

IMPACT OF CHEMICAL HERBICIDES TO BREAD WHEAT GENOTYPES (*Triticum aestivum* L)

M.R.A. Al-Latif

Assist. Prof.

Dept.Field Crops Coll. Agriculture. Tikrit University, Iraq

Mmaar79@tu.edu.iq

ABSTRACT

This study was aimed to investigate effect of wheat cultivates to herbicides. A field experiment was conducted at the Research Station of the Field Crops Department at the College of Agricultural , University of Tikrit during winter season 2017-2018. Factorial Experiment within Randomized Complete Block design with three replicates were used . This experiment contains two variables first was used the herbicide (Atlantis, Pallas, Chevalier) and control. The second variable includes four cultivates (Al-Hashimiyah, Al-Baraka, Nor, and Door 29). The results Al-Baraka revealed that the highest plant height (75.91 cm), number of spikes (372.67 m²) and the number of shoots m² (355.41), while the cultivate Noor had the highest value, number of grains spike⁻¹ (42.67) and the total grain yield (4.82) ton ha⁻¹. Atlantis herbicide recorded the highest number of tillers square meter⁻¹ (387.50) and the treatment Balas recorded the highest value in the weight of a thousand grains (40.24 g) and total grain yield (2.00 tons . ha⁻¹). The interaction between genotypes and pesticides produced highest grain yield (6.31) tons.ha⁻¹.

Key words: soft wheat genotypes, weeds, grain yield , yield components

ألطيف

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تأثير مبيدات الادغال الكيماوية على تراكيب وراثية من الحنطة *Triticum aestivum* L.

محمد رمضان أحمد الطيف

استاذ مساعد

كلية الزراعة/ جامعة تكريت . العراق

المستخلص

أجريت تجربة حقلية في محطة أبحاث قسم المحاصيل الحقلية التابع ألى حقول كلية الزراعة في جامعة تكريت في الموسم الشتوي 2017-2018 بهدف معرفة تفاعل تراكيب وراثية من الحنطة *Triticum aestivum* L. لمبيدات الأدغال الكيماوية، نفذت التجربة وفق تصميم ألقطاعات ألكاملة ألتعشبية R C B D وحسب أختبار دنكن أشتملت ألتجربة على عاملين العامل الأول (ألوحداث أالرئيسية) كان عامل أالمبيدات (Atlantis ، Pallas و Chevalier) بالأضافة ألى معاملة أالمقارنة (المدغلة)، أما العامل أالثاني (ألوحداث أالثانوية) أشتملت أربعة أصناف (هاشمية، بركة، نور ودور 29) توصل ألبحث ألى أن ألتركيب الوراثي بركة اعطى أعلى قيمة في صفة أرتفاع أنبات (75.91) سم، وصفة عدد الأشطاء م² (372.67) وصفة عدد ألسنابل م² (355.41)، في حين سجل ألتركيب الوراثي نور أعلى قيمة في صفة عدد ألبوب. ألسنبلة (42.67) وصفة أالحاصل ألكلي. (4.82) طن.هـ. سجلت معاملة أالمبيد Atlantis أعلى قيمة في صفة عدد الأشطاء م² (387.50)، عدد ألسنابل م² (378.08) وسجلت معاملة أالمبيد Pallas أعلى قيمة في صفة وزن ألف حبة (40.24) غم في حين سجلت معاملة أالمقارنة (المدغلة) أقل قيمة في صفة أالحاصل ألكلي (2.00) طن.هـ. ألتداخل أثنائي بين ألتراكيب الوراثية والمبيدات سجل أعلى قيمة في معاملة أالمبيد Pallas وللتركيب أالحاصل ألكلي وبلغت (6.31) طن.هـ.

الكلمات المفتاحية: تراكيب الحنطة الوراثية، أدغال، مبيدات أدغال.

