Impact of Physical and Chemical Weed Management Practices on Yield Attributes and Yield of Irrigated Greengram

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Abstract **- A field experiment was conducted during the month of June to August, 2021 at Annukudy village, Thiruvarur district, Tamilnadu. The treatments included of best combinations consisting of physical and chemical method of weed control. The studies signified the importance of pre-emergence application of pendimethalin 30% EC @ 1 kg a.i. ha-1 on 3 DAS + post-emergence application of imazethapyr 10% SL @ 0.05 kg a.i ha-1 on 21 DAS which could benefit the crops in reducing the different weed density and ultimately reduced the total weed biomass which resulted in increase in crop yield. Pre-emergence application of pendimethalin 30% EC @ 1 kg a.i. ha-1 on 3 DAS + post-emergence application of imazethapyr 10% SL @ 0.05 kg a.i ha-1 on 21 DAS recorded the highest weed control index. Higher seed and haulm yield under chemical method might be due to maintenance of weed free environment, particularly throughout vital growth stages of crop, cut back crop weed competition helped in higher growth and development of greengram crop leading to higher seed and haulm yield. The higher yield attributes and yield of irrigated greengram was recorded with pre-emergence application of pendimethalin 30% EC @ 1 kg a.i. ha-1 on 3 DAS + post-emergence application of imazethapyr 10% SL @ 0.05 kg a.i ha-1 on 21 DAS.**

Index Terms **- Greengram, Pendimethalin, Imazethapyr, Yield attributes and Yield.**

INTRODUCTION

Pulses constitute an important ingredient in Indian vegetarian diet, which are the main source of vegetable protein. On an average, pulses contain 20 to 25 per cent protein (Sooraj Chandra pankaj and Pradeep Kumar Dewangan, 2017) which is almost 2.5 to 3.0 times of the value normally found in cereals. Among the pulses, Greengram (*Vigna radiata* (L.)) is one of the most important pulse crops, which can be grown in tropical and subtropical regions. Greengram, also known as mungbean, is the fourth most produced pulse crop in India after chickpea, pigeon pea and blackgram. The area under greengram in India is 30.48 lakh hectares with a production of 13.45 lakh tonnes with productivity of 441 kg ha^{-1} (GOI, 2019). The total area under greengram in Tamil Nadu is 1.95 lakh hectares with the production of 0.89 lakh tonnes and the productivity of 444 kg ha^{-1}.

Among the various factors responsible for low productivity of irrigated greengram, weeds are considered to be one of the primary factors due to harmful effects. Weeds compete with crops for resources such as nutrients, water, light and space, thus reducing their yield. Naturally more hardy and competitive, they cause significant yield losses if not controlled properly. The magnitude of losses largely depends upon the composition of weed flora, period of weed-crop competition and its intensity. Weeds can cause 31 to 58 per cent yield loss in greengram under the irrigated conditions of Punjab (Singh *et al.*, 2015 and Kaur *et al*., 2016). Mousumi Dash *et al*. (2018) concluded that the initial 45 days period considered being critical period with respect to crop weed competition in greengram.

Chemical weed control may be preferred because of its better efficiency along with less cost and time involvement. Also, it causes no mechanical damage to the crop that happens during manual weeding. Moreover, the control is more effective as the weeds even within the rows are not killed during mechanical

control and would benefit the crop by providing proper aeration and conservation of moisture. Hence, the present study has been carried out to evaluate the best weed management practices on yield attributes and yield of irrigated greengram.

MATERIALS AND METHODS

The experiment was conducted at Annukudy village, Thiruvarur district, Tamilnadu during the month of June to August, 2021. The experimental field is geographically situated at 10°40'N latitude and 79°34'E longitude and at an altitude of + 3.0 meters above the mean sea level. The mean maximum and minimum temperature recorded during the cropping season were 36.4°C and 25.8°C and the mean relative humidity ranged from 70.7 to 77.7 per cent. The soil of the experimental field was clay in texture with pH of 7.7 and EC of 0.42 dS m^{-1}. The experimental soil was low in available nitrogen, medium in available phosphorous and medium in available potassium. The experiment was laid out in Randomized Block Design with three replications.

