<b>Management at same level of irrigation</b>												
<b>S.Em.±</b>	0.36	0.61	0.21	0.33	1.02	0.49	0.39	0.16	0.32	1.98	0.99	<b>1.46</b>
<b>CD at 5%</b>	NS	1.09	NS	0.76	NS	NS	NS	NS	NS	NS	NS	NS
<b>Irrigation at same level or different level of management</b>												
<b>S.Em.±</b>	0.62	0.30	0.34	0.33	0.75	0.38	0.53	0.29	0.34	1.36	0.61	<b>0.78</b>
<b>CD at 5%</b>	NS	<b>1.45</b>	NS	<b>0.76</b>	NS	NS	NS	NS	NS	NS	NS	NS

Note: Pulse magic \* (N -10%, P- 40%, PGR -20 ppm and micro nutrient 03 %). Spray\*\* At flowering and pod filling stage

**Table.2** Number of leaves plant<sup>-1</sup> of transplanted pigeonpea as influenced by irrigation levels, nipping and foliar nutrition management practices

Treatments	Number of leaves plant <sup>-1</sup>											
	At 75 DAS			At 120 DAS			At 165 DAS			At harvest		
	2016	2017	Pooled	2016	2017	Pooled	2016	2017	Pooled	2016	2017	Pooled
<b>Irrigation (I)</b>												
<b>I<sub>0</sub>-No Irrigation</b>	31.15	46.29	38.72	462.62	681.33	571.98	1131.91	1,441.26	1286.58	569.06	675.84	<b>622.45</b>
<b>I<sub>1</sub>-Two irrigations at pre-flowering and pod filling stage</b>	30.99	46.26	38.63	452.61	691.53	572.07	1162.70	1,445.86	1304.28	782.42	929.79	<b>856.10</b>
<b>S.Em.±</b>	0.39	0.23	0.28	13.47	4.07	8.75	2.72	1.45	1.49	9.38	48.33	<b>28.29</b>
<b>CD at 5%</b>	NS	NS	NS	NS	NS	NS	17.81	NS	9.78	61.47	NS	<b>185.33</b>
<b>Management practices (M)</b>												
<b>M<sub>1</sub>-Control-Without nipping</b>	30.90	42.07	36.48	430.47	575.20	502.83	941.77	1,032.00	986.88	561.93	668.37	<b>615.15</b>
<b>M<sub>2</sub>-Nipping</b>	31.30	47.00	39.15	463.40	702.80	583.10	1170.40	1,510.40	1340.40	689.27	768.93	<b>729.10</b>
<b>M<sub>3</sub>-Nipping + 1% Pulse magic* spray**</b>	30.53	46.80	38.67	469.13	710.27	589.70	1173.67	1,496.47	1335.07	696.03	875.70	<b>785.87</b>
<b>M<sub>4</sub>-Nipping + 2 % DAP spray**</b>	31.80	46.83	39.32	454.93	697.57	576.25	1181.50	1,500.83	1341.17	685.13	789.77	<b>737.45</b>
<b>M<sub>5</sub>-Nipping + 1 % 19 :19:19 NPK spray**</b>	30.47	46.77	38.62	460.20	691.47	575.83	1180.60	1,501.07	1340.84	681.43	873.03	<b>777.23</b>
<b>M<sub>6</sub>-Nipping + 1% pulse magic* +2 % DAP Spray**</b>	30.83	46.50	38.67	457.17	697.73	577.45	1173.23	1,502.13	1337.68	688.20	856.80	<b>772.50</b>
<b>M<sub>7</sub>-Nipping +1% pulse magic* +1 % 19:19:19 NPK Spray**</b>	31.50	47.13	39.32	463.20	711.27	587.23	1178.77	1,505.43	1342.10	704.90	793.63	<b>749.27</b>
<b>M<sub>8</sub>- Nipping +2 % DAP spray + 1 % 19:19:19 NPK Spray**</b>	31.23	47.10	39.17	452.40	705.17	578.78	1170.50	1,500.13	1335.32	699.00	796.30	<b>747.65</b>



