



STUDIES ON WEED CONTROL IN EGYPTIAN COTTON

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INTRODUCTION

Cotton (*Gossypium barbadense*, L.) is the most important fiber crop. Egyptian cotton (*Gossypium barbadense*, L.) account for more than 99 percent of the world supply of raw cotton for factory use. It is also an important source of the vegetable oil that can be estimated (15-20%) among its many other valuable uses. The cultivated area of cotton in Egypt was 238,998 feddan and production was 1,199,827.96 (kantar/fed.) with an average yield of 5.02 (kantar/ fed.) in 2019 (CATGO). (kantar = 157.5 kg).

There are several constraints for low productivity in cotton like competition from weeds, micronutrient deficiency (Boron and Zinc), boll shedding, leaf reddening, sucking pests and poor agronomic practices.

Weeds are a major factor limiting production of cotton in Egypt. Weeds compete throughout the life cycle of main crop but it is more sensitive to presence of weeds at a specific period during its life cycle. The battle for water, light, nutrients and space between weeds and the crop can reduce cotton yield population being a long duration crop yield potential of cotton crop is affected more than 40% due to weeds (**Khan and Khan 2003**), which significantly affect the rate of germination, number of plants in feddan, plants height, number of fruiting branches per plant, obstruction of the harvesting process and less acre production.

It is known as critical period of weed crop competition. During this, period weeds cause maximum yield losses. Critical period of

Summary

Cotton is the most important fiber crop. Where the broad-leaved and grassy weeds compete in the first life of the cotton plant, which causes competition with plants per unit area, light, water and nutrients, which causing a loss of up to 40% of seed cotton yield. Therefore, two field experiments were carried out at Shandaweel Agricultural Research Station, (A R C), Sohag Governorate, Egypt in of 2016 and 2017 summer seasons to evaluate some cultural practices and herbicides on weed control in cotton crop (Giza 90) and some technological traits with the aim:

1. Determine the critical period for weed competition for cotton crop.
2. The effect of some weed control treatments on yield, yield components and yield quality of cotton and its associated weeds.

First experiment:-

The first field experiment aimed to study the critical period between weeds and cotton crop, comprised in sixteen treatments as follows:-

*** Period of weed-free condition.**

1. Weed free for the whole season (at three months pre harvest.).
2. Weed free for two weeks after sowing (WAS).
3. Weed free for four (WAS).
4. Weed free for six (WAS).
5. Weed free for eight (WAS).
6. Weed free for ten (WAS).
7. Weed free for twelve (WAS).
8. Weed free for fourteen (WAS).

The above treatments were left without weeding for the remainder of growing season.

***Period of weed competition.**

9. Weed competition for two (WAS).
10. Weed competition for four (WAS).
11. Weed competition for six (WAS).
12. Weed competition for eight (WAS).
13. Weed competition for ten (WAS).
14. Weed competition for twelve (WAS).
15. Weed competition for fourteen (WAS).
16. Weed competition for the whole season.

Second experiment:-

The second field experiment aimed to study the effect of some weed control treatments on yield, yield components and yield quality of cotton and its associated weeds where twelve treatments were tested as follows: -

13. Amex (Butralin) applied into the soil surface after planting but before irrigation (pre-emergence) at rate (2.5 L/fed.) (T1).
14. Gesagard (Prometryn) applied as pre-emergence at rate (1.5 L/fed.) (T2).
15. Stomp Extra (Pendimethalin) applied as (pre-em.) at rate (1.7 L/fed.) (T3).
16. Amex (Butralin) applied as (pre-em.) at rate (2.5 L/fed.) followed by Fusilade Super (Fluazifop-p- butyl) applied as (post-em.) foliar spraying at 30 days after planting (DAP) at rate (2 L/fed.) (T4).
17. Gesagard (Prometryn) applied as (pre-em.) at rate (1.5 L/fed.) followed by Fusilade Super (Fluazifop-p- butyl) applied as (post-em.) at 30 (DAP) at rate (2 L/fed.) (T5).