INTRODUCTION

The bread wheat grain yield ranks first in the world's cereal crops in terms of cultivated area and economical, as it provides people with more than 25% of protein and calories. It is an important food source for more than 1.5 billion peoples, representing 35% of the world's population (10). The productivity of this crop increased per unit area at the beginning of the current century as a result of the use of improved genotypes, various pesticides, the development of fertilizers and the utilization of agricultural mechanization on a large scale. Cereals are considered one of the most important crops, including the bread wheat, which is considered the weakest competitor to weeds compared to other crops (14). As well as the reduction caused by these crops to the agricultural sector with its animal and increases in the costs management, and losses caused by weed exceed the losses caused management (1). Herbaceous plants compete with crop plants on the main growth components (water, light and nutrients) especially in the early stages of growth, as a result of the fierce competition. The growth of the crop is weak, and this is directly reflected in the outcome in terms of quantity and quality. The use of chemical herbicides is one of the easiest methods of weed control, and it has a great positive economic benefit. It also provides high effectiveness and variation of the genotypes of the soft wheat crop in its tolerance to herbicides and the response to chemical herbicides. This study was aimed to investigate the effect of herbicides to several wheat cultivars.

MATERIALS AND METHODS

A field experiment was carried out at the Field Crops Department, College of Agriculture, Tikrit University during 2017-2018 season. The experiment aims to determine response of wheat genotypes, (Hashemite, Baraka, Noor and Dor 29) to herbicides (Atlantis 3.6 wt.%), Chevalier and Pallas 4.5 wt.%) at the recommended concentrations for each pesticide (80 g/ dunum, 300 g/ha and 125 ml/dunum respectively), and control treatment (sprayed with distilled water). The field plowed by two perpendicular plows with the dump plow and smoothed by the disc harrows and the leveling was done with the screed. The

Factorial Experiments within Randomized Complete Block Design (RCBD) with three replicates was used. The herbicide occupied the main plots, while the genotypes within sub plots. The experimental field was divided into experimental units of 8 m² (4 m × 2 m). The seeds were sown manually on the lines distance between lines was 20 cm. In 11/21/2017 and 30/5/2018, the experimental field was irrigated, and the irrigation was repeated whenever needed. A fertilizer was used at a rate of 240 kg/ha (Urea 46%). The first batch was 100 kg/ha with the whole batch of triple superphosphate fertilizer (P₂O₅ 46%), while the remaining quantity of the urea fertilizer was added after 45 days from seeding (13). A dorsal sprinkler was used at a rate of 400 liters/h. The pesticides were used in the stage of 2-4 leaves age of broad weeds and 3-6 leaves of the thin-leaved weeds.

RESULTS AND DISCUSSION

Types and density of weed plants at the field during the study season: Types of the broad-leaved weeds developed at study field were identified as *Sonchus oleraceus*, *Silybum marianum*, *Beta vulgaris*, *Convolvulus arvensis*, *Daucus carota*, *Malva rotundifolia*, thin-leaved herbs *Avena Fatua* L., *Phalaris minor* and *Lolium rigidum*. The proportion of wide-leaved herbs was around 60% and 40% for the narrow herbs. Result in Table 1 show that the herbicide effect a significant decreases to density of the associated weeds compared to the control treatment. This is in agreement with previous studies investigated the effect of the herbicides on controlling of weeds growth (16,23). They confirmed that the use of chemical herbicides led to a significant reduction weeds density. The results of Table 1 showed that the Hashemite genotype was less competitive with the weeds. The reason for this is due to the differences in the genetic nature between the genotypes for competition with herbs or their differences in their growth and ability to inhibit the weeds growth. Their ability on the competition for the main growth requirements was obviously different. These results agree with (12). It could be observe from the same Table that there is a significant bilateral overlap between the pesticides and the genotypes where the results recorded the use of Nor and Dor 29 with treatment of the

Chevalier herbicides had excellent weeds control. Also, the treatment by Hashemite, with the control treatment, achieved the

highest average (47.67 grass/m²), this result agreed with the results of another researcher (8,15 20).

Table 1. Effect of the genotypes of soft wheat and chemical herbicides on characteristics of weeds density

Genotypes	Chevalier	Pallas	Atlantis	Control	Means
Hashemia	2.67 def	5.33 d	1.67 Ef	47.67 a	14.33 a
Baraka	3.00 def	00.00 f	4.67 De	20.00 c	6.92 bc
Nor	00.00 f	0.67 f	1.33 Ef	21.33 c	5.83 c
Dour 29	00.00 f	0.33 f	0.33 f	32.67 b	8.33 b
Means	1.42 b	1.6 b	2.22 B	30.42 a	

* Values followed by the same letters in the same row or same column were not significantly different at P=0.05.

