

## **Effect of Weed Management and Staggered Sowing of Sunflower on Weed Dynamics and Groundnut Pod Equivalent Yield in Kharif Groundnut and Sunflower Intercropping**

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### **ABSTRACT**

Pre-emergence application of metolachlot+hand weeding or pendimethalin+hand weeding was effective in reducing the density and dry weight of weeds. Two hand weedings were less effective in controlling weeds. Simultaneous sowing of groundnut+sunflower (4 : 1) recorded lower density and dry matter of weeds than sole crop of groundnut and sunflower. Pod equivalent yield was higher with staggered sowing of sunflower two weeks after sowing of groundnut in 4 : 1 ratio.

### **INTRODUCTION**

Groundnut is the principal oil seed crop in India and sunflower is gaining importance. Groundnut being short stature crop, tall stature crop like sunflower can be successfully intercropped. When both the crops are of same duration, the practice of staggered sowing of intercrop would create a competition free environment. Weed problem is severe in **kharif** groundnut+sunflower intercropping due to slow seedling emergence, initial growth and less lateral spread. The concept of efficient weed management in the early stages of crop using herbicides is gaining importance due to scarce and expensive labour. As such integration of weed management practices will be an ideal solution. In view of these facts and paucity of adequate evidences on effects of weed management in relation to cropping systems, the present study was undertaken.

### **MATERIALS AND METHODS**

The field experiment was conducted for two consecutive **kharif** seasons during 1999 and 2000 at S.V. Agricultural College Farm, Tirupati. The soil was sandy clay loam in texture, slightly alkaline in reaction and low in organic carbon. During the crop

period, a total rainfall of 274 mm was received in 20 rainy days during 1999 and 569 mm in 32 rainy days during 2000. During both the years to facilitate staggered sowing of sunflower as an intercrop, the entire experimental field was irrigated two weeks after groundnut sowing (WAS). Subsequently two protective irrigations were given during both the years. There were three main plot treatments, two hand weedings at 20 and 35 DAS, metolachlor at 1.0 kg ha<sup>-1</sup> as pre-emergence+HW at 35 DAS and pendimethalin at 0.75 kg ha<sup>-1</sup> as PE+HW at 35 DAS. The sub-plot treatments included sole groundnut (GN), sole sunflower (SF), simultaneous sowing of GN+SF 4 : 1, 6 : 1, staggered sowing of SF 2 WAS of GN 4 : 1, staggered sowing of SF 3 WAS of GN 4 : 1, staggered sowing of SF 2 WAS of GN 6 : 1 and staggered sowing of SF 3 WAS of GN 6 : 1. The gross plot size was 7.2 x 4.0 m. Sole groundnut (Tirupati-1, a Spanish bunch) was sown at a spacing of 30 x 10 cm, whereas sole sunflower (variety Morden) was sown at a spacing of 45 x 20 cm. In groundnut and sunflower intercropping treatment, 100% population of sole groundnut and 75% population of sole sunflower was maintained with interrow spacing of 30 cm and by altering intra row spacing.

Seed yield of sunflower from all the treatments was converted into groundnut pod equivalent yield

Table 1. Weed density (No. m<sup>-2</sup>) at 55 DAS as influenced by weed management practices and cropping systems

