Table 2. Quality character of soybean seed

Treatments	Nitrogen Uptake		Phosphorus Uptake	
	Season I	Season II	Season I	Season II
100% inorganic P_2O_5 alone (80 Kg ha^{-1})	41.15	41.13	22.35	22.32
100% inorganic P_2O_5 as enriched FYM (EFYM)	41.40	41.40	22.75	22.73
100% inorganic P_2O_5 + Phosphobacteria seed inoculation	41.25	41.23	22.46	22.46
100% inorganic P_2O_5 + Phosphobacteria soil application	41.29	41.28	22.50	22.51
100% inorganic P_2O_5 + Phosphobacteria seed and soil application	41.33	41.33	22.57	22.56
100% inorganic P_2O_5 as EFYM + Phosphobacteria seed inoculation	41.49	41.48	22.76	22.75
100% inorganic P_2O_5 as EFYM + Phosphobacteria soil application	41.64	41.62	22.80	22.80
100% inorganic P_2O_5 as EFYM + Phosphobacteria seed and soil application	41.88	41.87	22.86	22.85
75% inorganic P_2O_5 + Phosphobacteria seed inoculation	41.09	41.07	22.31	22.30
75% inorganic P_2O_5 + Phosphobacteria soil application	41.18	41.15	22.38	22.37
75% inorganic P_2O_5 + Phosphobacteria seed and soil application	41.22	41.22	22.43	22.40
75% inorganic P_2O_5 as EFYM + Phosphobacteria seed inoculation	41.36	41.32	22.61	22.61
75% inorganic P_2O_5 as EFYM + Phosphobacteria soil application	41.45	41.44	22.67	22.65
75% inorganic P_2O_5 as EFYM + Phosphobacteria seed and soil application	41.56	41.55	22.80	22.80
CD (P=0.05)	0.19	0.17	0.44	0.43

(1991) and Koshalendra Tedia *et al.* (1992) in soybean.

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EFFECT OF SOWING TIME AND MULCHING ON WEED CONTROL IN COTTON-BASED INTERCROPPING SYSTEM IN RAINFED VERTISOLS

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ABSTRACT

Field experiments conducted at the Agricultural Research Station, Kovilpatti during *rabi* seasons of 1993-94 and 1994-95 revealed that intercropping of cotton + black gram at 2:1 ratio reduced the weed density and dry matter. Mulching either with subabul loppings or *bajra* straw @ 6 t/ha recorded significantly lower weed population and the dry matter accumulation than the unmulched control.

KEY WORDS : Cotton, intercropping, mulching, weeds

Intercropping is an important feature of crop production system in India under dryland agriculture. In a slow growing crop like cotton, much of the interspace remains unutilised during early stages of the crop growth. The canopy does not cover the inter row space and as such weeds come up in the unutilised space and compete with cotton crop for the available moisture, nutrients and light. Whereas, under thick canopy the competition of weed is greatly reduced (Donald, 1963). One of the most important advantages of mulching is supression of weeds, thereby reducing the cost of intercultivation in rainfed agriculture. Hence, field experiments were conducted to find out the effect of mulching on weed control in cotton based

intercropping systems, under different sowing enviornments.

MATERIALS AND METHODS

Field experiments were conducted during the *rabi* season of 1993 and 1994 at the Agricultural Research Station, Kovilpatti to study the effect of mulching practice on weed control in cotton based intercropping systems. Treatments consisted of three sowing times *viz.*, pre-monsoon, monsoon and late-monsoon, and three intercropping systems *viz.*, sole cotton, cotton + black gram and cotton + clusterbean as main plot treatments and three mulching practices *viz.*, no mulch, subabul loppings @ 6 t/ha and *bajra* straw @ 6 t/ha as sub-plot treatments. The experiment was laid out in a split-plot design, replicated thrice. MCU 10 cotton, CO 5 black gram and Pusa Navbhagar clusterbean were used as test crops. The crops were sown on 30 September, 14 October and 28 October under pre-monsoon, monsoon and late-monsoon situations respectively by adopting a spacing of 45 cm between rows for pure stand of cotton and paired-row system (30/60 cm) at 2:1 ratio for intercropping of cotton. Intra-row spacing of 10 cm and 15 cm was adopted for black gram and cluster-bean respectively. The mulch materials were cut into small pieces and applied 15 days after germination in between the crop rows. The other cultivation practices were adopted uniformly for all treatments. In the cropping season, a total rainfall of 463.8 mm (31 rainy days) and 473.2 mm (26 rainy days) was received during 1993-94 and 1994-95 respectively.