Plant height

Data in Table 2, shows that the highest plant height recorded at the control treatment (78.6 cm), which was significantly higher than the pesticide treatments. The latter did show significant differences among their plant's height as the increases with the increasing of plant density. This increase caused to increase shading, which stimulates the activity of auxins with gibberellins to increase the elongation of the phalanges and resulted in an increases in plant height (21). This describes the high density of weeds in the control treatments compared to the pesticide treatments. It is reveal from the same Table that the composition Baraka and Dor 29 was superior, this may attributed to the variation of the genotypes in the phenotypic characteristics of the bilateral overlap, and the significant

superiority of the genotype that was obtained in the treatment of the control at a rate of 82 cm. This is an indication of the tolerance of the composition Baraka for weeds treatment and the increases in the action of auxins and gibberellins in this high density. Genetic characteristics related to the inherited composition characteristics and perhaps its ability to compete with herbs for the main growth requirements, especially food, water and light, its speed of germination emergence, and its rapid growth. These factors helped in escape the period of early and critical competition for the herbivore and has also been attributed to morpholithic factors related to the elongation of its roots, the composition of the vegetative system, and its ability to shade (25,26).

Table 2. Effect of the genotypes of soft wheat and chemical herbicide on plant height.

Genotypes	Chevalier	Pallas	Atlantis	Control	Means
Hashemia	72.33 bc	70.33 cd	70.00 cd	76.33 b	72.25 b
Baraka	73.67 bc	74.00 bc	74.00 bc	82.00 a	75.91 a
Nor	74.00 bc	66.67 d	66.67 d	73.67 bc	70.25 b
Dour 29	72.33 bc	72.67 bc	73.33 bc	82.33 a	75.16 a
Means	73.1 b	70.91 b	71.00 b	78.6 a	

* Values followed by the same letters in the same row or same column were not significantly different at P=0.05

Spike length

The results in Table 3 show that the average pesticide treatments were statistically superior when compared to the control treatment. This could be attribute to the best growth conditions, which improved the ability of these plants (control treatments) to compete with the

weeds and caused an increase the spike length. This result is consistent with several ongoing research of cereal crops, including wheat and barley, both cultivated tropically or dime, when combating weeds at 2-4 wide leaf and 3-6 thin leaf. This could be reduced the competition for moisture, nutrients and light,

which caused increases the growth rate in favor of crop plants and gave highest yield compared to the treatments (9). As for the genotypes, it is clear that the combination of Baraka had the lowest value, while the combination of Nor had the highest value. This

results consistent with the results of several research that found that combination or hybrids of crops in general and wheat types in special varies in softness, sensitivity, tolerance, or response to a specific herbicide or group of herbicides, (7,11,20,27).

Table 3. Effect of the genotypes of soft wheat and chemical herbicides on characteristics of spike length

Genotypes	Chevalier	Pallas	Atlantis	Control	Means
Hashemia	13.67 a	14.00 a	13.00 a	9.00 b	12.41 ab
Baraka	13.67 a	13.00 a	13.67 a	9.00 b	12.33 b
Nor	14.67 a	14.33 a	14.00 a	10.00 b	13.3 a
Dour 29	14.33 a	13.33 a	13.33 a	10.33 b	12.83 ab
Means	14.08 a	13.67 a	13.50 a	9.58 b	

* Values followed by the same letters in the same row or same column were not significantly different at P=0.05
Tillers number m⁻²

