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Studies on Competitive Effect of Sunflower and Nitrogen Application on Yield and Yield Attributes of Intercrops.

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A field experiment was conducted to study the effect of sunflower on the performance of intercrops. Smothering effect of sunflower on the associated intercrops was minimised when the intercrops were sown in advance. Advancing the sowing of intercrops viz. cowpea and groundnut by 7 to 14 days prior to sowing of sunflower increased the yield of both the intercrops. Nitrogen applied to sunflower had no effect on the yield and yield attributes of intercrops.

In an intercropping system, with two plants of contrasting habit, morphologically or physiologically, the exploitation of total environment will be more effective than in monoculture. However, in such systems, where there will be a competition for light, a successful plant need not necessarily be the plant with more foliage, but one with its foliage in an advantageous position in relation to the foliage of its competitors (Donald, 1963). Sunflower is such a competitive crop with aggressive nature having its foliage and roots in an advantageous position and so produces a shade effect in addition to the nutrient competition on the associated crops. Wilson and Rice (1968) proved the allelopathic effect of sunflower through root exudation on other species. Humphries (1975) and Tarhalkar and Ganga Prasada Rao (1975) recommended the staggered sowing of crops in the the cropping systems to avoid the possible failures of crops involved. To study the smothering effect of sunflower and role of nitrogen applied to sunflower on the intercrops this study was under taken.

MATERIAL AND METHODS

The experiment was laid out between July and November, 1977 at Agricultural College and Research Institute, Coimbatore. The soil of the experimental field was sandy loam with a pH of 7.7 and the available N, P_2O_5 and K_2O were 305, 30 and 585 kg/ha respectively. Rainfall received during the crop period was 511.7 mm in 28 rainy days. The experiment was laid out in split-plot design with three replications and the treatments were as follows:

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Main plot:

1.	Solid sunflower in uniform rows	T_0
2.	Paired row of sunflower + 1 row of cowpea (sown simultaneously)	T_1
3.	" + " (sown 1 week before the sowing of sunflower)	T_2
4.	" + " (sown 2 weeks before the sowing of sunflower)	T_3
5.	" + 2 rows of groundnut (sown simultaneously)	T_4
6.	" + " (sown 1 week before the sowing of sunflower)	T_5
7.	" + " (sown 2 weeks before the sowing of sunflower)	T_6

Sub-plot:

1.	40 kg N/ha - 1/3rd increment than recommended dose	N_{40}
2.	30 kg N/ha - Recommended dose	N_{30}
3.	20 kg N/ha - 2/3rd of recommended dose	N_{20}
4.	10 kg N/ha - 1/3rd of recommended dose	N_{10}

Phosphorus and potassium were applied uniformly to all the treatments to supply 15 kg P_2O_5 and 15 kg K_2O/ha and the crop was raised under dry conditions. 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 adopted were 45×22.5 cms for pure crop and 30×22.5 cms for paired row of sunflower leaving 60 cms spacing between paired rows to raise either one row of cowpea with a spacing of 22.5 cms between plants or two rows of groundnut with a spacing of 15 cms between rows and also between plants.

RESULTS AND DISCUSSION

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

a) **Yield attributes:** Pod length, seeds per pod and hundred seed weight of cowpea were not influenced by advancement of sowing of intercrops. This indicates that shade and nutrient competition effect-exerted by sunflower had no influence on these characters when the intercrops were advanced. Hundred seed weight of cowpea and hundred kernel weight of groundnut were unaffected since these characters are mostly determined by the pod size

TABLE Effect of sunflower and nitrgen application on yield and yield attributes of intercrops

Treatment	COWPEA					GROUNDNUT				
	Length of pod (cms)	Seeds/ pod	Pods/ plant	100 seed weight (gms)	Pod yield (kg/ha)	Mature pods/ plant	Immature pods/ plant	100 Pod weight (gms)	100 kernel weight (gms)	Pod yield (kg/ha)
T_1/T_4	10.8	7.7	3.7	7.3	25.2	4.8	1.9	60.3	28.7	338.0
T_2/T_5	11.1	8.1	6.4	7.4	35.2	5.3	1.9	60.3	28.4	383.2
T_3/T_6	10.7	8.3	7.3	7.3	45.0	5.5	2.0	60.3	28.8	413.8
S. E.	0.4	0.1	0.1	0.1	0.7	0.1	0.01	0.1	0.4	3.2
C.D.	N.S.	N.S.	0.3	N.S.	2.7	0.3	N.S.	N.S.	N.S.	12.7
N_{40}	10.6	8.0	5.9	7.3	35.7	5.2	2.0	60.0	28.7	383.7
N_{30}	10.9	8.3	5.8	7.3	35.3	5.3	2.0	60.2	28.8	381.3
N_{20}	10.9	7.8	5.8	7.4	35.1	5.2	1.9	60.5	28.3	374.5
N_{10}	11.1	7.9	5.7	7.3	34.6	5.1	1.9	60.4	28.7	373.8
S.E.	0.4	0.3	0.2	0.2	1.0	0.1	0.1	0.1	0.2	1.4
C.D.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

N.S. = Not Significant

and degree of maturity. Advancing the sowing of groundnut did not affect its duration of flowering and hence the number of immature pods was not altered. However, advanced sowing of intercrops produced the maximum number of pods both in cowpea and groundnut. Sowing of intercrops and sunflower at the same time resulted in greater shading over longer period while advanced sowing of intercrops resulted in less shading in the early period. Besides, the reduction in leaf area due to shading decreased the production of photosynthates, hence lesser number of pods were produced per plant. Tamaki and Naka (1972) and Reddy and Chatterjee (1975) also reported similar results. Nitrogen applied to sunflower had no influence on the yield attributes of intercrops. Although applied nitrogen was mobile in nature, band application very close to the seeds of sunflower and its rapid uptake of the applied nitrogen possibly decreased the utilisation of applied nitrogen by the intercrops.

b) **Yield :** Yield of intercrops was considerably increased with the period of advancement of sowing. Different doses of applied nitrogen to the sunflower had no significant effect on the yield of intercrops.

c) **Yield response to advancement of sowing :** The response for advanced sowing of intercrops was found to be linear. The linear equations were :

For cowpea : $\hat{Y} = 25.2033 + 1.4078X$

For groundnut : $\hat{Y} = 340.4050 + 5.4193X$

where $\hat{Y}$ was the yield in kg/ha and X was the days advanced. There was an increase of 1.41 kg/ha of seed yield for every day of advancement of sowing of cowpea. In groundnut, the increase in pod yield was 5.42 kg/ha for every day of advancement.

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