www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating 2017: 5.03
TPI 2017; 6(11): 316-321

www.thepharmajournal.com
Received: 13-09-2017
Accepted: 14-10-2017

P Arun Kumar
Agro Climate Research Centre
Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

N Maragatham,
Professor and Head
Department of Farm Management Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

S Panneerselvam
Agro Climate Research Centre
Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

SP Ramanthan,
Professor (Agronomy),
Water Technology Centre,
Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India.

P Jeyakumar,
Professor and Head
Department of Crop Physiology,
Tamil Nadu Agricultural University, Coimbatore,
Tamil Nadu, India

Correspondence
P Arun Kumar
Agro Climate Research Centre
Tamil Nadu Agricultural University, Coimbatore,
Tamil Nadu, India

Investigate seasonal variation on growth and yield of groundnut crop under different microclimate modification systems

Arunkumar P, Maragatham N, Panneerselvam S, Ramanathan SP and Jeyakumar P

Abstract
Field experiments were conducted at Tamil Nadu Agricultural University, Coimbatore during winter 2016 and summer 2017, to study seasonal variation on phenology and productivity of groundnut (*Arachis hypogaea*) along with red gram (*Cajanus cajan*), maize (*Zea mays*) and castor (*Ricinus communis*) as intercrop at different irrigation levels. Groundnut pod yield was higher under winter season (2214 kg ha^{-1}) against summer (2033 kg ha^{-1}). The microclimate parameters like leaf temperature, canopy temperature, soil surface temperature and the soil temperature were higher during summer as compared to winter. Harvest index of 0.34 noticed during summer, it was found that the harvest index was 0.50 during winter.

Keywords: Winter, summer, microclimate, groundnut, harvest, irrigation, cropping system

Introduction
The crop groundnut is the major oil seed crop, which meets about 1.46 million tonnes of edible oils demand from consumers across India; it is cultivated in all climates like tropical, temperate and subtropical. Its growth and development is greatly influenced by environmental factors. Sowing time is one of the important factors influencing the production of groundnut. To avoid the periodic stress, matching the phenology of crop to duration of favourable conditions by selecting the perfect sowing dates is crucial for getting maximum yield. Sowing date adjustment is important to optimize the climate in respect to growth and yield of groundnut. Through shifting of sowings stress is avoided during stages of plant growth. This study was undertaken to compare the phonological growth and development of groundnut under different irrigation levels and intercropped with different crops.

Materials and method
Experiments were conducted, during winter 2016 (Aug – Dec) and summer 2017 (Feb – Jun) Tamil Nadu Agricultural University, Coimbatore. The field is located at 11°83' N latitude and 76°71'E longitude at an elevation of 426.7 m above mean sea level (msl) in the Western Agro Climatic Zone of Tamil Nadu.

Field experiment was carried out under irrigated conditions and laid out in split-plot design with 4 levels of irrigation (main-plot treatments) and 4 cropping systems (sub-plot treatments) replicated thrice. Total number of plots was 48 each of 24 sq m area (5 m x 4.8 m) and irrigation channel was provided buffer channel in between main-plot irrigation treatments avoiding any water transfer by seepage among the adjacent plots.

In main-plot treatments, the levels of irrigation were as follows: I_1 = 0.7 IW /CPE ratio, I_2 = 0.6 IW /CPE ratio, I_3 = 0.5 IW /CPE ratio and I_4 = 0.4 IW /CPE ratio and 4 different intercropping systems under subplots were: C_1 - sole groundnut, C_2 – groundnut + red gram, C_3 - groundnut + maize, C_4 – groundnut + castor at 4:1 row ratio, respectively. This experiment was also recorded growth characters, yield and yield attributes.

Results and Discussion
Growth characteristic of groundnut
In winter 2016, the plant height (cm), leaf area index and dry matter production on groundnut recorded at 30, 60, 90 DAS and at harvest as influenced by the treatments.

