IN VITRO SCREENING OF EFFECT OF METOLACHLOR AND FLUORCLORIDONE ON SUNFLOWER

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Summary

Effect of metolachlor and fluorcloridone on some genotypes of cultivated sunflower with the use of a new method was estimated in this paper. Lenght of above-ground part and root and dry weight of above-ground part and root were used as criteria for estimation. Seeds placed on media supplemented with different concentrations of fluorcloridone turned brown in torpedo stadium and did not give rise to plants. Metolachlor had the greatest effect on lenght of above-ground part and brought to its significant reduction in all tested genotypes. Treated plants of all tested genotypes, except for NS-H-45 and RHA-583, did not differ significantly in dry weight of above-ground part from the control plants. As the results of this experiment are in agreement with the results obtained in field conditions, in vitro screening method can be considered reliable for estimation of effect of herbicides on sunflower and can be recommended for further investigations.

Key words: in vitro, screening, effect, metolachlor, fluorcloridone, sunflower

Introduction

In sunflower (*Helianthus annuus* L.) cultivation chemical weed control is an essential cultivation technique because presence of the weeds in the early stages of sunflower development can bring to a fall in production as much as 60% *(Nalwaya et al., 1972)*.

Herbicides metolachlor and florcloridone are among the most widely used herbiciedes for weed control in sunflower, but, in some, cases they can have negative effect on sunflower production. That is why an efficient method for reliable and rapid determination of effect of herbicides on different sunflower genotypes should be developed.

A new technique for screening of effect of herbicides on sunflower is described in this paper.

Materials and methods

Seeds of sunflower inbreds OCMS-74, OCMS-98, RHA-CD, RHA-583 and hybrids NS-H-17, NS-H-45 and NS-H-111 which have been incubated in distilled water for 24 hours and then dehulled, surface sterilized in 70% ethanol for 5 minutes and rinsed in two changes of sterilized distilled water were placed on sterilized filter paper. After two days, seeds that have germinated were placed on MS medium *(Murashige and Skoog, 1962)* supplemented with 12.6 ml^{-1} of metolachlor (Dual preparation) and 7.5 ml^{-1} and 10 ml^{-1} fluorcloridone (Racer preparation). Seeds

of control plants were placed on basic MS medium. After seven days of culture, lenght of above-ground part and root and dry weight of above-ground part and root of plants were determined.

Results and Discussion

Seeds of all tested genotypes turned brown on media supplemented with fluocloridone and did not give rise to plants. This could be caused by use of inappropriate concentrations of fluorcloridone, higher than those used in field conditions.

Lenght of above-ground part
Plants grown on medium supplemented with metolachlor had reduced lenght of above-ground part in comparison to control plants (*Figure 1*). The reduction ranged from 59% (NS-H-111) to 85% (NS-H-45).
Statistical analysis showed that treated plants differed significantly in lenght of above-ground part from the control plants.
These results are in agreement with results obtained in field conditions by *D' Alessandro et al. (1992)* and *D'Alessandro and Zora (1992)*. According to these authors plants treated with metolachlor had reduced height at thinning out in comparison to the values obtained with the unweeded control.

Root lenght
Metolachlor brought to significant decrease of root lenght of all tested genotypes (*Figure 2*), which ranged from 67% (NS-H-45) to18% (OCMS-74).
These genotypes had a small reduction of root lenght that ranged from 18% to 30%.

Dry weight of above-ground part
Plants grown on medium supplemented with metolachlor had reduced dry weight of above-ground part, but this reduction was not statistically significant. Exceptions were hybrid NS-H-45 and its parental inbred line RHA-583, for which statistically significant reduction of dry weight of above-ground part was found (*Figure 3*).
Reduction of dry weight of above-ground part ranged from 15% (NS-H-111) to 38% (RHA-583).
The obtained results are in agreement with the results of *Glušac and Kosovac (1988)*, obtained in field conditions. According to these authors plants treated with metolachlor did not differ significantly in dry weight of above-ground part from control plants. *D'Alessandro et al. (1992)* found metolachlor of particular interest as it provided, in two years field trials, the highest dry weight of uprooted seedlings.

Dry weight of root
Metolachlor brought to statistically significant decrease of dry weight of root in all tested genotypes, which ranged from 13% (RHA-583) to 92% (NS-H-45) (*Figure 4*). Exception was inbred line RHA-583 which did not differ significantly in dry weight of above-ground part from control plants.

Conclusion

On the basis of obtained results it can be concluded that metolachlor had the greatest effect on lenght of above-ground part as it brought to its significant reduction in all tested genotypes which is in agreement with the results of other autors *(D'Alessandro et al., 1992; D'Alessandro and Zora, 1992)*. Treated plants of all tested genotypes, except for NS-H-45 and RHA-583, did not differ significantly in dry weight of above-ground part from the control plants. *Glušac and Kosovac (1988)* and *D'Alessandro et al. (1992)* obtained the same results in the field conditions. Method of in vitro screening of effect of herbicides on sunflower can be considered reliable and recommended for further investigations as its results are in agreement with the results obtained in the field conditions.