<b>S.Em.±</b>	0.55	0.30	0.28	9.80	2.63	5.30	10.29	4.60	6.01	6.24	14.83	<b>7.62</b>
<b>CD at 5%</b>	NS	0.87	NS	NS	7.67	15.42	29.95	13.41	17.51	18.18	43.18	<b>22.20</b>
<b>Interactions (I X M)</b>												
<b>I<sub>0</sub> x M<sub>1</sub></b>	30.93	41.87	36.40	430.67	539.00	484.83	899.20	1,035.27	967.23	427.07	506.13	<b>466.60</b>
<b>I<sub>0</sub> x M<sub>2</sub></b>	32.53	46.60	39.57	471.33	711.47	591.40	1145.87	1,502.87	1324.37	601.07	667.00	<b>634.03</b>
<b>I<sub>0</sub> x M<sub>3</sub></b>	30.00	46.93	38.47	472.67	709.33	591.00	1164.07	1,478.13	1321.10	597.27	781.80	<b>689.53</b>
<b>I<sub>0</sub> x M<sub>4</sub></b>	31.80	47.40	39.60	459.00	693.87	576.43	1161.07	1,485.67	1323.37	582.47	645.93	<b>614.20</b>
<b>I<sub>0</sub> x M<sub>5</sub></b>	30.87	46.87	38.87	466.53	693.73	580.13	1171.00	1,501.00	1336.00	578.93	801.07	<b>690.00</b>
<b>I<sub>0</sub> x M<sub>6</sub></b>	31.60	46.40	39.00	455.67	694.40	575.03	1164.53	1,515.13	1339.83	579.60	731.20	<b>655.40</b>
<b>I<sub>0</sub> x M<sub>7</sub></b>	31.27	47.20	39.23	474.47	704.80	589.63	1177.20	1,511.07	1344.13	591.80	613.13	<b>602.47</b>
<b>I<sub>0</sub> x M<sub>8</sub></b>	30.20	47.07	38.63	460.60	704.07	582.33	1164.33	1,500.93	1332.63	594.27	660.47	<b>627.37</b>
<b>I<sub>1</sub> x M<sub>1</sub></b>	30.87	42.27	36.57	430.27	611.40	520.83	984.33	1,028.73	1006.53	696.80	830.60	<b>763.70</b>
<b>I<sub>1</sub> x M<sub>2</sub></b>	30.07	47.40	38.73	455.47	694.13	574.80	1194.93	1,517.93	1356.43	777.47	870.87	<b>824.17</b>
<b>I<sub>1</sub> x M<sub>3</sub></b>	31.07	46.67	38.87	465.60	711.20	588.40	1183.27	1,514.80	1349.03	794.80	969.60	<b>882.20</b>
<b>I<sub>1</sub> x M<sub>4</sub></b>	31.80	46.27	39.03	450.87	701.27	576.07	1201.93	1,516.00	1358.97	787.80	933.60	<b>860.70</b>
<b>I<sub>1</sub> x M<sub>5</sub></b>	30.07	46.67	38.37	453.87	689.20	571.53	1190.20	1,501.13	1345.67	783.93	945.00	<b>864.47</b>
<b>I<sub>1</sub> x M<sub>6</sub></b>	30.07	46.60	38.33	458.67	701.07	579.87	1181.93	1,489.13	1335.53	796.80	982.40	<b>889.60</b>
<b>I<sub>1</sub> x M<sub>7</sub></b>	31.73	47.07	39.40	451.93	717.73	584.83	1180.33	1,499.80	1340.07	818.00	974.13	<b>896.07</b>
<b>I<sub>1</sub> x M<sub>8</sub></b>	32.27	47.13	39.70	444.20	706.27	575.23	1176.67	1,499.33	1338.00	803.73	932.13	<b>867.93</b>
<b>Management at same level of irrigation</b>												
<b>S.Em.±</b>	1.10	0.64	0.78	38.10	11.52	24.74	7.69	4.10	4.22	26.54	136.70	<b>80.02</b>
<b>CD at 5%</b>	NS	NS	NS	NS	18.67	NS	NS	20.23	NS	43.82	126.60	<b>66.21</b>
<b>Irrigation at same level or different level of management</b>												
<b>S.Em.±</b>	0.82	0.46	0.48	18.70	5.36	11.21	13.88	6.26	8.09	12.50	52.16	<b>30.03</b>
<b>CD at 5%</b>	NS	NS	NS	NS	<b>26.86</b>	NS	NS	<b>19.45</b>	NS	<b>62.03</b>	<b>314.86</b>	<b>184.43</b>

Note: Pulse magic \* (N -10%, P- 40%, PGR -20 ppm and micro nutrient 03 %). Spray\*\* At flowering and pod filling stage

**Table.3** Leaf area of transplanted pigeonpea as influenced by irrigation levels, nipping and foliar nutrition management practices