At 30 and 60 days after sowing, the irrigation level I_2 did influence the plant height (Table 1) of groundnut significantly but it was at par with the irrigation treatment I_1. Among the intercropping treatments, both C_1 and C_2 treatments were at par in registering significantly higher plant height. In general the groundnut grown along with castor (C_4) had significantly least plant height. Except at 30 days, the effect of interaction was absent. Normally the plant height of the crop groundnut goes up to 47.5 cm at the time of harvest as per the report of and the entire ground space gets covered with higher leaf area index (Table 2) between 60 to 90 days of its growth as per the report of When there is interaction between bio system (groundnut + inter crop, sole ground nut) and physical system (weather and climate), totally the microclimate gets varied from the environmental climate.

In this processes, two interactions may happen between bio and physical systems. When the interaction is favourable, it increases the crop's yield. When groundnut alone is being grown the microclimate gets changed with the stages of the crop. But when intercrops of dissimilar architecture are introduced with the groundnut, the microclimate gets changed differently from the microclimate of sole of ground nut at each day of crop's growth. At harvest when comparing irrigation levels at each intercropping treatment, the result revealed that the irrigation treatment I_1 was significantly superior over other treatments under intercropping C_1 (sole groundnut).

The harvest of groundnut and intercropping treatments the result was significant only at 30, 60 DAS. Inversely significant was absent for irrigation treatments at 30, 60 DAS and at harvest. Irrigation treatments differed significantly only at 90 days of groundnut growth. At 30, 60 DAS and at harvest the intercropping treatment sole groundnut (C_1) did record more leaf area index significantly but it was at par with the groundnut crop grown along with red gram (C_2) and maize (C_3). At 90 days though the irrigation treatment I_1 did influence the leaf area index of groundnut significantly, it was at par with the other irrigation treatment I_2.

The entire ground space gets covered with higher leaf area index between 60 to 90 days of its growth as per the report of Both irrigation treatments I_1 and I_2 were significantly superior to the irrigation treatment I_4. Interactions were significance at 30 and 60 days after sowing. At harvest the interaction of comparing irrigation levels at each intercropping treatment was alone significant. Though interactions were significant as indicated above, interestingly nothing could be highlighted, at 30 days. In respect of 90 days when comparing irrigation levels at each intercropping treatment, significantly superiority was observed for I_2 irrigation treatment under C_2 intercropping treatment.

The both irrigation and cropping system were significant. Between irrigation levels evaluated, the result indicated that at 30, 60 DAS and at harvest the irrigation level I_1 did record highest dry matter production significantly, but it was at par with the other level I_2. Least dry matter production in general was observed with irrigation level I_4. But at 90 DAS, significantly the irrigation level I_1 had shown independent superiority in registering higher dry matter production. Among intercropping treatments, significantly higher dry matter production was recorded by the treatment sole crop of groundnut (C_1) at 30 DAS and at 90 DAS. This treatment C_1 was at par with C_3 at 60 DAS and also at harvest. Among the interactions, in all the days of observations, the interaction between C_1 and I_1 was significant in recording higher dry matter production. But at harvest, in addition to this treatment of C_1I_1 / I_1C_1, significance was observed for C_3 / I_4 C_4 / I_1, I_3 / C_1 and I_4 / C_3 for registering more dry matter production (Table 3).

In summer 2017, the plant height (cm) leaf area index and dry matter production of groundnut recorded at 30, 60, 90 DAS and at harvest are presented in Table 5, 6 and 7. It was observed that both main effects (I and C) and interactions were significant in influencing the groundnut plant height (Table 5) at 30 DAS. In respect of 60 DAS, 90 DAS and at harvest only the difference between irrigation levels was significant. At all the days of observations (30, 60, 90 and at harvest) between irrigation levels evaluated, the levels I_2 and I_1 were at par in influencing the plant height of groundnut significantly to higher level. At 30 DAS though significant result was obtained for intercropping treatments, the treatments C_2, C_4 and C_1 were at par and again C_1 had at par with C_3. Hence correct conclusion could not be drawn. In the interaction, also statistical mess was observed in terms of statistical par between treatments. Hence correct conclusion could not be drawn.

