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BEHAVIOUR OF NS SUNFLOWER HYBRIDS HARVESTED AT DIFFERENT SEED MOISTURES.

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ABSTRACT

The problem of efficient sunflower harvest is always present, regardless of the level of production. Yield losses per area unit, depending on the characteristics of harvesters used, working conditions, and crop health, range from 2 to 6%. The major loss comes from seed shedding on the drum. It usually amounts to 1.50 — 4.50%. In our tests, it ranged from 0.89 to 2.91%. Delays in harvest increase the losses and by the same token the number of volunteer sunflowers in subsequent seasons. Precision in setting the harvester and driver's skill considerably affect the quality of seed.

INTRODUCTION

Long-term tests showed that sunflower varieties and hybrids differ in the extent of losses and quality of seed when machine harvested. Since 1962 we have exclusively used wheat harvesters with special attachments for sunflower harvesting. Specialized sunflower harvesters constructed recently, as a "comb-type" harvester manufactured by "Zmaj", still allow sizeable losses, especially in shedded seeds, which depend on the hybrid harvested, its maturity and health. Volunteer sunflowers adversely affect the subsequent crop, especially sugar-beet, soybean, vegetables, corn, etc. Worse still, the seed of volunteer sunflowers remain viable for up to 3 — 4 years.

In this situation, efforts have been made to reduce the extent of seed shedding during machine harvesting.

This paper discusses the results of a study on the behaviour of NS hybrids harvested at different dates (seed moistures), with particular attention on the losses caused by seed shedding on the drum.

MATERIAL AND METHOD

Three most popular hybrids, NS-H-26-RM, NS-H-27-RM, and NS-H-62-RM, were tested. Standard quality seed produced in 1979, 1000-seed weight 55.6 — 67.2 gr., germinability 92 — 94%, was pneumatic planted on April 16, 1980 at AIC "Elan", Srbobran. Row-to-row distance was 0.70 m, plant-to-plant distances 23.5 and 25.5 cm. The seeding was increased by 21.7 — 24.5%. Each hybrid was planted on 1.68 ha in a regularly shaped plot of 20.0 ha. The preceeding crop was wheat. Conventional cultural practices were applied.

The weather conditions during the vegetative season were unfavorable. The rainfall in the period January-August was 443.6 mm, in the period April-August 350.6 mm. The spring was unusually cool and rainy. On July 21, a heavy storm with a westerly wind blowing at the speed of over 100 km/hr damaged the crop. DLG and ILR methods were used to evaluate the precision of planting and the changes in plant number during the season.

The harvest was performed on three dates, at seed moistures 15 — 17%, 11 — 13%, and below 10%, using the universal wheat combine harvester "Zmaj — 161", the working rate 6.0 kg of grain per second, equipped with a special attachment for sunflower harvesting.

All operations were conducted under internationally accepted methods, as OECD, NIAE, etc., adapted to the existing conditions and sunflower crop.

The harvester was regulated for sunflower harvesting in the conventional way, weather conditions were favorable.

RESULTS AND DISCUSSION

Condition and arrangement of emerged plants (Table 1). Observation plots (3 x 80 = 250 m²) were established for each hybrid and all changes on the plants were followed from planting to harvest.

Table 1. Condition and arrangement of emerged plants, stands realized, and yields at harvest.

No.	Indicator	Unit of measure	Hybrid		
			NS-H-26-RM	NS-H-27-RM	NS-H-62-RM
1.	Stand planned	ooo/ha	50.0	50.0	45.0
2.	Seeding rate	ooo/ha	60.8	60.8	56.0
		%	121.7	121.7	124.4
3.	Emerged	ooo/ha	51.4	52.1	49.6
		%	84.5	85.7	88.6
4.	No. of hills with				
	— one plant	%	98.1	97.6	98.5
	— two plants	%	1.9	2.4	1.5
5.	Arr. of emerged plants				
	— group 0,5	%	0.0	0.0	0.0
	— group 0, 5 — 1, 5	%	82.1	85.0	83.4
	— group 1, 5 — 2, 5	%	14.7	12.9	13.8
	— group 2, 5	%	3.2	2.1	2.8
6.	Perished plants	ooo/ha	6.0	5.7	6.5
		%	11.7	10.9	13.1
7.	Stand realized	ooo/ha	45.4	46.4	43.1
		%	90.8	92.8	95.8
8.	Seed yield at 11.0% moisture	t/ha	2.78	2.40	2.13

The number of emerged plants was about 50,000 (84 — 88%). There were 97.6 — 98.5% of hills with one plant and only 1.5 — 2.4% of hills with two plants. The percentage of well-arranged plants in the row was high: 82 — 85% of emerged plants at the distance of 0.5 — 1.5 (DLG) or 12.0 — 35.0 cm.

The number of dead plants (from planting to harvest) was 5,700 — 6,500 (10.9 — 13.1%); 90% of these were destroyed by pests, 10% by between-row cultivation. The stand at harvest was 90.8 — 95.8% which may be considered as satisfactory.

The yields obtained were 2.13 — 2.78 t/ha of dry seed.

Crop condition at harvest (Table 2). The moisture contents in seed, heads, and stems were 16.2 — 17.3%, 35 — 41%, and 29 — 35%, respectively, at the first harvest date, 10.0 — 12.8%, 23 — 26%, 21 — 24%, respectively, at the second harvest date, and below 10.0%, 20 — 25%, and 18 — 20%, respectively at the third harvest date. The harvest lasted from September 12 to 21.

Table 2. Crop condition at harvest.

