Original Research Article

Effects of Integrated weed management practices on weed parameters and yield of *Bt* cotton (*Gossypium hirsutum* L.).

ABSTRACT

Aim: To know the effect of integrated weed management on weed parameters and yield of bt cotton

Study design: Randomized complete block design

Place and duration of study: College of Agriculture Farm, Bheemaraynagudi between July 2021 and Feb 2022.

Methodology The field experiment was conducted during *Kharif* 2021 at Experimental block, College of Agriculture, Bheemarayanagudi. The soil of the experiment field was deep black clayey in texture. The experiment comprises 11 weed management practices *viz*., T_1: Pendimethalin 38.7% CS @ 750 g *a.i.*/ha as PE + Hand weeding @ 20-25 DAS and Intercultivation @ 55-60 DAS, T_2: Pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* Pyrithiobac Sodium 10 EC @ 75g *a.i.*/ha + Quizalofop ethyl 5 EC @ 37.5g *a.i.*/ha as PoE @ 25 DAS and Intercultivation @ 55-60 DAS. (Tank mix), T_3 : Pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* Pyrithiobac Sodium 10 EC @ 50g *a.i.*/ha + Quizalofop ethyl 5 EC @ 25 g *a.i.*/ha as PoE @ 25 DAS and Intercultivation @ 55-60 DAS, T_4 :Pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* Pyrithiobac Sodium 10 EC @ 75g *a.i.*/ha + Quizalofop ethyl 5 EC @ 37.5g *a.i.*/ha as PoE @ 25 DAS and Intercultivation @ 55-60 DAS, T_5 : Pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* Pyrithiobac Sodium 10 EC @ 100g *a.i.*/ha + Quizalofop ethyl 5 EC @ 50g *a.i.*/ha as PoE @ 25 DAS and Intercultivation @ 55-60 DAS, T_6 : Pyrithiobac Sodium 10 EC @ 50g *a.i.*/ha + Quizalofop ethyl 5 EC @ 25g *a.i.*/ha as PoE @ 25 DAS and Intercultivation @ 55-60 DAS, T_7: Pyrithiobac Sodium 10 EC @ 75g *a.i.*/ha + Quizalofop ethyl 5 EC @ 37.5g *a.i.*/ha as PoE @ 25 DAS and Intercultivation @ 55-60 DAS, T_8: Pyrithiobac Sodium 10 EC @ 100g *a.i.*/ha + Quizalofop ethyl 5 EC @ 50g *a.i.*/ha as PoE @ 25 DAS and Intercultivation @ 55-60 DAS, T_9: Farmers practice (Hand weeding @ 25 DAS and 2 intercultivations @ 50 and 75 DAS), T_{10}: Weedy check, T_{11}: Weed free check.

Results: Among the treatments, application of pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* pyrithiobac sodium 10 EC @ 100 g *a.i.*/ha + quizalofop ethyl 5 EC @ 50 g *a.i.*/ha as PoE (combi-product) @ 25 DAS and intercultivation @ 55-60 DAS recorded significantly lower weed density and higher weed control efficiency (82.39 %), also recorded higher seed cotton yield (2495 kg ha^{-1}) and stalk yield (4056 kg ha^{-1}) over other treatments.

Conclusion: Application of Pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb*

Pyrithiobac Sodium 10 EC @ 100g *a.i.*/ha + Quizalofop ethyl 5 EC @ 50g *a.i.*/ha as PoE @ 25 DAS and Intercultivation @ 55-60 DAS was found effective in controlling the weeds with coupled with higher seed cotton yield.

1.0 INTRODUCTION

Cotton (*Gossypium* spp.) is an important commercial fibre crop grown under diverse agro-climatic conditions around the world. It is called as “white gold” and “king of fibre crops”. It is cultivated in tropical and sub-tropical regions of more than 111 countries. It provides the main raw material for textile industry. Cotton is the most important global cash crop and controls economy of many nations. It provides gainful employment to several million people during its cultivation, trade, processing, manufacturing and marketing. Cotton textile industries are engines of economic growth in both developed and developing countries. The only genetically modified crop permitted for cultivation in the country by Govt. of India is *Bt* cotton that was introduced during 2002. *Bt* cotton is often portrayed as the technological revolution in Indian cotton cultivation which has changed the cotton scenario in India and pushed it to higher yields and to make India the second largest producer of cotton in the world.