Treatments	Leaf area( dm <sup>2</sup> plant <sup>-1</sup> )											
	At 75 DAS			At 120 DAS			At 165 DAS			At harvest		
	2016	2017	Pooled	2016	2017	Pooled	2016	2017	Pooled	2016	2017	Pooled
<b>Irrigation (I)</b>												
<b>I<sub>0</sub>-No Irrigation</b>	5.39	7.22	6.31	78.10	107.66	92.88	175.13	219.10	197.12	70.97	81.50	<b>76.23</b>
<b>I<sub>1</sub>-Two irrigations at pre-flowering and pod filling stage</b>	5.47	7.21	6.34	76.65	109.27	92.96	177.96	219.80	198.88	97.71	111.78	<b>104.74</b>
<b>S.Em.±</b>	0.04	0.04	0.01	0.65	0.64	0.58	0.34	0.23	0.22	5.17	0.35	<b>2.65</b>
<b>CD at 5%</b>	NS	0.23	NS	NS	NS	NS	2.23	NS	1.45	NS	2.32	<b>17.38</b>
<b>Management practices (M)</b>												
<b>M<sub>1</sub>-Control-Without nipping</b>	5.41	6.56	5.98	74.39	90.89	82.64	158.31	156.90	157.61	70.21	80.38	<b>75.29</b>
<b>M<sub>2</sub>-Nipping</b>	5.49	7.33	6.41	76.96	111.05	94.01	177.67	229.62	203.65	80.79	98.52	<b>89.65</b>
<b>M<sub>3</sub>-Nipping + 1% Pulse magic* spray **</b>	5.30	7.30	6.30	77.96	112.23	95.09	179.87	227.49	203.68	91.99	99.52	<b>95.74</b>
<b>M<sub>4</sub>-Nipping + 2 % DAP spray **</b>	5.46	7.30	6.38	78.22	110.22	94.22	179.43	228.16	203.79	82.99	98.03	<b>90.51</b>
<b>M<sub>5</sub>-Nipping + 1 % 19:19:19 NPK spray **</b>	5.25	7.29	6.27	77.98	109.76	93.87	180.54	228.19	204.37	91.72	97.55	<b>94.64</b>
<b>M<sub>6</sub>-Nipping + 1% pulse magic* +2 % DAP Spray**</b>	5.38	7.25	6.32	77.39	110.25	93.82	179.78	228.35	204.07	90.01	98.40	<b>94.20</b>
<b>M<sub>7</sub>-Nipping +1% pulse magic* +1 % 19:19:19 NPK Spray**</b>	5.52	7.32	6.42	78.57	112.39	95.48	179.03	228.85	203.94	83.36	100.77	<b>92.06</b>
<b>M<sub>8</sub>- Nipping +2 % DAP spray + 1 % 19:19:19 NPK Spray**</b>	5.51	7.31	6.41	78.04	111.42	94.73	177.73	228.05	202.89	83.67	99.93	<b>91.79</b>
<b>S.Em.±</b>	0.10	0.05	0.05	0.36	0.42	0.28	0.91	0.69	0.67	1.56	0.96	<b>0.82</b>

<b>CD at 5%</b>	NS	0.14	0.16	1.06	1.22	3.82	2.64	2.00	1.94	4.54	2.80	<b>2.38</b>
<b>Interactions (I X M)</b>												
<b>I<sub>0</sub> x M<sub>1</sub></b>	5.35	6.53	5.94	74.73	85.17	79.95	157.82	157.39	157.61	53.14	61.17	<b>57.14</b>
<b>I<sub>0</sub> x M<sub>2</sub></b>	5.73	7.26	6.50	78.03	112.42	95.22	175.50	228.47	201.99	70.05	86.00	<b>78.02</b>
<b>I<sub>0</sub> x M<sub>3</sub></b>	5.13	7.32	6.23	78.07	112.08	95.07	178.40	224.70	201.55	82.10	85.57	<b>83.82</b>
<b>I<sub>0</sub> x M<sub>4</sub></b>	5.38	7.39	6.39	78.41	109.64	94.03	177.90	225.85	201.87	67.83	83.47	<b>75.66</b>
<b>I<sub>0</sub> x M<sub>5</sub></b>	5.32	7.31	6.31	78.86	109.62	94.24	180.68	228.18	204.43	84.11	83.03	<b>83.58</b>
<b>I<sub>0</sub> x M<sub>6</sub></b>	5.44	7.23	6.34	77.64	109.72	93.68	178.43	230.33	204.39	76.80	83.03	<b>79.90</b>
<b>I<sub>0</sub> x M<sub>7</sub></b>	5.43	7.31	6.37	79.44	111.36	95.40	177.17	229.70	203.44	64.37	84.70	<b>74.53</b>
<b>I<sub>0</sub> x M<sub>8</sub></b>	5.39	7.30	6.35	79.58	111.25	95.41	175.17	228.18	201.67	69.36	85.00	<b>77.17</b>
<b>I<sub>1</sub> x M<sub>1</sub></b>	5.47	6.59	6.03	74.05	96.60	85.32	158.80	156.40	157.60	87.28	99.60	<b>93.44</b>
<b>I<sub>1</sub> x M<sub>2</sub></b>	5.26	7.39	6.32	75.90	109.68	92.79	179.84	230.76	205.30	91.52	111.03	<b>101.28</b>
<b>I<sub>1</sub> x M<sub>3</sub></b>	5.46	7.28	6.37	77.84	112.38	95.11	181.35	230.28	205.81	101.88	113.47	<b>107.66</b>
<b>I<sub>1</sub> x M<sub>4</sub></b>	5.53	7.21	6.37	78.02	110.80	94.41	180.96	230.46	205.71	98.14	112.60	<b>105.36</b>
<b>I<sub>1</sub> x M<sub>5</sub></b>	5.18	7.27	6.23	77.10	109.90	93.50	180.39	228.20	204.30	99.33	112.07	<b>105.69</b>
<b>I<sub>1</sub> x M<sub>6</sub></b>	5.31	7.27	6.29	77.13	110.77	93.95	181.12	226.37	203.74	103.23	113.77	<b>108.50</b>
<b>I<sub>1</sub> x M<sub>7</sub></b>	5.61	7.32	6.47	77.69	113.41	95.55	180.88	227.99	204.44	102.35	116.83	<b>109.58</b>
<b>I<sub>1</sub> x M<sub>8</sub></b>	5.62	7.32	6.47	76.50	111.59	94.05	180.29	227.93	204.11	97.98	114.87	<b>106.41</b>
<b>Management at same level of irrigation</b>												
<b>S.Em.±</b>	0.12	0.10	0.04	1.83	1.80	1.65	0.96	0.64	0.63	14.61	1.00	<b>7.50</b>
<b>CD at 5%</b>	NS	NS	NS	2.71	2.96	2.19	NS	3.04	NS	13.35	4.32	<b>6.97</b>
<b>Irrigation at same level or different level of management</b>												
<b>S.Em.±</b>	S	0.07	0.07	0.81	0.85	0.69	1.25	0.94	0.91	5.56	1.32	<b>2.86</b>
<b>CD at 5%</b>	NS	NS	NS	<b>4.24</b>	<b>4.20</b>	<b>3.80</b>	NS	<b>2.93</b>	NS	<b>33.66</b>	<b>4.19</b>	<b>17.28</b>