The experiment consisted of ten weed management treatments [*viz.*, T_1: Unweeded control, T_2: Two hand hoeing on 15 and 30 DAS, T_3: Pendimethalin 30% EC @ 1 kg a.i ha^{-1} on 3 DAS, T_4: Pendimethalin 38.7% CS @ 0.75 kg a.i ha^{-1} on 3 DAS, T_5: Imazethapyr 10% SL @ 0.05 kg a.i ha^{-1} on 21 DAS, T_6: Pendimethalin 30% EC @ 1 kg a.i ha^{-1} on 3 DAS + One hand hoeing on 30 DAS, T_7: Pendimethalin 38.7% CS @ 0.75 kg a.i ha^{-1} on 3 DAS + One hand hoeing 30 DAS, T_8: Pendimethalin 30% EC @ 1 kg a.i ha^{-1} on 3 DAS + Imazethapyr 10% SL @ 0.05 kg a.i ha^{-1} on 21 DAS, T_9: Pendimethalin 38.7% CS @ 0.75 kg a.i ha^{-1} on 3 DAS + Imazethapyr 10% SL @ 0.05 kg a.i ha^{-1} on 21 DAS, T_{10}: One hand hoeing on 15 DAS + Imazethapyr 10% SL @ 0.05 kg a.i ha^{-1} on 21 DAS] were evaluated on irrigated greengram. Greengram variety VBN 4 was sown in the first week of June and 30 cm row to row spacing and 10 cm plant to plant spacing with a seed rate of 20 kg ha^{-1}. Irrigation was given immediately after sowing. All other standard cultural practices were followed during the cropping season. Pre and post emergence application of pendimethalin and imazethapyr was done with the help of knapsack sprayer fitted with a flood fan nozzle with a spray volume of 500 l ha^{-1}. In manual weed control treatments, weeds are uprooted within the row and between the rows using with hand hoe as per days mentioned in each treatment. The yield attributes were recorded at harvest stage. The weed count (density) was taken from the tagged spot of 0.25 m^2 in the randomly selected each net plot and were calculated and converted into square meter basis for convenience. In order to draw a valid conclusion, the weed count data were subjected to $(\sqrt{X + 0.5})$ as suggested by Gomez and Gomez (1984) before statistical analysis. The seed and haulm yield were recorded from the net plot area.

RESULTS AND DISCUSSION

Total weed count:

Weed management practices in irrigated greengram has significantly influenced the total weed count (Table 1). Pre-emergence application of pendimethalin 30% EC @ 1 kg a.i. ha^{-1} on 3 DAS + post-emergence application of imazethapyr 10% SL @ 0.05 kg a.i. ha^{-1} on 21 DAS (T_8) markedly reduced the total weed count of 21.96 m^{-2} on 45 DAS in irrigated greengram. Pendimethalin is an herbicide of aniline group used as pre-emergence to control initial flush of weeds and it controls initial flush of annual grasses and some of the broadleaf weeds. The primary mode of action is to inhibit cell division and cell elongation cause effect on root and shoot growth. Imazethapyr belongs to the chemical group of imidazolinone herbicides and its mechanism of action is the inhibition of branched-chain amino acid biosynthesis which inturn cause chlorotic and necrotic effect on meristematic areas followed by a slow general foliar chlorosis and necrosis due this reason the weed count has reduced. This findings were similar with Kumar *et al*. (2017) and Kalaisudarson *et al*. (2020).

Yield attributes:

Yield attributes of greengram was significantly influenced by different weed management treatments. All yield attributing characters *viz*., number of pods $plant^{-1}$ (34.11) and number of seeds pod^{-1} (10.59) were significantly maximum under Pre-emergence application of pendimethalin 30% EC @ 1 kg a.i. ha^{-1} on 3 DAS + post-emergence application of imazethapyr 10% SL @ 0.05 kg a.i ha^{-1} on 21 DAS might be due to competition due to microclimate around plants due to weed control may allow plants to grow actively during vegetative growth and hence, the plant can utilize all the available resources *viz.*, light,

moisture, space and more nutrients at all stages which resulted in to more accumulation of photosynthesis, which ultimately converted into higher economic yield. Significant improvement in yield characters also might have resulted in higher number of pods per plant^{-1} and number of seeds pod^{-1}. These findings were similarly related by Sobhana *et al*. (2018).

Seed and haulm yield:

Seed and haulm yield of greengram were significantly influenced by different weed management treatments during the course of investigation (Table 2). The maximum seed yield (1424 kg ha^{-1}) was recorded under treatment pre-emergence application of pendimethalin 30% EC @ 1 kg a.i. ha^{-1} on 3 DAS + post-emergence application of imazethapyr 10% SL @ 0.05 kg a.i. ha^{-1} on 21 DAS (Fig. 1). The maximum haulm yield (3020 kg ha^{-1}) was recorded in pre-emergence application of pendimethalin 30% EC @ 1 kg a.i. ha^{-1} on 3 DAS + post-emergence application of imazethapyr 10% SL @ 0.05 kg a.i. ha^{-1} on 21 DAS (T_8). However, significantly minimum seed and haulm yield was recorded where weed management practices were not adopted *i.e.* Unweeded control (T_1). The increase in seed and haulm yield mainly due to maintenance of weed free environment, especially during critical growth stages of crop, reduce crop weed competition helped in better growth and development of greengram crop resulting in higher seed and haulm yield. It might be due to efficient and prolonged weed control by pre-emergence herbicides efficiently, supplemented with post-emergece herbicides control the late emergent flushes of weeds. It supports with the results of Muthuram *et al*. (2018) and Chaudhary *et al*. (2020).

CONCLUSION

From this field experiment, it could be concluded that pre-emergence application of pendimethalin 30% EC @ 1 kg a.i. ha^{-1} on 3 DAS + post-emergence application of imazethapyr 10% SL @ 0.05 kg a.i. ha^{-1} on 21 DAS was effective method of weed management practice for controlling weeds and increased yield attributes and yield of irrigated greengram.

