

WEED DYNAMICS IN RICE BASED CROPPING SEQUENCE IN CAUVERY DELTA ZONE

R. KAVIMANI, S. VIJAYABASKARAN and A. AROKIA RAJ

College of Agricultural Engineering,
Kumalur-621 712

ABSTRACT

Experiments conducted in a farmer's field with clay loam soil in Cauvery delta zone during 1993 and 1995 revealed that broad leaved weeds constituted the major weed flora followed by grasses and sedges in rice grown during thaladi season and in relay sown blackgram. In case of sesame, either sown immediately after rice or after blackgram or after a fallow period, grasses dominated the weed flora followed by broad leaved weeds and sedges.

KEY WORDS : Rice, Cropping sequence, Weed dynamics

In Cauvery delta zone, the magnitude of cropping intensity depends upon the availability of irrigation water, size of land holding and economic resource of the farmer. The composition of weed flora in a crop field is strongly influenced by different cropping sequences and their rotation (Sankaran and De Datta, 1985). Certain weeds are closely associated with a crop or cropping sequence. Various crops, soil, water and weed management practices shift the weed community from species that are more difficult to those that are easier to control (De Datta, 1974). Hence to study the weed flora and the weed dynamics in rice based cropping sequences field experiments were conducted in a farmer's field in Cauvery delta zone of Tiruchirapalli District of Tamil Nadu during 1993 and 1995.

MATERIALS AND METHODS

The experiments were conducted in split-split plot design with three replications. The treatments comprised of three cropping sequences viz., rice-rice-sesame (S_1), rice-rice-blackgram-sesame (S_2) and rice-rice-fallow-sesame (S_3) in main plots, two methods of sowing viz., broadcasting (B_1) and line sowing (B_2) in sub plots and three weed management practices viz., hand weeding twice on 15 and 30 DAS (M_1), pre-emergence application of pendimethalin at 0.75 kg a.i. ha⁻¹ followed by a hand weeding on 30 DAS (M_2), pre-emergence application of metolachlor at 0.75 kg a.i. ha⁻¹ followed by one hand weeding on 30 DAS (M_3) and unweeded check (M_4) in the sub-sub plots.

The soil type is ustifluent with clay loam in texture with low available N, medium available P_2O_5

and K_2O and soil organic carbon content is 0.40 - 0.45 percent. During *kuruvai* season (Jun-Sep) ADT 36 and *thaladi* season (Sep-Jan) IR 20 rice seedlings were transplanted. The ruling blackgram variety ADT 4 and sesame TMV 4 were sown. Recommended crop management practices and need based plant protection measures were followed. Sesame in the sequence S_1 was sown on 15th February and S_2 and S_3 sequences during II fortnight of April.

RESULTS AND DISCUSSION

WEED FLORA

The weed flora identified in the rice field (thaladi crop) were *Ammania baccifera*, *Eclipta alba* (broad leaved weeds), *Echinochloa colonum* (grass) and *Cyperus difformis* (sedge). These are the common weed species identified in flooded rice fields of Cauvery delta zone. In the blackgram field (relay crop) *Cleome viscosa*, *Gynandropsis pentaphylla*, *Trianthema protulacastrum* (broad leaved weeds), *Echinochloa colonum* (grass) and *Cyperus rotundus* (sedge) were identified as predominant weeds.

RELATIVE DENSITY OF WEEDS

In the rice field broad leaved weeds dominated the weed population (65.9 per cent) followed by grasses (24.0 per cent) and sedges (10.1 per cent). This might be due to the process of puddling especially with tractor drawn cage wheel which might have resulted in lesser weed species and reduced the incidence of grassy weeds as reported by Moody (1977). Relative dominance of broad leaved weed population was 72.6 per cent followed

