

EFFECT OF DIFFERENT METHODS OF WEED CONTROL ON WEED GROWTH AND YIELD OF COTTON (*Gossypium hirsutum* L.)

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ABSTRACT

Weed control study on cotton conducted during summer growing season 2005 at Sumel and Zakho (Dohuk Governorate) in Iraqi Kurdistan region, to determine the effect of different methods of weed control. Cultural practices used in different row spacing (60 or 80 cm) while mechanical methods used hoeing at 4, 8, 4+8 weeks after sowing (WAS). Also chemical herbicides such as Treflan pre-planting soil incorporated, Gallant super early post – emergence and Treflan+Gallant were used. Weeds can compete strongly with cotton, potentially reducing cotton yields .Decrease in row spacing (60 cm) was much better for reducing weed dry weight than 80cm within 75 or 100 days after sowing. On the other hand, the narrow spacing gave more cotton yield and increase up to 76.88 %, 40.81% at Sumel and Zakho locations respectively. Hoeing at an early stage or two times of hoeing was a good option for weed control. Also two times of hoeing 4+8 (WAS) was more effective on weed than row spacing. Lint yield was higher up to 408.75%, 173.55% in two times of hoeing treatment at the two locations, respectively. Treflan or Treflan+Gallant gave significant result in reducing weed biomass in both locations over two periods. However, Treflan+Gallant reduced weeds dry weights 42.8%, 41.8%, 70.6% and 71.5% at the two locations within the two periods, respectively.

INTRODUCTION

Many factors could be responsible for cotton yield reduction such as crop management. In Iraq, the main poor crop management practice was an ineffective weed control program (Sultan, 2004). Presence of weeds adversely affected the growth of crop and was subjected to greater weed competition due to insufficient space between rows . Usually , the first 6 to 8 weeks after planting control of weeds is important (Al-Khalidi, 2004). Manual weed hoeing is a valuable tool for removing low densities of weeds from the cotton plant line. Tanveer et al (2003) showed that both cultural and chemical weed control significantly affected the weed biomass. However, weed-free maintenance for 30 days or longer resulted in a significant reduction in weed population and its dry weight. Many researches studied the effect of different herbicides on weed and cotton crop. Trifluralin was commonly used as pre planting. This was followed by multiple cultivations and multiple post application of different herbicides (Salih 1999a, Panwar et al 1993, Hurst 2000 a). The object of this study was to evaluate plant density using different row spacing, hand hoeing and efficiency of some herbicides on weed growth and cotton yield.

MATERIALS AND METHODS

A field experiment was conducted at two locations (Sumel , Zakho) in northern Iraq during 2005 summer season .Each experiment was arranged in a factorial

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split plot design with three replicates as randomized complete block design . Different space (60, 80 cm) between rows was used in the main plots , while weed control treatments were randomly distributed in the sub- plots . There sub – plots can be divided into two factors ; the first one is hand hoeing (0, 4, 8 and 4+8) weeks after sowing , while the sub – sub plots were herbicides application . Each sub plot contained 3 rows with 4.5 m long . Dap fertilizer (46% P₂O₅ and 18% N) was applied at a rate 260 kg ha⁻¹ prior to sowing – Nitrogen fertilizer (Urea) 46 % N was added at a rate of 240 kg ha⁻¹ at flowering stage . Cotton variety was Lashata which sown at sumel on 23 April and 12 May at Zakho . The distance between plants was 25 cm . Thining was conducted (36 days) after cotton sowing date ,leaving two plants per hill . The weed control treatments were arranged as :

- 1-No hand hoeing + zero herbicides (check treatment) .
- 2- No hand hoeing +Treflan (1.15 kg a.i . ha⁻¹)
- 3- No hand hoeing +Gallant super (0.108 kg a.i .ha⁻¹)
- 4- No hand hoeing +Treflan + Gallant super .
- 5-One hand hoeing after 4 weeks + zero herbicides .
- 6- One hand hoeing after 4 weeks + Treflan .
- 7- One hand hoeing after 4 weeks + Gallant super .
- 8- One hand hoeing after 4 weeks +Treflan + Gallant super.
- 9- One hand hoeing after 8 weeks + zero herbicides .
- 10- One hand hoeing after 8 weeks + Treflan .
- 11- One hand hoeing after 8 weeks + Gallant super .
- 12- One hand hoeing after 8 weeks + Treflan + Gallant super .
- 13- Two hand hoeing after (4+8) weeks +zero herbicides .
- 14- Two hand hoeing after (4+8) weeks +Treflan .
- 15- Two hand hoeing after (4+8) weeks + Gallant super .
- 16- Two hand hoeing after (4+8) weeks + Treflan + Gallant super .

