CHALLENGES IN SUNFLOWER CULTURE

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Abstract

Among the most important soil pests that attack sunflowers are the sow beetle (*Agrotis segetum*), the wireworm (*Agriotes* sp.) and the corn borer (*Tanymecus dilaticollis*) and in recent years they represent a big problem in the south-east of Romania. Other pests that cause great damage to the sunflower crop are the seeding crow (*Corvus frugilegus*), the collared pigeon (*Columba palumbus*) and house sparrow (*Passer domesticus*). Besides these pests, field rabbit (*Lepus europaeus*) represent another problem that causes significant damage to the sunflower crop. Among the pathogens that attack sunflower culture in Romania, the most important are *Plasmopara halstedii*, which causes downy mildew, *Sclerotinia sclerotiorum*, which causes white mold and *Phomopsis helianthi*, which causes phomopsis stem canker of sunflower. In last years, we observed in sunflower culture in Romania, sunflower white rust (*Albugo tragopogonis*) but without important economic losses. Atmospheric and pedological drought cause significant damage to the sunflower culture even with irrigation systems because of the high temperatures recorded in the flowering phenophase which makes the pollen unreliable. Another problem in sunflower culture is represented by the high degree of infestation with weeds such as broomrape (*Orobanche cumana*), *Chenopodium album*, *Ambrosia artemisiifoli, Xanthium strumarium, Cirsium arvense, Atriplex littoralis, Setaria viridisi* and *Sorghum halepense*.

Key words: *sunflower, soil pests,weeds, disease*

A sunflower (*Helianthus annuus*) is an annual plant and represent main oleaginous plant in Romania (Csep N., 2018). The sunflower was cultivated in Romania, in year 2022 on 1093 thousand hectares with a production of 2107 thousand tons and in year 2023 on 1089 thousand hectares with a production of 2028 thousand tons (INSSE, 2024). In year 2023, among the states of the European Union, Romania took the first place in terms of the area cultivated with sunflowers and the second place in terms of production (INSSE, 2024).

The main soil pests that cause production losses in sunflower culture are corn borer (*Tanymecus dilaticollis*), cutworm *(Agrotis sp.)* and wireworm *(Agriotes sp.)* (Badiu A.F. *et al*, 2019**;** Georgescu E. *et al* 2019, 2020**;** Trașcă F. *et al* 2019)**.**

Tanymecus dilaticollis and *Agriotes sp.* attacks sunflowers in the first phases of vegetation and can be controlled with insecticides with active substance 600 gr/liter imidacloprid and can be used only with authorization from Ministry Of Agriculture And Rural Development – Romania and applied only on surfaces heavily infested with these pests (ANFDF, 2024).

In last years, in Romania, was reported a big attack of birds like *Corvus frugilegus, Columba livia livia, Columba palumbus* and *Passer domesticus* in emergence phenophase of sunflower and ripening stage (G4media 2023; Ferma 2023, 2024; Sanatatea plantelor 2022; Agrointel, 2023).

The field rabit (*Lepus europaeus*) is another pest that causes damage to the sunflower crop (Ziua de vest, 2021).

Pathogens *Plasmopara halstedii, Sclerotinia sclerotiorum, Phomopsis helianthi, Alternaria helianthi, Albugo tragopogonis* causes loses of seed yield of sunflower culture (Anton F.G., 2021; Chiriac A.R. *et al*, 2023;

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Oprea D. *et al*, 2022**;** Petrova M., 2023; Radu I. et al, 2019; Risnoveanu L. et al, 2019).

Among the most limiting abiotic factors that affect the sunflower culture are represented by drought and heat (Anton F.G. *et al*, 2023; Clapco S. *et al,* 2018; Sauca , Port A. *et al*, 2023; Prodan (Poalelungi) T. *et al,* 2021; Sauca F., Anton F.G., 2019; Sauca F., *et al,* 2018).

MATERIAL AND METHOD

In year 2023 was observed behavior of 5 sunflower hybrids created at NARDI Fundulea, in 12 localities from Romania (*figure 1*). In Fundulea, these sunflower hybrids were cultivated on non-irrigated field.