Table: 1.Effect of weed management practices on total weed count m^{-2} on 45 DAS and yield attributes of irrigated greengram

Treatment schedule	Total weed count (m^{-2})	No. of pods plant^{-1}	No. of seeds pod^{1}	Hundred seed weight (g)
T_1 - Unweeded control	12.95 (167.33)	22.30	5.98	3.59
T_2 - Two hand hoeing on 15 and 30 DAS	8.24 (67.34)	28.35	8.67	3.63
T_3 - Pendimethalin 30% EC @ 1 kg a.i. ha^{-1} on 3 DAS	9.32 (86.33)	26.19	7.93	3.61
T_4 - Pendimethalin 38.7% CS @ 0.75 kg a.i. ha^{-1} on 3 DAS	10.34 (106.46)	25.75	7.30	3.61
T_5 - Imazethapyr 10% SL @ 0.05 kg a.i. ha^{-1} on 21 DAS	11.46 (130.80)	24.01	6.66	3.60
T_6 - Pendimethalin 30% EC @ 1 kg a.i. ha^{-1} on 3 DAS + One hand hoeing on 30 DAS	7.16 (50.81)	30.51	9.35	3.63
T_7 - Pendimethalin 38.7% CS @ 0.75 kg a.i. ha^{-1} on 3 DAS + One hand hoeing on 30 DAS	8.02 (63.74)	28.71	8.73	3.63
T_8 - Pendimethalin 30% EC @ 1 kg a.i. ha^{-1} on 3 DAS + Imazethapyr 10% SL @ 0.05 kg a.i. ha^{-1} on 21 DAS	4.73 (21.96)	34.11	10.59	3.65
T_9 - Pendimethalin 38.7% CS @ 0.75 kg a.i. ha^{-1} on 3 DAS + Imazethapyr 10% SL @ 0.05 kg a.i. ha^{-1} on 21 DAS	5.83 (33.46)	32.29	9.96	3.64
T_{10}-One hand hoeing on 15 DAS+Imazethapyr 10% SL @ 0.05 kg a.i. ha^{-1} on 21 DAS	8.42 (70.34)	27.93	8.55	3.62
S.Em±	0.18	0.41	0.19	0.16
CD (P=0.05)	0.54	1.24	0.57	NS

(Figures in the parenthesis indicate the original values)

Table: 2. Effect of weed management practices on seed and haulm yield of irrigated greengram

Treatment schedule	Seed yield (kg ha^{-1})	Haulm yield (kg ha^{-1})
T_1 - Unweeded control	683.00	1432.00
T_2 - Two hand hoeing on 15 and 30 DAS	1113.00	2341.00
T_3 - Pendimethalin 30% EC @ 1 kg a.i. ha^{-1} on 3 DAS	972.00	2055.00
T_4 - Pendimethalin 38.7% CS @ 0.75 kg a.i. ha^{-1} on 3 DAS	880.00	1853.00
T_5 - Imazethapyr 10% SL @ 0.05 kg a.i. ha^{-1} on 21 DAS	785.00	1654.00
T_6 - Pendimethalin 30% EC @ 1 kg a.i. ha^{-1} on 3 DAS + One hand hoeing on 30 DAS	1230.00	2582.00
T_7 - Pendimethalin 38.7% CS @ 0.75 kg a.i. ha^{-1} on 3 DAS + One hand hoeing on 30 DAS	1138.00	2394.00
T_8 - Pendimethalin 30% EC @ 1 kg a.i. ha^{-1} on 3 DAS + Imazethapyr 10% SL @ 0.05 kg a.i. ha^{-1} on 21 DAS	1424.00	3020.00
T_9 - Pendimethalin 38.7% CS @ 0.75 kg a.i. ha^{-1} on 3 DAS + Imazethapyr 10% SL @ 0.05 kg a.i. ha^{-1} on 21 DAS	1326.00	2785.00
T_{10} - One hand hoeing on 15 DAS + Imazethapyr 10% SL @ 0.05 kg a.i. ha^{-1} on 21 DAS	1083.00	2262.00
S.Em±	28.12	56.78
CD (P=0.05)	84.19	170.01

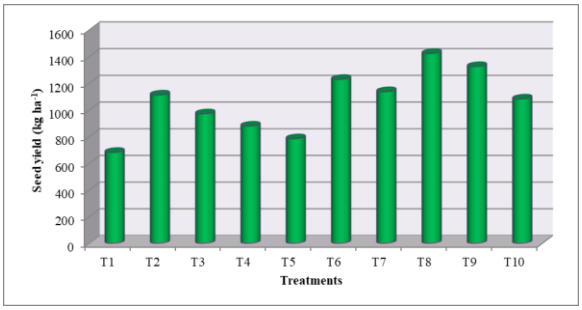

Fig. 1. Impact of weed management practices on seed yield of irrigated greengram.

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