Literature

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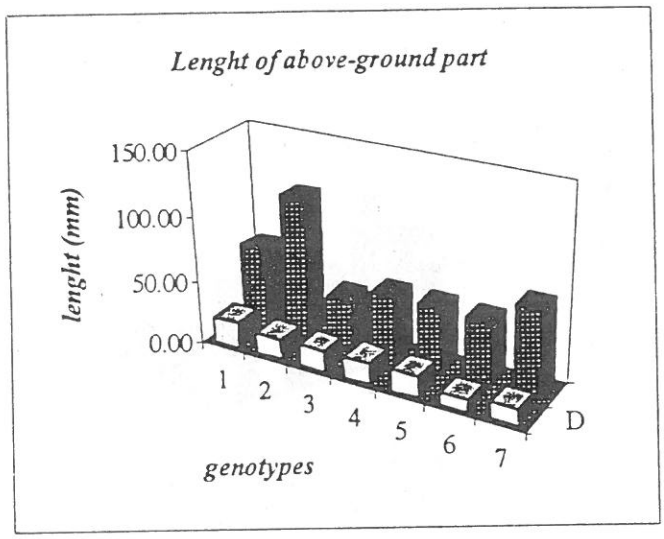
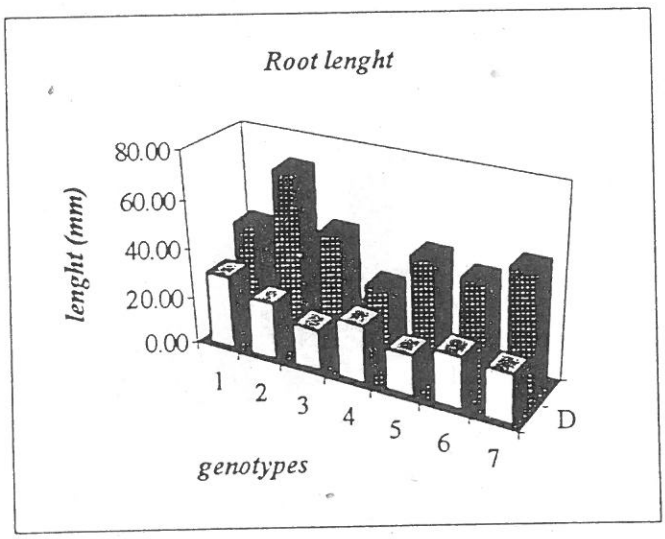
Figure 1. Effect of metolachlor on lenght of above-ground part of tested sunflower genotypes



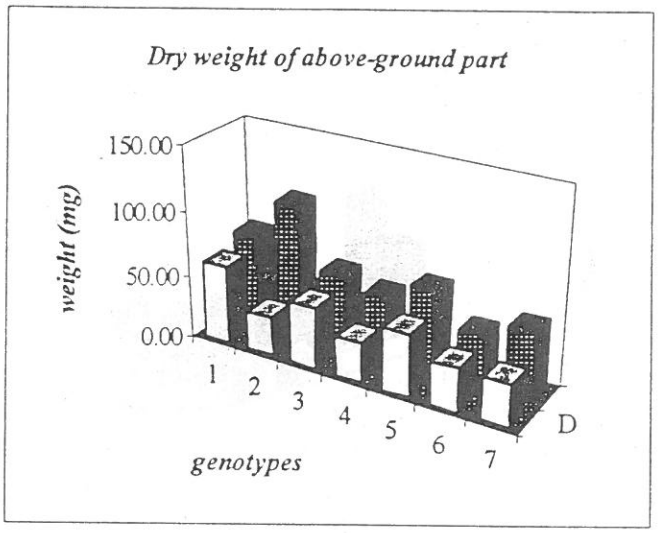
Genotypes: 1 - NS-H-17; 2 - NS-H-45; 3 - NS-H-111; 4 - OCMS-74; 5 - OCMS-98; 6 - RHA-CD; 7 - RHA-583

Figure 2. Effect of metolachlor on root lenght of tested sunflower genotypes



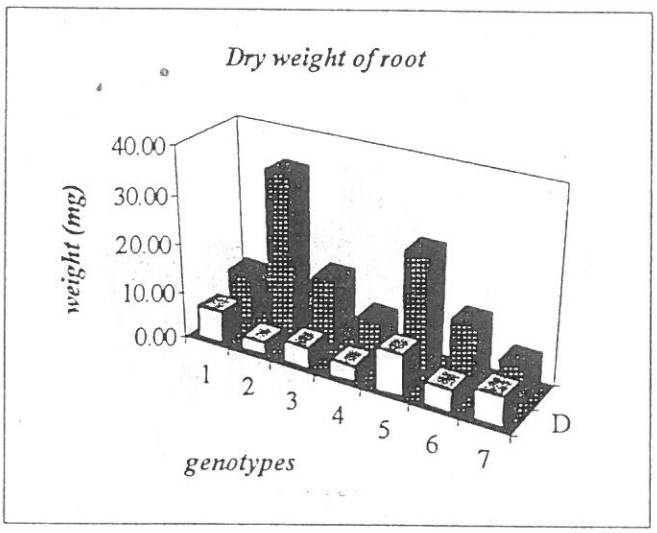
Genotypes: 1 - NS-H-17; 2 - NS-H-45; 3 - NS-H-111; 4 - OCMS-74; 5 - OCMS-98; 6 - RHA-CD; 7 - RHA-583

Figure 3. Effect of metolachlor on dry weight of above-ground part of tested sunflower genotypes



Genotypes: 1 - NS-H-17; 2 - NS-H-45; 3 - NS-H-111; 4 - OCMS-74; 5 - OCMS-98; 6 - RHA-CD; 7 - RHA-583

Figure 4. Effect of metolachlor on dry weight of root of tested sunflower genotypes



Genotypes: 1 - NS-H-17; 2 - NS-H-45; 3 - NS-H-111; 4 - OCMS-74; 5 - OCMS-98; 6 - RHA-CD; 7 - RHA-583