At 30 DAS significance was observed for intercropping treatments and its interaction with irrigation levels in influencing the leaf area index (Table 6). At 60 DAS both main effects (I and C) and their interactions were significant. At 90 DAS significance was observed for irrigation levels and their interactions with intercropping treatments. At harvest only the difference between irrigation levels was found significant. At 30 and 60 DAS between intercropping treatments evaluated, both C_2 and C_1 were at par in registering higher leaf area index. At 60 DAS the irrigation levels I_2 and I_1 were at par in influencing the leaf area index significantly. At harvest independent superiority of the irrigation level I_1 was observed. From the interaction study, the interaction C_4 / I_3 under 30 DAS, I_2C_2 and I_3C_4 under 60 DAS were significant.

At different days of observation (30, 60, 90 DAS and at harvest), both effects (I and C) and their interactions were significant (Table 7). Between irrigation levels at 30 DAS independent superiority of the level I_1 was seen significantly in influencing the dry matter production followed by I_2, I_3 and I_4. But at 60, 90 DAS and at harvest in general the level I_1 was at par either with I_3 or I_4. Between intercropping treatments, in all the days of observations, both C_1 and C_2 were at par in exhibiting higher dry matter production significantly. The lowest dry matter production was observed with the intercropping treatment C_4 at 30 DAS, 60 DAS and 90 DAS. Reviewing the data on interactions it was found that at 30 DAS C_1/I_1, C_4/I_3 and I_2/C_2 were significant. While at 60 DAS C_1 / I_1, C_4 / I_3, I_1 / C_1 and I_2 / C_2 were found significant. At 90 DAS C_4 / I_3, I_1 / C_1, I_2 / C_2 and I_4 / C_1 were significant. At harvest C_1 / I_1, C_4 / I_3, I_1 / C_1, I_2 / C_2, I_3 / C_4 and I_4 / C_1 were significant.

Yield and yield attributes

In winter season of pod yield (kg ha^{-1}), haulm yield (kg ha^{-1}) and harvest index of groundnut recorded at harvest as influenced by the treatments are presented in Table 4. The general mean of groundnut pod yield was 2414 kg ha^{-1} and the range was from 1898 kg ha^{-1} (I_3C_4) to 2588 kg ha^{-1}(I_1 C_1).Statistical significance was observed for main treatments namely irrigation levels and intercropping treatments. Interaction was absent. Among the irrigation levels significant superiority of the irrigation level I_1 was observed with a

hectare yield of 2394 kg ha^{-1} of pods. The lowest pod yield of 2053 kg ha^{-1} was observed with irrigation level I_4. The irrigation levels I_2 and I_3 were at par next to the irrigation level I_1. The reduction of pod yield was 341 kg ha^{-1} (14 per cent) for the irrigation level I_4 as compared to I_1. Between intercropping treatments sole groundnut had registered significantly higher pod yield of 2394 kg ha^{-1} followed by C_3 (groundnut + maize), C_2 (groundnut + red gram) and C_4 (groundnut + castor). The reduction in groundnut pod yield as compared to sole crop of groundnut was 8 per cent for C_3, 9 per cent for C_2 and 14 per cent for C_4 intercropping treatments.

In summer 2017 the pod yield of groundnut (kg ha^{-1}), haulm yield (kg ha $^{-1}$) recorded at harvest are presented in Table 8. The general pod yield was 2033 kg ha^{-1} and range was from 1778 kg ha^{-1} (I_4C_4) to 2374 kg ha^{-1} (I_1C_1). The differences between level of irrigation and between levels of intercropping treatment were alone significant. Interaction did not differ significantly. Among the irrigation levels studied, significantly independent superiority in registering higher mean pod yield was noted for the irrigation level I_1. The other levels I_2, I_3 and I_4 were at par. The increased pod yield under I_1 was 15 per cent over the other level I_4.Among the intercropping treatments, sole groundnut (C_1) did record significantly and independently higher pod yield over other levels evaluated. The intercropping treatments C_3, C_2 and C_4 were at par in registering pod yield next to the level C_1. The reduction in groundnut yield under intercropping treatments was 8 per cent for C_3 (groundnut + maize), 9 per cent for C_2 (groundnut + red gram) and 14 per cent for C_4 (groundnut + castor).

