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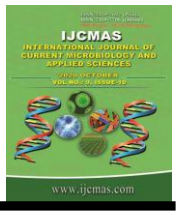

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# Effect of Sequential Application of Herbicides on Weed Density, Weed Dry Weight and Yield of Winter Irrigated Cotton

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**A B S T R A C T**

A field experiment was conducted to evaluate the effect of sequential application of herbicides on weed density, weed dry weight and yield of winter irrigated cotton in 2019-2020 at Agricultural College and Research Institute, Madurai, Tamil Nadu. In cotton field, lesser number of weeds $m^{-2}$ and weed dry weight $m^{-2}$ were observed in weed free check and was followed by pre-emergence(PE) application of pendimethalin at 1.0 kg $ha^{-1}$ at 3 DAS followed by one hand weeding at 30 DAS followed by pendimethalin 1.0 kg $ha^{-1}$ ($T_6$) (Lay by application). The highest seed cotton yield was obtained in weed free check ($T_7$) which was statistically on par with treatment pre-emergence application of pendimethalin at 1.0 kg $ha^{-1}$ at 3 DAS followed by one hand weeding at 30 DAS followed by pendimethalin 1.0 kg $ha^{-1}$ ($T_6$) (Lay by application). During the experimentation the highest B:C ratio was obtained in pre-emergence application of pendimethalin at 1.0 kg $ha^{-1}$ at 3 DAS followed by one hand weeding at 30 DAS followed by pendimethalin 1.0 kg $ha^{-1}$ ($T_6$)(Lay by application).

## Introduction

Cotton (*Gossypium hirsutum*.L) the "king of fibres" is one of the most important fibre crop of India. It has unique role in Indian economy as it has commercial value in textile industries. Globally, this naturally fibres contribute to one third of total fibres. Around the world, cotton plays a major role in sustaining livelihood of 5.8 million cotton farmers and 40-50 million people who are involved in post harvesting practices like cotton processing and trading activities. In India the cotton is grown in an area of 126.58 lakh hectares. India is a largest producer of cotton in the world with 5770 thousand metric tons but the productivity of cotton is poor with 454.20 kg $ha^{-1}$ (Indiastat, 2019). In Tamil Nadu, Cotton fibre has traditional importance and is cultivated in an area of 0.11 million ha with the production of 0.09 million tonnes, the average productivity of cotton in Tamil Nadu is 620 kg lint $ha^{-1}$ which is higher than national average of 577 kg lint $ha^{-1}$ (International cotton advisory committee, 2016). Cotton being a long duration crop, productivity of cotton would be reduced due to the incidence of different pests, diseases

and weeds during its life cycle. The initial slow growth of cotton coupled with wider spacing leads to abundant growth of weeds (Javaid and Anjum, 2006). To overcome this competation effective weed management practices should be carried out. Non chemical weed management is environmentally safe but it is highly expensive and it is associated with many labourers (Hozayn *et al.,* 2011).

To overcome this problem, use of herbicides has become an alternative method. Herbicide application is easier and economical to farmers compared to other weed management practices. Hence the present study deals with the effect of different weed management practices on weed density, weed dry weight and seed cotton yield.

## Materials and Methods

A field experiment was conducted at Agricultural College and Research Institute, Madurai as winter irrigated cotton in 2019-2020 to study the effect of sequential application of herbicides on weed density, weed dry weight and seed cotton yield under irrigated conditions. Cotton variety SVPR-6 was used for this experiment. The soil texture of the experimental field was sandy clay loam. The experiment was laid out in Randomized Block Design with eight treatments and replicated thrice.

The treatments consisted of $T_1$ - Application of Pendimethalin 1 kg a.i.ha$^{-1}$ as PE at 3 DAS followed by*(fb)* one hand weeding at 30 DAS,$T_2$-Application of Pendimethalin 1 kg a.i.ha$^{-1}$ as PE at 3 DAS *fb* directed spraying of glyphosate at1.25 kg.ha$^{-1}$ as POE at 30 DAS,$T_3$-Application of Pendimethalin 1 kg a.i.ha$^{-1}$ as PE at 3 DAS *fb* pyrithiobac sodium at1.5 kg a.i.ha$^{-1}$ as POE at 30 DAS,$T_4$-Application of Pendimethalin 1 kg a.i.ha$^{-1}$ as PE at 3 DAS + Intercropping with sun hemp and its incorporation at 45 days in cotton,$T_5$-Application of Pendimethalin 1 kg a.i.ha$^{-1}$ as PE at 3 DAS *fb* quizalofop-p-ethyl at 50 g a.i.ha$^{-1}$ as POE at 30 DAS,$T_6$ - Application of Pendimethalin 1 kg a.i. ha$^{-1}$ as PE at 3 DAS fb one hand weeding at 30 DAS fb pendimethalin 1 kg a.i. ha$^{-1}$ (Lay by Application), $T_7$-Weed free check, $T_8$-Unweeded check. All the herbicides were applied uniformly in the experimental plots with the help of knapsack sprayer. All the recommended agronomic and plant protection measures were adopted to raise the crop.