18. Stomp Extra (Pendimethalin) applied as (pre-em.) at rate (1.7 L/fed.) followed by Fusilade Super (Fluazifop-p-butyl) applied as (post-em.) at 30 (DAP) at rate (2 L/fed.) (T6).
19. Amex (Butralin) applied as (pre-em.) at rate (2.5 L/fed.) followed by Goal (Oxyflurofen) applied on the soil surface after sowing but before irrigation (pre-em.) at rate (0.750 L/fed.) (T7).
20. Gesagard (Prometryn) applied as (pre-em.) at rate (1.5 L/fed.) followed by Goal (Oxyflurofen) applied as (pre-em.) at rate (0.750 L/fed) (T8).
21. Stomp Extra (Pendimethalin) applied as (pre-em.) at rate (1.7 L/fed.) followed by Goal (Oxyflurofen) applied as (pre-em.) at rate (0.750 L/fed) (T9).
22. Gesagard (Prometryn) applied as (pre-em.) at rate (1.5 L/fed.) followed by Stomp Extra (Pendimethalin) applied as (pre-em.) at rate (1.7 L/fed.) (T10).
23. Hand hoeing thrice at 18, 30 and 45 (DAP) (T11).
24. Un-weeded check (control) (T12).

The results can be summarized as follows.

Experiment 1:

1-Effect the critical period competition on broad-leaved, grassy and total weeds (gm/m²).

The application of weed free for the whole season treatment followed by the application of the treatments weed competition for 2 weeks after sowing (WAS), weed free for 14 (WAS) and weed competition for 4 (WAS) significantly decreased the dry weight of broad-leaved, grassy and total weeds (g/m²) as compared with weed competition for whole season treatment in 2016 and 2017 seasons.

2- Effect of weed competition on growth characteristics:

2.1. Plant height (cm.).

The application of weed free for the whole season treatment followed by weed free for fourteen (WAS) treatment, weed free for twelve (WAS) treatment and weed competition for two (WAS) treatment significantly increased plant height (cm) as compared with weed competition for whole season treatment in 2016 and 2017 seasons.

2.2. Number of fruiting branches /plant.

The highest value of number of fruiting branches /plant was obtained by the application of weed free for whole season treatment or weed free for fourteen (WAS) treatment followed by the treatment weed free for ten (WAS) and weed free for twelve (WAS) as compared with weed competition for whole season treatment in 2016 season. In 2017 season, the application of weed free for the whole season treatment or weed free for fourteen (WAS) treatment and weed free for twelve (WAS) treatment significantly increased number of fruiting branches /plant as compared with weed competition for whole season.

2.3. Position of first fruiting node.

Weed free and weed competition treatments were not effect on position of first fruiting node in both seasons. The lowest values of position of first fruiting node obtained by weed free for the whole season or weed free for 14 WAS weed free for 12 WAS, weed competition for 2 WAS and weed competition for 4 WAS by (6.0), while, the high values of position of first fruiting node obtained by weed competition for the whole season by (7.0) in the first season.

In the second season, the lowest values of position of first fruiting node obtained by weed free for the whole season, weed free for 14 WAS weed free for 12 WAS, weed free for 10 WAS and weed competition for 2

WAS by (6.0) while, the high values of position of first fruiting node obtained by weed competition for the whole season by (7.0).

3. Effect of weed competition on yield and yield components:

3.1. Seed cotton yield (Kentar/fed.).

Weed free for whole season treatment significantly increased seed cotton yield (kentar/fed.) followed by the treatments weed free for fourteen (WAS), weed free for twelve (WAS), weed free for ten (WAS), weed competition for two (WAS), weed competition for four (WAS) and weed free for eight (WAS) as compared with weed competition for whole season treatment in 2016 season. In 2017 season, the application of weed free for the whole season treatment significantly affected by increases in seed cotton yield (kentar /fed.) followed by the treatments weed free for fourteen (WAS), weed competition for two (WAS), weed free for twelve (WAS), weed free for ten (WAS), weed competition for four (WAS) and weed free for eight (WAS) as compared with weed competition for whole season treatment.