Treatment	1999			2000		
	Grasses	BLW	Sedges	Grasses	BLW	Sedges
<b>Weed management</b>						
HW at 20 and 35 DAS	4.00 (16)	2.89 (9)	3.69 (14)	4.09 (17)	3.39 (12)	4.18 (18)
Metolachlor at 1.0 kg ha <sup>-1</sup> +HW at 35 DAS	2.55 (7)	2.25 (5)	3.10 (10)	3.08 (10)	2.51 (6)	3.18 (10)
Pendimethalin at 0.75 kg ha <sup>-1</sup> +HW 35 DAS	2.71 (7)	2.30 (5)	3.22 (11)	3.29 (11)	2.66 (7)	3.41 (12)
LSD (P=0.05)	0.05	0.06	0.09	0.18	0.09	0.12
<b>Cropping systems</b>						
Sole groundnut (GN)	3.63 (14)	2.88 (9)	3.87 (15)	4.01 (17)	3.33 (13)	4.14 (17)
Sole sunflower (SF)	3.35 (12)	2.75 (8)	3.63 (13)	3.79 (15)	3.20 (10)	3.96 (16)
GN+SF 4 : 1	2.74 (8)	2.21 (5)	2.93 (9)	3.16 (10)	2.47 (6)	3.18 (10)
GN+SF 6 : 1	2.89 (9)	2.27 (5)	3.09 (10)	3.25 (11)	2.56 (7)	3.32 (11)
GN+SF 4 : 1 (SF sowing at 2 WAS of GN)	2.96 (9)	2.33 (6)	3.16 (10)	3.31 (12)	2.65 (7)	3.41 (12)
GN+SF 4 : 1 (SF sowing at 3 WAS of GN)	3.04 (9)	2.41 (6)	3.28 (10)	3.38 (12)	2.73 (8)	3.50 (12)
GN+SF 6 : 1 (SF sowing at 2 WAS of GN)	2.98 (9)	2.46 (6)	3.34 (11)	3.44 (12)	2.92 (9)	3.57 (13)
GN+SF 6 : 1 (SF sowing at 3 WAS of GN)	3.09 (10)	2.50 (6)	3.38 (12)	3.54 (13)	3.00 (9)	3.65 (14)
LSD (P=0.05)	0.20	0.16	0.18	0.32	0.19	0.22

Original values are given in parentheses.

Table 2. Weed dry matter ( $\text{g m}^{-2}$ ) at 55 DAS as influenced by weed management practices and cropping systems

Treatment	1999			2000		
	Grasses	BLW	Sedges	Grasses	BLW	Sedges
<b>Weed management</b>						
HW at 20 and 35 DAS	5.2	3.9	5.4	7.5	5.1	7.7
Metolachlor 1.0 kg $\text{ha}^{-1}$ +HW at 35 DAS	2.0	1.8	3.6	4.5	1.4	4.8
Pendimethalin at 0.75 kg $\text{ha}^{-1}$ +HW at 35 DAS	2.6	1.8	4.2	5.2	2.2	5.2
LSD ( $P=0.05$ )	0.1	0.1	0.1	0.2	0.1	0.2
<b>Cropping systems</b>						
Sole groundnut (GN)	3.8	3.1	5.4	8.0	4.1	8.2
Sole sunflower (SF)	3.7	3.0	5.4	7.1	3.8	7.8
GN+SF 4 : 1	2.6	1.8	3.8	4.8	2.2	3.9
GN+SF 6 : 1	3.2	2.0	4.2	5.0	2.4	4.8
GN+SF 4 : 1 (SF sowing at 2 WAS of GN)	2.9	2.2	4.0	5.0	2.5	5.4
GN+SF 4 : 1 (SF sowing at 3 WAS of GN)	3.4	2.6	4.1	5.3	2.6	5.7
GN+SF 6 : 1 (SF sowing at 2 WAS of GN)	3.2	2.6	4.2	5.2	2.7	5.5
GN+SF 6 : 1 (SF sowing at 3 WAS of GN)	3.4	2.7	4.4	5.4	2.7	5.8
LSD ( $P=0.05$ )	0.3	0.2	0.3	0.4	0.2	0.4

on the basis of existing prices. Groundnut pod equivalent yield of cropping system was obtained by summing up of the pod yield of groundnut and groundnut pod equivalent yield of sunflower for each intercropping treatment.

## RESULTS AND DISCUSSION

### Effect on Weeds

*Digitaria sanguinalis*, *Dactyloctenium aegyptium* and *Tragus biflorus* were dominant among grasses; *Trianthema portulacastrum*, *Celosia argentea*, *Cleome viscosa*, *Borreria hispidum* and *Acanthospermum hispidum* among broad-leaved weeds and *Cyperus rotundus* was the only sedge observed in the experimental field. The total weed density (Table 1) was less with pre-emergence application of metolachlor+hand