Observations on weed parameters *viz.,* weed density and weed dry weight were recorded. Weed count was recorded by placing four quadrat of size 0.5 m x 0.5 m in each plot and the weeds falling within the frames of the quadrat were counted, recorded and the mean values expressed in number m$^{-2}$. The weeds falling within the frames of the quadrats were collected and dried in hot air oven at 80$^0$C for 72 hrs. The weed density and weed dry weight were analysed after subjecting the original data to square root transformation [$\sqrt{x}$+0.5]. The treatment effects were compared using transformed means. The experimental data obtained during the course of investigation were subjected to statistical analysis by following the procedure of Gomez and Gomez (1984).

## Results and Discussion

### Weed flora

Major weed flora of the experimental field were *Chloris barbata, Cynodon dactylon, Echinochloa colonum* in grasses, *Cyperus esculentus and Cyperus rotundus* in sedges and *Convolvulus arvensis, Cleome viscosa, Commelina benghalensis, Trianthema portulacastrum, Phyllanthus niruri, Phyllanthus maderaspatensis* and *Boerhavia erecta* in broad leaved weeds.

**Table.1** Effect of weed management on weed density and weed dry weight in cotton at 20 and 60 DAS

| Treatment | Weed density (Nom$^{-2}$) | | Weed dry weight (gm$^{-2}$) | |
|---|---|---|---|---|
| | 20 DAS | 60 DAS | 20 DAS | 60 DAS |
| $T_{1}$- PE pendimethalin(1.0 kg ha$^{-1}$) *fb* hand weeding at 30DAS | 39.74 (6.33) | 82.22 (9.09) | 31.99 (5.69) | 123.85 (11.15) |
| $T_{2}$- PE pendimethalin (1.0 kg ha$^{-1}$) *fb* POE glyphosate (1.25 kg ha$^{-1}$) | 34.62 (5.92) | 68.98 (8.33) | 29.18 (5.43) | 93.43 (9.66) |
| $T_{3}$- PE pendimethalin (1.0 kg ha$^{-1}$) *fb* POE pyrithiobac sodium (1.5 kg ha$^{-1}$) | 35.53 (5.98) | 92.31 (9.63) | 31.23 (5.63) | 134.43 (11.62) |
| $T_{4}$- PE pendimethalin(1.0 kg ha$^{-1}$)+ sunhemp incorporation at 45 days | 39.55 (6.30) | 57.13 (7.57) | 30.14 (5.52) | 89.83 (9.50) |
| $T_{5}$- PE pendimethalin(1.0 kg ha$^{-1}$) *fb* POE quizalofop-p-ethyl (50 g ha$^{-1}$) at 30 DAS | 31.42 (5.64) | 74.22 (8.64) | 28.21 (5.35) | 100.96 (10.06) |
| $T_{6}$- PE pendimethalin(1.0 kg ha$^{-1}$) *fb* one hand weeding at 30 DAS *fb* pendimethalin(1.0 kg ha$^{-1}$) (Lay by Application) | 34.35 (5.87) | 39.50 (6.29) | 25.90 (5.13) | 52.67 (7.29) |
| $T_{7}$: Weed free check | 16.01 (4.02) | 13.43 (3.70) | 8.77 (3.03) | 8.77 (3.02) |
| $T_{8}$:Unweeded check | 228.50 (15.11) | 471.72 (21.70) | 142.69 (11.95) | 1076.34 (32.79) |
| SEd | 0.38 | 0.56 | 0.39 | 0.60 |
| CD at 5% | 0.78 | 1.17 | 0.82 | 1.25 |

