

INTEGRATED WEED MANAGEMENT IN FCV TOBACCO (*NICOTIANA TABACUM*) GROWN UNDER IRRIGATED ALFISOLS

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Tobacco yield loss due to weed competition is the most important factor that causes yield and quality reduction. Due to the scarcity of human labour, manual weeding is becoming difficult in tobacco. In situations where manual weeding and intercultural operations are not done on time due to adverse soil and weather conditions use of herbicides is the obvious choice in FCV tobacco weed management. Hence, this study was proposed by inclusion of herbicides in weed management in FCV tobacco under irrigated Alfisols. The field experiment was conducted in RBD with 10 treatments viz. 1. Pre-plant soil incorporation (PPI) of Pendimethalin 3 days before planting + Quizalofop-ethyl 30 DAP 2. PPI of Pendimethalin 3 days before planting + Quizalofop-ethyl 75 days after planting (DAP) 3. Post emergence application (PEA) of Quizalofop-ethyl at 15 DAP 4. PEA of Quizalofop-ethyl at 60 DAP 5. PEA of Quizalofop-ethyl at 75 DAP 6. PEA of Quizalofop-ethyl at 15 + 75 DAP 7. PEA of Quizalofop-ethyl at 60 + 90 DAP 8. PEA of Quizalofop-ethyl at 75 + 125 DAP 9. Weed free check 10. Un weeded check integrated with intercultural operations and replicated thrice. Statistically lower weed dry matter production was recorded wherever herbicide application was done at 30, 60, 90 days of planting and at harvest in tobacco. Spraying of Quizalofop-ethyl at 15+75 days after planting effectively controlled the grassy weeds and also gave higher yields when compared to weed free check. Leaf reducing sugars, nicotine and chlorides were well within the desirable limits. Integrated weed management practices could not influence the soil chemical properties significantly. Two post emergence sprays of Quizalofop-ethyl @ 60 g a.i./ha at 15 and 75 DAP can be used in integrated weed management along with intercultural operations to control monocot weeds which are dominant in the irrigated Alfisols.

INTRODUCTION

Flue Cured Virginia (FCV) tobacco is premium and export oriented type mainly grown under irrigated uplands of East and West Godavari districts of Andhra Pradesh. Among the different biotic constraints affecting tobacco crop, heavy weed infestation is recognized as the major bottleneck in realizing the full yield potential. Wilson (1995) estimated around 77% and 10% reduction in tobacco yield and quality respectively due to weed infestation at various unknown densities of different weed species. Generally weeds in FCV tobacco crop growth period were controlled by summer ploughing, inter-cultural operations and hand weeding (one or two). In recent times manual weeding in tobacco become difficult due to scarcity of human labour. Monocot weeds are dominant in tobacco grown under irrigated Alfisol conditions. Most of these weeds exist in between crop rows and are controlled by inter-culturing up to ridge formation (45-50 days after planting). But the weeds around the plants and after 45-50 days are to be controlled by manual weeding only. In situations where manual weeding and intercultural operations are not done on time due to adverse soil and weather conditions use of herbicides is the obvious choice. But till recent days herbicides are not recommended for this tobacco anticipating residue problems due to non-judicious applications. Hence, this study was undertaken by inclusion of herbicides in weed management in FCV tobacco under irrigated Alfisols.

MATERIALS AND METHODS

The field experiment was conducted at the Central Tobacco Research Institute Research Station, Jeelugumilli with the variety Kanchan

Key words: FCV tobacco, herbicides, intercultural operations, irrigated alfisols, weed management, yield