Treflan was incorporated , pre- planting , in the soil at a depth of 7 cm . Gallant super used as post emergence (48 days after sowing) These herbicides were sprayed by knap sack sprayer . The volume of water was 500 liters ha⁻¹ .

Dry weight of weeds was evaluated after 75 and 100 days from sowing date while cotton yield and lint yield were taken after twice picking in (September and October) .

Data were computed for the analysis of variance of factorial within split plots with (RCBD) design according to the procedure given by steel and Torrie (1960) and Duncans multiple range test (1955) at 5% level was used to verify the significant differences between treatment means .

RESULTS AND DISCUSSION

Dry Weight of Weeds :In general , the total dry weight of weeds among treatments can be expressed as a result of main factors which reduce population of weeds , However, the mean weed dry weight did not affect the spacing at

Sumel within two periods (Table 1, 2) It may be attributed to the density of weeds with different species emerged compared with Zakho location . Therefore , the significant result was seen at Zakho whith 60 cm row spacing was better for reducing weed dry weight than 80 cm in two periods. Generally, at Sumel, increasing in total dry weight of weeds at the various growth stages was mainly due to the increase in annual weeds number, whereas at Zakho the increase could be attributed to the perennial weeds populatuin. On the other hand , when hoeing was done 8 weeks late after sowing (WAS) or 4+8 (WAS) had a significant effect on reducing total dry weight for two locations and periods (Table 1 and 2) . Moreover , some species can emerge lately, so the first hoeing did not affect them but it could catch up or control at second hoeing. These results supported by Al- Shamary (2002) , Treflan or Treflan + Gallant caused great damage to weed growth which reducad their dry weight in both locations and periods. Treflan + Gallant treatment was more effective than Treflan application. The activity of Treflan was higher on weeds than that of Gallant . It is likely due to the different species with their different density as well as that Treflan can control some broad and narrow leaf weed while Gallant herbicide was specialized for controlling narrow leaf weeds only. These differences in two herbicides may be related to the difference in mode of action. It could be noticed that some weeds such as *Solanum sp*, *Cyperus rotundus*, *Sorghum halepense* were resistant to Treflan or Gallant herbicides . The phytotoxicity of Treflan + Gallant at Sumel in both periods was less than that at Zakho which expressed their activity by 42.8%, 41.9% at Sumel and 70.6%, 71.5% at Zakho within two periods respectively . When there were cooperative treatments for weed control such as spacing and hoeing , the result was related to the 80 cm row spacing with two times of hoeing which significantly reduced the total weed dry weight up to 66.2%, 64.2% at Sumel for both periods and 82.5%, 81.2% at Zakho respectively. Two times of hoeing (4+8 weeks) with Treflan + Gallant application reduced dry weight up to 57.7%, 56.5% at Sumel for both periods and 39.8% , 39.1% at Zakho respectively .Treflan or Treflan +Gallant at Sumel gave a good result in reducing total try weight for two periods. While at Zakho , Treflan or Treflan + Gallant under 60cm row spacing had a significant effect and gave better result in both periods , inhibition in dry weight was seen with Treflan + Gallant only under 80 cm row spacing . This variation with the Treflan herbicide may be due to different narrow weed species grown at Zakho where Treflan can not inhibit weed growth , such as , *Sorghum halepense* and *Cyperus rotundus* which gave poor control for perennial weed . These results are in agreement with Samir and Al-Bander (2000) and Hurst (2000b). It appeared that Treflan with or without Gallant depressed weed dry weight under two times of hoeing 4+8 (WAS) regardlles row spacing (60 or 80 cm) at Sumel in both periods .The result at Zakho was not clear , but it seems that Treflan or Treflan + Gallant under one time of late hoeing 8 (WAS) or two times of hoeing 4+8 (WAS) was better at 60cm than 80 cm row spacing, especially in the second period 100 days after sowing (Table 2) However, because some results of check treatments were insignificant with herbicides or hoeing treatments it obscured that result.