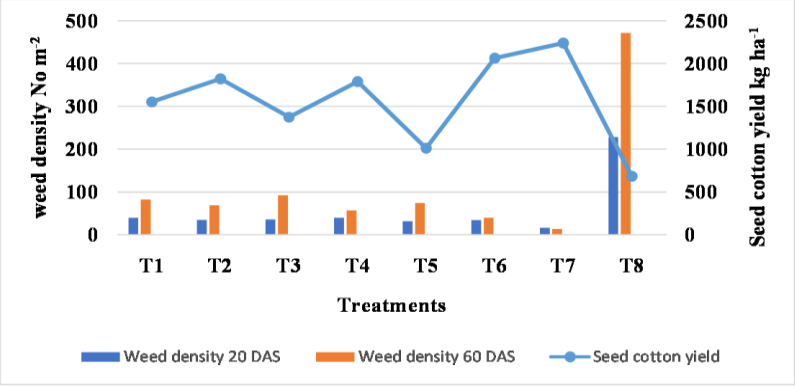
**Table.2** Effect of weed management on yield attributes of cotton

| Treatment | Bolls plant$^{-1}$ (Nos.) | Seed cotton yield |
|---|---|---|
| $T_{1}$- PE pendimethalin(1.0 kg ha$^{-1}$) *fb* hand weeding at 30DAS | 17.78 | 1554 |
| $T_{2}$- PE pendimethalin (1.0 kg ha$^{-1}$) *fb* POE glyphosate (1.25 kg ha$^{-1}$) | 21.03 | 1824 |
| $T_{3}$- PE pendimethalin (1.0 kg ha$^{-1}$) *fb* POE pyrithiobac sodium (1.5 kg ha$^{-1}$) | 15.60 | 1375 |
| $T_{4}$- PE pendimethalin(1.0 kg ha$^{-1}$)+ sunhemp incorporation at 45 days | 18.24 | 1791 |
| $T_{5}$- PE pendimethalin(1.0 kg ha$^{-1}$) *fb* POE quizalofop-p-ethyl (50 g ha$^{-1}$) at 30 DAS | 13.11 | 1012 |
| $T_{6}$- PE pendimethalin(1.0 kg ha$^{-1}$) *fb* one hand weeding at 30 DAS *fb* pendimethalin(1.0 kg ha$^{-1}$) (Lay by Application) | 21.61 | 2066 |
| $T_{7}$: Weed free check | 24.02 | 2242 |
| $T_{8}$:Unweeded check | 10.31 | 684 |
| SEd | 0.88 | 87.83 |
| CD at 5% | 1.83 | 183.49 |

**Table.3** Effect of weed management on economics

| Treatment | Cost of cultivation (Rs. ha$^{-1}$) | Gross monetary return (Rs. ha$^{-1}$) | Net monetary return (Rs. ha$^{-1}$) | B:C ratio |
|---|---|---|---|---|
| **$T_1$- PE pendimethalin (1.0 kg ha$^{-1}$) *fb* hand weeding at 30DAS** | 40969 | 76146 | 35177 | 1.86 |
| **$T_2$- PE pendimethalin (1.0 kg ha$^{-1}$) *fb* POE glyphosate (1.25 kg ha$^{-1}$)** | 38318 | 89392 | 51074 | 2.33 |
| **$T_3$- PE pendimethalin (1.0 kg ha$^{-1}$) *fb* POE pyrithiobac sodium (1.5 kg ha$^{-1}$)** | 60549 | 67375 | 6826 | 1.11 |
| **$T_4$- PE pendimethalin(1.0 kg ha$^{-1}$)+ sunhemp incorporation at 45 days** | 39309 | 87759 | 48450 | 2.23 |
| **$T_5$- PE pendimethalin(1.0 kg ha$^{-1}$) *fb* POE quizalofop-p-ethyl (50 g ha$^{-1}$) at 30 DAS** | 38199 | 49588 | 11389 | 1.30 |
| **$T_6$- PE pendimethalin(1.0 kg ha$^{-1}$) *fb* one hand weeding at 30 DAS *fb* pendimethalin(1.0 kg ha$^{-1}$) (Lay by Application)** | 43014 | 101234 | 58220 | 2.35 |
| **$T_7$: Weed free check** | 58304 | 109842 | 51538 | 1.88 |
| **$T_8$:Unweeded check** | 33824 | 33531 | -293 | 0.99 |

**Fig.1** Effect of weed density on seed cotton yield




## Weed density and weed dry weight

The weed density and weed dry weight significantly reduced by weed management practices (Table 1). At 20 days after sowing, lowest weed density and dry weight were recorded in weed free condition ($T_7$) and was followed by application of pendimethalin at 1.0 kg ha$^{-1}$ as PE at 3 DAS followed by POE quizalofop -p-ethyl 50 g ha$^{-1}$ ($T_5$). At 60 days after sowing, lowest weed density and dry weight were recorded in weed free

condition($T_7$) and was followed by the application of pendimethalin at 1.0 kg $ha^{-1}$ followed by one hand weeding at 30 DAS followed by pendimethalin 1.0 kg $ha^{-1}$ ($T_6$) (lay by application). Among the different herbicides, lay by application of pendimethalin has significant role in controlling grasses and broad leaved weeds. This might be due to influence of sequential use of pre emergence and post emergence herbicides. In this, initial flush of weeds where controlled by pre emergence while subsequent flush of weeds were controlled by combined effect of manual weeding and herbicide application resulted in inhibiting the germination and emergence of weeds over a longer period of time. Highest weed density and dry weight were observed in unweeded check ($T_8$). Similar findings were recorded by clewis and Wilcut (2008) (Fig. 1).