during 2011-13. The experiment was conducted in RBD with 10 treatments viz. 1. Pre-plant soil incorporation (PPI) of Pendimethalin 3 days before planting + Pre emergence application (PEA) of Quizalofop-ethyl at 30 days after planting (DAP) 2. PPI of Pendimethalin 3 days before planting + Quizalofop-ethyl at 75 DAP 3. Post emergence application (PEA) of Quizalofop-ethyl at 15 DAP 4. PEA of Quizalofop-ethyl at 60 DAP 5. PEA of Quizalofop-ethyl at 75 DAP 6. PEA of Quizalofop-ethyl at 15 + 75 DAP 7. PEA of Quizalofop-ethyl 60 + 90 at DAP 8. PEA of Quizalofop-ethyl at 75 + 125 DAP 9. Weed free check 10. Un weeded check, with three replications. All the treatments were integrated with inter-cultivation four times. PPI of Pendimethalin was done five days before planting after giving one light irrigation @ 750 g ai/ha and Quizalofop-ethyl @ 60 g ai/ha was applied as post emergence spray as per the treatment. Weed count was taken one m² quadrat at 30, 60, 90 days after planting and at harvest. Weeds were dried in an oven till a constant weight was observed and dry matter was recorded at different stages of crop growth and converted into kg dry weight per ha. Weed control efficiency (WCE) was worked out by the formula given below.

$$\text{WCE} = \frac{\text{WDC} - \text{WDT}}{\text{WDC}} \times 100$$

WDC: Weed dry matter in control; WDT: weed dry matter in treatment

The experimental soil is slightly acidic in reaction (pH 5.8) with low soluble salts (0.20 dS/m), chlorides (25 ppm) and nitrogen (137 kg/ha), medium P (21 kg/ha) and low K (177 kg/ha) in surface layers. The recommended packages of practices were followed to raise FCV tobacco in *rabi*. Tobacco leaves were harvested at maturity by priming 2-3 matured leaves each time at 7-8 days interval and cured in the flue-curing barn and on an average ten primings were done to complete the harvesting of tobacco. The data on green and cured leaf was recorded and analysed statistically. Soil samples were collected at the end of the experiment and analysed for pH, OC, available K and Chlorides. Soil samples were processed and analysed for the nutrient status as per the standard procedure. Data were subjected to statistical analysis as per the standard methods.

RESULTS AND DISCUSSION

Weed dry weight : Predominant weed species found in the experimental field were grassy weeds viz., *Dactyloctenium aegyptium*, *Digitaria sanguinalis*, *Panicum repens*, followed by sedges viz *Cyperus rotundus*, *Cyperus esculentus* and broad leaf weeds viz. *Cleome viscosa*, *Phyllanthus niruri* etc.

Weed dry weight was significantly affected by weed management treatments imposed (Table 1). Statistically lower weed dry matter production was recorded wherever herbicide application was done at 30, 60, 90 days of planting and at harvest. At 30 days after planting significantly lower weed dry weight was recorded in PPI of Pendimethalin and PEA at 15 days after planting of Quizalofop-ethyl treatments. In weed free check where hand weeding and intercultural operations were done at 20 days after planting also recorded significantly higher weed dry matter than herbicide applied plots. Weedy check recorded significantly higher weed at any stage of the crop growth. At 60, 90, and 150 days after planting all the treatments recorded lower weed dry matter production than un-weeded check. Application of Pendimethalin reduced the germination of monocot and dicot weeds except *Cyperus* spp whereas Quizalofop-ethyl at different stages controlled the monocot weeds which are the dominant weeds in Alfisols. Pre-plant incorporation of Pendimethalin 3 days before planting maintained field weed free up to 70 days of the crop period (except nut grass). Quizalofop-ethyl as post emergence application controlled only monocot weeds 6-10 days after its application. Paunescu et al (2002) reported that Quizalofop-ethyl herbicide used after tobacco controlled monocot weeds including the perennial ones.

In general, weed control efficiency (WCE) was higher wherever integrated weed control was followed by inclusion of herbicides along with inter-cultivation. Weed control efficiency (WCE) on the basis of dry matter production was higher (Table 1) in the treatments viz. Preplant soil incorporation of Pendimethalin 3 days before planting, post emergence spraying of Quizalofop-ethyl at 60, 75 days, 15+75, 60+90 days and in 75+125 days after planting. Dimeska et al (2006) stated that application of agrochemical products

Table 1: Weed dry weight (kg/ha) and weed control efficiency as influenced by weed management treatments in FCV tobacco grown under irrigated Alfisols (Pooled)

