



Evolving Viable Weed Management Practices for Rainfed Greengram

E. Sobhana*, A. Velayutham and P. Sujithra

Department of Agronomy, Agricultural College and Research Institute,
Tamil Nadu Agricultural University, Killikulam - 628 252, India

A field experiment was conducted at Agricultural Research Station, Kovilpatti during *kharif* 2017 to study the effect of pre and early post emergence herbicides on weed control in rainfed greengram. In this study, PE Oxyfluorfen @ 0.10 kg ha⁻¹ + EPOE Imazethapyr @ 50 g ha⁻¹ on 20 DAS or PE Pendimethalin @ 0.75 kg ha⁻¹ + EPOE Imazethapyr @ 50 g ha⁻¹ on 20 DAS provided a broad spectrum of weed control by significantly reducing weed density and dry weight at 45 DAS and resulted in higher weed control efficiency and lower weed index. PE application of Oxyfluorfen @ 0.10 kg ha⁻¹ + EPOE application of Imazethapyr @ 50 g ha⁻¹ on 20 DAS or application of Pendimethalin @ 0.75 kg ha⁻¹ + Imazethapyr @ 50 g ha⁻¹ on 20 DAS recorded significant improvement in plant height, yield attributes like number of pods plant⁻¹, number of seeds pod⁻¹, test weight (g) and produced higher grain and haulm yields of rainfed greengram.

Key words: Rainfed, Greengram, Weed management, Yield

Greengram [*Vigna radiata* (L.) Wilczek] is one of the thirteen food legumes grown in India and the third most important pulse crop after chickpea and pigeonpea. Greengram is a protein rich staple food. It is rich in protein (24%) and carbohydrates (60%), fat (1.5%), amino acids, vitamins and minerals. Because of its better nutritional quality it is called as "Queen of pulses" (Sathiyavani *et al.*, 2016). Dryland areas occupy extensive lands in all continents of the world. About 56 % of the total cultivated area in India falls under rainfed agriculture. The importance of the rainfed agriculture can be gauged from the fact that it contributes to 40 % of the country's food production; accounts for much of the national area under coarse cereals (85%), pulses (83%), oilseeds (70%) and cotton (65%); and holds 60 % of the total livestock populations (Venkateswarlu and Prasad, 2012). Area under greengram in India is 3.80 million ha with an annual production of 1.10 million tonnes. In Tamilnadu, the area under greengram is 0.13 million ha with an annual production of 458.8 tonnes. The average productivity of greengram over globe is 577 kg ha⁻¹ and in India it is 426 kg ha⁻¹, which is considered to be low (Indiastat, 2017b). Diwash Tamang *et al.* (2015) reported that weed infestation is one of the major constraints in greengram cultivation. The loss of yield due to weeds is quite high, which ranges from 40-68%. In view of severe infestation of annual and perennial weeds in greengram, the potential yield is generally not realized. Suitable weed management practices with pre and early post emergence herbicides, manual methods like hand weeding is essential to overcome these problems.

Material and Methods

The experiment was conducted at Agricultural

*Corresponding author's email: shobaagri1@gmail.com

Research Station, Kovilpatti during *kharif* 2017 to find out a viable and effective means of weed management in greengram under rainfed condition. The experiment was laid out in a randomized block design with three replications. It consisted of twelve treatments *viz.*, T₁- PE Pendimethalin @ 0.75 kg ha⁻¹ + HW on 30 DAS, T₂ - PE Oxyfluorfen @ 0.10 kg ha⁻¹ + HW on 30 DAS, T₃ - PE Pendimethalin @ 0.75 kg ha⁻¹ + EPOE Quizalofop ethyl @ 50 g ha⁻¹ on 20 DAS, T₄ - PE Pendimethalin @ 0.75 kg ha⁻¹ + EPOE Imazethapyr @ 50 g ha⁻¹ on 20 DAS, T₅ - PE Pendimethalin @ 0.75 kg ha⁻¹ + EPOE Chlorimuron - p - ethyl @ 4 g ha⁻¹ on 20 DAS, T₆ - PE Oxyfluorfen @ 0.10 kg ha⁻¹ + EPOE Quizalofop ethyl @ 50 g ha⁻¹ on 20 DAS, T₇ - PE Oxyfluorfen @ 0.10 kg ha⁻¹ + EPOE Imazethapyr @ 50 g ha⁻¹ on 20 DAS, T₈ - PE Oxyfluorfen @ 0.10 kg ha⁻¹ + EPOE Chlorimuron - p - ethyl @ 4 g ha⁻¹ on 20 DAS, T₉ - EPOE Quizalofop ethyl @ 50 g ha⁻¹ + Imazethapyr @ 50 g ha⁻¹ on 20 DAS, T₁₀ - HW twice on 15 and 30 DAS, T₁₁ - Weed free check and T₁₂ - Unweeded control. Greengram Co (Gg) 8 was used as a test variety. Observations were recorded on weed parameters *viz.*, weed density, weed dry weight, weed control efficiency, weed index and greengram yield parameters like number of pods plant⁻¹, number of seeds pod⁻¹ and 100 seed weight (g) and grain and haulm yields. All the data were statistically analyzed.

