

HARMFULNESS OF BIRDS (AVES) ON MATURING SUNFLOWER PLANTS IN NORTH-EAST REGIONS OF YUGOSLAVIA

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Sunflower is the most widespread industrial plant in Yugoslavia. According to the present studies which have not been completed, more than 70 species of pests of different importance (Čamprač, 1974) have been registered up to now on this crop only in the north-east region of Yugoslavia. Several species of birds are included in the group of the most important sunflower enemies in the mentioned region.

During the second part of summer and early in autumn different birds eat the maturing or mature seeds on sunflower fields pecking the seeds from sunflower head and very often scattering them on the soil. According to the data from several countries sunflower is damaged in the mentioned period by the following species of birds: *Columba livia* Gm., *Streptopelia turtur* L., *S. decaocto* Friv., *Myiopsittacus monachus* Bood., *Parus major* L., *Turdus merula* L., *Sitta europaea* L., *Emberiza* sp., *Carduelis carduelis* L., *C. chloris* L., *Passer domesticus* L., *P. hispaniolensis* Temm., *P. montanus* L., *Sturnus vulgaris* L., *Corvus frugilegus* L., *C. corone* L., *C. cryptoleucus* Couch., *Pica pica* L. and others.

In Iran birds represent a serious problem destroying sometimes up to 60—80% of seeds (according to the information given by N. Hodiati in personal contact). In the American state Minnesota the species of genus *Passer*, *Turdus merula* L., *Carduelis carduelis* L. and other birds eat up on some fields considerable amounts of sunflower seeds (Anonimus, 1967). Similar injuries caused by *Turdus merula* L. and other species were found out in the state North Dakota (Wilkins, 1972). In France the maturing seeds are attacked by *Passer domesticus* L., *P. montanus* L., *Carduelis chloris* L. and other species, where considerable losses are caused by sparrows (Anonimus, 1972). For the Soviet Union, according to Semihnenko (1965) five species of sparrows are harmful in the mentioned period and the most harmful of them is *Passer domesticus* L. In Poland higher losses on maturing crops in small sunflower fields are caused by *Passer domesticus* L.,

P. montanus L. and *Carduelis chloris* L. (Dembinski, 1971). In Romania sparrows can cause considerable losses of sunflower, mainly in the fields with uneven maturing and late harvest (Mózes, 1959). In Hungary according to Huzián (1963) among all sunflower pests the most important losses are caused by birds, particularly *Passer domesticus* L. and *Corvidae*, reducing the sunflower yield for 2—4% in average. In Hungary sparrows often destroy 20—30% of seeds (Botos, 1969) primarily near settlements and forest edges.

MATERIAL AND METHODS

In order to establish the losses caused by birds on maturing sunflower head, investigations have been conducted in Voivodina (the north-east part of Yugoslavia) where this crop has been grown on about 160,000 ha. During September in the period from 1970 to 1973 a total of 161 fields consisting of small and large plots were surveyed at different localities and 21,000 plants were analyzed. In the individual fields plants were surveyed diagonally at ten different places while for the whole field 120 plants were analyzed. Then the number of attacked sunflower heads and the degree of injury were recorded. The degree of attack was registered after the scale from 0 to 5 where each number had a definite value, as follows: 0 = healthy sunflower heads, 1 = to 5% of destroyed seeds, 2 = 5 to 25% of destroyed seeds, 3 = 25 to 50% of destroyed seeds, 4 = 50 to 75% of destroyed seeds and 5 = 75 to 100% of destroyed seeds per one head.

Beside the assessment of losses caused by birds for the whole plot, on large plots the harmful effect of birds was investigated at different places, namely from the edge towards the middle of field. On the fields of 25—30 ha the loss was registered at the points which were 10, 50, 100 and 200 m far away from the field edge. On the fields of 70—120 ha these testings were conducted on four points which were 10, 100, 300 and 500 m far away from the field edge.

The investigations of losses caused by birds on sunflower plants in Voivodina region were performed with the assistance of Kosovac V. (Zrenjanin), Stamenković S. (Novi Sad) and Bača F. (Belgrade) and on this occasion again we express our particular gratitude.