Treatments	30	60	90	At final	WCE (%)	WCE (%)
	DAP	DAP	DAP	harvest	60 DAP	At final harvest
PPI of Pendimethalin + PEA of Quizalofop- ethyl at 30 DAP	60.7	133	213	250	91	87
PPI of Pendimethalin + PEA Quizalofop- ethyl at 75 DAP	54.3	103	150	198	93	91
PEA of Quizalofop-ethyl at 15 DAP	49.3	150	395	430	90	75
PEA of Quizalofop-ethyl at 60 DAP	150	225	159	232	92	89
PEA of Quizalofop-ethyl at 75 DAP	152	213	60	139	82	96
PEA of Quizalofop-ethyl at 15 + 75 DAP	47	197	71	180	87	96
PEA of Quizalofop-ethyl at 60 + 90 DAP	146	235	138	104	84	92
PEA of Quizalofop-ethyl at 75 +125 DAP	123	225	80	44	81	95
Weed free check (Hand weeding)	113	65	77	63	96	95
Un-weeded check	175	1480	1583	1717		
S. Em±	6.99	20.38	15.18	21.86		
CD (P=0.05)	17.06	56.49	42.09	60.59		

Table 2: Tobacco leaf yield (kg/ha) as influenced by weed management treatments in FCV tobacco grown under irrigated Alfisols (Pooled)

S.No	Treatments	Yield (kg/ha)		
		Green leaf	Cured leaf	Grade index
1.	PPI of Pendimethalin + PEA of Quizalofop- ethyl at 30 DAP	12242	2025	1561
2.	PPI of Pendimethalin + PEA Quizalofop- ethyl at 75 DAP	12204	1987	1523
3.	PEA of Quizalofop-ethyl at 15 DAP	13267	2190	1705
4.	PEA of Quizalofop-ethyl at 60 DAP	13271	2196	1684
5.	PEA of Quizalofop-ethyl at 75 DAP	13428	2190	1700
6.	PEA of Quizalofop-ethyl at 15 + 75 DAP	14218	2303	1754
7.	PEA of Quizalofop-ethyl at 60 + 90 DAP	13707	2223	1720
8.	PEA of Quizalofop-ethyl at 75 +125 DAP	13064	2143	1665
9.	Weed free check (Hand weeding)	13595	2233	1738
10.	Un-weeded check	10572	1651	1235
	S. Em±	222	35.75	28.33
	CD(P=0.05)	615	99.08	78.54

(herbicides) is considered as the most rational measures in the control of weeds on tobacco plants and has positive effect on tobacco yield.

Yield: Weed management treatments influenced the yields of FCV tobacco significantly in Alfisols. (Table.2). Integrated weed management practices involving Quizalofop-ethyl recorded the green and

cured leaf yields on par with that of weed free check. Spraying of Quizalofop-ethyl at 15+75 days after planting effectively controlled the grassy weeds and also gave higher yields when compared to weed free check. Spraying of Quizalofop-ethyl at 15, 60, 75 days after planting with hand weeding and interculturing gave on a par yields with that of weed free check. Statistically lower yields were

Table 3: Chemical quality parameters as influenced by weed management treatments in FCV tobacco grown under irrigated Alfisols (Pooled)

Treatments	Reducing sugars (%)		Nicotine (%)		Chlorides (%)	
	X	L	X	L	X	L
PPI of Pendimethalin + PEA of Quizalofop- ethyl at 30 DAP	15.85	21.74	1.49	1.82	0.78	0.61
PPI of Pendimethalin + PEA of Quizalofop- ethyl at 75 DAP	16.52	21.57	1.63	1.75	0.77	0.64
PEA of Quizalofop-ethyl at 15 DAP	15.23	20.60	1.59	1.97	0.77	0.70
PEA of Quizalofop-ethyl at 60 DAP	15.15	20.60	1.40	1.92	0.72	0.66
PEA of Quizalofop-ethyl at 75 DAP	15.98	20.92	1.41	1.94	0.86	0.71
PEA of Quizalofop-ethyl at 15 + 75 DAP	15.22	20.02	1.56	2.00	0.88	0.74
PEA of Quizalofop-ethyl at 60 + 90 DAP	15.23	20.48	1.46	1.80	0.84	0.70
PEA of Quizalofop-ethyl at 75 +125 DAP	14.72	19.81	1.48	1.80	0.75	0.71
Weed free check (Hand weeding)	17.17	21.83	1.52	1.80	0.69	0.62
Un-weeded check	15.51	20.32	1.48	1.84	0.80	0.71
S.Em±	0.28	0.33	0.01	0.02	0.03	0.02
CD(P=0.05)	0.78	0.93	0.04	0.05	0.07	0.05