3.2. Lint yield (Kentar /fed.).

Weed free for whole season treatment gave significantly increases in lint yield (kentar/fed.) followed by weed free for fourteen (WAS) treatment , weed free for twelve (WAS) treatment, weed competition for two (WAS) treatment and weed free for ten (WAS) as compared with weed competition for whole season treatment in 2016 and 2017 seasons.

3.3. Lint percentage (Lint%).

The application of weed free for the whole season treatment followed by treatments weed free for fourteen (WAS), weed competition for two (WAS), weed free for twelve (WAS) and weed free for ten (WAS) treatments gave significantly increases in lint percentage (Lint%). as compared with weed competition for whole season treatment in 2016 and 2017 seasons.

3.4. Boll weight (g).

Weed free for whole season treatment significantly affected by increases in boll weight (g) followed by the treatments weed competition for two (WAS) and weed free for fourteen (WAS) as compared with weed competition for whole season treatment in 2016 season. In 2017 season, the application of weed free for the whole season treatment only gave the highest significantly increases in boll weight (g) as compared to weed competition for whole season treatment.

3.5. Number of bolls/plant (1000/fed.)

The application of weed free for the whole season treatment followed by the treatments weed free for fourteen (WAS) and weed free for twelve (WAS) gave significantly increases in number of bolls/plant (1000/fed.) as compared with weed competition for whole season treatment in 2016 and 2017 seasons.

3.6. Seed index (%).

The application of weed free for the whole season treatment followed by weed free for fourteen (WAS) gave significantly increases in seed index (%) as compared with weed competition for whole season treatment in 2016 and 2017 seasons.

3.7. Lint index (%).

Weed free for whole season treatment significantly affected by increases in lint index (%) as compared with weed competition for whole season treatment in 2016 and 2017 seasons.

4. Effect of weed competition on fiber properties:

4.1. Fiber fineness (F.F.).

The application of weed free for the whole season treatment followed by the treatments weed free for twelve (WAS) or weed free for fourteen (WAS) gave the height values in fiber fineness (F.F.) as compared

with weed competition for whole season treatment in 2016 and 2017 seasons.

4.2. Fiber strength (F.S).

The application of weed free for fourteen (WAS) treatment followed by weed free for twelve (WAS) treatment and weed free for ten (WAS) treatment gave the height values in fiber strength (F.S.) as compared with weed competition for whole season treatment in 2016 and 2017 seasons.

4.3. Upper half mean (U.H.M).

The application of weed free for the whole season treatment followed weed free for fourteen (WAS) treatment in 2016 and 2017 seasons gave the height values in upper half mean (U.H.M).

4.4. Uniformity ratio (U.R).

The application of weed free for the whole season treatment followed weed free for fourteen (WAS) treatment and weed free for twelve (WAS) treatment gave the height values in uniformity ratio (U.R) as compared to weed competition for whole season treatment in 2016 season while weed free for the whole season treatment gave only the height value in uniformity ratio (U.R) as compared to weed competition for whole season treatment in 2017 season.

Determination critical period of weed control as affected by weed – free and weed – competition.

The critical period of weed control over according to the recommended allowed losing yield value (10 %) being 7.6 and 8.1 weeks for weed free for and 2.4 and 2.6 weeks for weed competition for quadratic model in the first and second season, respectively.

For lint yield the critical period of weed control over according to the recommended allowed losing yield value (10 %) being 10.6 and 10.1 weeks for weed free for and 1.4 and 1.5 weeks for weed competition for quadratic model in the first and second season, respectively.

Experiment 11:

1. Effect of weed control treatments on weed.

1.1 Dry weight of broad leaf weeds (g/m²).

Using of hand hoeing thrice at 18, 30 and 45 (DAP), Gesagard applied as (pre-em.) at rate (1.5 L/fed.) followed by Goal applied as (pre-em.) at rate (0.750 L/fed.) and Gesagard applied as (pre-em.) at rate (1.5 L/fed.) followed by Stomp Extra applied as (pre-em.) at rate (1.7 L/fed.) significantly decreased the dry weight of broad-leaved weeds at 60 and 75 days after planting (DAP), respectively, as compared with un-weeded treatment in 2016 season.