The results in Table 4 indicate the superiority of the treatment by the pesticide Atlantis, with a statistical superiority of 387.50 tillers m⁻², followed by the pesticide Pallas, which was followed statistically, where it was 372.33 tillers m⁻², followed by a significant treatment of the pesticide Chevalier at a rate of 339.3 tillers m⁻². Whereas the treatment of the control recorded the lowest value (244.33 tillers m⁻²). The reason for this could be attributed to the reduction or lack of competition for the main growth components, which help to an increase in the number of tillers. This results was in agreement with (5), where they found that the pesticide Atlantis achieved the highest rate in the number of tillers. The results of the same Table showed that the combination of Baraka achieved the highest rate, followed by the Hashemite, and then the Dor 29 and the composition of Nur achieved the lowest value. These results

agreed with others (17) who explained the difference in compositions in the competitiveness ability and this was reflected in the outcome and its components. It was agreed with the resulting of other researcher (5) as the bilateral overlap between the combinations and pesticides was significant as the composition achieved an outstanding treatment by the pesticide Pallas at a rate of 466.67 psi/m², this shows the competition between the main growth factors and the positive effect of pesticides in reducing this competition. The increases in the number of tillers due to weed control gave a positive indication in improving productivity, when associated with the results obtained in these shoots of fertile spike (18). However, the limiting factor for the growth of these tillers is the amount of interaction between the plants or the tillers themselves on the elements necessary for growth of water, minerals and light (16).

Table 4. Effect of the genotypes of soft wheat and chemical herbicides on the characteristic of the number of tillers m⁻²

Genotypes	Chevalier	Pallas	Atlantis	Control	Means
Hashemia	381.33 c	378.67 c	354.67 cd	268.00 fg	345.67 b
Baraka	382.67 c	466.67 a	428.00 b	213.33 i	372.67 a
Nor	293.00 ef	306.67 e	384.00 c	238.67 hi	305.58 d
Dour 29	300.00 e	337.33 d	383.33 c	257.33 gh	319.50 c
Means	339.3 c	372.33 b	387.50 a	244.33 d	

* Values followed by the same letters in the same row or same column were not significantly different at P=0.05

Number of spikes m⁻²

The results of Table 5 show the effect of studied treatments on the number of spikes m⁻², where it is reveal that the control treatment recorded the lowest significant value at a rate of tillers 224.3 m², while the highest statistical value of the pesticide Atlantis was 378.08 tillers m², followed by Chevalier at 358 tillers m². This results were agreed with the results of others (21), also the Table 5 indicate that the combination of Barakah was significantly superior at a rate of 355.41 m², followed by

the combination of Hashemite, at a rate of 331.83 m². The combinations Dor 29 and Nor did not differ significantly as their rates were 299.58 and 294.50 m². It was observed that there is a variation in genotypes tolerance to the pesticides and their sensitivity to the associated weeds. The interaction between the pesticides and genotypes was significant, as a significant superiority recorded in the genotype of Baraka for the treatment of the pesticide Pallas with a rate of 448 m².

Table 5. Effect of the genotypes of bread wheat and chemical herbicides on the characteristic of the number of spikes m⁻²

Genotypes	Chevalier	Pallas	Atlantis	Control	Means
Hashemia	381.33 c	378.67 c	354.67 cd	268.00 fg	345.67 b
Baraka	382.67 c	466.67 a	428.00 b	213.33 i	372.67 a
Nor	293.00 ef	306.67 e	384.00 c	238.67 hi	305.58 d
Dour 29	300.00 e	337.33 d	383.33 c	257.33 gh	319.50 c
Means	339.3 c	372.33 b	387.50 a	244.33 d	

* Values followed by the same letters in the same row or same column were not significantly different at P=0.05

Number of grains spike⁻¹

The results in Table 6 show that the control treatment recorded the lowest rate of 22.67 grains spike⁻¹, while the treatment of Chevalier recorded the highest statistically value at a rate of 40.67 grains spike⁻¹, which did not differed significantly from the treatment of the pesticide Pallas, where had average number of grains spike⁻¹ was 38.75. This could be attributed to the provision of a suitable environment for wheat plants to develop without competing with the requirements of

growth. This was reflected to the growth activities and produced greater amount of the growing grains due to increase their knots and reduce their abortion. For the genotypes, a significant differences were recorded between the averages of the number of grains spike⁻¹, and this reveals the genetic differences, as shown for the Nor combination. Also, the bilateral interference was significant, where the genotype of the Pallasite was significantly superior to the genotype of the treatment of the pesticide Pallas at a rate of 54.67 grains spike⁻¹