Results and Discussion

Weed flora

The common weed flora of the experimental field consisted of sedges and broadleaved weeds which were observed from the unweeded control plot at flowering stage of the weeds. The major sedge weed was *Cyperus rotundus*. Among the

broad-leaved weeds *Amaranthus viridis*, *Boerhavia diffusa*, *Commelina benghalensis*, *Convolvulus arvensis*, *Corchorus fascicularis*, *Corchorus olitorius*, *Desmodium triflorum*, *Digera arvensis*, *Euphorbia hirta*, *Euphorbia microphylla*, *Phyllanthus niruri*, *Phyllanthus maderaspatensis*, *Trianthema portulacastrum*, *Tribulus terrestris* were the pre dominant species. None of the grassy weed was noticed in the experimental field.

Table 1. Effect of different weed management practices on the weeds and weed control efficiency in rainfed greengram

T.No	Total weed density (no. m ⁻²) at 45 DAS	Total weed dry weight (g m ⁻²) at 45 DAS	Weed control efficiency (%) at 45 DAS	Weed index (%)
T ₁	16.3 (4.04)	12.71 (3.57)	89.10	18.7
T ₂	14.6 (3.82)	11.39 (3.37)	90.24	14.2
T ₃	27.2 (5.22)	20.13 (4.49)	82.75	38.4
T ₄	9.5 (3.16)	7.51 (2.83)	93.57	7.5
T ₅	32.7 (5.72)	23.54 (4.85)	79.82	45.9
T ₆	24.5 (4.95)	18.13 (4.26)	84.46	36.5
T ₇	8.2 (2.95)	6.48 (2.64)	94.45	2.8
T ₈	29.5 (5.43)	21.24 (4.61)	81.80	43.4
T ₉	21.4 (4.63)	16.26 (4.03)	86.06	29.4
T ₁₀	20.4 (4.52)	15.50 (3.94)	86.71	23.9
T ₁₁	0.0 (0.71)	0.00 (0.71)	100.00	0.0
T ₁₂	171.6 (13.10)	116.69 (10.80)	-	58.3
SEd	0.17	0.17	-	-
CD(P=0.05)	0.36	0.33	-	-

Figure in parenthesis are transformed values.

Weed density and dry weight

All the weed control treatments significantly reduced the weed density and weed dry weight at 45 DAS over unweeded control (Table 1). Among the different weed management practices, weed free check significantly recorded lower weed density and weed dry weight. It was followed by the PE application of Oxyfluorfen @ 0.10 kg ha⁻¹ + EPOE application of Imazethapyr @ 50 g ha⁻¹ on 20 DAS and PE application of Pendimethalin @ 0.75 kg ha⁻¹ + EPOE

application of Imazethapyr @ 50 g ha⁻¹ on 20 DAS. These two treatments were comparable with each other. Invariably unweeded control registered higher weed density and weed dry weight. This might be due to the broad spectrum efficiency of pre-emergence and early post emergence herbicide application and hence, reduced the weed density and weed dry weight considerably as evinced from the data. The death of susceptible species of broadleaved weeds by imazethapyr application was due to the inhibition of acetolactate synthase (ALS) enzyme which is essential for leucine, valine and isoleucine synthesis in weeds (Komal *et al.*, 2015).

Weed control efficiency and weed index

Weed control efficiency was higher with PE application of Oxyfluorfen @ 0.10 kg ha⁻¹ + EPOE application of Imazethapyr @ 50 g ha⁻¹ on 20 DAS. It was on par with the PE application of Pendimethalin @ 0.75 kg ha⁻¹ + EPOE application of Imazethapyr @ 50 g ha⁻¹ on 20 DAS. Lower weed control efficiency was registered with unweeded control.