Cotton, being a long duration, widely spaced and relatively slow growing crop during early growth stages is subjected to severe weed menace. Weed infestation in cotton has been reported to offer severe competition and causing yield reduction to an extent of 40 to 85 per cent. Weeds which emerge with cotton plants offer a severe competition and bring about considerable reduction in seed cotton yield. Weeds in cotton field can be effectively killed or their growth can be minimised at the germination stage itself by the use of suitable herbicide. They are capable of giving the crop a relatively better weed free situation in the early stage of crop. Pre-emergence use of pendimethalin and oxyflurofen control the weeds in early stages and thereby ensure efficient utilization of inputs put in by the farmers. The weeds (annual and perennial), which appear in the later period of crop growth could be controlled by combining cultural methods and post-emergence application of herbicides like quizalofop-ethyl and pyrithiobac-sodium. Thus, herbicides would solve the weed problem quite efficiently and economically (Kamble *et al*., [9]). Presently several herbicides are recommended that includes pre-emergence (Pendimethalin, Alachlor) and post emergence (Pyrithiobac sodium, propaquizafop, fenoxaprop, quizalofop ethyl) herbicides, in which pendimethalin is the popularly and widely used herbicide.

2.0 MATERIALS AND METHODS

The field experiment was conducted during *Kharif* 2021 at Experimental block, College of Agriculture, Bheemarayanagudi. The soil of the experiment field was deep black clayey in texture. The experiment comprises 11 weed management practices *viz*., T_1: Pendimethalin 38.7% CS @ 750 g *a.i.*/ha as PE + Hand weeding @ 20-25 DAS and Intercultivation @ 55-60 DAS, T_2: Pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* Pyrithiobac Sodium 10 EC @ 75g *a.i.*/ha + Quizalofop ethyl 5 EC @ 37.5g *a.i.*/ha as PoE @ 25 DAS and Intercultivation @ 55-60 DAS. (Tank mix), T_3 : Pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* Pyrithiobac Sodium 10 EC @ 50g *a.i.*/ha + Quizalofop ethyl 5 EC @ 25 g *a.i.*/ha as PoE @ 25 DAS and

Intercultivation @ 55-60 DAS, T_4 :Pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* Pyrithiobac Sodium 10 EC @ 75g *a.i.*/ha + Quizalofop ethyl 5 EC @ 37.5g *a.i.*/ha as PoE @ 25 DAS and Intercultivation @ 55-60 DAS, T_5 : Pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* Pyrithiobac Sodium 10 EC @ 100g *a.i.*/ha + Quizalofop ethyl 5 EC @ 50g *a.i.*/ha as PoE @ 25 DAS and Intercultivation @ 55-60 DAS, T_6 : Pyrithiobac Sodium 10 EC @ 50g *a.i.*/ha + Quizalofop ethyl 5 EC @ 25g *a.i.*/ha as PoE @ 25 DAS and Intercultivation @ 55-60 DAS, T_7: Pyrithiobac Sodium 10 EC @ 75g *a.i.*/ha + Quizalofop ethyl 5 EC @ 37.5g *a.i.*/ha as PoE @ 25 DAS and Intercultivation @ 55-60 DAS, T_8: Pyrithiobac Sodium 10 EC @ 100g *a.i.*/ha + Quizalofop ethyl 5 EC @ 50g *a.i.*/ha as PoE @ 25 DAS and Intercultivation @ 55-60 DAS, T_9: Farmers practice (Hand weeding @ 25 DAS and 2 intercultivations @ 50 and 75 DAS), T_{10}: Weedy check, T_{11}: Weed free check.

These treatments were laid out in randomized block design with three replications. Pre-emergence herbicides were applied at one day after sowing the crop, post-emergence herbicides were applied at 2-4 leaves stage of weeds using a hand operated knapsack sprayer fitted with flat fan nozzle and at a spray volume of 750 l ha^{-1} (pre-emergence) and 500 l ha^{-1} (post-emergence). *Bt* cotton hybrid (US-4708) was sown at a spacing of 90 cm X 60 cm. The RDF of 180 kg N, 90 kg P_2O_5 and 90 kg K_2O ha^{-1} was applied as per package of practices. Weed density was recorded by placing a quadrant of 0.5 m^2 at random in each plot and converted to m^2. The weed density and dry weight data were subjected to transformation $(x+0.5)^{1/2}$.

