

PHYTOTOXICITY STUDY OF FLUMIOXAZIN AND ITS COMBINATIONS WITH DIFFERENT ADJUVANTS IN SUNFLOWER CULTIVARS

M. TORMA¹ – A. HORN² – L. HÓDI³ – I. KRISTÓ¹ – M. HÓDI-SZÉL¹

¹Szeged University of Sciences, College of Agriculture, Hódmezővásárhely

²Summit-Agro Hungaria Kft., Budapest

³Plant and Soil Protection Service of Csongrád County, Hódmezővásárhely

Introduction

In Hungary the growing area of sunflower is about 500 000 hectares. Weeds mean one of the most important problems in sunflower fields. Most preemergence herbicides require 10-20 mm of precipitation within two weeks after application to increase their effectiveness (Kádár 2001). In south-eastern part of Hungary the weather conditions generally are dry in spring so preemergence herbicide applications do not provide good effects against weeds. In Hungary two herbicide-active ingredients (bifenox, flumioxazin) are registered against dicotyledonous weeds for postemergence spraying in sunflower. During extremely dry weather condition the weeds develop a thick cuticle on the surface of their leaves so the herbicide effect is very low. The efficacy of flumioxazin combined with adjuvants increased but the injurious effect on sunflower also increased (Torma et al. 2004).

The aim of this study is to compare the phytotoxicity of Pledge 50 WP (flumioxazin) and its combinations with different adjuvants in sunflower. On the base of the result of this experiment we can give advice as to which the most convenient postemergence weed control technology is in the tested sunflower cultivars.

Material and methods

The experiments were carried out in the southern part of Great Hungarian Plain, Mezőhegyes in 2005 using a plot size of 55 m² and 3 replications. Spraying was performed by a Rau 800 sprayer fitted with TeeJet 100 06 nozzles and a spray volume of 350 lha⁻¹. The following sunflower cultivars were tested: Original, Cortinal, Lolita, Almanzor, Joana RM, Brocar RM, Alzan, Pomar RM. Table 1. shows the applied herbicides and herbicide technologies. The preemergent herbicides were applied immediately after sowing of sunflower. At the time of postemergence treatments the sunflower had 6-8 leaves. The precipitation within the first 2 weeks after pre-emergence spraying was 16 mm and 3 mm after postemergent spraying. Table 2. contains the meteorological data during the time of the experiment. The assessment of crop phytotoxicity was carried out as a description of the symptoms. At flowering the diameter of sunflower-head was measured (10 in every parcels). Data were analysed statistically by an analysis of variance.

Table 1. Herbicide treatments in the experiment

Treatments	Active ingredients	Rate g,l ha ⁻¹	Mode of application
1. Dual Gold 960 EC + Racer (standard control)	s-metholaclo + fluorkloridon	1,5 + 2,5	preemergence
2. Frontier 900 EC Pledge 50 WP	dimetanamid + flumioxazine	1,5 + 80,0	preemergence
3. Pledge 50 WP	flumioxazine	80,0	postemergence
4. Pledge 50 WP + Hyspray	flumioxazine + etoxylated-lipidamin	80,0 + 0,1	postemergence
5. Pledge 50 WP + Hyspray	flumioxazine + etoxilated-lipidamin	80,0 + 0,2	postemergence
6. Pledge 50 WP + Trend	flumioxazine + etoxylated izodecil-alcohol	80,0 + 0,2	postemergence
7. Pledge 50 WP + Dash HC	flumioxazine + methyloleat+methylpalmitat	80,0 + 0,1	postemergence

Table 2. Meteorological data during the experiment

Months	Decade	Average temp. °C	Precipitation mm
May	2.	15,1	18,6
	3.	19,5	0
June	1.	15,4	33
	2.	20,9	0
	3.	19,8	7
July	1.	20,4	48
	2.	20,5	50
	3.	23,4	1

Results

Data of the assessment and the result of analysis of variance can be seen in Table 3.

Pre-emergence treatments

None of the applied preemergence treatments caused injurious effect on the tested sunflower cultivars.

Post-emergence treatments

Pledge 50 WP alone did not cause considerable phytotoxicity on sunflower. Pledge mixed with different adjuvants burned the lower leaves of sunflower and deformed the upper leaves. 3 weeks after the treatments the phytotoxicity symptoms moderated.

Pledge +Dash HC was the gentlest treatment. Significant decrease of diameter of sunflower-head was measured only in Lolita cultivar. The tested cultivars had different reactions on the Pledge+Hyspray combination. The level of injurious effect increased by the increase of the rate of Hyspray from 0,1 lha⁻¹ to 0,2 lha⁻¹. At using of higher rate of adjuvant beside the above mentioned negative effects the stoppage of the growth of sunflower was observed too. The Joana cultivar was sensitive only to the treatment which contained Hyspray 0,2 lha⁻¹. The most serious burning and depression were observed in the case of Pledge+Trend treatment. This application caused a significant decrease of the diameter of sunflower-head in Alzan, Original, Lolita, Cortinal and Brocar cultivars.

