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# EFFICACY OF DIFFERENT HERBICIEDES ON WEED CONTROL IN HIGH DENSITY PLANTING IN COTTON

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## ABSTRACT

**A field experiment was carried out during rainy season of 2014 and 2015 at Cotton research Unit of Dr. Panjabrao Deshmukh Krishi Vidhyapeeth, Akola to study the relative performance of different herbicides on weed control in high density planting system of cotton (AKH 081) grown in clay soil. The experiment was laid out in randomized block design with three replications involving ten treatments viz., weedy check, cultural practices and different herbicides (Pre-emergence pendimethalin and Post-emergence Quazalofop ethyl, Pyrithiobac sodium and glyfosate at different stages). The results revealed that, application of pendimethalin 38.7 CS PE 1.25 a. i. kg ha$^{-1}$ + 1 hoeing at 30 DAS + 1 hand weeding at 45 DAS recorded consistently low weed density, weed dry weight and higher weed control efficiency by saving one hand weeding and one hoeing compared to weed free check (2 HW + 2H) and ultimately reflected higher seed cotton yield and stalk yield in these treatments under HDPS cotton.**

**(Key words: Weeds, herbicides, pendimethalin , HDPS cotton)**

## INTRODUCTION

Cotton the "white gold or the king of fibers" is one of the most important commercial crops in india. In india, cotton cultivation provides livelihood for over 4 million families. USDA anticipated a marginal reduction in India's production would be around 400 lakh bales of 170 kg each during year 2015-16, taking India to the first position. However, among the 84 old cotton growing nations, Indian productivity is at 32 $^{nd}$ place.

India has11.26 million hectares cotton area with the production of 3.70 miliion bales and average lint yield of 524 kg ha$^{-1}$ during year 2015. It is lower than the previous year yield of 527 kg ha$^{-1}$ because of deficient rains in the later half of the monsoon season and incidence of pest in Gujrat and Punjab. The key role that cotton plays in our country can be gauged from the fact that nearly 15 million farmers spread out in more than 10 states are dependent on cotton cultivation (Prasad and Prasad, 2009).

Among the various factors responsible for deplorable low yield of cotton, weed problem is a serious production constraints in cotton, which may cause yield loss from 40 to 85 per-cent depending upon nature and intensity of weeds (Nalayini and Kandasamy, 2013). Severe weed infestation is common one at initial stage and most unfavorable to growth of cotton plant. But mostly often due to incessant rains during *kharif* season, not only hand weeding and intercultivation become difficult in cotton, but also manual weeding has costly due to scarcity of laborers and hence, it has become extremely difficult to keep the crop weed free. Therefore, a chemical weed management as common trend in cotton. However, an investigation was carried out to find out suitable herbicides in application alone or in combination with cultural practices to maximum control of weeds under high density planting system of cotton in our region. High density planting system is new approach to increase yield by accommodation of more plants unit$^{-1}$ area and reduce weed management opportunity due to shortly closer canopy of the cotton plant.

## MATERALS AND METHODS

The present investigation "Efficacy of different herbicides on productivity of HDPS cotton" was undertaken during *kharif* season of 2014-15 and 2015-16 on clay soil at the farm of Cotton Research Unit, Dr. PDKV., Akola in randomized block design with ten treatments replicated thrice. In this trial one pre emergence weedicide and three post emergence herbicides were used. The treatments consists of pendimethalin 38.7 CS PE @ 1.25 kg a.i. ha$^{-1}$ *fb* hoeing at 30 DAS and one hand weeding at 45 DAS, quizalofop-ethyl 5 EC @ 0.075 kg a.i. ha$^{-1}$ POE (2-4 leaf weed stage) *fb* hoeing at 45 DAS, pyrithiobac sodium 10 EC @ 0.075 kg a.i. ha$^{-1}$ POE (2-4 leaf weed stage) *fb* hoeing at 45 DAS, pendimethalin 38.7 CS PE @ 1.25 kg a.i. ha$^{-1}$ *fb* quizalofop-ethyl 5 EC @ 0.075 kg a.i. ha$^{-1}$ POE (2-4 leaf weed stage), pendimethalin 38.7 CS PE @ 1.25 kg a.i. ha$^{-1}$ *fb*