In 2017 season, hand hoeing, Gesagard followed by Stomp Extra and Gesagard followed by Goal significantly decreased the dry weight of broad-leaved weeds at 60 and 75 (DAP), respectively, as compared with un-weeded treatment.

1.2. Dry weight of grassy weeds (g/m²).

The application of hand hoeing, Amex applied as (pre-em.) at rate (2.5 L/fed.) followed by Fusilade Super applied as (post-em.) foliar spraying at 30 days after planting (DAP) at rate (2 L/fed.), Gesagard applied as (pre-em.) at rate (1.5 L/fed.) followed by Fusilade Super applied as (post-em.) at 30 (DAP) at rate (2 L/fed.) and Stomp Extra applied as (pre-em.) at rate (1.7 L/fed.) followed by Fusilade Super applied as (post-em.) at 30 (DAP) at rate (2 L/fed.) significantly decreased the dry weight of grassy weeds, respectively, as compared with un-weeded treatment at 60 (DAP) in 2016 season. At 75 (DAP) applying, Amex followed by Fusilade Super, Amex applied as (pre-em.) at rate (2.5 L/fed.) followed by Goal applied on the soil surface after sowing but before irrigation (pre-em.) at rate (0.750 L/fed.), Gesagard followed by Fusilade Super and hand hoeing significantly decreased the dry weight of grassy weeds, respectively, as compared with un-weeded treatment in 2016 season.

In 2017 season, at 60 (DAP) the application of hand hoeing, Amex followed by Fusilade Super, Gesagard followed by Fusilade Super and Stomp Extra followed by Fusilade Super significantly decreased the dry weight of grassy weeds, respectively, as compared with un-weeded treatment. At 75 (DAP) using hand hoeing, Gesagard followed by Fusilade Super, Gesagard followed by Stomp Extra and Stomp Extra followed by Fusilade Super significantly decreased the dry weight of grassy weeds, respectively, as compared with un-weeded treatment.

1.3. Dry weight of total weeds (g/m²).

At 60 and 75 (DAP) the application of hand hoeing, Gesagard followed by Goal, Stomp Extra followed by Goal and Gesagard followed by Stomp Extra significantly decreased the dry weight of total weeds, respectively, as compared with un-weeded treatment in 2016 season.

In 2017 season, at 60 (DAP) the application of hand hoeing, Gesagard followed by Fusilade Super and Amex followed by Fusilade Super significantly decreased the dry weight of total weeds, respectively, as compared with un-weeded treatment. At 75 (DAP) the application of hand hoeing, Gesagard followed by Stomp Extra, Gesagard applied as pre-emergence at rate (1.5 L/fed.), Amex followed by Goal and Gesagard followed by Goal significantly decreased the dry weight of total weeds, respectively, as compared with un-weeded treatment.

2. Effect of weed control treatments on growth characteristics:

2.1. Plant height (cm.).

In 2016 season, applying hand hoeing, Gesagard followed by Stomp Extra and Gesagard followed by Goal significantly increased the plant height (cm), respectively, as compared with un-weeded treatment. In 2017 season, the application of hand hoeing, Gesagard followed by Stomp Extra and Gesagard significantly increased the plant height (cm), respectively, as compared with un-weeded treatment.

2.2. Number of fruiting branches /plant.

In 2016 season, applying hand hoeing, Gesagard followed by Stomp Extra and Gesagard followed by Goal significantly increased the number of fruiting branches/plant, respectively, as compared with un-weeded treatment. In 2017 season, the application of hand hoeing, Gesagard followed by Stomp Extra and Gesagard significantly increased the number of fruiting branches/plant, respectively, as compared with un-weeded treatment.

2.3. Position of first fruiting node.

Weed control treatments were not affected on position of first fruiting node in both seasons. The lowest values of position of first fruiting node were obtained from hand hoeing, Gesagard followed by Stomp Extra and Gesagard followed by Goal in the 1st season. The lowest values of position of first fruiting node were obtained from hand hoeing, Gesagard followed by Stomp Extra in the 2nd season.

