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DETERMINATION OF ACCASE INHIBITOR HERBICIDE RESISTANCE OF WILD OATS (*Avena spp.*) IN WHEAT PLANTING AREAS IN NORTHERN DISTRICTS OF KAHRAMANMARAŞ

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Highlights

- Herbicide use can be effective
- The use of herbicides with different effective substances
- Herbicide resistance status is determined

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Abstract

This study was carried out between 2015 and 2016 in order to determine the resistance of Accase inhibitor herbicides to wheat cultivation areas in Kahramanmaraş Göksun, Afşin and Elbistan districts. In the surveys conducted in the region between 2015 and 2016, *Avena* spp. seeds were collected from 25 different cultivation areas and field edges without herbicides for comparison. The seeds were blended and planted in the cuvettes and tested by screen screening test to detect durable (R) and sensitive (S) populations. Clodinafop-propargyl application dose of 20 ml / da was applied as 4 repeats in 2-5 leaf periods and it was observed that all plants could not survive on the 28th day and it was found to be sensitive to Clodinafop propargyl (S).

KAHRAMANMARAŞ'IN KUZEY İLÇELERİNDEKİ BUĞDAY EKİM ALANLARINDA GÖRÜLEN YABANI YULAF'IN (*Avena spp.*) ACCASE İNHİBİTÖRÜ HERBİSİTE KARŞI DAYANIKLILIĞININ BELİRLENMESİ

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Öz

Bu çalışma, Kahramanmaraş Göksun, Afşin ve Elbistan ilçelerindeki buğday ekim alanlarında Accase inhibitörü herbisitlere karşı dayanıklılık durumunun belirlenmesi amacıyla 2015-2016 yılları arasında yürütülmüştür. Bölgede 2015-2016 yıllarında yapılan surveylerde *Avena spp*. tohumları 25 farklı ekim alanından ve karşılaştırma amacıyla herbisit uygulanmayan tarla kenarlarından toplanmıştır. Tohumlar paçal yapılarak küvetlere ekilmiş ve dayanıklı (R) ve duyarlı (S) populasyonlarını tespit etmek amacıyla screen tarama testi ile testlenmiştir. 2-5 yapraklı dönemlerinde clodinafop-propargyl'in uygulama dozu olan 20 ml/da 4 tekerrürülü olarak uygulanmış ve 28. günde bitkilerin tamamının canlılıklarını devam ettiremediği gözlemlenmiş olup Clodinafop propargyl'e karşı duyarlı (S) olduğu belirlenmiştir.

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1. Introduction

In our country, wheat is one of the most important cultivated crops with approximately 9 million hectares of cultivation area and approximately 17 million tons of production every year. This production capacity with Turkey, among wheat-producing country in the world is located 10 Values (FAO, 2008). In Kahramanmaraş, where this study will be carried out, according to 2012 data, wheat cultivation was made in 903.000 land, total yield was around 298.000 tons and average yield was 331 kg / da (TUIK, 2012). There are many factors that adversely affect the agriculture of wheat, which has such a large cultivation area and production potential, and cause significant losses. Weeds are the leading ones.

Since the competitive power of weeds is generally high, the grain remains weak and the yield decreases. Depending on the weed type and density, the yield loss in wheat varies between 10-50% and the average loss is 27% (Bolton and Hepworth, 1972), 30% in Aegean Region (Bilgir, 1965) and 22% in Eastern Anatolia Region, 5 (Güncan, 1972). When weeds are not controlled, it is reported that the yield loss in winter cereals is between 10-25% in Germany (Hurle, 1988), and in England the yield loss due to weed damage reaches 66% (Whiteheat and Wright, 1989). Product loss in cereals is around 20-40% on average in the world (Özer et al., 1997, Güncan, 2010). In wheat, the yield will decrease significantly if weeds are not handled well.

T Although there are mechanical, cultural, biological and chemical control methods to minimize the damage of weeds, the most applied of these is chemical control with herbicides. The first chemical fight against weeds in our country started with 2,4-D amine and MCPA drugs, which were effective against wild mustard (Sinapis arvensis L.) in the 1960s and continued successfully until the 1980s (Anonymous, 2002a). . However, with the discovery of sulfonylurea group herbicides after 1980, the wider spectrum and cheaper use of these herbicides, their low-dose use, their advantages in environmental and toxicological aspects, and their use in cold climate grains, rice, corn, etc. provided.

The use of sulfonylurea group herbicides, which are ALS (acetolactate synthase) inhibitors, in our country first started with chlorsulfuron in 1984, and then continued with tribenuron methyl and imazamethabenz-methyl. In recent years, mesosulfuron and iodosulfuron have been used (Anonymous, 2002b). These herbicides, which are taken by the plant through roots and leaves, disrupt plant metabolism by inhibiting the ALS enzyme, which acts as a catalyst in the synthesis of amino acids (leucine, isooleucine and valine), which is the basic structure of proteins (Ray, 1984). The fact that there are about 20 effective substances belonging to this group in our country's herbicide market today is a clear indication that the sulfonylurea group herbicides are widely used (Anonymous, 2002b).