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pyrithiobac sodium 10 EC @ 0.075 kg a.i. ha$^{-1}$ PoE (2-4 leaf weed stage), pendimethalin 38.7 CS PE @ 1.25 kg a.i. ha$^{-1}$ *fb* quizalofop-ethyl 5 EC @ 0.060 kg a.i. ha$^{-1}$ + pyrithiobac sodium 10 EC POE @ 0.062 kg a.i. ha$^{-1}$ POE (tank mix) ( 2-4 leaf weed stage), weed free check, weedy check (No weed control), *In –situ* mulching of greengram and Hoeing at 15-20 DAS *fb* Glyphosate 71 G @ 1.5 kg ha$^{-1}$ at 45 DAS. Application of Pendimethalin was done on next day of sowing and post –emergence herbicides as per treatments using hand operated knapsack sprayer fitted with flat fan nozzle. Cotton seed variety AKH 081 was sown in broad bed furrow (BBF) with tractor at spacing of 60 x 10 cm on 18 th July 2014 and 18th June 2015 with seed rate of 20 kg ha$^{-1}$, RDF 60:30:30 NPK kg ha$^{-1}$, half N and full P and K applied at sowing and 50 % N was applied at square initiation stage. The rain fall of season was 560.9 and 591 mm in 26 and 29 rainy days and no rain fall received after 9 September and 18th September during 2014 and 2015 respectively. Monsoon was delayed by one month in 2014, whereas monsoon onset was timely but dry spell of 25 days occurred after germination. Weed population was counted from one m$^2$ area at 30 DAS intervals from sowing to harvest. Weed dry weight was recorded from the fixed area in each plot. In the field *Cyperus rotunds, Cynodon dactylon, Commelina benghalensis* among monocot species and *Euphorbia geniculata, Euphorbia hitra*, *Digera arvensis, Parthenium hysterophorus,* and *Celosia argentea* among the dicot species were found dominant weeds during experimentation.

## RESULTS AND DISCUSSION

The presented data in table 1 and 2 revealed that weed count and weed biomass were significantly influenced by the various weed management practices. At 30 DAS lowest weed count (4.38) was recorded with the application of pendimethalin *fb* quazalofop ethyl among treatments studied followed by treatment pendimethalin *fb* tank mix (4.45), pendimethalin fb pyrithiobac sodium (4.59), weed free check (5.11) and pendimethalin 38.7 CS PE @ 1.25 a.i. kg ha$^{-1}$ + one hoeing at 30 DAS + one hand weeding at 45 DAS (5.19) during year 2014. During year 2015, lowest weed count was noticed with treatment weed free check followed by treatment with pendimethalin 38.7 CS PE @ 1.25 a.i. kg ha$^{-1}$ + one hoeing at 30 DAS + one hand weeding at 45 DAS. It might be due to 25 days dry spell. Effect of post emergence herbicides was effective due to high evaporation rate.

At 60 DAS, lowest weed count was recorded with treatment weed free check (3.14) followed by application of pendimethalin 38.7 CS PE @ 1.25 a. i. kg ha$^{-1}$ + one hoeing at 30 DAS + one hand weeding at 45 DAS (3.89), hoeing at 15-20 DAS + spray of glyfosate at 45 DAS (3.01) and *in-situ* mulching of green gram in cotton row (3.05). Similar trend was found at 90 DAS and onwards during both the years of experimentation. This might be due to suppression of weeds by pre-emergence herbicides application at 30 DAS. While a hand weeding operation, glyfosate spray and *in- situ* mulching of green gram at 45 DAS found best control of weeds over rest of the treatments. This indicates, effective control of weeds due to broad action of chemical herbicides at initial stage (30 DAS) and left over weeds were controlled by physical weed control methods i.e. manual weeding at 45 DAS. These results corroborated with findings of Ali *et al*. (2013), who reported that cotton cultivated in alternate furrow planting system and use of pre-emergence pendimethalin in combination with interculturing + alternate row earthing up provided an efficient weed control over longer period of time. Kamble *et al.* (2006) reported that application of Pendimethalin @ 7.50 kg ha$^{-1}$ (pre-emergence) + 1 HW at 15 DAS + 1 hoeing at 30 DAS and weed free check were best treatments to control weed bio-mass at harvest in groundnut.