weeding (HW) and PE of pendimethalin+HW compared to two hand weedings done at 20 and 35 DAS. *Cyperus rotundus* alone was the major component in the total weed density in metolachlor or pendimethalin treated plots which was due to the fact that the total weed control was effective even from early stages due to herbicides application. Simultaneous sowing of groundnut (GN)+sunflower (SF) 4 : 1 recorded lower weed density of grasses, BLW and *Cyperus rotundus* (Table 1), which was closely followed by simultaneous sowing of GN+SF 6 : 1 and staggered sowing of SF 2 or 3 WAS of GN in GN+SF 4 : 1 and 6 : 1. GN+SF intercropping effectively suppressed grasses, BLW and *Cyperus rotundus* compared to sole groundnut and sunflower smothering weeds due to higher crop population. The effect of treatments on weed dry matter production was similar to that of weed density (Table 2).

Table 3. Groundnut pod equivalent yield (kg ha<sup>-1</sup>) as influenced by weed management practices and cropping systems

Treatment	Groundnut pod equivalent yield (kg ha <sup>-1</sup> )		
	1999	2000	Pooled mean
<b>Weed management</b>			
HW at 20 and 35 DAS	1152	1929	1541
Metolachlor at 1.0 kg ha <sup>-1</sup> +HW at 35 DAS	1311	2109	1710
Pendimethalin at 0.75 kg ha <sup>-1</sup> +HW at 35 DAS	1269	2113	1691
LSD (P=0.05)	27	35	29
<b>Cropping systems</b>			
Sole groundnut (GN)	1160	2019	1590
Sole sunflower (SF)	1033	1248	1141
GN+SF 4 : 1	1253	1965	1609
GN+SF 6 : 1	1191	2092	1642
GN+SF 4 : 1 (SF sowing at 2 WAS of GN)	1358	2294	1826
GN+SF 4 : 1 (SF sowing at 3 WAS of GN)	1345	2299	1822
GN+SF 6 : 1 (SF sowing at 2 WAS of GN)	1317	2226	1772
GN+SF 6 : 1 (SF sowing at 3 WAS of GN)	1294	2261	1778
LSD (P=0.05)	73	129	99

### Groundnut Pod Equivalent Yield

sunflower.

The pooled mean groundnut pod equivalent yield (Table 3) was higher with metolachlor+HW and was comparable with pendimethalin+HW, which might be due to low weed infestation with these treatments, resulting in higher yield of both the crops. Similar results of higher groundnut pod yield and sunflower seed yield were reported by Manickam *et al.* (2000) and Jayakumar *et al.* (1998), respectively. The highest groundnut pod equivalent yield with staggered sowing of sunflower was due to less competition between groundnut and

### REFERENCES

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### INTRODUCTION

Blackgram is an important pulse crop being grown during summer/rainy season throughout northern India. The productivity of this crop is adversely affected due to varying biotic and abiotic stresses. In field experiments conducted at 12 locations during kharif season of 1987-88, under All India Coordinated Pulse Improvement Project, results revealed that weed management to be most critical, controlled significantly (109.7%) followed by applied fertilizer use (56.2%) and insect pest (and disease control) (74.7%) in blackgram yield (Ali and Lal, 1989). With this background, the present investigation was undertaken to develop an integrated approach saving and eco-friendly integrated weed management technology in blackgram grown under mixed cropping system of Gram Panchayat.

### MATERIALS AND METHODS

Field experiment was conducted for two consecutive rainy seasons (2001 and 2002) at Sree Narayana Guru Agricultural University, the soil was sandy loam in texture, low in organic carbon (0.42%), medium in available phosphorus (14.4 kg/ha) and available potassium (137 kg/ha) with 75% of Tenure. The treatments were assigned in randomized block design replicated four times. The crop cultivation was done at a row spacing of 30 cm on August

### RESULTS AND DISCUSSION

#### Effect on Weeds

The major weed flora was *Cyperus rotundus*, *Panicum polyanthum*, *Digitaria pruriens*, *Eleusine indica*, *Setaria viridis* and *Eleusine indica*. The weed population was significantly reduced in the treatments with metolachlor+HW and pendimethalin+HW. The weed population was significantly reduced in the treatments with metolachlor+HW and pendimethalin+HW. The weed population was significantly reduced in the treatments with metolachlor+HW and pendimethalin+HW.