Maintaining a weed free condition till maturity or till 60 days is labourious and hence maintaining a weed free condition till the critical period of first 30 days after sowing is sufficient and also efficient. the economic analysis also reveal that weed free upto 30 DAS produces highest cost benefit ratio of 2.65.

Regarding the intercrop of groundnut, similar trend was observed. These results are in line with the findings of Kalaiselvan *et al.*, (1991).

Weed dry matter and weed control efficiency

Highest and significant weed dry weight of 341 g/m^2 was observed in unweeded check which was on par with unweeded upto 45 and 60 days. Lowest weed dry weight was seen in weed free upto 60 days which was on par with weed free upto 30 and 45 days. The weed control efficiency was higher for weed free upto 60 days which was closely followed by weed free upto 30 and 45 days.

The study clearly indicates that maintaining a weed free condition upto 30 days after sowing is the best weed management practice for pigeonpea + groundnut intercropping system.

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(Received: January 1995 Revised: April 1996)

Madras Agric. J., 83(5): 300-302 May 1996

https://doi.org/10.29321/MAJ.10.A01029

INTERGATED WEED MANAGEMENT FOR THE PREMONSOON SOWN SORGHUM - COWPEA INTERCROPPING SYSTEM UNDER RAINFED VERTISOLS

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ABSTRACT

At the Agricultural Research Station, Kovilpatti, in rainfed vertisols, experiments were conducted to findout the effect of integrated weed management practice for pre monsoon sown sorghum cowpea intercropping system during 1992-93 and 1993 - 94 in a randomised block design. Different herbicides and their time of applicaiton formed the treatments. The results revealed that butachlor applied at 1.00 kg or 0.75 kg ai/ha immediately after the receipt of sowing rain followed by one hand weeding on 40 days after sowing (DAS) recorded lesser weed density and increased grain yields of base crop sorghum and intercrop cowpea. Application of butachlor at 0.75 kg ai/ha with one had weeding on 40 DAS registered highest net returns in both the years.

KEY WORDS: Sorghum - Cowpea Intercropping, Rainfed Vertisols, Premonsoon Sowing, Intergrated Weed Management

In rainfed farming system, sorghum intercropping with pulses especially cowpea is quite common to cover the risk of total crop failure. Intercrops suppress weed growth, but the efficiency of weed suppression largely depends on the nature of component crops (Venkateswaralu and Ahlawat, 1986). The main method of controlling weeds under intercroppping system under rainfed situation is mainly by manual weeding which is costlier and time consuming. Recommendations on application of herbicides for sole crop situations are available. But information on use of herbicides under sorghum+cowpea intercropping system which is predominant in the rainfed vertisols of Tamil Nadu is lacking.

MATERIALS AND METHODS

During the North east monsoon season of 1992-93 and 1993-94, field experiments were conducted at the Agricultural Research Station, Kovilpatti, to find out the effect of an intergraded weed management practice in sorghum based cowpea intercropping system under rainfed vertisols. The soil was classified as typic chromosterts having low N, P and high available K with neutral reaction. Premonsoon sowing during 1992-93 was taken on 17 September 1992 and during 1993-94, it was taken on 18 September 1993. The rainfall recived during the crop period was 530 mm in the first year and 445 mm in the second yeart. Base crop sorghum and intercrop cowpea were sown at 2:1 ratio adopting a spacing of 30 cm between rows and 15 cm between plants. Recommended fertilizer schedule of 40:20 Kg/ha N and P was given to sorghum alone. Need based plant protection measures were adopted against pest and diseases. The experients were conducted in randomised block design replicated thrice in both the years. Two treatments comprised of time of application of herbicides *viz.*, application on the premonsoon sowing day itself and application immediately after the receipt of first rain of 20 mm. Herbicide application was followed by one hand weeding on 40 days after sowing (DAS). The herbicides tested were butachlor, thiobencarb and fluchlorolin at 0.75 and 1.00 kg ai/ha in the first year. During second year, the lower dose of 0.75 kg was excluded in thiobencarb and fluchorolin as they were not effective; instead, a new treatment with pendimethalin was included to test its effectiveness. The herbicides were compared with rotary weeder weeding, farmers method of weeding and absolute control. Observations on weed density / m^2 were recorded on 20 and 40 DAS.

RESULTS AND DISCUSSION

The weed flora observed in the experimental field were *Boerhavia diffusa, Phyllanthus madaraspetentensis, Alysicorpus rugosus, Biophytum sensitivum, Cyonotis cuculeata, Digera arvensis, Amaranthus viridis, Aristoloccia bracheata, Dactylactenium engypticum panicum* Sp *Eleusene indica* and *Cyperus rotundus.*

It was observed (Table 1) in both the years, that butachlor applied on 20 DAS at 1.00 kg/ha immediately after the receipt of sowing rains recorded the least weed density. In the first year, it was comparable with butachlor at 0.75 kg applied at first sowing rain, butachlor at 1.00 kg and 0.75 kg applied on the day of premonsoon sowing and thiobencarb 1.00 kg applied at first sowing rain and it was significantly superior to other weed control measures. In the second year, butachlor at 1.00 kg was comparable with 0.75 kg butachlor. thiobencarb 1.00 kg, pendimethalin 1.00 kg and 0.75 kg applied at the first sowing rain and it was significantly superiot to the other weed control treatments.

