

GROWTH AND DRYMATTER PRODUCTION IN GROUNDNUT-PIGEONPEA INTERCROPPING SYSTEM

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ABSTRACT

In an experiment conducted at Agricultural Research Station, Anantapur to study the effect of intercropping on the growth and yield of component crops of groundnut and pigeonpea during 1986 and 1987 kharif seasons, growth and drymatter production of component crops were also studied. A favourable early monsoon during 1986 helped in better vegetative growth of both the crops compared to 1987. LAI in pigeonpea increased gradually upto 120 to 150 days after sowing (DAS) and then declined in June sown crop. where as LAI increased upto 90 day only in the August sown crop. However, drymatter production increased gradually upto harvest. June sown pigeonpea recorded significantly more LAI and drymatter than August sown crop, leading to higher grain yield. Sole pigeonpea recorded significantly more LAI than intercrop. Sole groundnut recorded significantly more LAI and drymatter at all the stages of crop growth, leading to higher pod yields. LAI in groundnut increased upto 60 DAS and then declined. Drymatter production increased upto harvest in 1987, but only upto 60 days in 1986. LAI and drymatter production in the staggered groundnut was very low because of competition from pigeonpea for available resources which decreased the pod yield to a great extent.

INTRODUCTION

In the semi arid regions of Rayalaseema in Andhra Pradesh, intercropping of groundnut-pigeonpea in different ratios is the most common practice. The practice of intercropping of a long duration pigeonpea with a short duration groundnut is of great significance because of slow initial growth of pigeonpea on one hand and its planting in wider rows on the other. Groundnut can be intercropped in between the rows of pigeonpea. Sole pigeonpea recorded very low LAI and drymatter production in the initial stages and recorded maximum at 60-90 DAS. However, intercropped pigeonpea accumulated only 45% drymatter at 60 DAS (Masood Ali and Raut 1985). The present study was undertaken to understand the growth pattern of groundnut and pigeonpea in an intercropping situation where the crop components were sown at different times.

MATERIAL AND METHODS

An experiment was conducted for two kharif seasons during 1986 and 1987 at Agricultural Research Station, Anantapur with seven treatments replicated four times

in a randomised block design. The treatments consisted of sole crops of pigeonpea (June and August sowings) and groundnut and intercropping treatments in 7:1 and 6:1 ratios as simultaneous and staggered sowings. Pigeonpea (LRG 30) was sown in the first week of June with 90 x 15 cm, 240 x 5.6 cm and 210 x 6.4 cm spacing in T₅, T₆ and T₇ treatments respectively. Groundnut (TMV 2) was sown with 30 x 8.8 cm and 30 x 8.3 cm spacing as an intercrop in the first week of August in between the standing rows of pigeonpea in T₆ and T₇ treatments. Besides, pigeonpea and groundnut were sown in the first week of August as sole crops (T₁ and T₂) and as simultaneous sown intercrops in 7:1 and 6:1 ratios (T₃ and T₄). An uniform dose of 20-40-40 kg N, P₂O₅ and K₂O/ha was applied as basal dose. The crop was raised under rainfed conditions.

In 1986, the rainfall was fairly good and helped in the timely sowing of crops. The crops were not subjected to any moisture stress in the initial stages which encouraged good vegetative growth. However, the crops were subjected to moisture stress at pod development stage during October, thereby affecting the crop yields to some extent in case of groundnut. Pigeonpea also suffered moisture stress at flowering and pod formation stages in November. In 1987, after sowing of the crops, there was a long dryspell which restricted early vegetative growth in both the crops. However, sufficient moisture was available at later stages of the crop growth resulting in satisfactory yields. The total rainfall during crop growth period was 411.8 mm and 487.3 mm in 1986 and 1987 respectively (Fig 1).