Dry matter of weeds was influenced significantly due to various weed control treatments. Weed free check recorded less weed dry matter at all stages among weed management practices during both the years. Among the herbicidal treatments, application of pendimethalin 38.7 CS PE @ 1.25 a.i. kg ha$^{-1}$ + one hoeing at 30 DAS + one hand weeding at 45 DAS (183.4 kg plant$^{-1}$) and hoeing at 15-20 DAS + Glyfosate spray 71 G @ 1.5 a.i. kg ha$^{-1}$ at 45 DAS (20.84 g) recorded less dry matter over rest of the treatments at all the stages during both the years. However, at 60 DAS weed frèe check recorded significantly less weed dry matter which was at par with the application of pendimethalin 38.7 CS PE @ 1.25 a.i. kg ha$^{-1}$ + one hoeing at 30 DAS + one hand weeding at 45 DAS and hoeing at 15-20 DAS + Glyfosate spray 71 G @ 1.5 a.i. kg ha$^{-1}$ at 45 DAS. Application of pendimethalin at early growth stages of cotton helps to establish better and make early growth under reduced weed situation. However, pre-emergence or post –emergence herbicides alone were not effective in controlling the weeds for longer periods, thus combination of chemical and physical weed control treatments are necessary to cotton crops. These results are in conformity with the findings of Ganavel and Babu (2008) and Nalini *et al*. (2011). They reported that Pendimethalin (PE) combination with cultural practices up to 60 DAS produced lower weed dry weight. Dilbaugh *et al.* (2009) reported that, application of 33 % Pendimethalin controlled 82.5 % broad leaf and 84 % narrow leaf weed in cotton. Maximum value of weed control efficiency (Table 3) obtained under weed free check treatment (86-93 % and 75-83 %) at all stages among all treatments, while application of pendimethalin 38.7 CS PE @ 1.25 a.i. kg ha$^{-1}$ + one hoeing at 30 DAS + one hand weeding at 45 DAS was found suitable to control weeds having WCE of 88% and 70-80 % during 2014 and 2015 respectively. Paslawar *et al*. (2015) reported that weed control efficiency was higher with integrated weed management practices in cotton. Seed cotton yield was significantly highest (Table 4) with weed free check [1.75 (2014) and 2.84 (2015) t ha$^{-1}$] followed by application of pendimethalin 38.7 CS PE @ 1.25 a.i. kg ha$^{-1}$ + one hoeing at 30 DAS + one hand weeding at 45 DAS [1.63 (2104) and 2.65 (2105) t ha$^{-1}$) over rest of the treatments during both the years of experimentation.