Weed control efficiency was calculated by the formula given by Mani *et al*. [13]

$$WCE\ (\%) = \frac{WCC\text{-}WCT}{WCC} \times 100$$

Where,

WCC = Dry weight of weeds in weedy check

WCT = Dry weight of weeds in treated plot

Weed index was calculated by the formula given by Gill and Vijayakumar [6]

$$WI\ (\%) = \frac{X - Y}{X} \times 100$$

Where, X- Seed cotton yield in weed free check plot

Y- Seed cotton yield in treated plot

3.0 RESULTS AND DISCUSSION

3.1 Effect on weeds

The predominant weed flora observed in the experimental field included grasses like, *Chloris barbata, Cynodon dactylon, Dactyloctenium aegyptium, Echinochloa colonum, Eleusine indica* and *Panicum repens.* Among broad leaved weeds, *Ageratum conyzoides, Celosia argentia, Commelina benghalensis, Parthenium hysterophorus, Phyllanthus niruri, Portulaca oleraceae, Tridax procumbens* and among sedges*, Cyperus rotundus* were noticed*.* Among the weed species, the densities of *Cyperus rotundus, Cynodon dactylon, Echinochloa colonum, Ageratum conyzoides, Commelina benghalensis* and *Portulaca oleraceae* were more than other weed species indicating their dominance and competitiveness with the cotton.

3.2 Total weed count (m^{-2})

The total number of weeds varied significantly at all stages of crop growth due to integrated weed management practices are presented in Table 1.

At 15 DAS, data revealed that application of herbicides *viz*., pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* pyrithiobac sodium 10 EC @ 100 g *a.i.*/ha + quizalofop ethyl 5 EC @ 50 g *a.i.*/ha as PoE @ 25 DAS and intercultivation @ 55-60 DAS resulted in significantly lower weed count (2.75 m^{-2}) when compared with other treatments however at par with application of pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* pyrithiobac sodium 10 EC @ 75 g *a.i.*/ha + quizalofop ethyl 5 EC @ 37.5 g *a.i.*/ha as PoE @ 25 DAS and intercultivation @ 55-60 DAS (2.82 m^{-2}). At 45 DAS, minimum total weeds were noticed in weed free check (0.71 m^{-2}) when compared with all the treatments. Among the IWM practices, application of pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* pyrithiobac sodium 10 EC @ 100 g *a.i.*/ha + quizalofop ethyl 5 EC @ 50 g *a.i.*/ha as PoE @ 25 DAS and intercultivation @ 55-60 DAS recorded significantly lower total number of weeds (4.24 m^{-2}) as compared to all the treatments. Weedy check recorded significantly higher total weeds (8.89 m^{-2}) compared to others. Similar trend was followed at 75 DAS.

At harvest, significantly higher numbers of total weeds were recorded in weedy check (16.05 m^{-2}) and lower number of total weeds were recorded in weed free check (0.71 m^{-2}). Among the treatments, pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* pyrithiobac sodium 10 EC @ 100 g *a.i.*/ha + quizalofop ethyl 5 EC @ 50 g *a.i.*/ha as PoE @ 25 DAS and intercultivation @ 55-60 DAS recorded significantly higher total weeds (8.15 m^{-2}) than pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* pyrithiobac sodium 10 EC @ 75 g *a.i.*/ha + quizalofop ethyl 5 EC @ 37.5 g *a.i.*/ha as PoE @ 25 DAS and intercultivation @ 55-60 DAS (8.37 m^{-2}) and pyrithiobac sodium 10 EC @ 75 g *a.i.*/ha + quizalofop ethyl 5 EC @ 37.5 g *a.i.*/ha as PoE @ 25 DAS and intercultivation @ 55-60 DAS (8.48 m^{-2}) and were on par with each other and recorded significantly lower weeds than weedy check. At 45 DAS, total weeds count was reduced as due to the effect of post-emergent spray of pyrithiobac sodium + quizalofop ethyl (combi-product). It was mainly due to the application of herbicides along with intercultivation could be attributed to weed free situation during initial stages and further control of new flush of weeds by intercultivation at 55 DAS and thus, reduced the weed competition during critical initial period of cotton. Similar results were reported by Hiremath *et al*. (2013). Similarly, at the later part of the crop growth period, PoE application of herbicide followed by intercultivation or post emergence application of pyrithiobac sodium controlled the weeds. The results were in conformity with the findings of Ma *et al*. [11], Veeraputhiran and Srinivasan [20], Iqbal *et al*. [8], Tariq *et al.*[17] and Chen *et al*. [4].