Note: Pulse magic \* (N -10%, P- 40%, PGR -20 ppm and micro nutrient 03 %). Spray\*\* At flowering and pod filling stage

**Table.4** LAI (Leaf area index) of transplanted pigeonpea as influenced by irrigation levels, nipping and foliar nutrition management practices

Treatments	LAI											
	At 75 DAS			At 120 DAS			At 165 DAS			At harvest		
	2016	2017	Pooled	2016	2017	Pooled	2016	2017	Pooled	2016	2017	Pooled
<b>Irrigation (I)</b>												
<b>I<sub>0</sub>-No Irrigation</b>	0.05	0.065	0.059	0.656	0.957	0.807	1.557	1.948	1.753	0.631	0.725	<b>0.678</b>
<b>I<sub>1</sub>-Two irrigations at pre-flowering and pod filling stage</b>	0.05	0.066	0.059	0.651	0.970	0.810	1.582	1.954	1.768	0.868	0.993	<b>0.932</b>
<b>S.Em.±</b>	0.001	0.001	0.001	0.005	0.005	0.006	0.003	0.002	0.002	0.046	0.003	<b>0.024</b>
<b>CD at 5%</b>	NS	NS	NS	NS	NS	NS	0.019	NS	0.012	NS	0.018	<b>0.156</b>
<b>Management practices (M)</b>												
<b>M<sub>1</sub>-Control-Without nipping</b>	0.05	0.058	0.053	0.608	0.808	0.707	1.408	1.397	1.402	0.622	0.717	<b>0.668</b>
<b>M<sub>2</sub>-Nipping</b>	0.05	0.067	0.060	0.661	0.987	0.823	1.578	2.040	1.812	0.718	0.873	<b>0.795</b>
<b>M<sub>3</sub>-Nipping + 1% Pulse magic* spray **</b>	0.05	0.067	0.058	0.667	0.998	0.833	1.598	2.020	1.808	0.820	0.885	<b>0.852</b>
<b>M<sub>4</sub>-Nipping + 2 % DAP spray **</b>	0.05	0.067	0.060	0.660	0.978	0.820	1.595	2.027	1.812	0.737	0.872	<b>0.807</b>
<b>M<sub>5</sub>-Nipping + 1 % 19 :19:19 NPK spray **</b>	0.05	0.067	0.060	0.660	0.980	0.820	1.603	2.030	1.817	0.815	0.867	<b>0.842</b>
<b>M<sub>6</sub>-Nipping + 1% pulse magic* +2 % DAP Spray**</b>	0.05	0.067	0.060	0.663	0.980	0.822	1.598	2.030	1.815	0.800	0.877	<b>0.840</b>
<b>M<sub>7</sub>-Nipping +1% pulse magic* +1 % 19:19:19 NPK Spray**</b>	0.06	0.067	0.060	0.670	0.998	0.832	1.592	2.037	1.813	0.742	0.895	<b>0.818</b>
<b>M<sub>8</sub>- Nipping +2 % DAP spray + 1 % 19:19:19 NPK Spray**</b>	0.05	0.067	0.060	0.658	0.988	0.823	1.580	2.028	1.803	0.743	0.888	<b>0.818</b>
<b>S.Em.±</b>	0.001	0.001	0.001	0.008	0.004	0.005	0.008	0.006	0.006	0.014	0.009	<b>0.007</b>
<b>CD at 5%</b>	NS	0.002	0.004	0.023	0.012	0.013	0.019	0.018	0.018	0.040	0.018	<b>0.021</b>
<b>Interactions (I X M)</b>												
<b>I<sub>0</sub> x M<sub>1</sub></b>	0.05	0.057	0.053	0.607	0.757	0.680	1.403	1.400	1.400	0.470	0.547	<b>0.507</b>
<b>I<sub>0</sub> x M<sub>2</sub></b>	0.06	0.067	0.063	0.667	0.984	0.827	1.560	2.030	1.797	0.623	0.763	<b>0.690</b>