During the both the years, the weed density recorded at 40 DAS indicated that farmers method of hand weeding on 20 and 40 DAS recorded the least weed density. It was comparable with weeding by rotary weeder on 20 and 40 DAS and butachlor 1.00 kg and 0.75 kg applied at first sowing rain. When the effectiveness of weed control by different treatment is considered as a whole, it could be inferred that butachlor at 1.00 kg and 0.75 kg applied at first sowing rain was effective in controlling the weeds throughout the cropping period. This has also reflected in the grain yield of sorghum as well as cowpea in both the years which have recorded the higher yields of 3629 and 280 kg in the first year and 2786 and 242 kg in the second year, respectively.

On the grain yields, yields of sorghum and cowpea in the first year recorded by the above two treatments were comparable with butachlor 1.00 and 0.75 kg applied on the day of premonsoon sowing as well as rotary weeder weeding and farmers method of weeding. During the second year, a similar trend was registered in the treatments except butachlor 1.00 and 0.75 kg applied at the time of premonsoon sowing. This might be due to the fact that in the first year, the time gap between application of herbicide at premonsoon sowing day and first sowing rain was only two days, where as in the second year, it was 20 days. This time gap in the second year had resulted in the less effectiveness of the herbicides on weed density. From these results it could be inferred that butachlor at 1.00 and 0.75 kg was effective in controlling the weeds and increasing

Table 1. Effect of weed control treatments on weed density, yields and economics of sorghum - cowpea intercropping system

Treatment	1992-93					1993-94				
	Weed density/M^2		Grain yield (kg/ha)		Net returns Rs/ha	Weed density/M^2		Grain yield (kg/ha)		Net returns Rs/ha
	20DAS	40DAS	Sorghum	Cowpea		20DAS	40DAS	Sorghum	Cowpea	
Butachlor										
0.75 kg at PMSD+HW 40 DAS	51(1.70)	79(1.90)	3559	268	7563	151(2.18)	214(2.33)	1927	188	4285
1.00 " "	44(1.63)	76(1.88)	3413	255	7202	158(2.20)	195(2.29)	1942	192	4287
0.75 " at Ist SR "	49(1.68)	72(1.86)	3629	280	7704	60(1.78)	85(1.83)	2786	242	7231
1.00 " " "	41(1.60)	69(1.84)	3518	270	7271	51(1.71)	60(1.78)	2775	228	7107
Thiobencarb										
0.75 kg at PMSD	60(1.78)	87(1.94)	3230	250	6618	--	--	--	--	--
1.00 kg " "	53(1.72)	83(1.92)	3209	235	6355	158(2.20)	209(2.32)	1907	189	4106
0.75 at Ist SR "	61(1.77)	79(1.90)	3251	248	6649	--	--	--	--	--
1.00 kg at " "	49(1.68)	78(1.89)	3280	242	6830	60(1.78)	65(1.86)	2660	175	6245
Fluchlorolin										
0.75 kg at PMSD	75(1.86)	110(2.04)	2582	218	4679	--	--	--	--	--
1.00 kg " "	86(1.91)	102(201)	2983	230	5507	166(2.22)	219(2.34)	1829	231	3900
0.75 at Ist SR "	61(1.78)	91(1.96)	3271	242	6421	--	--	--	--	--
1.00 kg at " "	63(1.80)	89(1.95)	3189	253	6186	58(1.76)	68(1.88)	2652	240	6441
Pendimethalin										
0.75 kg at PMSD	--	--	--	--	--	148(2.17)	204(2.31)	1896	186	3971
1.00 kg " "	--	--	--	--	--	135(2.13)	200(2.30)	1925	180	3860
0.75 at Ist SR "	--	--	--	--	--	62(1.79)	81(1.91)	2600	236	6480
1.00 kg at " "	--	--	--	--	--	55(1.74)	62(1.89)	2686	230	6543
Rotary weeder weeder on 20 and 40 DAS	122(2.08)	62(1.79)	3457	270	7087	170(2.23)	55(1.74)	2675	238	6454
Farmers' Method of HW on 20 and 40 DAS	121(2.07)	56(1.75)	3394	276	7578	174(2.24)	50(1.70)	2708	241	6472
Unweeded control	127(2.10)	200(2.30)	2551	148	4814	178(2.25)	263(2.42)	1447	165	3461
SE	0.03	0.04	119	9	--	0.06	0.05	66	7	--
CD (P=0.05)	0.10	0.12	346	26	--	0.16	0.15	92	20	--

PMSD - Application on premonsoon sowing day; Ist SR - First sowing rain; HW - Hand weeding; DAS - Days after sowing;

the yields in both the years and was comparable with farmers method of weeding and rotary weeding in all respects.

Regarding the economics, it could be inferred that, butachlor at 0.75 kg applied at first sowing rain had resulted in the maximum net return of Rs.7704 and Rs.7231/ha in the first year and second year respectively as compared to butachlor 1.00 kg applied at first sowing rain. In sorghum, the critical period of weed competition is between 18 to 40 days after seeding (AICRPDA, 1976) During this period, there will be a heavy demand for labour for weeding operations. At times, there will be continuous rains which will interfere with the manual or mechanical weeding. As such, chemical weed control is the only alternative to achieve effective weed control. Hence, it could be concluded that butachlor at 0.75 kg ai/ha applied at first sowing rain followed by one hand weeding on 40 DAS was effective in controlling the weeds and increasing the yields of premonsoon sown sorghum based cowpea intercropping system and consequently the net returns in rainfed vertisols.

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(Recieved: February 1995 Revised: June 1995)