No.	Hybrid	Harvest date	Seed moisture	No. of plants	Lodged plants	Infected plants
1.	NS-H-26-RM	1	16.2	47.4	9.5	11.9
		2	12.2	49.2	13.4	7.9
		3	8.6	45.1	14.1	9.9
	Average		12.3	47.2	12.3	9.9
2.	NS-H-27-RM	1	17.2	47.4	8.4	12.2
		2	10.0	48.1	8.4	12.3
		3	8.1	48.9	9.1	11.4
	Average		11.7	48.1	8.6	11.9
3.	NS-H-62-RM	1	17.3	43.3	17.9	18.7
		2	12.8	46.4	17.0	15.8
		3	9.1	45.2	18.1	16.5
	Average		13.1	44.9	17.7	17.0

The average number of plants at harvest (outside the observation plots) was 44,900 — 48,100, which is close to the stand planned.

The percentages of lodged and broken plants ranged from 8.6% in NS-H-27-RM to 17.7% in NS-H-62-RM. The percentages of infected and stunted plants were similar.

The average plant height, head diameter, and stem diameter at 60 cm above the ground were 140 cm, 19.3 cm, and 2.4 cm, respectively, in NS-H-26-RM, 154 cm, 17.1 cm, and 2.4 cm, respectively, in NS-H-27-RM, and 161 cm, 12.4 cm, and 2.0 cm, respectively, in NS-H-62-RM.

Losses at harvest (Table 3). The losses in shedded seeds ranged from 0.89 to 1.30% at the first date, 1.85 to 2.10% at the second, and 2.44 to 2.91% at the third. Expressed in kg/ha, the losses were 25.0, 40 — 50, and 56 — 70, respectively. It ensues that the losses were 10 — 15 times larger than the seeding rate (3 — 4.5 kg/ha). NS-H-62-RM had the largest losses. There were no large differences in the losses in the heads among the harvest dates. 80 — 85% of the lost heads were unharvested and 15 — 20% were cut off but fell to the ground.

Table 3. Losses at harvest per hectare (%).

No.	Hybrid	Harv. date	Working speed km/hr	Seed yield t/ha	Drum		Losses Total	Tresher harv.	Total
					Shed.	Heads			
1.	NS-H-26-RM	1	4.05		1.77	1.75	2.95	0.50	3.45
		2	4.80	2.73	1.85	2.10	3.95	0.34	4.29
		3	5.05		2.60	2.30	4.90	0.40	5.30
		Average	4.63	2.73	1.87	2.05	3.92	0.41	4.33
2.	NS-H-27-RM	1	4.00		0.89	1.89	2.78	0.81	3.59
		2	4.73	2.33	1.89	1.99	3.88	0.73	4.61
		3	5.10		2.44	2.10	4.54	0.68	5.22
		Average	4.61	2.33	1.74	1.99	3.73	0.74	4.47
3.	NS-H-62-RM	1	3.73		1.30	2.05	3.35	1.04	4.39
		2	4.70	1.93	2.10	2.31	4.41	0.69	5.10
		3	5.00		2.91	2.52	5.43	0.54	5.97
		Average	4.48	1.93	2.10	2.29	4.39	0.76	5.15

The average losses on the drum ranged from 3.73% in NS-H-27-RM to 4.39% in NS-H-62-RM. The losses on the tresher were small, 0.41 — 0.76%, at the working rate of 3.0 — 3.70 kg of seed per second.

The losses, ranging from 4.33 to 5.15%, depended on harvest date and hybrid harvested.

Seed quality (Table 4). In average working conditions and satisfactory setting of the harvester, the quality of harvested seed (mechanical composition) was good. There were no differences in seed quality in relation to harvest date. NS-H-26-RM had the best quality — 4.48% of seeds with damaged husks. The percentage of damage with the other hybrids was 6.0%.

Table 4. Average degree of damage of harvested seed.

No.	Hybrid	Seed moist.	Damaged seed	Husked seed	Total (4 + 5)	Mech. impur.
1.	2.	3.	4.	5.	6.	7.
1.	NS-H-26-RM	12.3	2.10	2.38	4.48	2.70
2.	NS-H-27-RM	11.7	3.06	3.10	6.16	3.39
3.	NS-H-62-RM	13.0	2.64	3.69	6.33	3.72

Effect of harvester setting on the degree of damage (Table 5). A proper adjustment of the drum is essential in sunflower harvest. This frequently is not the case in

commercial production and the result is reduced seed quality. It means that different seed quality may be obtained with the same harvester and the same driver.

Table 5. Effect of harvester regulation on the degree of seed damage.

No.	Hybrid	Seed moist.	Drum and concave Entrance in mm.	Rpm	Damaged seed %	Husked seed %	Total %
1.	NS-H-26-RM	12.2	28	900	3.90	7.07	10.97
		12.2	32	500	2.85	3.75	6.06
			28	300	2.05	1.85	3.90
		Average	29.3	566.6	2.93	4.22	7.16
2.	NS-H-27-RM	10.0	28	900	4.90	8.57	13.47
			32	500	2.35	4.60	6.95
			28	300	1.93	3.00	4.93
		Average	29.3	566.6	3.06	5.39	8.45

CONCLUSIONS

The weather conditions of 1980 were unfavorable for sunflower crop.

The cultural practices used produced 90.0 — 96.0% of the stand planned. The arrangement of plants in rows was very good.

The crop condition at harvest was unsatisfactory. The percentages of lodged and damaged plants (due to wind and diseases) ranged from 8.6% in NS-H-27-RM to 17.7% in NS-H-62-RM. The percentages of infected and stunted plants ranged from 10 to 17%.

The losses at harvest, which were larger than usual, were 4.33 — 5.15% on the average. The losses increased with delays in harvest. The largest problem was seed shedding on the drum. These losses also increased with delays in harvest (Table 3).

The quality of harvested seed depended on the precision in setting the harvester and driver's skill.

The yields obtained (2.0 — 2.7 t/ha) were quite satisfactory.

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