Table 6. Effect of the genotypes of soft wheat and chemical herbicides on the characteristic of the number of grains spike⁻¹

Genotypes	Chevalier	Pallas	Atlantis	Control	Means
Hashemia	26.67 fg	32.67 ef	34.00 E	18.33 h	27.91 c
Baraka	37.00 de	26.33 fg	33.00 Ef	23.00 gh	29.83 c
Nor	47.33 bc	54.67 a	44.00 C	24.67 gh	42.67 a
Dour 29	51.67 ab	41.33 cd	32.67 Ef	24.67 gh	37.58 b
Means	40.67 a	38.75 ab	35.91 B	22.67 c	

* Values followed by the same letters in the same row or same column were not significantly different at P=0.05

Grams weight (1000 grains g⁻¹)

It is reveal from the results in Table 7 that a significant superiority of the herbicide treatment Pallas, where the highest rate was

recorded at 40.24 g, while the control treatment recorded the lowest value with an average of 37.20 g. This result reflects the intensity of competition for the basic growth

factors (water, light and nutrients) between weeds and crop plants. On the other hand, the positive role of the herbicides used in the experiment was shown by reducing competition between wheat crop plants and the associated weeds. The same Table shows the superiority of the Hashemite genotype. These

results agreed with other result (7). The bilateral interaction between genotypes and pesticide treatments was significant, as the Hashemite composition of the Pallasite treatment achieved the highest average 42.53 g.

Table 7. Effect of the genotypes of soft wheat and chemical herbicides on the weight characteristic of a thousand grains

Genotypes	Chevalier	Pallas	Atlantis	Control	Means
Hashemia	40.23 Abc	42.53 a	40.90 ab	38.73 a-e	40.60 a
Baraka	37.07 b-e	40.07 abc	40.33 abc	35.10 e	38.14 b
Nor	39.60 a-d	37.47 b-e	39.17 a-d	36.17 de	38.10 b
Dour 29	36.93 Cde	40.90 ab	38.77 a-e	38.83 a-e	38.85 b
Means	38.45 Bc	40.24 a	39.79 ab	37.20 c	

* Values followed by the same letters in the same row or same column were not significantly different at P=0.05

Grain yield (t.ha⁻¹)

The weed control with Pallas effect a significantly to the total grain yield, with an average of 5.25 tons ha⁻¹, which indicates that the pesticide an excellent weed control. On the other hand, it shows that the weed plants associated with the crop had a negative effect on the grain yield of the crop. The control treatment showed the lowest statistical average (2.00 tons ha⁻¹). These results agree with (25) Ishati results show that the superiority in grain yield was due to the excellent characteristics of 1000 grain weight and grains spike⁻¹. When comparing general rates of genotypes for all treatments it was showed that there are significant differences between the grain yield of the grains development and the superiority

of the combination Nor over the combinations used in the present study. The bilateral overlap between the combinations treatments and the pesticides was significant, and this means that there is a variation of the genotypes in their response to the herbicide treatments. The use of chemical herbicides for weed control led to reduce competition with the crop, which in turns led to the provision of good conditions for better growth of the crop. In comparing of the results of the grain yield of the different combinations of wheat and according to the herbicide treatments used and the overlap between them with the results of previous research it was noticed that there is a great agreement with several other results (5 ,28).

Table 8. Effect of the genotypes of bread wheat and chemical herbicides on the grain yield characteristic ton ha⁻¹

Genotypes	Chevalier	Pallas	Atlantis	Control	Means
Hashemia	3.83 g	4.78 def	4.41 f	1.74 h	3.69 d
Baraka	4.91 def	4.64 ef	4.71 ef	1.92 h	4.04 c
Nor	5.01 cde	6.31 a	5.87 ab	2.11 h	4.82 a
Dour 29	5.43 bc	5.24 cd	4.49 ef	2.25 h	4.35 b
Means	4.79 b	5.25 a	4.87 b	2.00 c	

* Values followed by the same letters in the same row or same column were not significantly different at P=0.05

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