**Table 1. Total weed count as influenced by different weed management practices**

| | Treatments | Total weed number/ $m^2$ | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | *kharif* season 2014 | | | | *kharif* season 2015 | | | |
| | | 30 DAS | 60 DAS | 90 DAS | At Harvest | 30 DAS | 60 DAS | 90 DAS | At Harvest |
| $T_1$ | Pendimethalin 38.7 CS PE @ 1.25 a.i. kg $ha^{-1}$ *fb* hoeing at 30 DAS and one hand weeding at 45 DAS. | 5.19 (26.68) | 3.89 (14.67) | 3.78 (14.02) | 4.15 (17.00) | 3.76 (13.67) | 3.94 (15.00) | 4.42 (19.00) | 3.94 (15.00) |
| $T_2$ | Quizalofop ethyl 5 EC@ 0.075 kg a.i. $ha^{-1}$ POE (2 -4 leaf weed stage) *fb* hoeing at 45 DAS | 5.55 (30.67) | 5.76 (32.91) | 5.87 (34.25) | 6.34 (39.91) | 5.87 (34.00) | 5.34 (28.00) | 5.82 (33.33) | 4.81 (22.67) |
| $T_3$ | Pyrithiobac sodium 10 EC @ 0.075 kg a.i. $ha^{-1}$ POE (2-4 leaf weed stage) *fb* hoeing at 45 DAS | 5.57 (30.75) | 5.55 (30.50) | 5.92 (34.75) | 5.84 (33.85) | 5.70 (32.00) | 4.92 (23.67) | 5.52 (30.00) | 4.85 (23.00) |
| $T_4$ | Pendimethalin 38.7 CS PE @ 1.25 kg a.i. $ha^{-1}$ *fb* Quizalofop ethyl 5 EC@ 0.075 kg a.i. $ha^{-1}$ POE (2 -4 leaf weed stage) | 4.38 (18.90) | 5.36 (28.53) | 6.25 (38.84) | 6.55 (42.63) | 4.53 (20.00) | 5.24 (27.00) | 5.49 (29.67) | 4.95 (24.00) |
| $T_5$ | Pendimethalin 38.7 CS PE @ 1.25 kg a.i. $ha^{-1}$ *fb* Pyrithiobac sodium 10 EC @ 0.075 kg a.i. $ha^{-1}$ POE (2 -4 leaf weed stage). | 4.59 (20.84) | 5.75 (32.83) | 6.36 (40.20) | 6.36 (40.23) | 4.74 (22.00) | 5.12 (25.67) | 5.37 (28.33) | 4.92 (23.67) |
| $T_6$ | Pendimethalin 38.7 CS PE @ 1.25 kg a.i. $ha^{-1}$ *fb* Quizalofop ethyl 5 EC@ 0.060 kg a.i. /ha + Pyrithiobac sodium 10 EC POE @ 0.062 kg a.i. $ha^{-1}$ POE (tank mix) ( 2 -4 leaf weed stage). | 4.45 (19.53) | 5.37 (28.56) | 6.01 (35.89) | 6.49 (41.84) | 4.49 (19.67) | 4.88 (23.33) | 5.08 (25.33) | 4.78 (22.33) |
| $T_7$ | Weed free check (2 Weedings *fb* 2 Hoeings) | 5.11 (23.33) | 3.34 (11.00) | 3.36 (11.07) | 3.89 (14.67) | 3.33 (10.67) | 3.29 (10.33) | 3.98 (15.33) | 3.81 (14.00) |
| $T_8$ | Weedy check | 8.09 (65.17) | 9.30 (86.17) | 10.26 (105.1) | 10.65 (113.21) | 7.31 (53.00) | 8.26 (67.67) | 8.51 (72.00) | 8.20 66.67) |
| $T_9$ | *In- situ* mulching of Greengram in cotton. | 5.43 (29.26) | 4.05 (16.18) | 5.40 (28.91) | 5.39 (28.80) | 6.39 (40.33) | 3.98 (15.33) | 4.49 (19.67) | 5.28 (27.33) |
| $T_{10}$ | Hoeing at 15 -20 DAS *fb* Glyphosate 71 G @ 1.50 kg a.i. $ha^{-1}$ as directed spray at 45 DAS | 5.28 (27.30) | 4.01 (15.83) | 4.25 (17.67) | 4.45 (19.67) | 4.67 (21.33) | 3.67 (13.00) | 4.14 (16.67) | 4.22 (17.33) |
| SE(m) ± | | 0.27 | 0.26 | 0.18 | 0.19 | 0.33 | 0.32 | 0.34 | 0.31 |
| CD at 5 % | | 0.81 | 0.76 | 0.53 | 0.56 | 0.98 | 0.94 | 1.00 | 0.93 |

Upper values are transformed value $\sqrt{x + 0.2}$, Figures in parentheses are original values.

