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Weed Management Studies in Sunflower Based Intercropping System

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ABSTRACT

Field investigation were carried out at Experimental Farm, Annamalai University, Annamalainagar, to evaluate the effect of cultural and chemical method of weed control in sunflower based intercropping system during the year of 2015. The results revealed that adoption of sunflower + greengram cropping system produced the highest seed yield of 1486 kg ha^{-1} during summer season, which has followed by sunflower + sesame. Sole sunflower crop recorded the lowest seed yield of 1379 kg ha^{-1} during summer season.

Key words: *Greengram, Herbicide intercropping, Seed yield, Weed and Weed control efficiency.*

INTRODUCTION

Sunflower is the latest addition to the list of major edible oilseed crops in importance after soybean, groundnut, rapeseed and mustard at all over the world and India. It accounts eight per cent towards the total edible oil production in the country behind soybean 21 per cent, groundnut 14 per cent and rapeseed 13 per cent[5]. It has 45 per cent good quality oil and it is a rich source of linoleic acid (64 per cent).

At the present, in India sunflower is grown over an area of 6.91 lakh hectares with a production of about 5.46 lakh tones and with average productivity of 791 kg per hectare. Yield of sunflower seed production due to many reasons. Among them weeds are the major problem for yield loss at the 30 40 per cent. Reduction in yield depends on various aspects like weed density, time and duration of weed competition and weed spectrum etc[1]. However, maximization of crop depends on effective weed control methods and it may be less expensive along with intensive cropping system.

Intercropping is followed to maximize the land utilization and it's plays an important role in suppressing weed growth. Less weed infestation was observed and recorded in an intercropping system than sole cropping. But intercropping system alone is not sufficient to ensure adequate weed control methods, because of varied canopy coverage prevailing in intercrops. Hence, the present study was practiced to evaluate the effect of integrated weed control methods in sunflower based intercropping system.

Wanjarai *et al.*[15], recorded the yield loss of 45 to 55 per cent in sunflower due to weed infestation. The reduction in seed yield of sunflower due to full weed competition is to the extent of 58 per cent[2].

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MATERIAL AND METHODS

Field investigation was conducted at Experimental Farm, Annamalai University to evaluate the effect of cultural and chemical weed control in sunflower based intercropping system. The experimental farm is genotypically located at 11°24′N latitude and 79°44′E longitude with an altitude of ± 5.79 meter above mean sea level. The soil of the experimental field is clayey loam in texture. The nutrient status of the experiment soil are low in nitrogen, medium in phosphorus and high in potassium status.

The hybrid sunflower was chosen for the experiment, greengram and sesame were grown as intercrop obtained from the Annamalai University Experimental Farm. The crops were raised during the month of January – May (Summer) 2015. The experiment was laid out in split plot design with replicated thrice. The field was applied with 12.5 t ha^{-1} of farm yard manure and recommended dose of N, P_2O_5 and K_2O (60:30:30 kg ha^{-1}). Half dose of N and full dose of P_2O_5 and K_2O were applied as basally along with gypsum 25 kg ha^{-1}. The half dose of N was applied on 30 DAS an first top dressing. Sunflower seeds were sown with a spacing of 60 × 30 cm at depth of 3 cm. Greengram (VBN 1) and sesame (TMV 3) 20 kg ha^{-1} and 5 kg ha^{-1}, respectively were sown in the main field. The greengram seeds were dibbled @ 2 seeds per hole and sesame seeds were sown by line sowing in between two rows of sunflower as per treatment schedule sowing of 60 × 30 cm spacing for the base crop sunflower was adopted. The intercrop were sown in single row in the sunflower inter spaces, greengram and sesame crops were sown with intra row spacing of 30 cm and 30 cm respectively. Herbicide pendimethalin @ 0.75 kg ha^{-1} was sprayed by using Knapsack sprayer fitted with flood jet nozzle. Manual hand weedings were given on 20, 30 and at 40 DAS separately in specified plots as per the treatment schedule. Total weed counts were recorded at 30, 60 DAS and at harvest and computed as weed count in m^2. Similarly individual weed count was taken at 30 DAS in both crops. Treatment schedule were as follows main treatment M_1 – Sole sunflower, M_2 – Sunflower + Greengram, M_3 – Sunflower + Seseame; Sub treatment S_1 – Unweeded control, S_2 – Twice hand weeding, S_3 – Pendimethalin 0.75 kg ha^{-1}, S_4 – Pendimethalin 0.75 kg ha^{-1} + One hand weeding at 30 DAS.

Pendimethalin @ 0.75 kg ha^{-1} was applied at 3 DAS followed by one hand weeding at 30 DAS for effective control of annual broad leaved and grassy weeds like *Trianthema portulacastrum* and *Cynodon dactylon* weed count was recorded at 15, 30 and 50 DAS using 0.25 m^{-2} quadrant from five places in each plot and expressed as m^{-2} as suggested by Burnside and Wicks. The observed weeds at experimental field were classified as grasses (*Cynodon dactylon* and *Chroris barbata*), sedges (*Cyperus rotundus*) and broad leaved weeds (*Digeria avensis, Parthenium lysterophorus, Trianthema portulacastrum, Amaranthus viridis*) and *Cammelina bengalensis*. From each plot, quadrate was kept in five places at randomly and the above ground portions of the weeds were removed weed samples were collected and spreading in flat floor for sun drying at 75°C till a constant weight was attained and dry weight of weed was expressed in kg ha^{-1}.