RESULTS AND DISCUSSION

Weed flora

The major weed flora observed in the experimental field were *Trianthema portulacastrum (L)., Trifolium spp., Digeria arvensis (L.,) Forsskal, Boerhaavia diffusa L., Celosia argentea L Dactyloctenium aegypticum (L.) Willd., Elecucine indica (L.) Gaertn., Sorghum halepense and Cyperus rotundus L.*

Effect of sowing time on weed growth

Due to erratic behaviour of the monsoon and drought experienced, the weed population and dry matter (DM) were 37.5 and 65.5 per cent less during 1994-95 as compared to 1993-94 (Table 1). Weed population and dry matter accumulation (DMA) were significantly higher in pre-monsoon sowing during both the years. The pre-monsoon and monsoon showers have helped for germination of most of the weed seeds, accounting for more weed population and DM under pre-monsoon and monsoon sowings. Subsequent land preparation, before sowing of cotton and pulses, had greatly reduced the weed population under late-monsoon situation. Some trend on weed growth was prevailed upto harvest stage. Pre-monsoon sowing

Table 1. Density and dry matter of weeds as influenced by management practices in cotton

Treatments	Weed density (No/m2)				Weed dry matter (kg/ha)			
	1993-94		1994-95		1993-94		1994-95	
	45 DAS	AT HARVEST	45 DAS	AT HARVEST	45 DAS	AT HARVEST	45 DAS	AT HARVEST
Sowing time								
Pre-monsoon	51.7	37.5	47.7	26.7	249	498	228	199
Monsoon	51.4	37.1	46.7	21.3	250	493	222	154
Lai.monsoon	45.1	32.4	43.8	18.8	204	432	195	138
CD (P=0.05)	3.4	1.8	1.1	1.9	17.9	22.4	5.5	12.5
Intercropping								
Cotton Sole	53.6	38.6	49.2	25.5	257	526	229	187
Cotton + Black gram	47.0	34.6	44.0	22.2	221	461	205	162
Cotton + Clusterbean	48.0	33.8	45.1	19.1	225	438	210	137
CD (P=0.05)	3.4	1.8	1.1	1.9	17.9	22.4	5.5	12.3
Mulching								
No mulch	77.1	41.8	57.5	28.9	365	757	271	210
Subabul Lopping	35.5	33.6	41.0	19.4	168	334	191	141
Bajra straw	36.0	31.6	39.9	18.6	169	331	182	135
CD (P=0.05)	4.8	4.3	4.6	2.2	24.4	47.4	16.1	18.8

recorded 15.7 and 42.0 per cent higher weed density than in late-sowing situation during 1993-94 and 1994-95 respectively. Low rainfall in the later stage of the crop would have reduced the growth and DMA of weeds under late sown situations.

Effect of intercropping on weed growth

Data recorded on density and DM of weeds at 45 days after sowing (DAS) revealed that cotton + black gram intercropping significantly reduced the density and DM of weeds compared to sole cotton but at par with cotton + clusterbean combination. The reduction in weed DM under cotton + black gram system was 12.5 and 10.5 per cent as compared to sole cotton. This might be due to early growth and shading effect of black gram component under intercropping situation. At harvest stage, the density and DM of weeds were less under cotton + clusterbean intercropping situation. As clusterbean was in the field for longer duration with the base crop, the weed suppression effect was more than black gram combination at harvest stage. Such depressive effect on weed growth due to legume intercropping was pointed out earlier by Chatterjee and Mandal (1992) and Thakur (1994).

Effect of mulching on weed growth

Both *subabul* and *bajra* straw mulching had suppressed the weed density and DM compared to no mulch throughout the growth stages. The reduction in weed DM at harvest stage under *bajra* straw mulching was 56.3 and 35.7 per cent as compared to unmulched control during 1993-94 and 1994-95. However, *subabul* loppings and *bajra* straw had identical effect on controlling the weed growth both at initial stage (45 DAS) and at harvest. Lesser weed growth under mulched environment was due to inhibition of weed germination and growth by the mulch materials. Similar weed suppression effect by mulching practice was reported by Shaikh *et al.*, (1994) under rainfed situation.