Table 1. Relative density of individual weeds in rice and blackgram

Crop	Season	Weed	Relative density			
			Summer '93	Summer '95		
I. Rice	Thaladi (Sep-Jan)	1. Broad leaved weeds				
		* <i>Ammannia baccifera</i> L.	28.3	33.4		
		* <i>Eclipta alba</i> Hassak.	34.2	35.8		
		2. Grasses				
		* <i>Echinochloa colonum</i> L.	25.0	23.1		
		3. Sedges				
		<i>Cyperus difformis</i> L.	12.5	7.7		
II. Black gram	Relay crop (Jan-Apr)	1. Broad leaved weeds				
		* <i>Cleome viscosa</i> L.	10.2	14.5		
		* <i>Euphorbia prostrata</i> Ail.	0.0	4.0		
		* <i>Gynandropsis pentaphylla</i> Ail.	22.4	19.5		
		<i>Phyllanthus niruri</i> L.	1.0	0.9		
		* <i>Trianthema portulacastrum</i> L.	32.7	37.9		
		<i>Vernonia cinerea</i> L.	0.6	1.4		
		2. Grasses				
		<i>Cynodon dactylon</i> L.	5.1	0.8		
		* <i>Echinochloa colonum</i> L.	16.8	18.2		
		<i>Panicum repens</i> L.	1.0	0.5		
		3. Sedges				
				<i>Cyperus rotundus</i> L.	10.2	2.3

* Predominant

by grasses with 21.2 per cent and sedges with 6.2 per cent in rice fallow blackgram field. Gracy Mathew and Sreenivasan (1998) confirmed that dicot weeds dominated the weed population in rice fallow summer cowpea. The dominance of broad leaved weeds might have been due to the blackgram that was raised as a relay crop with residual moisture. The soil moisture might have been sufficient only for the broad leaved weeds to grow.

Sesame raised after rice crop (S_1) registered more grass weeds with a mean relative density of 84.6 per cent followed by broad leaved weeds with 14.6 per cent and sedges with 0.8 per cent. As reported by Porwal and Mundra (1993) humid climatic condition prevailed with adequate moisture and temperature favoured the heavy infestation of grassy weeds in the sesame crop raised in S_1 sequence. In sesame crop raised after a relay crop of blackgram (S_2), there was a reduction in grasses with a mean relative density of 55.3 per cent followed by broad leaved weeds of 42.3 per cent and sedges 2.4 per cent. In case of sesame raised after a fallow period (S_3), grasses accounted for a mean relative density of 68.3 per cent, broad leaved

weeds of 30.1 per cent and sedges 1.6 per cent. In general, grass weeds have the character of staggered germination. Hence its dominance was recorded in the sequences S_1 , S_2 and S_3 .

DISTRIBUTION OF INDIVIDUAL WEED SPECIES

In the rice field, *Eclipta alba* and *Ammannia baccifera* (broad leaved weeds) were dominating with a relative density of 34.2 and 28.3 during summer '93, 35.8 and 33.4 during summer '95 respectively. It was followed by *Echinochloa colonum* (grass) with a relative density of 25.0 and 23.1, *Cyperus difformis* (sedge) with a relative density of 12.5 and 7.7 during summer '93 and summer '95 respectively. In the subsequent crop of blackgram, broad leaved weeds were identified as the predominant group consisting of *Trianthema portulacastrum* with a relative density of 32.7 and 37.9, *Gynandropsis pentaphylla* with 22.4 and 19.5. Among grasses *Echinochloa colonum* (16.8 and 18.2) and in sedges *Cyperus rotundus* (10.2 and 2.3) were dominant (Table 1).

Unlike in rice and blackgram, grasses were dominating in sesame and was followed by broad leaved weeds and sedges. But the proportionate occurrence of different group of weeds were