Figure 1 County from Romania were was tested 5 sunflower hybrids in 12 localities, in year 2023

Oil sunflower hybrid FD15E27 is a semi-late hybrid and is cultivated in system Express Sun and is resistant at sulfonylurea herbicide with active substance tribenuron methyl.

Oil sunflower hybrids HS8445CLP, HS8840CLP and HS9233CLP are semi-late hybrids and are cultivated in system Clearfield Plus and are resistant at imidazolinone herbicides with active substance imazamox.

Oil sunflower hybrid HS1122CON is a semi-late hybrid and is cultivated in conventional system and is suitable for organic farming system. These five oil sunflower hybrids was sowing at beginning of April, in year 2023 in 12 localities in different environmental conditions to observe interaction between genotype and environment (GxE).

RESULTS AND DISCUSSIONS

The lowest seed yield was registered in Fundulea, because in growth stage of plant emergence (BBCH 10-12) and in seed filind and beginning of ripening (BBCH 78-85) was an a big attach of birds (*Corvus frugilegus, Columba palumbus* and *Passer domesticus)* and field rabbits, *Lepus europaeus (figure 2)*.

High infestation with weeds and sunflower broomrape (*Orobanche cumana Wallr)* affected production of sunflower (Anton F.G., Rîşnoveanu L., 2020; Anton F.G. *et al,* 2018, 2023; Clapco S., 2021; Clapco S., Duca M., 2020; Clapco S. *et al*, 2020; Cvejić S.*et al*, 2020; Duca M., Bivol I., 2023; Rîşnoveanu L. *et al*, 2016; Seiler G.J., 2019; Shevchenko S. *et al*, 2024 a,b).

For scaring birds, in Fundulea, in year 2023, we use mechanical cannon with gas explosion that make noise and scarecrows but it was unsuccessful.


Figure 2 Aspects of the sunflower field where there are large gaps caused by birds in year 2023, in Fundulea

Average monthly temperature registered in Fundulea, in year 2023 was higher than average monthly on 60 years (*figure 3*). Average annual temperature was 14.1ºC in year 2023 and average multiannual temperature of 60 years was 10.9ºC.

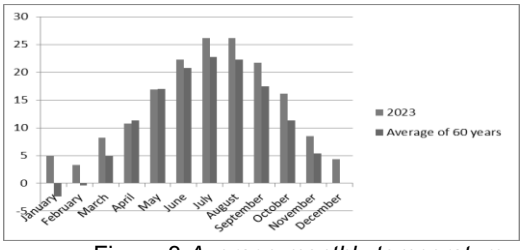

Figure 3 *Average monthly temperature registered in Fundulea, in year 2023*

Total amount rainfalls registered year 2023 in Fundulea of 423.4 mm, was lower than average of 60 years of 584.3mm (*figure 4*). Total amount rainfalls registered during vegetation of sunflower from months April to September was 204.4 mm and average of 60 years was 351.8 mm.

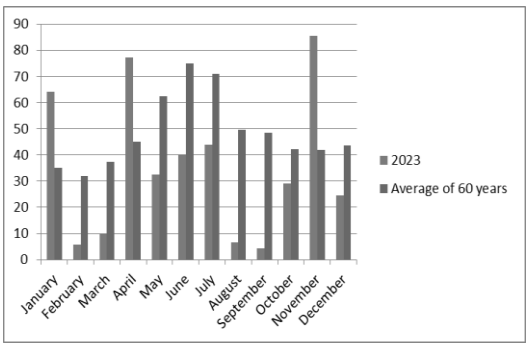

Figure 4 *Average monthly rainfalls registered in Fundulea, in year 2023*

The highest average seed yield from year 2023, was registered in locality Tecuci (county Galati) with 3832 Kg/ha and the lowest was registered in locality Fundulea (county Calarasi) with 1137 kg/ha (*table 1 and figure 5*).