PE application of Oxyfluorfen @ 0.10 kg ha⁻¹ + EPOE application of Imazethapyr @ 50 g ha⁻¹ on 20 DAS was found to be the best treatment since it recorded lower weed index (WI). It was comparable with PE application of Pendimethalin @ 0.75 kg ha⁻¹ + EPOE application of Imazethapyr @ 50 g ha⁻¹ on 20 DAS. Higher yield reduction was observed in unweeded control. The continuance of earlier effect made the pre-emergence herbicides performed equally with hand weeding or post-emergence herbicides at later stages of the crop growth accounted with very low weed biomass might be the reason for higher WCE and lower WI in the above combination of weed control practices in greengram. [Kachhadiya *et al.* (2009), Komal *et al.* (2015) and Chhodavadia *et al.* (2014)].

Yield attributes and yield

Weed free check recorded high values of yields attributes viz., number of pods plant⁻¹, number of seeds pod⁻¹, 100 seed weight and this was comparable with the PE application of Oxyfluorfen @ 0.10 kg ha⁻¹ + EPOE application of Imazethapyr @ 50 g ha⁻¹ on 20 DAS and PE application of Pendimethalin @ 0.75 kg ha⁻¹ + EPOE application of Imazethapyr @ 50 g ha⁻¹ on 20 DAS (Table 2). Unweeded control recorded lower values for all the above yield parameters. This might be due to the minimization of competition by weeds with the crop for resources viz., space, light, nutrients and moisture with the adoption of effective weed control methods. Thus, reduced crop- weed competition resulted in overall improvement in crop growth as reflected by plant height and dry matter accumulation consequently resulted into better development of reproductive structure and translocation of photosynthates to the sink.

Higher grain and haulm yields were obtained with weed free check (Table 2). This was comparable with the PE application of Oxyfluorfen @ 0.10 kg ha⁻¹ +

EPOE application of Imazethapyr @ 50 g ha⁻¹ on 20 DAS and PE application of Pendimethalin @ 0.75 kg ha⁻¹ + EPOE application of Imazethapyr @ 50 g ha⁻¹ on 20 DAS. Unweeded control recorded lower yield through lesser growth and yield parameters. This might be due to reduced weeds and competition free environment at the critical stages of crop which in turn favoured the crop to utilize the factors for growth and

production and enhanced the well balanced source sink capacities which attributed to the production of more branches DMP, number of pods plant⁻¹ and number of seeds pod⁻¹ responsible for higher yield compared to all the other treatments. The results are in accordance with the findings of Kachhadiya *et al.* (2009) in Chickpea and Komal *et al.*, (2015) in greengram.

Table 2. Effect of different weed management practices on the yield attributes and yield of rainfed greengram

T.No	No. of pods plant ⁻¹	No. of Seeds pod ⁻¹	100 seed weight (g)	Grain yield (kg ha ⁻¹)	Haulm Yield (kg ha ⁻¹)	Harvest Index
T ₁	23.9	7.75	3.76	532	2215	0.19
T ₂	25.1	7.94	3.79	561	2247	0.20
T ₃	19.6	6.82	3.40	403	1903	0.17
T ₄	26.5	8.25	3.81	605	2398	0.20
T ₅	16.3	6.40	3.25	354	1650	0.18
T ₆	20.2	6.94	3.49	415	1965	0.17
T ₇	27.0	8.31	3.82	636	2453	0.21
T ₈	19.1	6.75	3.37	370	1819	0.17
T ₉	21.6	7.26	3.63	462	2021	0.19
T ₁₀	22.8	7.38	3.76	498	2069	0.19
T ₁₁	27.3	8.45	3.82	654	2475	0.21
T ₁₂	9.1	5.00	3.06	273	1328	0.17
SEd	0.58	0.09	0.10	24	71	*
CD(P=0.05)	1.26	0.20	NS	49	147	*

* Data not statistically analyzed.

From the above results, it could be concluded that PE application of Oxyfluorfen @ 0.10 kg ha⁻¹ + EPOE application of Imazethapyr @ 50 g ha⁻¹ on 20 DAS or PE application of Pendimethalin @ 0.75 kg ha⁻¹ + EPOE application of Imazethapyr @ 50 g ha⁻¹ on 20 DAS was found to be the suitable weed management practice for achieving higher productivity of rainfed greengram.

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