Total Cotton yield (kg ha⁻¹): The cotton yield in narrow row spacing was greater than width row spacing . The efficiency of 60 cm row spacing when compared to 80 cm row spacing was (43.46%), (28.98%) at Sumel and Zakho location respectively (Table 3) .The lower total number and dry weight of weeds in narrow row spacing treatment (Table 1 and 2) caused increasing in cotton yield . These results were confirmed by observations of Jones and Wells (1998) Siebert et al (2005) .The highest cotton yields obvious in two hoeing 4+8 weeks after sowing (WAS) and 4 (WAS) treatments were at Sumel and Zakho locations respectively. These results are in agreement with those found by Sultan (1999b) who indicated hoeing operation had a great role in reduction of weed effects on cotton growth and yield. On the other hand, late hoeing was in the second rank due to the poor weed control (Table 1 and 2). The highest yield was shown among Treflan + Gallant treatment due to a good activity of herbicides in controlling weeds, thereby increasing the yield. The reason of the increasing in cotton yield came from good efficiency of these herbicides, especially treflan in reducing dry weight of weeds (Tables 1, 2) comparison to check treatment which included more number and dry weight of weeds . These results are in agreement with those found by Al-Sinjary (2002) , Shatti (2003) . The most cotton yield was shown in narrow row spacing with one hoeing after 4 (WAS) and also with two hoeing 4+8 (WAS). Generally , one could detect that the cooperative of hoeing with narrow row spacing in both locations provided higher weed control which reflected on yield . More yield of cotton was noticed at Sumel from Treflan treatment that followed by two hoeing 4+8 (WAS) while at Zakho Treflan + Gallant with one hoeing 4 (WAS) gave highest yield . This could be depended on time of emergence of weed seeds , weed species , life cycle of weeds and weed rate growth . These results are in agreement with those found by Vencill *et al.* (1993) and Graham et al. (1998) . The interaction of spacing × herbicides showed significant effects between treatments. The higher yield was shown in Treflan with or without Gallant in narrow spacing at Sumel and Zakho locations respectively in comparison with width row spacing . It can be deduced that Gallant was not the best herbicide for narrow weed control at that environment . The best treatment that gave the highest yield at the two locations was within narrow row spacing treated with Treflan herbicide and two times of hoeing 4+8 (WAS) at Sumel . However, at Zakho some treatments were shown to have insignificant effects between them . This state caused creating a problem in discussion of these results at Zakho, but in general the Treflan herbicide and two hoeing gave excellent results . Regarding this result , cotton plant had a higher susceptibility of different weed species , especially at the early stage of cotton plant growth.

Total lint yield (kg ha⁻¹) :Table 4 indicate significant differences between two row spacing at both location . The narrow row spacing gave more lint yield than with row spacing . The efficiency of 60 cm row spacing as compared to 80 cm row spacing was (42.74%) , (26%) at Sumel and Zakho locations respectively. These results were due to higher seed yield per plant as a sequence to better weed control (James, et al 2004) . Significant differences were shown among treatments at both locations .However , the highest lint yields obvious from two hoeing 4+8 weeks after sowing (WAS) with efficiency of (80.34%) , (63.44%) when compared to check treatment at Sumel and Zakho locations respectively . These results agree with those found by Papamichail et

al , (2002) . Furthermore , early hoeing was similar for improvement yield to twice hoeing at Sumel only . While late sowing at Zakho was not different significantly from the check treatment . These result are on line with early hoeing of weed , in which more yields could be obtained . Also significant effects were noticed from herbicides treatment at two locations . Most lint yield was shown in Treflan or Treflan +Gallant treatments. These results are in agreement with those found by Shaker (1999) . On the other hand , Gallant had less activity than Treflan according to the different weed species , especially when broad leaves weed might emerge or that dose had less effect on high growth rate of perennial weeds. The intreraction spacing x hoeing showed significant differences between treatments at Sumel but the effects were insignificant at Zakho location . In the un-weeded plots , high yield was obtained in plots of 60 cm of row spacing than 80 cm . Also early hoeing with one or two hoeing gave better results , especially at 60 cm of row spacing , while late hoeing with 80 cm had less yield . The highest lint was obvious from Treflan treatment that followed by two hoeing 4+8 (WAS) at Sumel and Treflan + Gallant with one hoeing 4 (WAS) at Zakho location . Furthermore , this result did not differ significantly with Treflan or Gallant at the same location . This is line with findings of Shaker (1999) , Alsinjary (2002) and Al-Khalidi (2004) .Alwasys , 60 cm of row spacing with Treflan alone or with Gallant improved lint yield than 80 cm row spacing . It can be concluded that 80 cm row spacing stimulated some of weed species for rapid growth or re-growth which was possible to reduce herbicide activity . So the survival weeds plants inversely reflected on lint yield . The best treatment at two locations was within narrow row spacing treated with Treflan herbicide and two times of hoeing 4+8(WAS) at Sumel and with early hoeing or twice hoeing at Zakho location . This is in line with finding Papamichail et al (2002) who found that cotton yield was positively correlated with the duration of the weed-free period after crop emergence.