<b>I<sub>0</sub> x M<sub>3</sub></b>	0.05	0.067	0.057	0.667	0.997	0.833	1.583	1.997	1.790	0.730	0.760	<b>0.747</b>
<b>I<sub>0</sub> x M<sub>4</sub></b>	0.05	0.067	0.060	0.657	0.973	0.817	1.580	2.007	1.797	0.603	0.743	<b>0.673</b>
<b>I<sub>0</sub> x M<sub>5</sub></b>	0.05	0.067	0.060	0.663	0.973	0.818	1.607	2.030	1.817	0.747	0.737	<b>0.743</b>
<b>I<sub>0</sub> x M<sub>6</sub></b>	0.06	0.067	0.060	0.673	0.977	0.823	1.587	2.047	1.817	0.683	0.740	<b>0.713</b>
<b>I<sub>0</sub> x M<sub>7</sub></b>	0.05	0.067	0.060	0.673	0.990	0.830	1.577	2.043	1.810	0.573	0.753	<b>0.663</b>
<b>I<sub>0</sub> x M<sub>8</sub></b>	0.05	0.067	0.060	0.660	0.987	0.827	1.557	2.030	1.793	0.617	0.757	<b>0.690</b>
<b>I<sub>1</sub> x M<sub>1</sub></b>	0.05	0.060	0.053	0.610	0.860	0.733	1.413	1.393	1.403	0.773	0.887	<b>0.830</b>
<b>I<sub>1</sub> x M<sub>2</sub></b>	0.05	0.067	0.057	0.654	0.973	0.814	1.597	2.050	1.827	0.813	0.983	<b>0.900</b>
<b>I<sub>1</sub> x M<sub>3</sub></b>	0.05	0.067	0.060	0.667	0.990	0.833	1.613	2.043	1.827	0.910	1.010	<b>0.957</b>
<b>I<sub>1</sub> x M<sub>4</sub></b>	0.06	0.067	0.060	0.663	0.983	0.823	1.610	2.047	1.827	0.870	1.000	<b>0.940</b>
<b>I<sub>1</sub> x M<sub>5</sub></b>	0.05	0.067	0.060	0.657	0.987	0.822	1.600	2.030	1.817	0.883	0.997	<b>0.940</b>
<b>I<sub>1</sub> x M<sub>6</sub></b>	0.05	0.067	0.060	0.653	0.983	0.820	1.610	2.013	1.813	0.917	1.013	<b>0.967</b>
<b>I<sub>1</sub> x M<sub>7</sub></b>	0.06	0.067	0.060	0.667	1.007	0.833	1.607	2.030	1.817	0.910	1.037	<b>0.973</b>
<b>I<sub>1</sub> x M<sub>8</sub></b>	0.06	0.067	0.060	0.657	0.990	0.820	1.603	2.027	1.813	0.870	1.020	<b>0.947</b>
<b>Management at same level of irrigation</b>												
<b>S.Em.±</b>	0.001	0.001	0.001	0.014	0.015	0.018	0.008	0.005	0.005	0.131	0.008	<b>0.067</b>
<b>CD at 5%</b>	NS	NS	NS	NS	0.027	0.031	NS	0.027	NS	0.118	0.039	<b>0.062</b>
<b>Irrigation at same level or different level of management</b>												
<b>S.Em.±</b>	0.001	0.001	0.002	0.012	0.007	0.009	0.011	0.008	0.008	0.050	0.012	<b>0.026</b>
<b>CD at 5%</b>	NS	NS	NS	NS	<b>0.036</b>	<b>0.041</b>	NS	<b>0.026</b>	NS	<b>0.301</b>	<b>0.037</b>	<b>0.155</b>

Note: Pulse magic \* (N -10%, P- 40%, PGR -20 ppm and micro nutrient 03 %). Spray\*\* At flowering and pod filling stage

**Table.5** Leaf area duration of transplanted pigeonpea as influenced by irrigation levels, nipping and foliar nutrition management