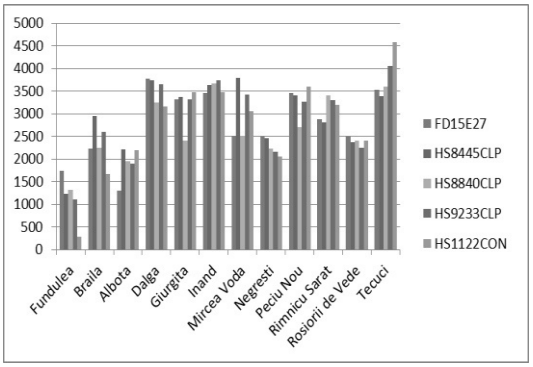

Figure 5 *Average seed yield (kg\ha) of five sunflower hybrids recorded in 12 localities, in Romania in year 2023*

Table 1

Average seed yield (kg\ha) registered in year 2023, in 12 localities

Locality	Average seed yield kg\ha	Difference
Fundulea	1137	-1665
Braila	2339	-463
Albota	1909	-893
Dalga	3511	+709
Giurgita	3177	+375
Inand	3591	+789
Mircea Voda	3060	+258
Negresti	2282	-520
Peciu Nou	3288	+486
Rimnicu Sarat	3119	+317
Rosiorii de Vede	2387	-415
Tecuci	3832	+1030
Average	2802	0

Average monthly rainfalls of 6.6 mm registered in month august in Fundulea, in year 2023, in phenological stage of seed filing, led to lower seed yield. High temperature registered in Fundulea, in year 2023, in phenological stage of flowering with a maximum of 39,3ºC in date of 25.07.2023, 39,6ºC in date of 26.07.2023 and 39,6ºC in date of 4.08.2023, led to low pollen viability.

Average highest seed yield registered in year 2023 was 2946 kg/ha by sunflower hybrids HS8445CLP in system Clearfield Plus (*table 2*).

Table 2

Average seed yield (kg\ha) of five sunflower hybrids, registered in year 2023 in 12 localities

Sunflower genotype	Average seed Yield Kg\ha	Difference
FD15E27	2766	-36
HS8445CLP	2946	+144
HS8840CLP	2638	-164
HS9233CLP	2898	+96
HS1122CO	2762	-40
Average	2802	0

Oil sunflower hybrid HS1122CON registered the lowest seed yield in Fundulea to the high infestation with weeds like *Chenopodium album*, *Ambrosia artemisiifoli, Xanthium strumarium, Cirsium arvense, Atriplex littoralis, Setaria viridisi* and *Sorghum halepense.* These weeds can be controlled with an integrated system of herbicides applied preemergence and postemergence. Clearfield, Clearfield Plus and Express Sun systems have better control against annual and perennial monocotyledonous and dicotyledonous weeds. In all systems of sunflower culture, but in special for conventional system we can use preemergence herbicides with active substance pendimetalin, aclonifen, S-metolaclor and selective graminicidal herbicides with active substance quizalofop-p-etil, quizalofop-p-tefuril, cletodim.

Soil pests *Tanymecus dilaticollis, Agrotis sp*. and *Agriotes sp.* has insignificant attack in year 2023, in Fundulea due to the protection offered by the seed treatment with systemic insecticide with active substance cyantraniliprol and imidacloprid (use only with authorization from Ministry Of Agriculture And Rural Development). An alternative to chemical treatments for *Tanymecus dilaticollis* is neem oil (Georgescu E. *et al*, 2024).

Pathogens *Plasmopara halstedii, Sclerotinia sclerotiorum, Phomopsis helianthi, Alternaria helianthi, Albugo tragopogonis* has insignificant attack in year 2023, in Fundulea due to the protection offered by the seed treatment with fungicides with active substance oxathiapiprolin and with treatment in vegetation with systemic fungicides with active substance boscalid, piraclostrobin, azoxistrobin, difenoconazol.

In Braila in year 2023, oil sunflower hybrid HS1122CON registered the lowest seed yield

(1670 kg/ha) due to high infestation with parasite *Orobanche cumana.* In fields with broomrape is better to cultivated sunflower hybrids Clearfield in system Clearfield Plus witch controlled this parasite.

All five sunflower hybrids registered different heights in all localities were they were tested (*figure 6*). Maximum height was registered by sunflower hybrid HS9233CLP with 215 cm, in locality Giurgita, in county Dolj and minimum height was registered by sunflower hybrid HS1122CON with 100cm, in locality Mircea Voda, in county Braila.