The relatively long growth period of weeds has slowed the development of resistance to chemicals compared to insects and diseases. The fact that herbicides with 2,4-D active substances were resistant to 25 weed species in only 15 countries approximately 60 years after their use in 1946 is the proof of this (Heap, 2007). The first resistance to herbicides was simazine-resistant Senecio vulgaris (ragweed), which was introduced in the USA in the late 1960s (Ryan, 1970). After that, with the introduction of predominantly triazine group, then ALS inhibitor herbicides in the 1980s, resistance events increased rapidly. Herbicide Resistance Action Commit (HRAC) was established because of the rapid increase in endurance events and serious problems.

Today, resistance to herbicides has been found in 323 weed biotypes belonging to a total of 187 weed species, of which 112 broad-leafed and 75 narrow-leafed (Heap, 2008). Only 2 years after the introduction of the first

ALS inhibitor herbicide chlorsulfuron in 1982, it was found to be resistant to *Alopecurus myosuroides* (foxtail) and *Lolium rigidum* (fine delice) in 1984, and to *Lactuca serriola* (wild lettuce) 5 years later (Heap, 2007).

2. Material/Method

According to the sectional sampling method (Bora and Karaca, 1970), 25 samples were determined from the wheat fields of Kahramanmaraş Göksun, Afşin and Elbistan Districts, and 25 different sampling numbers were determined according to the sectional sampling method (Bora and Karaca, 1970) and 25 different samples were collected by rinsing at certain intervals in the direction of travel in the study areas and by stopping at the nearest wheat field. Weed seeds were collected from the location, (Uygur 1997). The disinfected and non-disinfected samples collected from the studied wheat field of 402.016 decrease were dried in paper bags and then separated from other parts and their seeds were obtained, Table 1.

Table 1. Sampled Field Numbers

Districts	Cultivation areas (da)	Number of sample
Göksun	49.072	3
Afşin	97.332	7
Elbistan	255.612	15
TOTAL	402.016	25

The seeds obtained were mixed and planted in tubs containing mixed soil in the ratio (1: 1: 1). After the seeds germinated, the recommended dose of clodinafop-propargyl was applied at a dose of 20ml / da during the 2-5 leaf stages of wild oats and tested by screen scanning test. The experiments were carried out in 4 replications in the Eastern Mediterranean Gateway Zone Agricultural Research Institute's experimental areas, the best effect was observed on the 28th day, and the observations were taken and evaluated according to a scale of 1-5, Table 2.

3. Results and Discussion

1-5 scale evaluations of the resistance of wild oats against the licensed dose (1X) of clodinafop propargyl effective substance herbicide with Accase effect mechanism are given in Table 3.

Table 2. Scale of 1-5

Scale Value	Symptom	Plant Condition
1	No effect, the plant is all green	Alive
2	Very little effect, slight shortening, there is a change in color and shape, growth point green.	Alive
3	Moderate effect, significant height shortening, there is a change in color and shape, growth point continued again.	Alive
4	High effect, significant lengthening, there is a change in color and shape, no growth points or completely dried.	Dead
5	The effect is too high. Plants completely yellowed and dried.	Dead

Table 3. Test results to determine herbicide (clodinafop propargyl) resistance (scale 1-5)

Population	Control 0X	Clodinafop propargyl 1X	Population	Control 0X	Clodinafop propargyl 1X
KMG1	0	5	KME1	0	5
KMG2	0	5	KME2	0	5
KMG3	0	5	KME3	0	5
KMA1	0	5	KME4	0	5
KMA2	0	5	KME5	0	5
KMA3	0	5	KME6	0	5
KMA4	0	5	KME7	0	5
KMA5	0	5	KME8	0	5
KMA6	0	5	KME9	0	5
KMA7	0	5	KME10	0	5
KME13	0	5	KME11	0	5
KME14	0	5	KME12	0	5
KME15	0	5			

3.1. Discussion

In addition to being the culture plant with the most resistant weed biotype, Lolium and Avena, which are among the most important weeds gaining resistance, are among the most important weeds of wheat (Uygur, 1985; Kadıoğlu, 1989).

Herbicide resistance is a condition that results from the continuous and uncontrolled use of the same herbicide or herbicides with the same active ingredient in an area. In addition to triggering herbicide resistance with high dose applications, low doses applied continuously can also cause herbicide resistance (Eymirli 2012).

Uludağ et al. (2007) investigated the resistance of Avena species, which started in the 1990s and could not be successful in chemical control. It has been reported that herbicides with ACCase action mechanism are continuously used in the chemical control of Avena species, which are a problem in wheat. In their study, wild oat seeds were collected from a total of 20 different wheat fields, including Adana, Hatay, Gaziantep and Kahramanmaraş. As a result of these studies, resistance to phenoxaprop was determined in 7 of 20 different populations collected. The existence of resistant populations in the region has been determined with the studies. It supports that endurance studies are also required in areas of doubt.

There was no evidence of resistance to herbicides of wild oats in the wheat cultivation areas where this study was conducted. However, it is thought that it is necessary to perform endurance studies by expanding the working areas of such studies at intervals.

4. Conclusions

In this study conducted in the wheat cultivation areas of Kahramanmaraş Göksun, Afşin and Elbistan districs, no evidence was found regarding the resistance to clodinafop propargyl used in the fight against wild oats (*Avena* spp.).

Conflict of Interest

There is no conflict of interest.

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