3. Effect of weed control treatments on yield and yield components:

3.1. Seed cotton yield (Kentar /fed.).

In 2016 season, the application of hand hoeing, Gesagard followed by Stomp Extra and Gesagard followed by Goal significantly increased seed cotton yield (kentar/fed.), respectively, as compared with un-weeded treatment. In 2017 season, using hand hoeing, Gesagard followed by Stomp Extra and Gesagard significantly increased seed cotton yield (kentar/fed.), respectively, as compared with un-weeded treatment.

3.2. Lint yield (Kentar/fed.).

In 2016 season, the application of hand hoeing, Gesagard followed by Stomp Extra and Gesagard followed by Goal significantly increased lint yield (kentar/fed.), respectively, as compared with un-weeded treatment. In 2017 season, using hand hoeing, Gesagard followed by Stomp Extra and Gesagard significantly increased lint yield (kentar/fed.), respectively, as

compared with un-weeded treatment. These results due to increase the ability of nutrients and improved the growth characters due to prevent weed/cotton competition.

3.3. Lint percentage (Lint%).

In 2016 season, applying hand hoeing, Gesagard followed by Stomp Extra and Gesagard followed by Goal significantly increased lint percentage, respectively, as compared with un-weeded treatment. In 2017 season, the application of hand hoeing, Gesagard followed by Stomp Extra and Gesagard significantly increased lint percentage, respectively, as compared with un-weeded treatment.

3.4. Boll weight (g):

In 2016 season, the application of hand hoeing, Gesagard followed by Stomp Extra and Gesagard followed by Goal significantly increased boll weight (g), respectively, as compared with un-weeded treatment. In 2017 season, using hand hoeing, Gesagard followed by Stomp Extra and Gesagard significantly increased boll weight (g), respectively, as compared with un-weeded treatment.

3.5. Number of bolls /plant(1000/fed.).

In 2016 season, the application of hand hoeing, Gesagard followed by Stomp Extra and Gesagard followed by Goal significantly increased the number of bolls/plant (1000/fed.), respectively, as compared with un-weeded treatment. In 2017 season, the applying of hand hoeing, Gesagard followed by Stomp Extra and Gesagard significantly increased the boll weight (g), respectively, as compared with un-weeded treatment.

3.6. Seed index (%).

In 2016 season, the application of hand hoeing, Gesagard followed by Stomp Extra and Gesagard followed by Goal significantly increased the seed index (%), respectively, as compared with un-weeded treatment. In 2017 season, using hand hoeing, Gesagard followed by Stomp Extra and

Gesagard significantly increased the seed index (%), respectively, as compared with un-weeded treatment.

3.7. Lint index (%).

In 2016 season, the application of hand hoeing, Gesagard followed by Stomp Extra and Gesagard followed by Goal significantly increased the lint index (%), respectively, as compared with un-weeded treatment. In 2017 season, using hand hoeing, Gesagard followed by Stomp Extra and Gesagard significantly increased the lint index (%), respectively, as compared with un-weeded treatment.

4. Effect of weed control treatments on fiber properties:

4.1. Fiber fineness (F.F.).

In 2016 season, the highest values were obtained from the application of hand hoeing, Gesagard followed by Stomp Extra and Gesagard followed by Goal while, the lowest value was obtained from un-weeded treatment. In 2017 season, the highest values were obtained from using hand hoeing, Gesagard followed by Stomp Extra and Gesagard while, the lowest value was obtained from un-weeded treatment.

4.2. Fiber strength (F.S).

In 2016 season, the highest values were obtained from the application of hand hoeing, Gesagard followed by Stomp Extra and Gesagard followed by Goal while, the lowest value was obtained from un-weeded treatment. In 2017 season, the highest values were obtained from using hand hoeing, Gesagard followed by Stomp Extra and Gesagard while, the lowest value was obtained from un-weeded treatment.