Treatments	Leaf area duration(days)								
	At (75-120 DAS)			At (120 -165 DAS)			At (165- harvest)		
	2016	2017	Pooled	2016	2017	Pooled	2016	2017	Pooled
<b>Irrigation (I)</b>									
<b>I<sub>0</sub>-No Irrigation</b>	17.17	24.42	20.79	49.80	65.35	57.57	103.91	126.92	<b>115.41</b>
<b>I<sub>1</sub>-Two irrigations at pre- flowering and pod filling stage</b>	17.06	24.74	20.90	50.23	65.81	58.02	116.39	140.00	<b>128.19</b>
<b>S.Em.±</b>	0.14	0.11	0.13	0.14	0.09	0.12	2.05	0.26	<b>1.05</b>
<b>CD at 5%</b>	NS	NS	NS	NS	NS	NS	NS	1.70	<b>6.86</b>
<b>Management practices (M)</b>									
<b>M<sub>1</sub>-Control-Without nipping</b>	16.05	20.80	18.43	45.33	49.56	47.44	96.49	100.18	<b>98.34</b>
<b>M<sub>2</sub>-Nipping</b>	17.03	25.14	21.09	50.13	68.14	59.13	109.13	138.55	<b>123.84</b>
<b>M<sub>3</sub>-Nipping + 1% Pulse magic* spray **</b>	17.39	25.36	21.38	50.99	67.94	59.47	114.79	138.06	<b>126.42</b>
<b>M<sub>4</sub>-Nipping + 2 % DAP spray **</b>	17.27	24.97	21.12	50.74	67.67	59.21	110.80	137.72	<b>124.26</b>
<b>M<sub>5</sub>-Nipping + 1 % 19 :19:19 NPK spray **</b>	17.10	25.77	21.44	50.86	67.49	59.18	114.95	137.54	<b>126.25</b>
<b>M<sub>6</sub>-Nipping + 1% pulse magic* +2 % DAP Spray**</b>	17.33	24.95	21.14	50.87	67.72	59.30	113.91	137.96	<b>125.93</b>
<b>M<sub>7</sub>-Nipping +1% pulse magic* +1 % 19:19:19 NPK Spray**</b>	17.51	25.42	21.46	50.85	68.25	59.55	110.79	139.17	<b>124.97</b>
<b>M<sub>8</sub>- Nipping +2 % DAP spray + 1 % 19:19:19 NPK Spray**</b>	17.22	25.22	21.22	50.35	67.90	59.12	110.37	138.47	<b>124.42</b>
<b>S.Em.±</b>	0.18	0.32	0.12	0.23	0.19	0.17	0.79	0.54	<b>0.51</b>
<b>CD at 5%</b>	0.53	0.59	0.34	0.66	0.55	0.51	2.31	1.56	<b>1.48</b>
<b>Interactions (I X M)</b>									
<b>I<sub>0</sub> x M<sub>1</sub></b>	16.04	19.65	17.84	45.21	48.51	46.86	89.07	92.27	<b>90.67</b>
<b>I<sub>0</sub> x M<sub>2</sub></b>	17.30	25.39	21.34	49.88	68.18	59.03	103.68	132.78	<b>118.23</b>
<b>I<sub>0</sub> x M<sub>3</sub></b>	17.33	25.34	21.33	50.68	67.35	59.02	109.99	130.99	<b>120.49</b>
<b>I<sub>0</sub> x M<sub>4</sub></b>	17.16	24.88	21.02	50.37	67.09	58.73	103.75	130.60	<b>117.18</b>
<b>I<sub>0</sub> x M<sub>5</sub></b>	17.14	25.85	21.00	50.90	67.56	59.23	111.80	131.40	<b>121.60</b>

<b>I<sub>0</sub> x M<sub>6</sub></b>	17.57	24.84	21.21	50.81	68.01	59.41	107.77	132.30	<b>120.03</b>
<b>I<sub>0</sub> x M<sub>7</sub></b>	17.56	25.22	21.39	50.57	68.21	59.39	101.98	132.75	<b>117.36</b>
<b>I<sub>0</sub> x M<sub>8</sub></b>	17.23	25.18	21.21	49.94	67.88	58.91	103.24	132.22	<b>117.73</b>
<b>I<sub>1</sub> x M<sub>1</sub></b>	16.07	21.96	19.01	45.45	50.60	48.02	103.90	108.09	<b>106.00</b>
<b>I<sub>1</sub> x M<sub>2</sub></b>	16.76	24.89	20.83	50.38	68.09	59.23	114.57	144.32	<b>129.44</b>
<b>I<sub>1</sub> x M<sub>3</sub></b>	17.46	25.38	21.43	51.31	68.53	59.92	119.59	145.13	<b>132.35</b>
<b>I<sub>1</sub> x M<sub>4</sub></b>	17.38	25.05	21.21	51.11	68.25	59.68	117.84	144.84	<b>131.34</b>
<b>I<sub>1</sub> x M<sub>5</sub></b>	17.06	25.69	20.88	50.82	67.42	59.12	118.10	143.67	<b>130.89</b>
<b>I<sub>1</sub> x M<sub>6</sub></b>	17.10	25.06	21.08	50.93	67.43	59.18	120.05	143.61	<b>131.83</b>
<b>I<sub>1</sub> x M<sub>7</sub></b>	17.45	25.62	21.53	51.12	68.28	59.70	119.59	145.59	<b>132.58</b>
<b>I<sub>1</sub> x M<sub>8</sub></b>	17.20	25.26	21.23	50.76	67.91	59.33	117.49	144.72	<b>131.11</b>
<b>Management at same level of irrigation</b>									
<b>S.Em.±</b>	0.38	0.32	0.35	0.40	0.26	0.33	5.81	0.74	<b>2.96</b>
<b>CD at 5%</b>	NS	0.59	0.72	NS	0.90	NS	6.50	NS	<b>3.94</b>
<b>Irrigation at same level or different level of management</b>									
<b>S.Em.±</b>	0.28	0.16	0.20	0.33	0.27	0.26	2.31	0.76	<b>1.24</b>
<b>CD at 5%</b>	NS	<b>0.77</b>	<b>0.86</b>	NS	<b>0.90</b>	NS	<b>13.37</b>	NS	<b>6.83</b>

Note: Pulse magic \* (N -10%, P- 40%, PGR -20 ppm and micro nutrient 03 %). Spray\*\* At flowering and pod filling stage

**Table.6** Total dry matter production  $\text{plant}^{-1}$  of transplanted pigeonpea as influenced by irrigation levels, nipping and foliar nutrition management