Table 3. Diameter of sunflower-head

Treat.	Average diameter of sunflower head (cm)							
	Cultivars							
	Original	Cortinal	Lolita	Almanzor	Joana MR	Brocar	Alzan	Pomar RM
1.	19,2	19,64	20,5	16,0	18,7	18,9	19,0	18,6
2.	20,1	17,8	18,9	16,6	20,4	18,6	20,2	19,1
3.	18,9	18,0	18,6	16,5	19,4	18,9	19,0	19,2
4.	19,6	17,1	18,3	15,7	19,3	16,7	18,3	18,3
5.	18,3	17,6	18,3	16,4	16,8	16,1	18,4	17,6
6.	16,7	17,7	18,0	16,5	17,3	17,4	17,1	18,1
7.	19,3	18,4	18,3	15,4	17,2	18,3	18,4	18,3
LSD _{5%}	2,138	1,75	1,776	1,058	1,62	1,424	1,5	1,4

The diameter of sunflower-heads in percentage of standard control (Dual Gold 960 EC + Pledge 50 WP) can be seen in Fig. 1-8.

13% decrease of the sunflower-head was caused by Pledge+Trend combination in Original cultivar (Fig.1). The studied postemergence treatments caused more or less decrease of sunflower-head (5-12 %) in Cortinal (Fig. 2). The most serious injury was noticed at the application of Pledge+Hyspay. All the treatments made nearly the same diameter-decrease (8-11 %) in Lolita (Fig. 3). No considerable injury was noticed in Almanzor (Fig. 4). Significant decrease of sunflower-head was measured in Joana cultivar when Pledge was combined with Hyspray at rate of 0,1 lha⁻¹ (Fig. 5). Brocar was sensitive to all the Pledge+ adjuvant applications except Dash (Fig.6). In Alzan cultivar Pledge+Trend was the only treatment which decreased the diameter of sunflower-head considerably (10 %)(Fig. 7.). Pomar got over the injury effect of herbicide combinations and no decrease diameter of sunflower-head was noticed (Fig. 8).

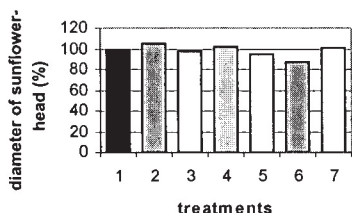


Fig. 1. Original

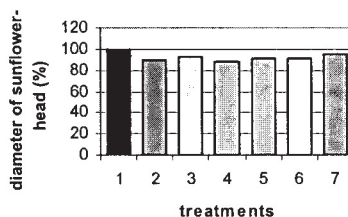


Fig. 2. Cortinal

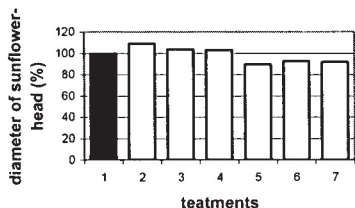


Fig. 3. Lolita

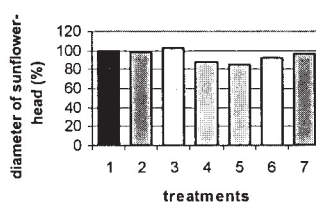


Fig. 4. Almanzor

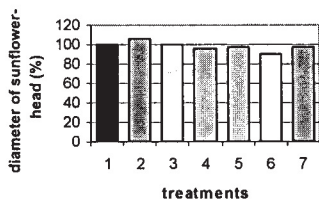


Fig. 5. Joana RM

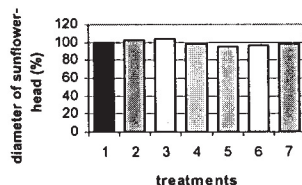


Fig. 6. Brocar RM

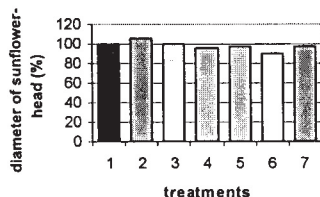


Fig. 7. Alzan

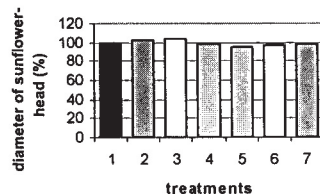


Fig. 8. Pomar RM

Conclusion

Lolita cultivar is very sensitive to flumioxazine and its combinations with different adjuvants. The farmers have to reckon with yield decrease at the occasion of using these mixtures. The regeneration ability of Almanzor and Pomar is good so all the tested combination are suitable for postemergence treatment in sunflower. Pledge 50 WP+Dash can be sprayed in all the examined cultivar but for Lolita without causing enduring phytotoxicity.

References

- Kádár A. (2001): Vegyszeres gyomirtás és termés szabályozás. Factum BT. Budapest, 206-213
- Torma M., Hódi L., Horn A. (2004): Study of flumioxazin in sunflower, onion and garlic. 4 th International Weed Science Congress, Durban, South-Africa, Abst. 23.
- Kádár, I. (2004): Szennyvíziszap-adagok hatása a növény (*Triticum vulgare* L.)-talaj rendszer néhány mikrobiológiai és biokémiai tulajdonságára (Impact of sludge treatments on some microbiological and biochemical properties of plant (*Triticum vulgare* L.)-soil system. – in Hungarian). Agrokémia és Talajtan. 53. 3-4. 331-342 pp
- Svetková, K.; Henselová, M.; Morvová, M. (2005): Effects of a carbonization product as additive on the germination, growth and yield parameters of agricultural crops. Acta Agron. Hun. 53. (3). 241-250 pp
- Tanács, L., Matuz, J., Gerő, L., Petróczi, I.M. (2005): Effect of NPK Fertilizers and Fungicides on the Quality of Bread Wheat in Different Years. Cereal Res. Commun. 33 (2-3): 627-634 pp