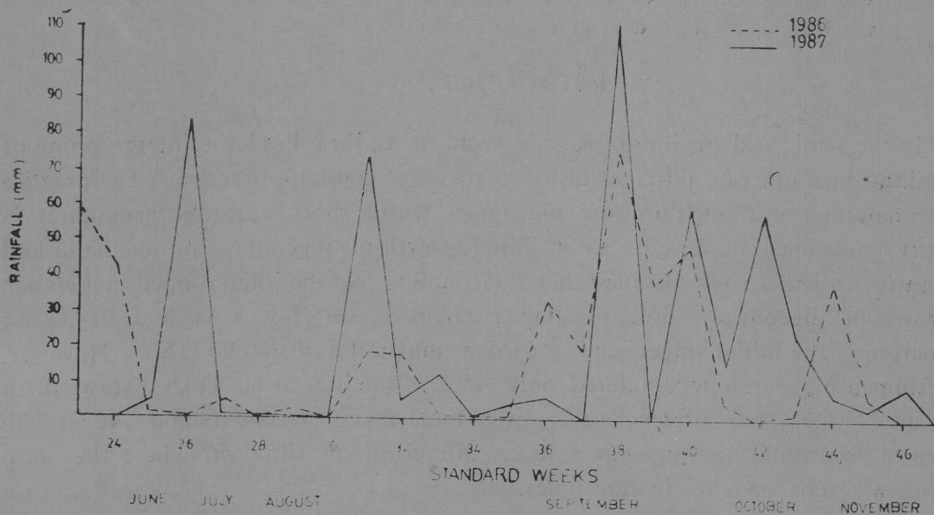


Fig 1 Rainfall distribution during crop growth period

RESULTS AND DISCUSSION

Growth and drymatter production in pigeonpea

1. Leaf area index (LAI)

LAI increased upto 120 days after sowing(DAS) and then declined in June sown crops in 1986, while in 1987 it increased even upto 150 DAS because of good soil moisture conditions (Table 1). LAI increased upto 90 days only in August sown crops in both the years. June sown crops recorded significantly more LAI than August sown crops. Sole pigeonpea recorded significantly more LAI than intercropped one in both the years in June sowing, while no such significant differences were found in August sown crops.

Table 1 Leaf area index in pigeonpea

Treatment	Days after sowing					At groundnut harvest	At pigeonpea harvest
	30	60	90 30	120 60	180 120		
1986							
T ₁	—	—	0.03	0.91	1.61	1.76	1.58
T ₃	—	—	0.02	0.89	1.43	1.54	1.39
T ₄	—	—	0.02	0.91	1.54	1.60	1.13
T ₅	0.02	0.08	1.03	5.20	2.82	3.22	2.51
T ₆	0.02	0.08	0.86	5.00	1.80	2.01	1.71
T ₇	0.02	0.08	0.72	4.68	1.88	2.08	1.83
CD 5%	—	—	—	—	—	0.29	0.13
1987							
T ₁	—	—	0.02	0.62	1.43	1.53	1.39
T ₄	—	—	0.02	0.54	1.36	1.45	1.30
T ₄	—	—	0.02	0.53	1.34	1.44	1.28
T ₅	0.02	0.06	0.09	3.18	3.22	3.84	2.42
T ₆	0.02	0.06	0.08	3.04	2.94	3.28	2.01
T ₇	0.02	0.06	0.08	3.03	2.89	3.22	1.98
CD 5%	—	—	—	—	—	0.32	0.24

2. Drymatter production

Drymatter per plant increased gradually and reached maximum at harvesting in both the years. June sown crops recorded significantly more drymatter per plant than August sown crops (Table 2). However, the differences between sole and intercropped pigeonpea were not significant. Drymatter production at harvest was significantly higher both in June sown crops and in sole crops compared to August sown crops and intercrops respectively (Table 1). It was mainly due to reduced plant stand at harvest in intercrops due to severe intra row competition among the plants.

Table 2. Drymatter production per plant and total drymatter at harvest in pigeonpea

Treatment	Drymatter per plant (g)					At groundnut harvest	At pigeonpea harvest	Total dry- matter at harvest (kg/ha)
	Days after sowing							
	30	60	90 30	120 60	180 120			
1986								
T ₁	—	—	0.50	15.79	72.89	41.94	81.99	9416
T ₃	—	—	0.37	13.49	66.24	39.30	82.43	4571
T ₄	—	—	0.42	14.20	74.32	43.32	85.70	5813
T ₅	0.19	0.94	12.92	93.50	221.94	151.35	252.28	12445
T ₆	0.17	0.62	12.70	84.12	228.76	151.81	251.67	8877
T ₇	0.19	0.63	10.31	73.55	219.01	151.53	251.13	9648
CD 5%	—	—	—	—	—	7.62	13.31	1854
1987								
T ₁	—	—	0.67	11.49	42.43	31.76	47.03	3512
T ₃	—	—	0.42	9.73	37.30	26.49	40.00	1835
T ₄	—	—	0.42	10.27	58.11	27.16	40.67	2037
T ₅	0.20	0.54	10.13	48.11	112.43	105.40	116.89	7291
T ₆	0.20	0.40	9.46	43.78	103.92	96.35	105.54	4829
T ₇	0.20	0.41	9.19	43.38	103.24	95.13	105.94	4950
CD 5%	—	—	—	—	—	10.93	7.74	755

3. Crop yield

June sown pigeonpea recorded significantly higher grain and stalk yield compared to August sown crops (Table 3). It was mainly due to earliness in sowing leading to higher LAI and drymatter production. Irrespective of time of sowing, intercropped pigeonpea recorded significantly lower yields than sole crop because of lower plant stand.

