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## Effect of Advanced Sowing of Intercrops and Nitrogen Levels on Yield Components of Rainfed Sunflower

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A field experiment was conducted to study the feasibility of advancing the sowing of intercrops in rainfed sunflower under different nitrogen levels. Pure crop of sunflower recorded the maximum yield. Yield of sunflower was reduced when cowpea or groundnut was grown as an intercrop and the reduction increased with the period of advancement of intercrops. An extra dose of 10 kg N/ha in addition to the recommended dose of 30 kg N/ha recorded the maximum yield.

The experience of the past few years has shown that sunflower as a principal crop or as an intercrop smothers the associated crops. This may be due to the shade effect (Gopalasundaram, 1976), nutrient competition (Venkataraman, 1977) or toxic root exudates (allelopathic effect) of sunflower (Wilson and Rice, 1968). Tarhalkar and Ganga Prasada Rao (1975) opined that staggered sowing of component crops in a cropping system was an insurance against possible failures of crops involved. An attempt was made, therefore, to investigate the feasibility of advancing the sowing of intercrops in sunflower. In addition, the possibility of economising on the nitrogen application with legumes as intercrops was also studied.

### MATERIAL AND METHODS

A field experiment was conducted during the South-West monsoon season (15th July-November) of the year 1977 at Agricultural College and Research Institute, Coimbatore. The soil used

was sandy loam with a pH of 7.7 and the available N, P and K were 305, 30 and 585 kg/ha respectively. Rainfall received during the season was 511.7mm over 28 rainy days. Crops and varieties chosen for the study were sunflower EC. 68415 as main crop, cowpea PLS. 370 and groundnut POL. 2 as intercrops. The spacings were 45 x 22.5 cm for pure crop and 30 x 22.5 cm for paired row sunflower leaving 60 cm spacing between paired rows to raise either one row of cowpea with a spacing of 22.5 cm between plants or two rows of groundnut with 15 cm between rows and also between plants. P and K were applied uniformly to all the treatments to supply 15 kg P<sub>2</sub>O<sub>5</sub> and 15 kg K<sub>2</sub>O/ha respectively and the crop was raised under dry conditions. The experiment was laid out in split-plot design with three replications and the treatments were as follows.

#### Main Plot

- T<sub>0</sub> Solid sunflower in uniform rows
- T<sub>1</sub> Paired sunflower + 1 row cowpea (sown simultaneously)

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T <sub>2</sub>	"	+	"	(sown 1 week before the sowing of sunflower)
T <sub>3</sub>	"	+	"	(sown 2 weeks before the sowing of sunflower)
T <sub>4</sub>	"	+	2 rows/groundnut	(sown simultaneously)
T <sub>5</sub>	"	+	"	(sown 1 week before the sowing of sunflower)
T <sub>6</sub>	"	+	"	(sown 2 weeks before the sowing of sunflower)

## Sub Plot

N <sub>40</sub>	40 kg N/ha - 1/3rd increment than recommended dose
N <sub>30</sub>	30 kg N/ha - Recommended dose
N <sub>20</sub>	20 kg N/ha - 2/3rd of recommended dose
N <sub>10</sub>	10 kg N/ha - 1/3rd of recommended dose

## RESULTS AND DISCUSSION

The effect of treatments on the yield and yield attributes are presented in the Table.

a. Yield attributes : Yield attributing characters of sunflower viz. diameter of flower head and number of seeds per head were decreased by intercropping and also by advancing the sowing of intercrops. This may be due to the competition because of increased 'population pressure' on unit area of land in the intercropped plots for light, moisture and nutrients. Advancing the sowing of intercrops further enhanced the competition which may be due to the better establishment of intercrops early causing increased competition. But the hundred seed weight was not affected since it was a varietal character. Application of 40 kg N/ha increased the yield

attributes of sunflower, indicating that the leguminous intercrops had not added sufficient nitrogen to sunflower crop through nitrogen fixation. Probably the nitrogen utilization by legumes might have been much faster than nitrogen addition.

b. Yield : Pure crop of sunflower recorded the maximum yield. As observed in the yield attributes, sunflower yield was drastically reduced when intercropped with groundnut and the reduction increased with the period of advancement of sowing of the intercrops. Application of 40 kg N/ha gave the maximum yield of sunflower.

c. Response curves : Separate response curves for pure and intercropped sunflower were fitted and these were quadratic. The response equations were :

$$\text{Pure sunflower: } Y = 624.9875 + 27.0586X - 0.257225X^2$$

$$\text{Sunflower with cowpea: } Y = 577.4825 + 31.5099X - 0.408675X^2$$

$$\text{Sunflower with groundnut: } Y = 618.5850 + 24.6366X - 0.2653X^2$$

Where Y was the yield in kg/ha and X was the nitrogen applied in kg/ha. The optimum dose for pure crop was 52.60 kg while the economic dose was 45.60 kg N/ha. Optimum doses of 38.55 and 46.43 kg N/ha and economic doses of 34.15 and 39.65 kg N/ha were obtained for sunflower with cowpea and groundnut as intercrops respectively.

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TABLE. Effect of advanced sowing of intercrops and nitrogen levels on yield and yield attributes of sunflower

	Treatment	Diameter of flower head (cms)	Number of seed per head	100 seed weight (gms)	Seed yield (kg/ha)			
Pure sunflower	T <sub>0</sub>	13.1	352.3	4.3	1108.5			
Sunflower with cowpea	T <sub>1</sub>	13.1	351.0	4.1	1070.0			
	T <sub>2</sub>	13.0	340.4	4.2	1055.0			
	T <sub>3</sub>	12.9	336.1	4.2	1051.1			
	Mean	13.0	342.5	4.2	1058.7			
Sunflower with groundnut	T <sub>4</sub>	12.5	340.6	4.2	1066.5			
	T <sub>5</sub>	12.0	334.2	4.1	1031.2			
	T <sub>6</sub>	11.9	330.3	4.1	1008.9			
	Mean	12.1	335.1	4.1	1035.5			
Inter cropped sunflower	Mean	12.9	338.8	4.1	1047.1			
Time of sowing of intercrops	Sown simultaneously	12.8	345.8	4.2	1068.2			
	One week advanced	12.5	337.3	4.1	1043.1			
	Two weeks advanced	12.4	333.3	4.1	1030.0			
N Levels	N <sub>40</sub>	13.1	359.6	4.6	1178.5			
	N <sub>30</sub>	12.9	345.3	4.4	1146.8			
	N <sub>20</sub>	12.7	343.0	4.0	1014.8			
	N <sub>10</sub>	11.8	315.0	3.7	848.3			
	S.E.	C.D.	S.E.	C.D.	S.E.	C.D.	S.E.	C.D.
Between main plots	0.13	6.4	4.1	12.7	0.1	N.S.	18.0	55.0
Pure Vs intercropped	0.1	0.4	4.5	13.8	0.1	N.S.	19.5	59.3
Between intercropped	0.1	0.2	2.4	7.4	0.1	N.S.	10.4	N.S.
Between time of sowing	0.1	0.3	2.9	N.S.	0.1	N.S.	12.7	N.S.
Crops x Time	0.1	0.4	4.2	2.7	0.1	N.S.	18.0	N.S.
Between N levels	0.1	0.2	2.3	6.5	0.1	0.2	5.0	14.8

N.S. — Not significant

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