It is evidence from the study that groundnut pod yield was higher under winter season (2214 kg ha^{-1}) against summer (2033 kg ha^{-1}). Similar evidence was seen from the report of Senthilkumar, (1990) [5] and Suresh *et al.*, (2013) [6]. This was due to increase in one hundred pod weight, one hundred kernel weight and shelling percent of groundnut during winter as compared to summer. The increase in yield components during winter was due to prevalence of mild weather and favorable micro climate as compared to summer. In the present investigation the microclimate parameters like leaf temperature, canopy temperature, soil surface temperature and the soil temperature were higher during summer as compared to winter.

The both irrigation and cropping system were significant, while interaction was absent. The result on groundnut haulm yield is something different from the result obtained from groundnut pod yield, in sense that among the irrigation levels I_1, I_3 and I_2 were statistically at par in registering higher mean haulm yield (kg ha^{-1}). While between intercropping treatments C_1, C_3 and C_2 were at par. Statistical significance was obtained only for the cropping systems irrigation and levels. The result indicated that the harvest index was significantly lesser with the irrigation level I_3. Though the irrigation level I_1 had produced significantly higher harvest index, this was, at par with the harvest index produced by irrigation levels I_2 and I_4.

In general the haulm yield of experiment data was 3925 kg ha^{-1}. Though the levels between irrigation and the levels between intercropping were significant, concrete conclusion could not be made since they were at par between levels respectively. The harvest index results revealed statistically non significant between treatments evaluated.

Table 1: Changes in mean plant height of groundnut (cm) as influenced by different irrigation schedules and intercropping (winter 2016)

Treatment	30 DAS					60 DAS					90 DAS					Harvest				
	I_1	I_2	I_3	I_4	Mean	I_1	I_2	I_3	I_4	Mean	I_1	I_2	I_3	I_4	Mean	I_1	I_2	I_3	I_4	Mean
C_1	14.6	14.8	14.8	13.6	14.4	28.5	29.3	28.9	26.3	28.2	36.5	36.5	37.0	34.3	36.1	37.4	37.8	38.0	34.8	37.0
C_2	15.0	14.0	13.9	15.0	14.5	29.5	28.1	27.0	29.2	28.5	37.3	35.0	34.0	37.0	35.8	37.8	36.3	34.6	37.1	36.4
C_3	12.1	13.5	12.0	13.7	12.8	23.6	26.1	23.0	22.8	23.9	31.2	33.5	31.0	32.0	31.9	31.3	34.3	31.1	33.9	32.6
C_4	13.0	15.5	11.3	14.7	13.6	21.7	23.1	22.3	20.8	22.0	31.8	32.5	32.2	30.0	31.6	32.5	34.2	33.9	30.4	32.7
Mean	13.7	14.5	13.0	14.2	13.8	25.8	26.7	25.3	24.8	25.6	34.2	34.4	33.5	33.3	33.9	34.7	35.7	34.4	34.0	34.7
	SEd		CD (P=0.05)			SEd		CD (P=0.05)			SEd		CD (P=0.05)			SEd		CD (P=0.05)		
C	0.37		0.90		*	0.66		1.62		*	0.89		2.19		*	0.91		2.23		*
I	0.31		0.64		*	0.60		1.24		*	0.77		1.59		NS	0.79		1.62		NS
C at I	0.65		1.34		*	1.23		2.54		NS	1.60		3.31		NS	1.64		3.38		NS
I at C	0.62		1.27		*	1.20		2.48		NS	1.54		3.17		NS	1.57		3.24		NS

Table 2: Changes in mean leaf area index of groundnut as influenced by different irrigation schedules and intercropping (winter 2016)