observed in the un-weeded check. Yousafzai *et al.*, (2006) reported that herbicides not only increased the yield but also increased the desirable chemical characteristics. Paunescu et al (2002) reported that Quizalofop-ethyl herbicide used after tobacco transplantation gave higher yields than non treated and non weeded control. Pendimethalin incorporation 5 days before planting in combination with PE spray of Quizalofop-ethyl either at 30 or 75 DAP maintained field weed free during crop growth period (except nut grass) and the yields were reduced by 9.3 and 11.0 % respectively when compared to hand weeding. Statistically lower yields were observed in the weedy check.

Quality parameters: Reducing sugars, nicotine and chlorides were well within the desirable limits (Table 3). Nicotine values increased from X to L leaf positions. Chloride values decreased from X to L position. Reducing sugars are within the acceptable limits in X and L position and increased from X to L position. Weed free check recorded higher values than other treatments. Lower values were observed when two sprays of Quizalofop-ethyl were given. In general nicotine values were lower in X and L position and increased from X to L positions. Lower reducing sugars in X position and lower nicotine content

might be due to continuous rains coupled with low sunshine hours. Chlorides are within the acceptable limits (< 1.5%) and decreased from X to L position.

Soil properties: Integrated weed management practices could not influence the soil chemical properties significantly (Table 4). pH values ranged between 5.21-5.69 in 0-9" and 4.54-4.93 in 9-18" and pH values decreased from top to bottom and much differences were not observed due to weed management practices in both the depths. OC values were found to be significant in 0-9" depth only. Higher OC was observed in un-weeded check. Though much differences were not observed in available K values, lower values were recorded in un-weeded check. Significantly higher values were observed in Pendimethalin applied plots. Chlorides increased from upper to lower layers and significant differences among the treatments were found in 9-18" only. Pendimethalin applied plots recorded higher chlorides than weed free check. Based on the experimental results it can be concluded that two post emergence sprays of Quizalofop-ethyl @ 60 g a.i./ha at 15 and 75 DAP can be used in integrated weed management along with intercultural practices to control monocot weeds which are dominant in the irrigated Alfisols.

Table 4: Soil chemical properties as influenced by weed management treatments in FCV tobacco grown under irrigated Alfisols

Treatments	0-9" depth			9-18" depth				
	pH	OC (%)	Av. K (kg/ha)	Cl (ppm)	pH	OC (%)	Av. K (kg/ha)	Cl (ppm)
PPI of Pendimethalin + PEA of Quizalofop-ethyl at 30 DAP	5.69	0.10	230	57.3	4.57	0.10	407	61.3
PPI of Pendimethalin + PEA Quizalofop-ethyl at 75 DAP	5.21	0.12	255	49.3	4.92	0.12	428	64.0
PEA of Quizalofop-ethyl at 15 DAP	5.62	0.20	217	50.7	4.74	0.13	414	60.0
PEA of Quizalofop-ethyl at 60 DAP	5.35	0.14	210	52.0	4.55	0.13	372	58.0
PEA of Quizalofop-ethyl at 75 DAP	5.25	0.14	207	50.1	4.57	0.10	387	61.3
PEA of Quizalofop-ethyl at 15 + 75 DAP	5.38	0.18	204	53.3	4.74	0.10	395	58.7
PEA of Quizalofop-ethyl at 60 + 90 DAP	5.40	0.19	206	53.3	4.54	0.13	389	54.3
PEA of Quizalofop-ethyl at 75 + 125 DAP	5.45	0.18	213	53.3	4.79	0.12	364	57.3
Weed free check (Hand weeding)	5.21	0.20	218	58.7	4.59	0.13	372	54.0
Un-weeded check	5.66	0.21	206	54.7	4.93	0.14	427	60.0
S.Em±	0.127	0.026	9.98	2.71	0.16	0.02	17.01	4.33
CD (P=0.05)	NS	0.077	29.68	NS	NS	NS	NS	12.87

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