Table 2. Relative density of individual weeds in sesame

Crop	Weed	Relative density					
		S ₁ (Feb - April)		S ₂ (April - July)		S ₃ (April - July)	
		Summer '93	Summer '95	Summer '93	Summer '95	Summer '93	Summer '95
Sesame	1. Broad leaved weeds						
	<i>Amaranthus viridis</i> L.	0.4	0.1	0.0	0.0	0.0	0.0
	* <i>Cleome viscosa</i> L.	1.1	1.6	2.6	2.6	3.4	2.5
	<i>Croton sparsiflorus</i> L.	0.0	0.0	0.0	0.0	0.2	0.1
	* <i>Euphorbia prostrata</i> L.	0.8	0.8	2.6	3.7	1.4	2.0
	* <i>Gynandropsis pentaphylla</i> Dc.	4.6	5.8	0.0	0.0	3.8	1.8
	<i>Phyllanthus niruri</i> L.	0.2	0.1	1.1	0.4	1.0	1.6
	* <i>Trianthema portulacastrum</i> L.	8.1	5.6	37.0	33.8	19.2	21.8
	<i>Vernonia cinerea</i> L.	0.0	0.0	0.7	0.1	0.5	0.9
	2. Grasses						
	<i>Cynodon dactylon</i> L.	2.0	0.6	0.0	0.0	0.0	0.0
	* <i>Echinochloa colonum</i> L.	75.9	79.2	49.6	53.6	62.0	63.6
	<i>Panicum repens</i> L.	6.6	4.8	3.7	3.6	6.7	4.2
	3. Sedges						
	<i>Cyperus rotundus</i> L.	0.3	1.4	2.7	2.2	1.8	1.5

* Predominant

varying in sesame field raised in different sequences. *Echinochloa colonum* was the major weed with a relative density of 75.9 and 79.2 during summer '93 and '95 respectively, followed by *Trianthema portulacastrum* (8.1 and 5.6) and *Gynandropsis pentaphylla* (4.6 and 5.8) in sesame field raised after rice crop (S₁).

In sesame crop raised after black gram (S₂) though *Echinochloa colonum* was dominant, the relative density was lesser than S₁, viz., 49.6 and 53.6 during summer '93 and summer '95 respectively. But the relative density of *Trianthema portulacastrum* had moderately increased (37.0 and 33.8). There was dominance of *Echinochloa colonum* with a relative density of 62.0 and 63.6 in the sesame raised after a fallow period (S₃) with a slight reduction in *Trianthema portulacastrum* (19.2 and 21.8) when compared to S₂. *Trianthema portulacastrum* was a summer season annual weed, preferring hot dry condition with adequate moisture (Baruna and Gogoi, 1993). Hence its relative density was more in S₂ and S₃ compared to S₁ (Table 2).

CONCLUSION

The study revealed that broad leaved weeds dominated the weed flora followed by grasses and sedges in rice grown during *thaladi* season and in relay sown blackgram. In case of rice fallow summer sesame grasses dominated the weed flora followed

by broad leaved weeds and sedges. The result clearly indicates that the composition of weed flora in a crop field is strongly influenced by different cropping sequences and their rotation.

REFERENCES

- BARUNA, I.C. and GOGOI, A.K. (1993). Eco diversity of common weeds in rice fields of Assam. Proc. Int. Symp. Vol.II. IWM for sustainable agriculture. Hisar, India. Nov. 18-20. P.19-23.
- DE DATTA, S.K. (1974). Weed control in rice : present status and future challenge. Philippines Weed Sci. Bull.1:1-16.
- GRACY MATHEW and SREENIVASAN, E. (1988). Effect of weed control methods on yield and economics of rainfed and rice fallow summer cowpea. Madras Agric. J., 85(1) : 50-52.
- MOODY, K. (1977). Weed control in sequential cropping in rainfed low land rice growing areas in Tropical Asia. Paper presented at the workshop on weed control in small scale farms during the 6th Asian-Pac Weed Sci. Conf., 11-17, July, 1997, Jakarta, Indonesia.
- PORWAL, M.K. and Munira, S.L. (1993). Allelopathic effects of purple nut sedge and barn yard grass on germination and seedling growth of blackgram and paddy. Proc. Int. Symp. Vol III. IWM for sustainable agriculture. Hisar, India. Nov. 18-20, p. 123-125.
- SANKARAN, S. and DE DATTA, S.K. (1985). Weeds and weed management in upland rice. Adv. in Agron. 38:p.283-337.

(Received : August 1997 Revised : July 1998)