Treatment	30 DAS					60 DAS					90 DAS					Harvest				
	I_1	I_2	I_3	I_4	Mean	I_1	I_2	I_3	I_4	Mean	I_1	I_2	I_3	I_4	Mean	I_1	I_2	I_3	I_4	Mean
C_1	1.84	1.67	1.78	1.76	1.76	2.74	2.72	2.62	2.49	2.64	3.94	3.93	3.35	3.07	3.57	3.59	3.07	3.22	3.11	3.25
C_2	1.67	1.76	1.68	1.63	1.68	2.66	2.71	2.46	2.65	2.62	3.50	4.01	3.62	3.31	3.61	2.91	3.21	2.94	2.86	2.98
C_3	1.73	1.76	1.46	1.76	1.68	2.31	2.43	2.38	2.55	2.42	3.62	3.26	3.19	3.47	3.39	3.15	3.09	2.76	3.09	3.02
C_4	1.62	1.68	1.61	1.48	1.59	2.31	2.50	2.29	2.29	2.35	3.79	3.21	3.46	3.32	3.45	2.83	3.06	2.82	2.79	2.87
Mean	1.72	1.72	1.63	1.66	1.68	2.51	2.59	2.44	2.50	2.51	3.71	3.60	3.41	3.29	3.51	3.12	3.11	2.94	2.96	3.03
	SEd		CD (P=0.05)			SEd		CD (P=0.05)			SEd		CD (P=0.05)			SEd		CD (P=0.05)		
C	0.04		0.11		*	0.06		0.16		*	0.09		0.21		NS	0.08		0.19		*
I	0.04		0.08		NS	0.06		0.12		NS	0.08		0.16		*	0.07		0.14		NS
C at I	0.08		0.16		*	0.12		0.24		NS	0.16		0.33		*	0.14		0.29		NS
I at C	0.08		0.16		*	0.11		0.23		NS	0.15		0.32		*	0.14		0.28		*

Table 3: Changes in mean dry matter production of groundnut (kg ha $^{-1}$) as influenced by different irrigation schedules and intercropping (winter 2016)

Treatment	30 DAS					60 DAS					90 DAS					Harvest				
	I_1	I_2	I_3	I_4	Mean	I_1	I_2	I_3	I_4	Mean	I_1	I_2	I_3	I_4	Mean	I_1	I_2	I_3	I_4	Mean
C_1	1955.0	1570.0	1697.5	1562.5	1696.2	5065.0	4155.0	4465.0	4070.0	4438.7	7317.5	5685.0	6107.5	5392.5	6125.6	7075.0	5880.0	6305.0	5537.5	6199.4
C_2	1417.5	1560.0	1485.0	1377.5	1460.0	3745.0	4225.0	3915.0	3617.5	3875.6	5115.0	5780.0	5352.5	4930.0	5294.4	5275.0	5975.0	5527.5	5087.5	5466.2
C_3	1552.5	1562.5	1165.0	1560.0	1460.0	4017.5	4175.0	4220.0	4225.0	4159.4	5320.0	5690.0	4752.5	5330.0	5273.1	5457.5	5862.5	5487.5	6657.5	5866.2
C_4	1392.5	1395.0	1345.0	1177.5	1327.5	3955.0	4192.5	3262.5	3820.0	3807.5	6440.0	5625.0	4980.0	4777.5	5455.6	5810.0	5140.0	4900.0	5045.0	5223.7
Mean	1579.4	1521.9	1423.1	1419.4	1485.9	4195.6	4186.9	3965.6	3933.1	4070.3	6048.1	5695.0	5298.1	5107.5	5537.2	5904.4	5714.4	5555.0	5581.9	5688.9
	SEd		CD (P=0.05)			SEd		CD (P=0.05)			SEd		CD (P=0.05)			SEd		CD (P=0.05)		
C	38.91		95.20		*	105.32		257.71		*	147.23		360.26		*	144.74		354.17		*
I	34.20		70.58		*	90.79		187.38		*	123.16		254.18		*	127.51		263.16		*
C at I	70.87		146.26		*	189.26		390.62		*	259.19		534.95		*	264.05		544.98		*
I at C	68.40		141.17		*	181.58		374.76		*	246.31		508.37		*	255.01		526.32		*

Table 4: Changes in mean pod yield (kg ha^{-1}), mean haulm yield (kg ha^{-1}) and mean harvest index of groundnut as influenced by different irrigation schedules and intercropping (winter 2016)