تأثير الطرق المختلفة للمكافحة في نمو الادغال وحاصل القطن

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الخلاصة

أجريت هذه الدراسة لمكافحة الادغال في موقعي سميل وزاخو ضمن محافظة دهوك في إقليم كردستان العراق للموسم النمو الصيفي لعام ٢٠٠٥ لاختبار طرق مختلفة في مكافحة الادغال . تضمنت التجربة ثلاث عوامل : العامل الاول المسافة بين المروز (٦٠ أو ٨٠ سم) والعامل الثاني العزق اليدوي (بعد ٤ ، ٨ ، ١٤ أسابيع من الزراعة) أما العامل الثالث فكان استخدام المبيدات الكيميائية (بدون مبيد ، الترفلان قبل الزراعة ، كالنت سوبر بعد الانبات وترفلان + كالانت) . أظهرت النتائج ان الادغال تنافس القطن بقوة وبالتالي تؤدي الى خفض الحاصل ولكن تواجد انواع معينة من الادغال هو نتيجة للموقع أو المحيط أكثر من تأثير المحصول نفسه ، تقليل المسافة بين المروز الى ٦٠ سم حسن من قوة المنافسة للمحصول ضد الادغال حيث ان هذه المسافة (٦٠ سم) كان تأثيرها معنوي في خفض الوزن الجاف للادغال مقارنة بـ ٨٠ سم خلال ٧٥ أو ١٠٠ يوم من الزراعة . المسافة الضيقة بين المروز أعطت حاصلا أعلى للقطن مقداره ٧٦.٨٨% و ٤٠.٨١% في موقعي سميل وزاخو على التوالي . كذلك لوحظ زيادة معنوية مقدارها ٧٤.٦٥% و ٣٥.١٥% في حاصل الالياف باستخدام المسافة الضيقة بين المروز ٦٠ سم مقارنة بالمسافة الاكبر (٨٠سم) وفي كلا الموقعين على التوالي . العزق في مرحلة مبكرة أو العزق لمرة واحدة كان اختيارا صائبا وجيدا لمكافحة الادغال ، إجراء العزق مرتين (٨+٤ أسابيع بعد الزراعة) كان مؤثرا أكثر في الادغال مما في

المسافات بين المروز . هذا فضلا عن كون العزق اليدوي مفيدا جدا في حال عدم الحصول على نتائج مرضية في مكافحة الادغال باستخدام المبيدات . إن الادغال التي تقاوم المكافحة عبر المبيدات يمكن التخلص منها عن طريق العزق المتأخر . تم الحصول على أعلى حاصل للقطن عند إجراء العزق لمرتين (٨+٤ أسابيع بعد الزراعة) أو العزق المبكر (٤ أسابيع بعد الزراعة) وعليه فأن حاصل الالياف كان الاعلى عند إجراء العزق لمرتين بمقدار ٤٠٨.٧٥ % و ١٧٣.٧٥ % في كلا الموقعين على التوالي ، مبيد الترفلان + كارلنت أعطوا نتائج معنوية في خفض الوزن الحيوي للادغال في كلا الموقعين . لم تؤثر المبيدات إلا قليلا على بعض الانواع من الادغال مثل *Solanum sp* , *Sorghum halepense* , *Cyperus rotundus* عند استخدامها بالتراكيز المتبعة في التجربة ، ترفلان + كالانت خفضت من الوزن الجاف للادغال الى ٤٢.٨ % ، ٤١.٩ % ، ٧٠.٦ % و ٧١.٥ % في كلا الموقعين وفي كلتا الفترتين على التوالي . وعليه فإن نشاط العوامل الثلاثة خلال هذه الدراسة كان متاخلا ومتعاوناً في خفض الوزن الحيوي والمنافسة التي تبديها هذه الادغال وبالتالي رفع حاصل القطن

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