## Yield attributes

The data on the yield attributes are presented in Table 2. Weed management practices had positive influences on seed cotton yield. Highest seed cotton yield was recorded in weed free check ($T_7$), which was mainly due to minimum crop weed competition throughout the crop growth period, thus enabling the crop for maximum utilization of nutrients, moisture, light and space which favoured growth and yield components. This was comparable with PE pendimethalin 1.0 kg $ha^{-1}$ followed by one hand weeding at 30 DAS followed by pendimethalin 1.0 kg $ha^{-1}$ ($T_6$) (lay by application). It was followed by PE pendimethalin 1.0 kg $ha^{-1}$ followed by POE glyphosate 1.25 kg $ha^{-1}$($T_2$) and PE pendimethalin 1.0 kg $ha^{-1}$ + sun hemp incorporation at 45 DAS ($T_4$). This is conformity with the results obtained by Rao (2011). It might be due to timely and effective control of weeds by sequential application of pre emergence and in combination with one hand weeding with post emergence herbicide application.

The lowest yield attributes and seed cotton yield was resulted with unweeded check ($T_8$). Due to heavy infestation of weeds, the crop may not be able to obtain growth factors in optimum quantity resulting in reduced leaf area, dry matter production and poor yield. Presence of weeds throughout the growing season caused poor growth and cause yield reduction in unweeded plots (Bhoi *et al.*, 2007).

## Economics

In respect of economics highest gross returns of Rs.101234 $ha^{-1}$,net return of Rs.58220 $ha^{-1}$ with the B:C ratio of 2.35 was recorded in PE pendimethalin 1.0 kg $ha^{-1}$ followed by one hand weeding at 30 DAS followed by pendimethalin 1.0 kg $ha^{-1}$ ($T_6$) (Table 3).

From the field studies, it could be concluded that application of pendimethalin at 1.0 kg $ha^{-1}$ as PE at 3 DAS followed by one hand weeding at 30 DAS followed by pendimethalin 1.0 kg $ha^{-1}$ ($T_6$) lay by application method shows effective in controlling weeds compared to other treatments and recorded the higher seed cotton yield (2066 kg $ha^{-1}$) and B:C ratio (2.35). This lay by application method was more suitable in obtaining higher seed cotton yields and B:C ratio.

## References

Shazia Parveen, Rana Muhammad Iqbal, Muhammad Akram, Faheem Iqbal, Muhammad Tahir and Muhammad Rafay. 2017. Improvement of growth and productivity of cotton (*Gossypium hirsutum* L.) through foliar applications of naphthalene acetic acid. Semina: Ciencias Agrarias, Londrina, 38(2): p.561-570.

International Cotton Advisory Committee. 2016. From farm to fabric: Many faces of cotton. 74th plenary meeting.

Mumbai, India.

Rao, A.S. 2011. Evaluation of Pyrithiobac alone and in combination with grassy herbicides on weed control in cotton. In: Proceeding 5th world cotton research conference held at Mumbai, India, 406.

Clewis, S.B. and J.W. Wilcut. 2008. Economic assessment of weed management in strip and conventional tillage non-transgenic and transgenic cotton. Weed Technol. 27: 45-52.

Gomez, K.A, and Gomez, A.A. 1984. Statistical Procedures for Agriculture Research. A Wiley-Inter Science Publication. John Wiley & Sons, Inc., New York, USA.

Javaid, A., and T. Anjum. 2006. Control of *Parthenium hysterophorus* (L.) by aqueous extracts of allelopathic grasses. Pak. J. Bot., 38 (1):139-145.

Hozayn, M., A.A.A. Monem and E.M.A. Lateef. 2011. Crop residues, an effective tool for improving growth of wheat and suppression of some associated weeds. Allelopathy J. 27 (2):237-344.

Bhoi, S., R. Lakpale, H.C. Nanda and G.K. Shrivastava. 2007. Effect of weed management practices on productivity and economics of hybrid cotton in vertisols of Chhattisgarh plains. J. Agril. Issues, 12(2):118-121.

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