**Table 2. Weed dry weight as influenced by different weed management practices**

| Treatments | Dry weight of total weeds kg ha$^{-1}$ | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2014 | | | | 2015 | | | |
| | 30 DAS | 60DAS | 90 DAS | At Harvest | 30 DAS | 60 DAS | 90 DAS | At Harvest |
| $T_1$ Pendimethalin 38.7 CS PE @ 1.25 kg a.i. ha$^{-1}$ *fb* hoeing at 30 DAS and one hand weeding at 45 DAS. | 63.9 | 183.4 | 250.9 | 248.2 | 53.6 | 138.4 | 304.4 | 255.3 |
| $T_2$ Quizalofop ethyl 5 EC @ 0.075kg a.i. ha$^{-1}$ POE (2 -4 leaf weed stage) *fb* hoeing at 45 DAS | 163.7 | 525.9 | 421.6 | 448.0 | 94.2 | 277.4 | 610.3 | 345.0 |
| $T_3$ Pyrithiobac sodium 10 EC @ 0.075 kg a.i. ha$^{-1}$ POE (2-4 leaf weed stage) *fb* hoeing at 45 DAS | 173.0 | 509.6 | 419.5 | 410.0 | 88.2 | 274.5 | 603.9 | 328.5 |
| $T_4$ Pendimethalin 38.7 CS PE @ 1.25 kg a.i. ha$^{-1}$ *fb* Quizalofop ethyl 5 EC @ 0.075 kg a.i. ha$^{-1}$ POE (2-4 leaf weed stage) | 89.6 | 385.7 | 479.5 | 475.0 | 55.0 | 266.5 | 586.3 | 367.8 |
| $T_5$ Pendimethalin 38.7 CS PE @ 1.25 kg a.i. ha$^{-1}$ *fb* Pyrithiobac sodium 10 EC @ 0.075 kg a.i. ha$^{-1}$ POE (2-4 leaf weed stage). | 99.5 | 418.1 | 440.0 | 480.0 | 58.1 | 256.2 | 563.7 | 340.9 |
| $T_6$ Pendimethalin 38.7 CS PE @ 1.25 kg a.i. ha$^{-1}$ *fb* Quizalofop ethyl 5 EC @ 0.060 kg a.i. ha$^{-1}$ + Pyrithiobac sodium 10 EC POE @ 0.062 kg a.i. ha$^{-1}$ POE (tank mix) ( 2-4 leaf weed stage). | 94.4 | 371.2 | 445.8 | 524.9 | 56.1 | 255.6 | 562.4 | 370.1 |
| $T_7$ Weed free check (2weedings *fb* 2 hoeings) | 57.3 | 170.0 | 163.3 | 171.5 | 43.9 | 122.1 | 268.7 | 236.8 |
| $T_8$ Weedy check | 458.0 | 1513.6 | 1995.0 | 2110.7 | 180.3 | 736.6 | 1520.6 | 1027.4 |
| $T_9$ *In- situ* mulching of Greengram in cotton. | 151.2 | 208.7 | 315.3 | 360.5 | 114.5 | 189.4 | 416.6 | 266.2 |
| $T_{10}$ Hoeing at 15 -20 DAS *fb* Glyphosate 71 G @ 1.50 kg a.i. ha$^{-1}$ as directed spray at 45 DAS | 119.1 | 203.2 | 188.5 | 201.9 | 55.7 | 152.0 | 334.4 | 272.9 |
| SE(m) ± | 9.8 | 30.7 | 34.4 | 36.3 | 5.0 | 17.5 | 38.5 | 24.7 |
| CD at 5 % | 29.1 | 91.3 | 102.1 | 107.2 | 15.0 | 52.0 | 114.4 | 71.8 |