Seed cotton yield

The seed cotton yield was 29.7 and 59.4 per cent higher under pre- monsoon than late sowing during 1993-94 and 1994-95 respectively. This was mainly due to utilisation of pre-monsoon showers and early monsoon rains under pre-monsoon sown condition. The sole crop of cotton had registered higher seed cotton yield of 671 and 554 kg/ha during both the years compared to cotton under intercropped situation. Among the intercrop components, the yield reduction of cotton was more with clusterbean (13.0 and 13.9 %) than with black gram during both the years which might be due to the competitions of clusterbean for a long period. Deshpande *et al.*, (1989) observed yield reduction of seed cotton in cotton based intercropping systems.

Table 2. Effect of sowing time, intercropping and mulching practices on seed cotton yield

Treatments	Seed cotton yield (kg/ha)	
	1993-94	1994-95
Sowing time		
Pre-monsoon	677	628
Monsoon	673	505
Post monsoon	522	394
Cd (P=0.05)	23	16
Intercropping		
Cotton sole	671	554
Cotton+Black gram	618	697
Cotton + Clusterbean	584	477
CD (P=0.05)	23	16
Mulching		
No mulch	571	462
Subabul loppings	657	544
Bajra straw	645	521
CD (P=0.05)	35	30

Both mulching practices had significantly increased the seed cotton yield as compared to unmulched control. Application of *subabul* loppings recorded significantly higher seed cotton yield of 657 and 544 kg/ha during 1993-94 and 1994-95 respectively, which was at par with *bajra* straw mulching. Suppression of weed growth and maintenance of soil moisture due to mulching practices had increased the seed cotton yield.

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FIELD EVALUATION OF PLANT PRODUCTS AGAINST CHILLI THRIPS *SCIRTOTHRIPS DORSALIS*

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ABSTRACT

Field experiments were conducted to evaluate the efficacy of plant products, viz., Achook (0.5%, 1%, 1.5%), neem oil (1%, 3%, 5%), neem cake extract (1%, 3%, 5%), tobacco leaf extract (1%, 3%, 5%) along with an insecticide monocrotophos (0.05%) against the chilli thrips, *Scirtothrips dorsalis* during January '96 - April '96 and August '96 - November '96 at the Annamalai University Farm. Results revealed that all treatments were found significantly superior to untreated check. However, monocrotophos (0.05%) was the most effective treatment. Among the plant products tested Achook (1.5%) was the most effective treatment. Among the plant products tested Achook (1.5%) significantly reduced the thrips population, it was followed by neem oil (5%, 3%) and neem cake extract was the least effective one in reducing thrips population.

KEY WORDS : Chilli thrips, *Scirtothrips dorsalis*, plant products, efficacy

Scirtothrips dorsalis Hood (Thysanoptera : Thripidae) is a serious pest of *Capsicum annum* Linn. in India, responsible for leaf curling (Ananthakrishnan, 1971). It multiplies appreciably at a faster rate during dry weather periods and causes 30-50 per cent yield loss in South India (Varadharajan, 1994). Being a polyphagous pest, it is not always amenable for chemical control measures and attempts with plant products for its management are not many. Hence, the present study was undertaken to evaluate the effectiveness of plant products against the chilli thrips under field conditions.

MATERIALS AND METHODS

Field trials were conducted during January '96 - April '96 and August '96 - November '96 at the Annamalai University Farm, Annamalai Nagar, in a randomized block design in three replications with a plot size of 3m x 2m for each treatment that accommadated 45 plant. The first spray of the treatments (Table 1) was given 40 days after transplanting when the infestation was noticed. The remaining three sprays were given at fortnightly intervals. Monocrotophos 36 WSC served as standard check. The population of the insect was assessed on five random plants in a plot following routine methods (Kandasamy *et al.*, 1990). Efficacy of treatments was assessed on the basis of reduction in population in treated plots over that of untreated plots (Handerson and Tilton, 1955), and the data were analysed and compared by Duncan's Multiple Range Test (DMRT) (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Two field trials were conducted to study the effect of four sprays of plant products in the management of chilli thrips. It was observed (Table 1) that the monocrotophos (0.05%) was the most effective insecticide in checking the population of thrips. Among the plant products, Achook 1.5% (72.94%) and 1% (65.49%) significantly reduced the thrips population. It was followed by neem oil 5% and tobacco waste extract 5%. Population reduction was moderate (54.52%) in the Achook 0.5% treated plots and the lowest reduction was recorded in the tobacco waste extract 1% (28.21%) and neem cake extract 1% (28.17%) treated plots.

The products found effective in the first trial were retested in the second trial (Table 2). It was