The pre-emergence herbicide Pendimethalin was sprayed as per recommended dose in better the crop rows as per treatments using 500 litres of water per hectare.

The total weed density and weed dry weight was recorded at harvest using an iron quadrate of 0.5 m^2 from net plot area at five spots from each treatment and data were formed for statistical analysis. The weed samples were collected from the main field and dried in sunlight and then in hot air oven at 70°C for three days for recording the dry matter weed control efficiency (WCE) was collected by the following method as per the procedure given by Mani *et al.*[6].

$$WCE\ (\%) = \frac{WCC - WCT}{WCC} \times 100$$

Where,

WCC – Dry weight of weeds in unweeded control plot

WCT – Dry weight of weeds in treated plot

Five plants were randomly selected from each plot and biometric observations were recorded for growth and yield attributes. The data were statistically analyzed as per the procedure given by Gomez and Gomez[4], for randomized block design.

RESULTS AND DISCUSSION

Effect of different weed control methods on growth and yield attributes of sunflower based intercropping system.

The experimental field was infested with *Amaranthus spinosus, Digera arvenss, Trianthema portulacastrum, Euphorbia hirta, Cleome viscose, Tribulus terrestris* and *Cyperus rotundus* species of weeds were found in field experimentation.

Effect on crop

Adoption of sunflower + greengram intercropping system (M_2) recorded the higher value of plant height (cm), dry matter production (kg ha^{-1}), number of filled seeds $head^{-1}$, seed yield (kg ha^{-1}) and stalk yield (kg ha^{-1}). Compared with sole cropping (M_1) were significantly higher in weed free situation with Pendimethalin @ 0.75 kg ha^{-1} + One hand weeding on 30 DAS. This might be due to favourable conditions obtained under these treatments there by less crop weed competition, leads to better crop growth resulting more growth as compared to other treatments. This might be due to weed free condition maintained by application of Pendimethalin @ 0.75 kg ha^{-1} + One hand weeding on 30 DAS which was responsible for controlling the weed population and dry matter production of weeds.

Effect of weeds

The dominant weed flora in the experimental field were narrow leaved weeds *viz., Ehinochloa colonum, Brachiaria* spp. and *Cyperus rotundus*. The broad leaved weeds *viz., Commelina benghalensis, Digera arvensis* and *Amaranthus viridis*. The predominance of grassy and sedge weeds during kharif season have also been reported by Singh *et al.*[9], Sumathi *et al.*[14], Sridhar[13], Singh and Singh[10].

Adoption of Pendimethalin @ 0.75 kg ha^{-1} as pre-emergence had registered lowest dry weight of weed (Table 1). The lowest weed control efficiency was recorded in application of unweeded treatment. This might be due to continuous competition of intercrop with the obnoxious weed species for nutrient and moisture. Similar findings were reported by Dubey *et al.*[3], in groundnut crop and Sivashankar and Subramaniyam[12].

It could be concluded that the sunflower + greengram intercropping system with pre-sowing soil incorporation of Pendimethalin @ 0.75 kg ha^{-1} followed by one hand weeding at 30 DAS is an more beneficial with high productivity, efficient and economically suitable weed management techniques to maximizing the yield of sunflower.

Growth, yield attributes and yield

Nagamani *et al.*[7], and Pandit *et al.*[8], significant lowest values of plant height, dry matter, no. of filled seeds $head^{-1}$, seed yield and straw yield (kg ha^{-1}), were recorded under weed free treatment. Among various cropping system sunflower + greengram registered, highest values of plant height, dry matter production, no. of filled seeds $head^{-1}$, seed yield and stalk yield (kg ha^{-1}). Similar findings were reported by Singh and Giri[11].

Table 1. Weed management studies in sunflower based intercropping system

Treatments	Plant height (cm)	Dry matter production (kg ha^{-1})	No. of filled seeds $head^{-1}$	Seed yield (kg ha^{-1})	Stalk yield (kg ha^{-1})
Intercropping system					
M_1	112.21	3340.24	546.25	1379.25	2736.21
M_2	133.69	3626.49	696.21	1676.58	3407.46
M_3	122.47	3494.18	633.69	1449.21	3182.65

S.Ed.	5.22	46.23	11.23	38.34	60.34
CD (p=0.05)	11.45	92.46	22.46	76.69	120.69
Weed control methods					
S_1	75.69	2394.46	236.16	836.17	2024.41
S_2	140.47	3889.21	776.69	1521.36	3592.43
S_3	129.26	3646.93	705.48	1306.24	3149.09
S_4	147.69	4006.61	799.21	1563.84	3662.34
S.Ed.	4.26	113.13	19.61	42.22	82.20
CD (p=0.05)	8.52	249.42	42.22	84.45	165.40

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