**Table3. Weed control efficiency (%) as influenced by different weed management practices**

| | Treatments | Weed control efficiency (%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 2014 | | | | 2015 | | | |
| | | 30 DAS | 60DAS | 90 DAS | At Harvest | 30 DAS | 60 DAS | 90 DAS | At Harvest |
| $T_1$ | Pendimethalin 38.7 CS PE @ 1.25 kg a.i. ha $^{-1}$ *fb* hoeing at 30 DAS and one hand weeding at 45 DAS. | 87.48 | 87.88 | 87.42 | 88.24 | 70.28 | 81.22 | 79.97 | 75.15 |
| $T_2$ | Quizalofop ethyl 5 EC@ 0.075kg a.i. ha $^{-1}$ POE (2 -4 leaf weed stage) *fb* hoeing at 45 DAS | 64.25 | 65.26 | 78.87 | 78.77 | 47.75 | 62.34 | 59.85 | 66.42 |
| $T_3$ | Pyrithiobac sodium 10 EC @ 0.075 kg a.i. ha $^{-1}$ POE (2-4 leaf weed stage) *fb* hoeing at 45 DAS | 62.24 | 66.33 | 78.97 | 80.58 | 51.08 | 62.74 | 60.27 | 68.03 |
| $T_4$ | Pendimethalin 38.7 CS PE @ 1.25 kg a.i. ha $^{-1}$ *fb* Quizalofop ethyl 5 EC @ 0.075 kg a.i. ha POE (2-4 leaf weed stage) | 80.44 | 74.52 | 75.97 | 77.50 | 69.48 | 63.82 | 61.43 | 64.20 |
| $T_5$ | Pendimethalin 38.7 CS PE @ 1.25 kg a.i. ha $^{-1}$ *fb* Pyrithiobac sodium 10 EC @ 0.075 kg a.i. ha$^{-1}$ POE (2-4 leaf weed stage). | 78.28 | 72.38 | 77.94 | 77.26 | 67.74 | 65.22 | 62.91 | 66.82 |
| $T_6$ | Pendimethalin 38.7 CS PE @ 1.25 kg a.i. ha $^{-1}$ *fb* Quizalofop ethyl 5 EC @ 0.060 kg a.i. ha $^{-1}$ + Pyrithiobac sodium 10 EC POE @ 0.062 kg a.i. ha $^{-1}$ POE (tank mix) ( 2-4 leaf weed stage). | 79.40 | 75.48 | 77.65 | 75.13 | 68.88 | 65.30 | 63.00 | 63.98 |
| $T_7$ | Weed free check (2weedings *fb* 2 hoeings) | 86.05 | 88.77 | 91.81 | 91.87 | 75.64 | 83.42 | 82.32 | 76.95 |
| $T_8$ | Weedy check | - | - | - | - | - | - | - | - |
| $T_9$ | *In- situ* mulching of Greengram in cotton. | 66.99 | 86.58 | 84.19 | 82.92 | 36.50 | 79.37 | 78.00 | 73.44 |
| $T_{10}$ | Hoeing at 15 -20 DAS *fb* Glyphosate 71 G @ 1.50 kg a.i. ha$^{-1}$ as directed spray at 45 DAS | 74.00 | 86.21 | 90.55 | 90.43 | 69.08 | 74.30 | 72.59 | 74.09 |

**Table 4 Seed cotton yield and stalk yield (t ha$^{-1}$) as influenced by different weed management practices**

| | Treatments | Seed cotton yield t ha$^{-1}$ | | Stalk yield t ha$^{-1}$ | |
|---|---|---|---|---|---|
| | | 2014 | 2015 | 2014 | 2015 |
| $T_1$ | Pendimethalin 38.7 CS PE @ 1.25 kg a.i. ha$^{-1}$ *fb* hoeing at 30 DAS and one hand weeding at 45 DAS. | 1.63 | 2.65 | 2.67 | 4.07 |
| $T_2$ | Quizalofop ethyl 5 EC@ 0.075kg a.i. ha POE (2 -4 leaf weed stage) *fb* hoeing at 45 DAS | 1.29 | 1.94 | 2.14 | 3.10 |
| $T_3$ | Pyrithiobac sodium 10 EC @ 0.075 kg a.i. ha$^{-1}$ POE (2-4 leaf weed stage) *fb* hoeing at 45 DAS | 1.18 | 1.99 | 1.87 | 3.22 |
| $T_4$ | Pendimethalin 38.7 CS PE @ 1.25 kg a.i. ha$^{-1}$ *fb* Quizalofop ethyl 5 EC @ 0.075 kg a.i. ha POE (2-4 leaf weed stage) | 0.99 | 1.90 | 1.54 | 3.16 |
| $T_5$ | Pendimethalin 38.7 CS PE @ 1.25 kg a.i. ha$^{-1}$ *fb* Pyrithiobac sodium 10 EC @ 0.075 kg a.i. ha$^{-1}$ POE (2-4 leaf weed stage). | 1.07 | 2.06 | 1.69 | 3.17 |
| $T_6$ | Pendimethalin 38.7 CS PE @ 1.25 kg a.i. ha$^{-1}$ *fb* Quizalofop ethyl 5 EC @ 0.060 kg a.i. ha$^{-1}$ + Pyrithiobac sodium 10 EC POE @ 0.062 kg a.i. ha$^{-1}$ POE (tank mix) ( 2-4 leaf weed stage). | 1.14 | 2.22 | 1.82 | 3.51 |
| $T_7$ | Weed free check (2weeding s *fb* 2 hoeings) | 1.75 | 2.84 | 2.75 | 4.12 |
| $T_8$ | Weedy check | 0.26 | 0.91 | 0.43 | 1.29 |
| $T_9$ | *In- situ* mulching of Greengram in cotton. | 1.48 | 2.17 | 2.39 | 3.40 |
| $T_{10}$ | Hoeing at 15 -20 DAS *fb* Glyphosate 71 G @ 1.50 kg a.i. ha$^{-1}$ as directed spray at 45 DAS | 1.55 | 2.29 | 2.59 | 3.45 |
| | SE(m) ± | 0.07 | 0.15 | 0.14 | 0.23 |
| | CD at 5% | 0.18 | 0.43 | 0.42 | 0.67 |

