581.132 : 582.998.2 : 631.55

COMPARATIVE STUDY ON PAR ABSORPTION IN SUNFLOWER-BASED INTERCROPPING SYSTEMS UNDER RAINFED CONDITIONS OF WESTERN MAHARASHTRA PLAIN ZONE

1. The competition for light (interception and its distribution) in component crops of intercropping system can be improved by proper choice of component crops, genotypes, selecting shade tolerant shorter components, harvesting one of the component crops sufficiently early so that late harvested component is not affected much and light interception and its distribution within the crop canopy is improved which finally improves light use efficiency (LUE) (Okigbo 1981). The research work on sunflower-based intercropping with regard to absorbed photosynthetically active radiation (PAR) and light use efficiency (LUE) is very limited. Further, the sunflower-based intercropping of groundnut and soybean is a proven remunerative agricultural practice, keeping this in view, an experiment was conducted to study the absorption of PAR in sunflower-based intercropping systems under rainfed conditions of western Maharashtra plain zone.

2. The experiment was conducted at the farm of Centre of Advanced Studies in Agricultural Meteorology at the College of Agriculture, Pune (18° 32'N, 73° 51'E; 559 m amsl) during the monsoon season of 1992. It was laid out in a randomised block design with three replications to study seven sunflower based intercroppings (Table 1).

2.1. The certified seed of sunflower (*SS56*), groundnut (*Phule Pragati*) and soybean (*MACS-124*) was dibbled on June 27, 1992 as per the treatment spacings. Sole sunflower was fertilized with 60 kg N and 30 kg P_2O_5 ha^{-1}, whereas, sole groundnut and soybean were fertilized with 25 kg N and 50 kg P_2O_5 ha^{-1}. The intercropped sunflower was fertilized with 72.5 kg N and 55 kg P_2O_5 ha^{-1}. Nitrogen was applied in two splits, half at sowing and remaining half on 28 days after sowing (DAS). The experimental soil was vertisol (deep black) in nature with an uniform depth up to 100 cm.

The various components of PAR, *viz.*, incoming (PAR), intercepted (IPAR), transmitted (TPAR) and reflected (RPAR) were measured with the help of line quantum sensor. Absorbed component (APAR) was worked out following Gallow and Daughtry (1986). The components of PAR were converted into % PAR. All measurements were made around solar noon between 1130 to 1300 to eliminate effect of solar elevation (Sivakumar and Virmani 1984). Leaf area index (LAI) was measured by using leaf area meter at 14 days' interval from 28 DAS.

3. The APAR values increased with increase in crop growth upto 63rd day owing to increase in leaf area upto this stage. Thereafter, it started decreasing because of increase in leaf senescence. These findings are similar to those reported by Rosenthal *et al.* (1985).

3.1. The APAR was significantly the lowest under solid planted soybean upto 35th DAS owing to its slow growth during early stages resulting in less LAI and consequently less absorption of PAR. However, reverse was true in case of sole groundnut, where, absorbed PAR was significantly the highest during sunflower growing period because of more LAI due to dense canopy which caused less transmission of PAR and its reflection by soil. Sole sunflower significantly absorbed more

TABLE 1

Mean absorbed photosynthetically active radiation (%) as influenced periodically by different treatments

Treatment	APAR (%) on various days after sowing												
	21	28	35	42	49	56	63	70	77	84	91	98	105
Sole sunflower	12.46	43.84	67.36	76.77	83.23	89.79	85.51	78.96	72.75	56.26			
Sole groundnut	17.16	55.34	70.33	79.55	85.92	89.26	91.85	93.15	88.87	85.29	75.86	59.93	51.49
Sole soybean	7.02	25.16	44.02	62.12	76.03	82.74	87.91	93.51	90.03	84.81	67.94	47.37	29.72
2 SF (45 × 30 cm) + 2 GN	16.09	46.53	65.51	72.48	77.16	83.35	82.72	80.85	78.91	70.03	79.69	74.55	66.71
2 SF (45 × 45 cm) + 2 GN	13.95	44.51	63.68	69.11	76.79	82.80	83.07	82.70	80.63	72.41	80.53	70.33	60.61
SF (45 × 30 cm) + 2 SB	9.96	31.80	50.56	62.81	70.52	77.66	79.48	79.56	78.18	71.55	77.52	57.87	40.25
2 SF (45 × 45 cm) + 2 SB	8.39	30.78	49.59	60.46	70.66	77.99	80.77	81.09	79.02	72.08	72.39	55.26	34.16
S E ±	0.21	0.44	0.24	0.36	0.30	0.39	0.26	0.30	0.26	0.43	0.76	0.59	0.73
C D at 5 %	0.57	1.21	0.67	1.01	0.82	1.10	0.74	0.83	0.72	1.19	2.11	1.62	2.03
General mean	12.14	39.71	58.75	69.04	77.19	83.37	84.49	84.26	81.22	73.20	75.03	60.93	47.16

PAR than its association either with groundnut or with soybean from 35th to 56th day during its grand growth period owing to faster growth and higher LAI. Similar results were reported by Lakudzode (1992) in sunflower + pigeonpea intercropping.

3.2. Sunflower assoicated with groundnut under both the intra-row spacings significantly absorbed more PAR than its association with soybean and sole soybean upto flowering (58th DAS). The absorbed PAR was significantly more under sole soybean than its association with sunflower under both intra-row spacings. sole sunflower and sunflower + groundnut intercroppings. from the 58th to 84th day as faster growth of soybean started resulting in higher LAI and more absorption of PAR.

3.3. After harvest of sunflower. the intercroppings of sunflower + groundnut absorbed significantly more PAR than sunflower + soybean intercroppings and sole crops of groundnut and soybean owing to faster growth of groundnut during later period under intercropping. Sole groundnut also had significantly higher APAR values as compared to sunflower + soybean intercroppings and sole soybean on the 98th and 105th day. The absorbed PAR was significantly the lowest under sole soybean because of senescence of leaves. These results are similar to those reported by Rosenthal *et al.* (1985) in sorghum. Gallo and Daughtry (1986) in corn Lakudzode (1992) in sunflower + pigeonpea intercropping.

4. The absorbed PAR values were the highest under sole groundnut during sunflower growing period. These values were significantly more in sole sunflower upto the 56th day and in sole soybean from 56th day onwards. After harvest of sunflower. intercropping of sunflower + groundnut absorbed significantly more PAR than sunflower + soybean intercropping and sole component crops.

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