Treatments	Total dry matter production ( $\text{g plant}^{-1}$ )											
	At 75 DAS			At 120 DAS			At 165 DAS			At harvest		
	2016	2017	Pooled	2016	2017	Pooled	2016	2017	Pooled	2016	2017	Pooled
<b>Irrigation (I)</b>												
<b>I<sub>0</sub>-No Irrigation</b>	37.85	57.24	47.55	157.22	189.59	173.40	358.83	434.51	396.67	559.83	618.62	<b>589.22</b>
<b>I<sub>1</sub>-Two irrigations at pre- flowering and pod filling stage</b>	38.68	57.35	48.02	156.30	192.00	174.15	369.58	442.30	405.94	740.59	884.83	<b>812.71</b>
<b>S.Em.±</b>	0.48	0.73	0.348	1.61	0.60	1.08	1.34	0.46	0.46	18.17	33.84	<b>22.03</b>
<b>CD at 5%</b>	NS	NS	NS	NS	NS	NS	8.77	2.98	3.02	119.01	221.68	<b>144.35</b>
<b>Management practices (M)</b>												
<b>M<sub>1</sub>-Control-Without nipping</b>	37.03	52.95	44.99	146.22	175.17	160.69	287.67	337.70	312.68	488.57	579.77	<b>534.17</b>
<b>M<sub>2</sub>-Nipping</b>	38.03	58.42	48.23	156.18	192.10	174.14	374.58	459.62	417.10	557.78	663.34	<b>610.56</b>
<b>M<sub>3</sub>-Nipping + 1% Pulse magic* spray **</b>	38.18	57.57	47.88	159.43	193.60	176.52	376.72	450.03	413.38	715.62	838.23	<b>776.93</b>
<b>M<sub>4</sub>-Nipping + 2 % DAP spray **</b>	38.45	57.72	48.08	159.85	192.60	176.23	375.32	446.93	411.13	645.27	697.26	<b>671.27</b>
<b>M<sub>5</sub>-Nipping + 1 % 19 :19:19 NPK spray **</b>	38.43	57.95	48.19	157.47	193.03	175.25	379.95	454.97	417.46	690.10	790.15	<b>740.13</b>
<b>M<sub>6</sub>-Nipping + 1% pulse magic* +2 % DAP Spray**</b>	38.90	57.08	47.99	157.43	193.08	175.26	378.22	451.40	414.81	709.27	808.61	<b>758.94</b>
<b>M<sub>7</sub>-Nipping +1% pulse magic* +1 % 19:19:19 NPK Spray**</b>	38.63	58.65	48.64	159.32	193.38	176.35	374.35	453.03	413.69	734.90	853.89	<b>794.39</b>
<b>M<sub>8</sub>- Nipping +2 % DAP spray + 1 % 19:19:19 NPK Spray**</b>	38.45	58.05	48.25	158.15	193.40	175.78	366.80	453.58	410.19	660.17	782.53	<b>721.35</b>



<b>S.Em.±</b>	0.13	0.60	0.348	1.80	1.89	1.25	3.66	4.76	3.45	25.10	31.93	<b>19.00</b>
<b>CD at 5%</b>	0.37	1.74	NS	5.25	5.49	3.65	10.64	13.86	10.06	73.10	92.96	<b>55.31</b>
<b>Interactions (I X M)</b>												
<b>I<sub>0</sub> x M<sub>1</sub></b>	36.37	53.00	44.68	145.97	165.10	155.53	284.77	340.53	312.65	382.37	468.17	<b>425.27</b>
<b>I<sub>0</sub> x M<sub>2</sub></b>	37.57	58.00	47.78	157.50	192.87	175.18	367.37	449.83	408.60	463.67	534.73	<b>499.20</b>
<b>I<sub>0</sub> x M<sub>3</sub></b>	37.80	57.73	47.77	160.10	193.93	177.02	370.90	433.43	402.17	624.80	736.33	<b>680.57</b>
<b>I<sub>0</sub> x M<sub>4</sub></b>	37.97	58.63	48.30	160.13	192.50	176.32	369.73	425.13	397.43	597.90	539.02	<b>568.46</b>
<b>I<sub>0</sub> x M<sub>5</sub></b>	38.43	57.00	47.72	157.40	191.80	174.60	381.50	452.73	417.12	650.37	700.47	<b>675.42</b>
<b>I<sub>0</sub> x M<sub>6</sub></b>	38.70	56.50	47.60	157.00	193.33	175.17	374.53	467.00	420.77	612.70	650.53	<b>631.62</b>
<b>I<sub>0</sub> x M<sub>7</sub></b>	37.70	58.97	48.33	160.60	193.33	176.97	366.23	457.47	411.85	587.80	667.97	<b>627.89</b>
<b>I<sub>0</sub> x M<sub>8</sub></b>	38.30	58.10	48.20	159.03	193.83	176.43	355.57	449.97	402.77	559.03	651.71	<b>605.37</b>
<b>I<sub>1</sub> x M<sub>1</sub></b>	37.70	52.90	45.30	146.47	185.23	165.85	290.57	334.87	312.72	594.77	691.37	<b>643.07</b>
<b>I<sub>1</sub> x M<sub>2</sub></b>	38.50	58.83	48.67	154.87	191.33	173.10	381.80	469.40	425.60	651.90	791.94	<b>721.92</b>
<b>I<sub>1</sub> x M<sub>3</sub></b>	38.57	57.40	47.98	158.77	193.27	176.02	382.53	466.63	424.58	806.43	940.13	<b>873.29</b>
<b>I<sub>1</sub> x M<sub>4</sub></b>	38.93	56.80	47.87	159.57	192.70	176.13	380.90	468.73	424.82	692.63	855.50	<b>774.08</b>
<b>I<sub>1</sub> x M<sub>5</sub></b>	38.43	58.90	48.67	157.53	194.27	175.90	378.40	457.20	417.80	729.83	879.82	<b>804.83</b>
<b>I<sub>1</sub> x M<sub>6</sub></b>	39.10	57.67	48.38	157.87	192.83	175.35	381.90	435.80	408.85	805.83	966.69	<b>886.27</b>
<b>I<sub>1</sub> x M<sub>7</sub></b>	39.57	58.33	48.95	158.03	193.43	175.73	382.47	448.60	415.53	882.00	1039.80	<b>960.90</b>
<b>I<sub>1</sub> x M<sub>8</sub></b>	38.60	58.00	48.30	157.27	192.97	175.12	378.03	457.20	417.62	761.30	913.34	<b>837.33</b>
<b>Management at same level of irrigation</b>												
<b>S.Em.±</b>	1.36	2.07	0.984	4.56	1.69	3.05	3.79	1.29	1.30	51.38	95.71	<b>62.32</b>
<b>CD at 5%</b>	1.10	NS	NS	NS	8.29	7.08	NS	19.72	14.40	NS	NS	<b>NS</b>
<b>Irrigation at same level or different level of management</b>												
<b>S.Em±</b>	0.51	1.08	0.000	2.88	2.56	1.98	5.02	6.31	4.59	37.853	54.12	<b>33.42</b>
<b>CD at 5%</b>	<b>3.13</b>	<b>NS</b>	<b>NS</b>	<b>NS</b>	<b>7.97</b>	<b>7.91</b>	<b>NS</b>	<b>18.50</b>	<b>13.54</b>	<b>NS</b>	<b>NS</b>	<b>NS</b>