The results of the present study indicated that application of pendimethalin + cultural practices produced higher WCE among weed management practices throughout the crop period which was comparable with weed free check by saving one hand weeding and one hoeing and gave the broad spectrum weed control as a result of longer persistency in the soil profile. Manual weeding is difficult especially during monsoon season due to intermittent rains and consequently the moisture content of the soil would be too high for mechanical manipulation. On the other hand, weed control by glyphosate showed phyto-toxicity effect on lower leaves of cotton plant in high density planting system caused injury to plant. Thus, application of pendimethalin 38.7 CS @ 1.25 a.i. kg ha$^{-1}$ + one hoeing at 30 DAS + one hand weeding at 45 DAS is a quit suitable to overcome weed problem in HDPS cotton.

## REFERENCES


Ali Hakoomat, A. Shoukat, A. Shakeel, S. Naeem, M. Arooj, A. Mahmood and A.N. Shahzad, 2013. Integrated weed management in cotton cultivated in the alternate-furrow planting system J. Food Agric. and Environ. **11** (3&4) : 1664- 1669.

Dilbaugh Muhammad, Muhammad Naveed Afzal, Ilyas Raza and Muhammad Azam Mian, 2009. Effect of mechanical and chemical weed control on the productivity of cotton. Pak. J. Weed Sci. Res. **15** (2-3):117-122.

Kamble, A. B., R.N. Chavan, Y.R. Jadhav and A.A. Pisal, 2006. Integrated weed management in *kharif* groundnut. J. Soil and Crops, **16**(1) : 61-64.

Ganavel, I. and S. Babu, 2008. Integrated weed management in irrigated hybrid cotton. Agric. Sci. Digest, **28**(2):93-96.

Nalini, K., P. Muthukrishnan and C. Chinnusamy, 2011. Evaluation of pendimithalin 38.7 EC on weed management in winter irrigated cotton. Madras agric. J.**98**(4-6) : 165-168.

Nalayani, P. and O.S. Kandasamy, 2013. Classical growth analysis for cotton hybrids as influenced by N level and weed control methods. Res. Crops. **3**(2): 303-306.

Paslawar, A.N., P.G. Ingole , M.D. Yenpreddiwar, A.S. Deotalu, V.M. Bhale and T. H. Rathod, 2015. Weed management in high density planting system in cotton . 25th Ascian-Pasific weed science society conference on "Weed Science for sustainable Agriculture, Environment and Biodiversity" at Hyderabad, India, pp. 334.

Prasad ,V. R. and Y.E. Prasad, 2009. Study of economics of cotton and its competing crops in Guntur district of Andra Pradesh. Mysore J. Agric. Sci. **43**: 234-238.


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