3.3 Total weed dry matter (g m^{-2})

Observation on total dry matter of weeds were recorded at 15, 45, 75 DAS and at harvest and they varied significant at all the growth stages of cotton crop (Table 1).

At 15 DAS, weed free check recorded significantly lower total weeds dry matter (0.71 g) and significantly higher total weed dry matter was recorded in weedy check (7.56 g) over rest of other treatments. Among IWM practices, application of pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* pyrithiobac sodium 10 EC @ 100 g *a.i.*/ha + quizalofop ethyl 5 EC @ 50 g *a.i.*/ha as PoE @ 25 DAS and intercultivation @ 55-60 DAS resulted in significantly lower weeds dry matter (3.53 g) when compared with all other treatments except pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* pyrithiobac sodium 10 EC @ 75 g *a.i.*/ha + quizalofop ethyl 5 EC @ 37.5 g *a.i.*/ha as PoE @ 25 DAS and intercultivation @ 55-60 DAS (3.64 g).

At 45 DAS, application of herbicides *viz.,* pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* pyrithiobac sodium 10 EC @ 100 g *a.i.*/ha + quizalofop ethyl 5 EC @ 50 g *a.i.*/ha as PoE @ 25 DAS and intercultivation @ 55-60 DAS produced significantly lower weeds dry matter (5.80 g) compared to other treatments howerever at par with application of pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* pyrithiobac sodium 10 EC @ 75 g *a.i.*/ha + quizalofop ethyl 5 EC @ 37.5 g *a.i.*/ha as PoE @ 25 DAS and intercultivation @ 55-60 DAS (5.86 g). Weedy check registered highest weeds dray matter (14.18 g).Similar trend was followed at 75 DAS.

At harvest, significantly higher total dry matter of weeds was recorded in weedy check (25.76 g) and lower with weed free check (0.71 g) treatment. Further, among the treatments, application of pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* pyrithiobac sodium 10 EC @ 100 g *a.i.*/ha + quizalofop ethyl 5 EC @ 50 g *a.i.*/ha as PoE @ 25 DAS and intercultivation @ 55-60 DAS recorded significantly lower total weed dry matter (10.99 g) than other but at with pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* pyrithiobac sodium 10 EC @ 75 g *a.i.*/ha + quizalofop ethyl 5 EC @ 37.5 g *a.i.*/ha as PoE @ 25 DAS and intercultivation @ 55-60 DAS (11.29 g).

The total weed dry matter followed similar trend to that of weed density. The pre-emergent application of pendimethalin recorded the lesser total weed dry matter indicated that this herbicide was efficient in controlling weeds. Similarly, the post-emergent application of pyrithiobac sodium + quizalofop ethyl (combi-product) controlled emerged weeds after 15 to 20 DAS. These herbicides controlled the weeds up to 35-40 days after application and later intercultivation controlled the weeds. The results were in line with the findings of Manalil *et al*. [12], Miller *et al*. [14], Yogananda *et al*. [22], Iqbal *et al*. [8], Tariq *et al*. [17] and Chen *et al*. [4].

3.4 Weed control efficiency (%)

The crop yield is directly proportional to weed control efficiency (WCE) in any crop. Weed control efficiency of cotton crop at different stages of crop growth was profoundly influenced by the different weed management practices.

Observation on weed control efficiency was recorded at 15, 45, 75 DAS and at harvest and they varied significantly at all growth stages of crop (Table 2).

At 15 DAS, weed free check recorded significantly higher weed control efficiency (100 %) over all the treatments. Among IWM practices, application of pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* pyrithiobac sodium 10 EC @ 100 g *a.i.*/ha + quizalofop ethyl 5 EC @ 50 g *a.i.*/ha as PoE @ 25 DAS and intercultivation @ 55-60 DAS showed found to be significantly superiority in weed control efficiency (78.91 %) over other treatments except application of pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* pyrithiobac sodium 10 EC @ 75 g *a.i.*/ha + quizalofop ethyl 5 EC @ 37.5 g *a.i.*/ha as PoE @ 25 DAS and intercultivation @ 55-60 DAS (77.56 %). The weed control efficiency was significantly lower in weedy check (0.00 %).