RESULTS

In the fields under maturing sunflower plants in north-east part of Yugoslavia there can be found about ten species of birds belonging to the families *Ploceidae*, *Sturnidae*, *Columbidae*, *Corvidae*, *Alaudidae* and some others among which the most outstanding is the first mentioned one. Among the individual species we found the following ones: *Passer domesticus* L., *P. montanus* L., *Columba livia* Gm., *Streptopelia decaocto* Friv., *S. turtur* L., *Corvus frugilegus* L., *Pica pica* L., *Sturnus vulgaris* L., *Alauda arvensis* L. and some others. They feed by pecking the seeds from head during August and September coming to the sunflower fields mostly in smaller or larger flocks. As regards the fre-

quency of their coming and their harmfulness the first place belongs to *Passer domesticus* L. and *P. montanus* L.; in the second group are *Corvus frugilegus* L. and some representatives of the family *Columbidae* whereas the rest of birds belong to the third group (table 1):

Table 1

Damages of birds in the period from 1970 to 1973 on small sunflower plots in Voivodina

Date of survey	Number of localities	Number of surveyed fields	Number of analyzed plants	Hurted heads in %
3 — 18 IX 1970	5	19	1900	20.1
7 — 17 IX 1971	12	12	1660	54.2
6 — 21 IX 1972	10	10	1200	79.5
12 — 19 IX 1973	23	32	3200	33.9
3 — 21 IX 1970-73	50	73	7960	46.5

Birds peck seeds during September nearly on each field under sunflower. During four years we analyzed 161 fields in total and on each of them damage caused by birds were established. In the individual years the average damage ranged from 22.4 to 70.4% with a medium degree of attack from 1.73 to 1.92. If we take into account all four years then the average damage on sunflower plants caused by birds is 42.3%.

Most of the fields had from 11 to 30% of damaged sunflower heads (in total more than one third of all analyzed plots), then one fourth belongs to the group with 31 to 50% of damaged plants namely nearly one fourth of field with 51 to 80% of attacked heads. Rarely it can be find fields with nearly every head (91 to 100%) being damaged by birds.

On small private fields it was established that 23.5% of plants had 1—5% of damaged seeds per head, 12.3% of plants had 5—25% of damaged seeds, 6.2% of plants with 25—50%, 3.3% of plants with 50—75% and only 1.2% of plants with the loss of 75—100%.

Damages gradually increase when the harvest time approaches. For instance, in one region between 3rd and 5th September in 1970 only 10.6% of plants were attacked and two weeks later already 33% of heads. Furthermore, losses are considerably higher when sunflower harvest is in delay which is confirmed also by the Hungarian authors (Kadocsa, 1943, Gyémánt, 1973) who point out that birds cause problems primarily at late harvest.

Damages caused by different birds on maturing sunflowers are higher when the field is small (Hungarian, French and Polish authors state that the highest damages are on small fields under sunflower — Gyémánt, 1973; Anonimus, 1972; Dembinski, 1971), if there are no other fields under this crop in vicinity, if sunflower field is close to the settlement, farm, estate, near the treelined path and

smaller or larger forests. For instance, in September in 1970 three fields near an estate had damages varying from 34 to 58% and on other 6 fields which were not near the building or settlement, the damage was registered on an average of 27% of sunflower heads (table 2).

Table 2

Average damages of birds in different parts of 10 sunflower fields of 25 to 30 ha, in dependence of the distance of field edge (September 1972)

Treatments	\bar{x}	Distance from field edge		
		200 m	100 m	50 m
		$\bar{x} - 52.51$	$\bar{x} - 57.91$	$\bar{x} - 66.73$
10 m distance from edge	72.39	19.88**	14.48**	5.66
50 m "	66.73	14.22**	8.82*	
100 m "	57.91	5.40		
200 m "	52.51			

LSD_{0,05} = 7,31

LSD_{0,01} = 9,81.

Greater damages were regularly found at the edge of field in comparison to the rest parts of the plot. Three year average for the damage of heads on the plots of 25—30 ha, is as follows: 10 m from the edge there are 63% of damaged heads, at 50 m the damage decreases to 54%, at 100 m it is 44% and at 200 m only 36%. Thus from the edge of field to its middle, the percent of attacked heads decreases and at 200 m it decreases for about 40% in comparison to the damaged plants which are near the very edge of the field. According to the one year results in the fields of 70 to 120 ha the damage was as follows: 10 m from edge of plot the damage of heads was 38%, at 100 m the damage decreases to 32%, at 300 m it decreases to 20% and at 500 m it decreases to only 11%. At 300 m the percent of attack amounted only to one half in relation to the edge part and at 500 m nearly a fourth.

On the basis of the results obtained in many-year investigations it can be concluded that different birds in average cause the reduction of sunflower yield from 3 to 5% which is 50 to 90 kg of seeds per 1 ha. At a mean reduction of seed yield only for 3%, birds cause in Voivodina region a total annual loss of 8,000 tons of sunflower. Damages caused by birds can be decreased by the following measures: to grow sunflower on as large plots as possible; sunflower field should be far removed from the settlements, estates and forests; harvest should be performed on time.

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