Note: Pulse magic \* (N -10%, P- 40%, PGR -20 ppm and micro nutrient 03 %). Spray\*\* At flowering and pod filling stage

The treatment combination (I<sub>1</sub>X<sub>7</sub>) two irrigations at pre-flowering and pod filling stage along with nipping + 1% pulse magic + 1% 19:19:19 spray at flowering and 15 days then after, noticed significantly higher number of leaves (896.07) (Table 2). and found at par with treatments which received two irrigations at pre-flowering and pod filling stage with different management practices which was found at par with I<sub>1</sub>X<sub>6</sub> (889.60), I<sub>1</sub>X<sub>3</sub> (882.20), I<sub>1</sub>X<sub>3</sub> (867.93), I<sub>1</sub>X<sub>5</sub> (864.47), I<sub>1</sub>X<sub>4</sub> (860.70), I<sub>1</sub>X<sub>2</sub> (824.14) and I<sub>1</sub>X<sub>1</sub> (763.79).

Significantly higher leaf area (109.58 dm<sup>2</sup> plant<sup>-1</sup>) with (I<sub>1</sub>X<sub>7</sub>) over I<sub>0</sub>X<sub>1</sub> no-irrigation and no nipping (57.14) and found at par with treatment combinations which received two irrigations at flowering and pod filling stage (Table 3).

The treatment combination of (I<sub>1</sub>X<sub>7</sub>) two irrigations at pre-flowering pod filling stage with nipping+ 1% pulse magic + 1% 19:19:19 NPK spray at flowering and 15 days after first spray noticed higher LAI (0.973) compared to I<sub>0</sub> X M1(0.507) (Table 4).

The treatment combination I<sub>1</sub>X<sub>7</sub> recorded significantly higher leaf area duration (132.58 days) over rest of treatment combinations except, I<sub>1</sub>X<sub>2</sub> (129.44), I<sub>1</sub>X<sub>8</sub> (131.11), (I<sub>1</sub>X<sub>4</sub> (131.34), I<sub>1</sub>X<sub>5</sub> (130.89), I<sub>1</sub>X<sub>6</sub> (131.83) and I<sub>1</sub>X<sub>3</sub> (132.35) which were found at par with each other (Table 5). Interaction due to irrigation levels and management practices found non significant on total dry production at harvest (Table 6).

Based on the research results, it can be concluded that among the levels of irrigation providing two supplemental irrigations one at pre- flowering and another at pod filling stage resulted in higher growth parameters like plant height, number of leaves, leaf area, leaf area index, leaf area duration and total dry matter production. Among the management practices higher growth parameter like plant height and total dry matter was noticed (I<sub>1</sub>X<sub>7</sub>) two irrigations at pre-flowering pod filling stage with nipping+ 1% pulse magic + 1% 19:19:19 NPK

spray at flowering and 15 days after first spray and number of leaves, leaf area, leaf area index, leaf area duration was noticed with M<sub>3</sub>-nipping+ 1 % pulse magic spray at flowering and 15 days after first spray-nipping +1% pulse magic spray. In interaction growth parameters higher in (I<sub>1</sub>X<sub>7</sub>) two irrigations at pre-flowering pod filling stage with nipping+ 1% pulse magic + 1% 19:19:19 NPK spray at flowering and 15 days after first spray.

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