Treatment	Mean pod yield (kg ha $^{-1}$)					Mean haulm yield (kg ha $^{-1}$)					Mean harvest index				
	I_1	I_2	I_3	I_4	Mean	I_1	I_2	I_3	I_4	Mean	I_1	I_2	I_3	I_4	Mean
C_1	2588	2365	2384	2239	2394	4873	4851	4769	4385	4720	0.53	0.49	0.49	0.51	0.51
C_2	2254	2229	2131	2102	2179	4567	4312	4499	4205	4396	0.49	0.52	0.47	0.50	0.50
C_3	2500	2236	2145	1972	2213	4765	4620	4670	4147	4551	0.51	0.48	0.46	0.48	0.48
C_4	2234	2153	1998	1898	2071	4274	4069	4149	3957	4112	0.52	0.53	0.48	0.48	0.50
Mean	2394	2246	2165	2053	2214	4620	4463	4522	4174	4445	0.51	0.51	0.48	0.49	0.50
	SEd		CD (P=0.05)			SEd		CD (P=0.05)			SEd		CD (P=0.05)		
C	58.68		143.59		*	115.64		282.96		*	0.01		0.03		NS
I	49.68		102.54		*	98.77		203.85		*	0.01		0.02		*
C at I	104.16		214.97		NS	206.49		426.18		NS	0.02		0.05		NS
I at C	99.37		205.08		NS	197.54		407.70		NS	0.02		0.04		NS

Table 5: Changes in mean plant height of groundnut (cm) as influenced by different irrigation schedules and intercropping (summer 2017)

Treatment	30 DAS					60 DAS					90 DAS					Harvest				
	I_1	I_2	I_3	I_4	Mean	I_1	I_2	I_3	I_4	Mean	I_1	I_2	I_3	I_4	Mean	I_1	I_2	I_3	I_4	Mean
C_1	13.60	13.92	11.27	12.05	12.71	27.90	28.94	23.16	21.29	25.32	34.59	35.41	29.63	30.19	32.46	36.24	36.63	30.33	31.52	33.68
C_2	13.74	13.02	12.56	14.45	13.44	28.72	27.55	25.56	22.64	26.12	34.64	33.25	31.74	30.82	32.61	36.66	35.23	33.29	33.21	34.60
C_3	13.77	12.90	11.14	10.54	12.09	28.30	26.46	22.55	21.84	24.79	35.08	32.24	29.38	30.56	31.82	36.84	33.51	30.17	32.84	33.34
C_4	12.62	13.98	12.70	13.69	13.25	25.80	28.59	22.30	20.34	24.26	32.57	35.08	30.32	28.48	31.61	33.79	36.02	32.84	29.45	33.03
Mean	13.43	13.46	11.92	12.68	12.87	27.68	27.89	23.39	21.53	25.12	34.22	34.00	30.27	30.01	32.12	35.88	35.35	31.66	31.76	33.66
	SEd		CD (P=0.05)			SEd		CD (P=0.05)			SEd		CD (P=0.05)			SEd		CD (P=0.05)		
C	0.35		0.87		*	0.65		1.58		NS	0.84		2.07		NS	0.89		2.17		NS
I	0.28		0.58		*	0.55		1.14		*	0.71		1.46		*	0.74		1.53		*
C at I	0.60		1.25		*	1.15		2.38		NS	1.48		3.06		NS	1.56		3.22		NS
I at C	0.56		1.17		*	1.10		2.28		NS	1.41		2.91		NS	1.48		3.05		NS

Table 6: Changes in mean leaf area index of groundnut as influenced by different irrigation schedules and intercropping (summer 2017)