Growth and drymatter production in groundnut

1. Leaf area index

Sole groundnut recorded significantly higher LAI at all stages of crop growth in both the years (Table 4). LAI increased gradually in all the treatments upto 60 DAS and then declined. Higher LAI was recorded in 1986 compared to 1987 because of good vegetative growth due to favourable soil moisture conditions. Groundnut in staggered intercropping recorded less LAI than the simultaneous intercropping treatment because of competition from pigeonpea sown earlier.

2. Drymatter production

Drymatter per plant increased gradually upto harvest in 1987, whereas in 1986, the increase in drymatter production was seen upto 60 DAS and then declined later. It was due to severe moisture stress at pod development stage of the crop which encouraged leaf drop in 1986. Sole groundnut recorded significantly more drymatter

Table 3. Plant stand and crop yields (kg/ha) at harvest in pigeonpea and groundnut

Treatments	Pigeonpea						Groundnut					
	Plant stand		Grain yield		Stalk yield		Plant stand		Pod yield		Haulm yield	
	1986	1987	1986	1987	1986	1987	1986	1987	1986	1987	1986	1987
T ₁	7.16	6.70	236	387	9180	3125	—	—	—	—	—	—
T ₂	—	—	—	—	—	—	25.42	24.80	1447	1320	2983	3370
T ₃	4.33	4.16	143	146	4430	1690	23.10	22.35	1109	1070	2984	2925
T ₄	5.20	5.86	161	180	5650	1857	22.60	22.00	999	1102	2916	2812
T ₅	7.16	6.78	988	783	11460	6507	—	—	—	—	—	—
T ₆	4.80	5.01	546	529	8330	4300	22.92	22.02	721	735	2083	2347
T ₇	4.75	5.76	573	563	9070	4387	22.50	21.85	620	635	2369	2010
CD 5%	0.98	0.63	92	72	2307	882	1.33	1.07	202	200	408	495

Table 4 Plant height at harvest and leaf area index in groundnut

Treatment	Leaf area index					
	30 DAS		60 DAS		At harvest	
	1986	1987	1986	1987	1986	1987
T ₂	0.59	0.42	5.68	2.82	1.50	2.02
T ₃	0.40	0.36	3.20	2.08	1.33	1.50
T ₄	0.41	0.38	3.14	2.18	1.39	1.51
T ₆	0.36	0.30	2.92	1.94	1.31	1.35
T ₇	0.35	0.31	2.65	1.98	1.30	1.38
CD 5%	0.03	0.03	0.42	0.21	0.05	0.14

per plant than intercropped groundnut (Table 5). Similarly groundnut in simultaneous intercropping produced higher drymatter than plants in staggered intercropping. It was mainly due to severe competition from pigeonpea sown two months earlier.

Table 5 Drymatter production per plant and total drymatter at harvest in groundnut

Treatment	Dry matter per plant (g)						Total drymatter at harvest (kg/ha)	
	30 DAS		60 DAS		At harvest		1986	1987
	1986	1987	1986	1987	1986	1987		
T ₂	1.00	0.63	17.60	6.55	13.30	10.00	4430	4690
T ₃	0.90	0.60	13.21	5.77	11.77	8.71	4093	3995
T ₄	0.90	0.60	12.07	5.85	10.87	8.56	3916	3915
T ₆	0.84	0.57	9.13	4.89	8.14	6.91	2805	3075
T ₇	0.84	0.54	9.00	4.91	7.87	6.85	2989	2645
CD 5%	0.14	0.05	1.09	0.46	0.97	1.17	476	652

Sole groundnut also recorded significantly more drymatter at harvest in both the years (Table 5). Groundnut in simultaneous intercropping system also produced significantly higher drymatter at harvest than staggered intercrop. The poor performance of staggered groundnut crop was due to the smothering effect of pigeonpea sown earlier which was established well by the time of sowing groundnut.

3. Crop yields

Sole groundnut recorded significantly more pod and haulm yield than the intercrops in both the years (Table 3). It was mainly due to higher LAI and drymatter production in the sole crop. Similarly simultaneous intercrop also recorded higher pod and haulm yield, than the staggered intercrop due to the similar reasons.

REFERENCES

- Masood Ali and Raut, M.S. 1985. Drymatter accumulation pattern and productivity of sorghum and pigeonpea under different systems of intercropping. *Indian Journal of Agronomy* 30 : 271-273.