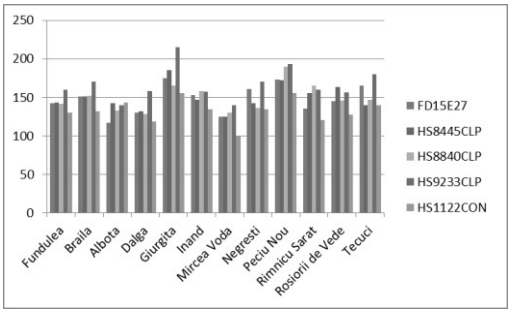

Figure 6 *Average height (cm) of five sunflower hybrids recorded in 12 localities, in Romania in year 2023*

Hectolitre weight (kg 100L -1) of al 5 sunflower hybrids was between 30.4 kg 100L -1 at sunflower hybrid HS1122CON, in locality Fundulea and 46.3 kg 100L -1 at sunflower hybrid HS8445CLP, in locality Braila (*figure 7*).

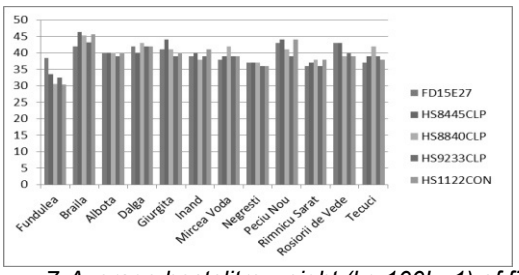

Figure 7 *Average hectolitre weight (kg 100L -1) of five sunflower hybrids recorded in 12 localities, in Romania in year 2023*

TSW (one thousand seed weight in grams) of all five sunflower hybrids was between 25.57g at sunflower hybrid HS1122CON in Braila location and 84g at sunflower hybrid HS9233CLP in Peciu Nou, in county Timis (*figure 8*).

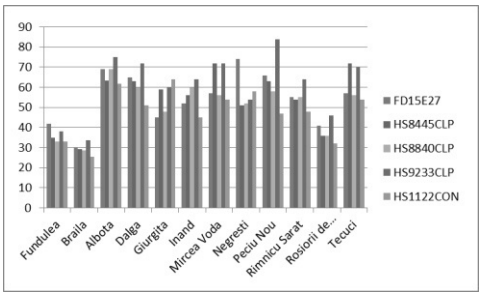

Figure 8 *Average TSW (g) of five sunflower hybrids recorded in 12 localities, in Romania in year 2023*

CONCLUSIONS

To manage difficulties from sunflower culture is necessary to use integrated plant protection measures.

For controlling populations of pests such *Tanymecus dilaticollis, Agrotis sp*. and *Agriotes sp* is recommended to use seed pre sowing treatment with insecticides and treatment in vegetation with systemic and contact insecticides.

For controlling soil borne pathogens *Plasmopara halstedii*, *Sclerotinia sclerotiorum, Phomopsis helianthi, Alternaria helianthi* and *Albugo tragopogonis* is recommended to use seed pre sowing treatment with system fungicides and treatment in vegetation with systemic and contact fungicides.

To avoid drought and heat is recommended to sowing earlier sunflower between middle and end of March and to use irrigation systems were is possible, before flowering and in stage of seed filling.

For controlling infestation with weeds such as *Amaranthus retroflexus, Atriplex littoralis, Chenopodium spp. Cirsium arvense, Solanum nigrum and Xanthium spp.* is recommended to sowing sunflower hybrids with resistance at sulfonylurea herbicides in Express Sun system.

For controlling infestation with weeds such as *Xanthium strumarium, Ambrosia artemisiifolia, Setaria viridis, Cirsium arvense, Convolvulus arvensis* and parasitic plant *Orobanche cumana* Wallr, is recommended to sowing sunflower hybrids with resistance at imidazolinone herbicides in Clearfield Plus system.

For conventional sunflower hybrids, to manage weeds infestation is recommended to use an preemergent herbicide and a graminicidal herbicide in vegetation.

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