Treatment	30 DAS					60 DAS					90 DAS					Harvest				
	I_1	I_2	I_3	I_4	Mean	I_1	I_2	I_3	I_4	Mean	I_1	I_2	I_3	I_4	Mean	I_1	I_2	I_3	I_4	Mean
C_1	1.88	1.64	1.82	1.70	1.76	2.80	2.61	2.42	2.42	2.56	3.66	3.71	3.44	3.68	3.62	3.34	3.08	2.99	2.75	3.04
C_2	1.79	1.88	1.67	1.76	1.78	2.92	2.90	2.31	2.62	2.69	3.85	3.85	3.29	3.11	3.53	3.01	3.08	3.12	2.96	3.04
C_3	1.65	1.73	1.45	1.69	1.63	2.43	2.53	2.36	2.40	2.43	3.45	3.58	3.28	3.36	3.42	3.32	2.91	2.85	2.74	2.96
C_4	1.58	1.55	1.85	1.55	1.63	2.24	2.52	2.68	2.40	2.46	3.19	3.60	3.37	3.22	3.35	3.23	3.12	3.00	2.71	3.02
Mean	1.73	1.70	1.70	1.68	1.70	2.60	2.64	2.44	2.46	2.54	3.54	3.69	3.35	3.34	3.48	3.23	3.05	2.99	2.79	3.01
	SEd		CD (P=0.05)			SEd		CD (P=0.05)			SEd		CD (P=0.05)			SEd		CD (P=0.05)		
C	0.05		0.11		*	0.07		0.17		*	0.09		0.23		NS	0.08		0.20		NS
I	0.04		0.08		NS	0.06		0.12		*	0.08		0.16		*	0.07		0.13		*
C at I	0.08		0.17		*	0.12		0.25		*	0.16		0.34		*	0.14		0.29		NS
I at C	0.08		0.16		*	0.11		0.23		*	0.15		0.32		*	0.13		0.27		NS

Table 7: Changes in mean dry matter production of groundnut (kg ha $^{-1}$) as influenced by different irrigation schedules and intercropping (summer 2017)

Treatment	30 DAS					60 DAS					90 DAS					Harvest				
	I_1	I_2	I_3	I_4	Mean	I_1	I_2	I_3	I_4	Mean	I_1	I_2	I_3	I_4	Mean	I_1	I_2	I_3	I_4	Mean
C_1	1897.5	1447.5	1537.5	1492.5	1593.8	5162.5	3822.5	3980.0	4237.5	4300.6	7110.0	5222.5	5270.0	6900.0	6125.6	7357.5	5385.0	5407.5	6225.0	6093.7
C_2	1767.5	1720.0	1427.5	1495.0	1602.5	4677.5	4660.0	3812.5	4492.5	4410.6	6405.0	6375.0	5197.5	6027.5	6001.2	6622.5	6590.0	5355.0	5505.0	6018.1
C_3	1517.5	1560.0	1177.5	1442.5	1424.4	3992.5	4115.0	4262.5	3495.0	3966.3	5462.5	5625.0	4527.5	5337.5	5238.1	5640.0	5810.0	5555.0	5250.0	5563.7
C_4	1325.0	1362.5	1670.0	1260.0	1404.4	3455.0	3580.0	4525.0	4092.5	3913.1	4580.0	4880.0	5710.0	5117.5	5071.9	4700.0	5035.0	7135.0	5407.5	5569.4
Mean	1626.9	1522.5	1453.1	1422.5	1506.3	4321.9	4044.4	4145.0	4079.4	4147.7	5889.4	5525.6	5176.2	5845.6	5609.2	6080.0	5705.0	5863.1	5596.9	5811.2
	SEd		CD (P=0.05)			SEd		CD (P=0.05)			SEd		CD (P=0.05)			SEd		CD (P=0.05)		
C	40.94		100.18		*	114.03		279.03		*	156.82		383.73		*	158.59		388.05		*
I	33.98		70.13		*	93.19		192.34		*	131.31		271.02		*	130.34		269.00		*
C at I	71.69		147.97		*	197.63		407.89		*	276.26		570.18		*	275.89		569.40		*
I at C	67.96		140.26		*	186.39		384.68		*	262.63		542.04		*	260.67		538.01		*

Table 8: Changes in mean value of pod yield (kg ha^{-1}), mean haulm yield (kg ha^{-1}) of groundnut as influenced by different irrigation schedules and Intercropping (summer 2017)