At 45 DAS, application of herbicides *viz.,* pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* pyrithiobac sodium 10 EC @ 100 g *a.i.*/ha + quizalofop ethyl 5 EC @ 50 g *a.i.*/ha as PoE @ 25 DAS and intercultivation @ 55-60 DAS recorded higher weed control efficiency (83.48 %) as compared to others however at par with pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* pyrithiobac sodium 10 EC @ 75 g *a.i.*/ha + quizalofop ethyl 5 EC @ 37.5 g *a.i.*/ha as PoE @ 25 DAS and intercultivation @ 55-60 DAS (82.54 %). Similar trend was followed at 75 DAS.

At harvest, significantly higher weed control efficiency was noticed in weed

free check (100 %) compared to all the treatments. Among the treatments, application of pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* pyrithiobac sodium 10 EC @ 100 g *a.i.*/ha + quizalofop ethyl 5 EC @ 50 g *a.i.*/ha as PoE @ 25 DAS and intercultivation @ 55-60 DAS recorded significantly higher weed control efficiency (81.85 %) compared to other treatments except pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* pyrithiobac sodium 10 EC @ 75 g *a.i.*/ha + quizalofop ethyl 5 EC @

Table 1. Total weed count and total weed dry matter in *Bt* cotton as influenced by integrated weed management practices at different stages of crop growth

Treatments	Total weeds count (m^{-2})				Total weed dry matter (g m^{-2})			
	15 DAS	**45 DAS**	**75 DAS**	**At harvest**	**15 DAS**	**45 DAS**	**75 DAS**	**At harvest**
T_1	3.71 (13.24)	5.35 (28.15)	6.79 (45.57)	9.20 (84.25)	4.92 (23.68)	7.31 (52.92)	9.31 (86.24)	12.60 (158.18)
T_2	3.47 (11.57)	5.14 (25.94)	6.59 (42.88)	9.04 (81.25)	4.47 (19.49)	6.96 (47.94)	8.88 (78.39)	12.19 (148.14)
T_3	3.27 (10.18)	5.07 (25.25)	6.43 (40.91)	8.92 (79.13)	4.22 (17.27)	6.73 (44.86)	8.75 (76.14)	12.05 (144.74)
T_4	2.82 (7.46)	4.34 (18.34)	5.85 (33.71)	8.37 (69.58)	3.64 (12.72)	5.96 (35.00)	8.02 (63.86)	11.29 (127.04)
T_5	2.75 (7.07)	4.24 (17.48)	5.70 (31.96)	8.15 (65.94)	3.53 (11.96)	5.80 (33.11)	7.79 (60.13)	10.99 (120.33)
T_6	3.76 (13.63)	5.45 (29.19)	6.95 (47.79)	9.28 (85.65)	5.14 (25.96)	7.46 (55.18)	9.54 (90.53)	12.87 (165.11)
T_7	2.88 (7.80)	4.46 (19.41)	6.01 (35.58)	8.48 (71.43)	3.73 (13.39)	6.11 (36.80)	8.21 (66.95)	11.56 (133.06)
T_8	3.19 (9.65)	4.82 (22.74)	6.23 (38.34)	8.74 (75.99)	4.00 (15.52)	6.51 (41.95)	8.49 (71.61)	11.87 (140.54)
T_9	3.64 (12.77)	5.28 (27.39)	6.66 (43.84)	9.15 (83.24)	4.61 (20.73)	7.05 (49.21)	9.11 (82.55)	12.37 (152.43)
T_{10}	4.70 (21.64)	8.89 (78.49)	12.47 (154.99)	16.05 (257.01)	7.56 (56.73)	14.18 (200.52)	20.28 (410.74)	25.76 (663.41)
T_{11}	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)
S. Em±	**0.03**	**0.04**	**0.06**	**0.07**	**0.04**	**0.06**	**0.08**	**0.11**
C. D. at 5%	**0.08**	**0.12**	**0.17**	**0.21**	**0.11**	**0.17**	**0.23**	**0.33**

Data in the parenthesis indicates the transformed data

37.5 g *a.i.*/ha as PoE @ 25 DAS and intercultivation @ 55-60 DAS (80.84 %). Significantly lower weed control efficiency was noticed in weedy check (0.00 %) over others.

At 15 DAS, higher weed control efficiency was observed in weed free check due to continuous removal of weeds as and when observed which reduced weed dry weight throughout the crop growth period. Pre-emergent application of pendimethalin recorded higher weed control efficiency which was attributed to effective suppression of weeds. At later stages, post emergence application of herbicide pyrithiobac sodium + quizalofop ethyl (combi-product) or intercultivation controlled the later germinated weeds thus recorded lesser weed dry weight and finally recorded higher WCE. Similar results were reported by Hiremath *et al.* [7], Charles *et al*. [3], Sharma *et al*. [16] and Blaise [1].