4.3. Upper half mean (U.H.M).

In 2016 season, the highest values were obtained from applying hand hoeing, Gesagard followed by Stomp Extra and Gesagard followed by Goal while, the lowest value was obtained from untreated treatment. In 2017 season, the highest values were obtained from the application of hand

hoeing, Gesagard followed by Stomp Extra and Gesagard while, the lowest value was obtained from un-weeded treatment.

4.4. Uniformity ratio (U.R).

In 2016 season, the highest values were obtained from applying hand hoeing, Gesagard followed by Stomp Extra and Gesagard followed by Goal while, the lowest value was obtained from un-weeded treatment. In 2017 season, the highest values were obtained from the application of hand hoeing, Gesagard followed by Stomp Extra and Gesagard while, the lowest value was obtained from un-weeded treatment.

Conclusion

Under the conditions of this study, the critical period for weed competition for cotton yield is from 18 to 55 days of planting, and control methods must be available to overcome weed competition during this period. The use of hand hoeing can be recommended three times 18, 30, 45 days of planting or integration between two Gesagard at a rate of 1.5 L/fed., followed by Stomp Extra per-emergence 1.7 L/fed, to control total weeds (grassy and broad-leaved weeds), and obtain the highest seed cotton yield (kentar/fed).

- 9- أعطت معاملة العزيق ثم معاملة جيساجارد متبوعاً بـ ستومب اكسترا و جيساجارد متبوعاً بـ الجول زيادة معنوية في نسبة المئوية للشعر بالمقارنة بمعاملة الكنترول في كلا الموسمين.
- 10- أعطت معاملة العزيق، جيساجارد متبوعاً بـ ستومب اكسترا و جيساجارد متبوعاً بـ الجول زيادة معنوية وزن اللوزة بالجرام بالمقارنة بمعاملة الكنترول في كلا الموسمين.
- 11- أعطت معاملة العزيق ، جيساجارد متبوعاً بـ ستومب اكسترا و جيساجارد متبوعاً بـ الجول زيادة معنوية عدد اللوز للنبات (بألف للفدان) بالمقارنة بمعاملة الكنترول في كلا الموسمين.
- 12- أعطت معاملة العزيق ، جيساجارد متبوعاً بـ ستومب اكسترا و جيساجارد متبوعاً بـ الجول أعطت زيادة معنوية في النسبة المئوية لدليل البذرة بالمقارنة بمعاملة الكنترول في كلا الموسمين.
- 13- أعطت معاملة العزيق، جيساجارد متبوعاً بـ ستومب اكسترا و جيساجارد متبوعاً بـ الجول أعطت زيادة معنوية في النسبة المئوية لدليل الشعر بالمقارنة بمعاملة الكنترول في كلا الموسمين.
- 14- أعطت معاملة العزيق، جيساجارد متبوعاً بـ ستومب اكسترا و جيساجارد متبوعاً بـ الجول زيادة معنوية في النسبة المئوية لدليل الشعر مقارنة بمعاملة الكنترول في كلا الموسمين.
- 15- لوحظ أعلى قيم في صفة النعومة، المتانة، الطول والانتظام عند تطبيق معاملة العزيق ثلاث مرات ثم معاملة مبيد جيساجارد متبوعاً بـ ستومب اكسترا و جيساجارد متبوعاً بـ الجول وأقل القيم في معاملة الكنترول في كلا الموسمين.

الخلاصة:

من النتائج السابقة يمكن التوصية بالآتي:

تحت ظروف هذه الدراسة كانت الفترة الحرجة لمنافسة الحشائش لمحصول القطن من 18 إلى 55 يوم من الزراعة ويجب توفر طرق مكافحة للتغلب على منافسة الحشائش خلال هذه الفترة يمكن التوصية باستخدام العزيق ثلاث مرات 18, 30, 45 يوم من الزراعة ويليه التكامل بين جيساجارد بمعدل 1,5 لتر/ ف بعد الزراعة وقبل الري متبوعاً بـ ستومب اكسترا بمعدل 1,7 لتر/ ف بعد الزراعة وقبل الري للحصول على أعلى نسبة مكافحة للحشائش (الضيقة والعريضة الأوراق) والحصول على أعلى محصول للقطن الزهر (قنطار/فدان).