S	Mean pod yield kg ha $^{-1}$					Mean haulm yield kg ha $^{-1}$					Mean harvest index				
	I_1	**I_2**	**I_3**	**I_4**	**Mean**	**I_1**	**I_2**	**I_3**	**I_4**	**Mean**	**I_1**	**I_2**	**I_3**	**I_4**	**Mean**
C_1	2374.00	2170.00	2144.00	2054.00	2185.50	4358.00	4199.00	4292.00	3862.00	4178.00	0.35	0.33	0.34	0.35	0.34
C_2	2068.00	2045.00	1955.00	1929.00	1999.25	4281.00	4069.00	4113.00	3703.00	4041.00	0.34	0.33	0.33	0.35	0.34
C_3	2249.00	2051.00	1968.00	1847.00	2028.75	4022.00	3798.00	3962.00	3652.00	3859.00	0.35	0.34	0.33	0.34	0.34
C_4	2049.00	1975.00	1873.00	1778.00	1918.75	3764.00	3584.00	3655.00	3485.00	3622.00	0.35	0.35	0.34	0.34	0.34
Mean	2185.00	2060.25	1985.00	1902.00	2033.06	4106.00	3913.00	4006.00	3676.00	3925.00	0.35	0.34	0.34	0.34	0.34
	SEd		CD (P=0.05)			SEd		CD (P=0.05)			SEd		CD (P=0.05)		
C	53.84		131.73		*	102.7		251.2		*	0.01		0.02		NS
I	45.47		93.85		*	87.3		180.2		*	0.01		0.02		NS
C at I	95.40		196.90		NS	182.8		377.2		NS	0.02		0.03		NS
I at C	90.95		187.70		NS	174.6		360.3		NS	0.01		0.03		NS

Conclusion

In both the seasons, the plant height and leaf area index were higher under 0.6 IW/CPE ratio. Whereas dry matter production was higher under 0.7 IW/CPE ratio irrigation level in both seasons. In intercropping system plant height and dry matter production were higher in sole crop of groundnut and leaf are index was higher under groundnut + red gram in winter. In summer plant height and leaf area index were higher in groundnut + red gram and dry matter production was higher in sole crop of groundnut.

Yield of groundnut was more under 0.7 IW/CPE ratio under sole crop of groundnut, where an yield of 2394 kg / ha was recorded during winter, while it was 2185 kg / ha during summer. The reduction in yield under C_2 C_3 and C_4 were 8, 9 and 14 per cent respectively during winter 2016 and similar trend was observed during summer 2017 also. Though groundnut yield was affected when intercrops were introduced, the groundnut yield equivalent was higher under intercropped situation.

Reference

1. Geethalakshmi VA, Christopher Lourduraj, Raveendran TS. Irrigation scheduling for summer groundnut. Madras Agric. J. 1994; 81(8):452-453.
2. Janamatti VS, Sashidhar VR, Prasad IG, Sastry KSK. Effect of cycles of moisture stress on flowering pattern, flower production, gynophore length and their relationship to pod yield in bunch types of groundnut. Narendra Deva J. Agric. Res. 1986; 1(2):136-142.
3. Khonok A, Amiri E, Hossein B. Irrigation management and fertilizer of peanut (*Arachis hypogaea* L) with a drip irrigation system: yield, HI and water use efficiency. Biological Forum – An Int. J. 2015; 7(1):609-616.
4. Sampathkumar T, Pandian BJ. Nutrient uptake rate and relationship with grain yields of hybrid maize under drip fertigation. Madras Agric. J. 2011; 98(4-6):151-153.
5. Senthilkumar P. Studies on the response of groundnut to land, irrigation and water stress management. M.Sc. (Ag.) Thesis, (unpubl.), Tamil Nadu Agric. University, Coimbatore, 1990.
6. Suresh K, Balaguravaiah D, Ramulu V, Sujani Rao CH. Comparative efficiency of sprinkler irrigation over check basin irrigation in groundnut at different irrigation schedules. Int. J. Plt. Animal and Environ. Sci. 2013; 3(2):9-13.