3.5 Weed index (%)

Among the herbicidal treatments, significantly lower weed index was recorded with application of T_5: Pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* Pyrithiobac Sodium 10 EC @ 100g *a.i.*/ha + Quizalofop ethyl 5 EC @ 50g *a.i.*/ha as PoE @ 25 DAS and Intercultivation @ 55-60 DAS (4.01 %). However, it was found on par with the application of T_4: Pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* Pyrithiobac Sodium 10 EC @ 75g *a.i.*/ha + Quizalofop ethyl 5 EC @ 37.5g *a.i.*/ha as PoE @ 25 DAS and Intercultivation @ 55-60 DAS (7.24 %). Weedy check recorded significantly higher weed index (34.62 %) than the rest of the treatments. These finding is in line with Choudhary *et al*. [5] and Yang *et al*. [21].

3.6 Seed cotton yield and stalk yield of *Bt* cotton

Among herbicidal application treatments, significantly higher seed cotton yield and stalk yield was recorded with the application of T_5: Pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* Pyrithiobac Sodium 10 EC @ 100g *a.i.*/ha + Quizalofop ethyl 5 EC @ 50g *a.i.*/ha as PoE @ 25 DAS and Intercultivation @ 55-60 DAS (2495 and 4056 kg ha^{-1}, respectively). However, it was found on par with the application of T_4: Pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* Pyrithiobac Sodium 10 EC @ 75g *a.i.*/ha + Quizalofop ethyl 5 EC @ 37.5g *a.i.*/ha as PoE @ 25 DAS and Intercultivation @ 55-60 DAS (2403 and 4018 kg ha^{-1}, respectively). Significantly lower seed cotton yield and stalk yield was observed in weedy check (1694 and 2817 kg ha^{-1}, respectively). The increase in yield in the herbicidal treatments was mainly due to the significant higher weed control efficiency and lower weed index observed in these treatments over the remaining treatments. The enhanced yield under these treatments was due to control of weeds which helped in enhancing the availability of nutrients, space, sunlight and water resulting in better growth and development of crop plants. These results were in conformity with those reported by Khan and Chauhan [10], Tariq *et al*. [17] and Cahoon and York [2]. These results were in conformity with findings of Toler *et al*. [19], Pinnamaneni, [15] and Chen *et al*. [4].

4.0 CONCLUSION

The results revealed that application of Pendimethalin 38.7 % CS @ 750 g *a.i.*/ha as PE *fb* Pyrithiobac Sodium 10 EC @ 100g *a.i.*/ha + Quizalofop ethyl 5 EC @ 50g *a.i.*/ha as PoE @ 25 DAS and Intercultivation @ 55-60 DAS was found effective in controlling the weeds with higher coupled with higher seed cotton yield.

Table 2. Weed control efficiency in *Bt* cotton as influenced by integrated weed management practices at different stages of crop growth

Treatments	Weed control efficiency (%)				Weed index (%)	Seed cotton yield (kg ha^{-1})	Stalk yield (kg ha^{-1})
	15 DAS	45 DAS	75 DAS	At harvest			
T_1	58.26	73.61	79.00	76.16	15.50	2189	3584
T_2	65.58	76.05	80.88	77.63	13.71	2231	3654
T_3	69.56	77.63	81.46	78.18	12.47	2268	3774
T_4	77.56	82.54	84.45	80.84	7.24	2403	4018
T_5	78.91	83.48	85.35	81.85	4.01	2495	4056
T_6	54.24	72.48	77.96	75.11	17.10	2148	3551
T_7	76.40	81.65	83.70	79.94	8.76	2364	3899
T_8	72.64	79.08	82.57	78.82	10.79	2311	3827
T_9	63.46	75.46	79.90	77.02	14.85	2206	3614
T_{10}	0.00	0.00	0.00	0.00	34.62	1694	2817
T_{11}	100.00	100.00	100.00	100.00	0.00	2527	4112
S. Em±	**0.48**	**0.32**	**0.26**	**0.32**	**1.17**	**32**	**52**
C. D. at 5%	**1.41**	**0.95**	**0.76**	**0.95**	**3.46**	**93**	**151**

5.0 REFERENCES

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