

Sunflower Harvesting

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Abstract: Over the period 1993-97 at the Institute for Wheat and Sunflower "Dobroudja" as well as in the production under the new agricultural conditions investigations were conducted concerning the obtained sunflower produce by means of some new grain harvest combines - Claas Dominator 108 SL, "MAXI", Don-1500 A as well as the rotary combine Case 1666 aggregated with devices for sunflower harvesting MA 922, PSP-10, Case 1030 and PSP-1.5, respectively. Investigations were conducted when harvesting sunflower hybrid Albena.

When harvesting sunflower it is necessary to aggregate the grain harvest combines with devices possessing active gripping - transporting operating mechanisms being of the MA 922, PSP-10 and PSP-1.5 type. Devices Case 1030 designed for sunflower have passive lifter operating mechanisms do not meet the agrotechnical requirements. Regarding the threshing quality the results suggest, that in certain conditions the combines Claas Dominator 108 SL, "MAXI" and Don-1500 A coned comply with the purpose they are designed for. Very good results were obtained from the rotary combine Case 1666. Sound seeds reached 96 %, broken seeds - up to 1.0 %, and the naked ones - up to 0.2 %. There is a tendency towards decreasing the mechanical seed damage when increasing the loading of the combine.

Key words: sunflower, active gripper, rotary combine, harvest improvement, lowering of seed damage

Introduction

Harvesting the produce obtained is one of the most important processes of the present - day agriculture. In this respect various modern harvesting technologies have been sought after and applied as well.

The tendency towards increasing the grain crop yields predetermines the necessity for grain harvest combines to go into production, which should have throughput reaching 8-10 kg/s or even more [2]. In this connection when harvesting sunflower the problem of using certain devices arises - which could provide the corresponding loading of the combine.

In respect with the mechanical seed damage rotary combines of the International Harvester, Case, etc. type have been used [1, 3].

Over the period 1993-97 at the Institute for Wheat and Sunflower "Dobroudja" as well as in the production under the new agricultural conditions investigations were conducted concerning the obtained sunflower produce by means of some new grain harvest combines.

Materials and methods

Investigations were carried out using the grain harvest combines Claas Dominator 108 SL, "MAXI", Don-1500 A as well as the rotary combine Case 1666 aggregated with devices for sunflower harvesting MA 922, PSP-10, Case 1030 and PSP-1.5, respectively. The PSP-10 and MA 922 devices harvest at the same time 8 rows and their operating width is 5.6 m. With the PSP-10 and PSP 1.5 devices the conveyors for the stems are of a chain-click type and conveyors for shed seed have been built in on the dividers. The device MA 922 is of auger type conveyors for stems and it is mounted on the grain reaper. Case 1030 and PSP-1.5 gather simultaneously 6 rows and their operating grip is 4.20 m. Case 1030 has passive lifter dividers for the stems and during harvest time those have no built - in conveyors neither for the stems nor for the shed seed.

Besides the quality criteria when harvesting the produce obtained the amount of the acceptable losses of sunflower seed is also of importance. The losses were determined applying the standard method.

Analyzing the threshed quantity at different loading of the thresh-separating apparatus (with 3 loading regimes) the following kind of seeds have been determined: whole sound seed, broken seed, naked seed, inert and other admixture.

Investigations were conducted when harvesting sunflower hybrid Albena.

Results and discussion

The conditions in which the studies were carried out are given in Table 1. The planting density over the particular years varied from 4.2 to 4.9 plants per 1 m^2 , whereas the height was in the range from 158.1 cm to 168.1 cm. The yield of sunflower seed proved to be the lowest in 1994 - 2.168 t/ha, while it was the

highest in 1995 - 2.785 t/ha. Preliminary losses were not recorded. Seed moisture ranged from 12.5 to 12.8 %.

Table 1. Characteristic of the sowing

Indexes	Values in years				
	1993	1994	1995	1996	1997
Number of plants per 1 m ²	4.4	4.5	4.9	4.9	4.2
Plant height, cm	162.0	158.1	163.1	168.1	161.0
Seed yield, t/ha	2.210	2.168	2.785	2.655	2.537
Moisture of the seed, %	12.5	12.8	12.6	12.6	12.5

The losses established significantly differed in regard to the machines (Tab.2). The lowest losses were given by the PSP-10, MA 922 and PSP-1.5 devices aggregated with Don-1500 A.

Table 2. Seed losses in harvesting (on the average for 1993-97)

Machines	Operating speed km/h	Losses of			Total losses of seed %
		Shed seed %	Scattered heads %	Scattered and noncut stems %	
Claas Dominator 108 SL "MAXI" + MA 922					
- I regime	4.1	0.4	0.5	0.2	1.1
- II regime	5.7	0.5	0.6	0.3	1.4
- III regime	6.9	0.6	0.9	0.4	1.9
Don 1500 A + PSP - 10					
- I regime	4.2	0.4	0.2	0.1	0.7
- II regime	5.6	0.5	0.5	0.2	1.2
- III regime	7.2	0.5	0.4	0.5	1.4
CASE 1666 + CASE 1030					
- I regime	4.5	0.9	1.1	1.1	3.1
- II regime	5.6	1.0	1.2	1.2	3.4
- III regime	7.0	1.0	1.3	1.5	3.8
CASE 1666 + PSP - 1.5					
- I regime	4.6	0.5	0.6	0.2	1.3
- II regime	5.8	0.5	0.5	0.2	1.2
- III regime	7.2	0.6	0.7	0.6	1.9

Claas Dominator 108 SL, "MAXI" and Case 1666, respectively. The losses of shed seed with all the three machines exceeded 0.6 %. The losses of scattered and non - cut stems did not exceed 0.6 %. The lowest losses of scattered heads were given by PSP-10 - up to 0.5 %; by PSP-1.5 - up to 0.7 %; and by MA 922 up to 0.9 %. The total losses of sunflower harvesting were the lowest with PSP-10 - from 0.7 to 1.4 % depending on the operating speed of the

combine. The total losses with MA 922 and PSP-1.5 appeared to be low as well - from 1.1 to 1.9 %, respectively.

The total losses of seed were the highest with Case 1030 - from 3.1 % to 3.8 % depending on the operating speed of the combine. The Case 1030 device does not meet the agrotechnical requirements related to the acceptable loss. Acceptable losses were also high with Case 1030 in regard to the particular elements: loss of shed seed - from 0.9 to 1.0 %; loss of scattered heads - from 1.1 to 1.3 %; and losses of non - cut and scattered plants - from 1.1 to 1.5 %. That was due to the lifter operating mechanisms which possess neither conveyors for stems, nor conveyors for shaded seed during the harvest time.

The results concerning the analysis of the threshed sunflower significantly differed in regard to the machines (Tab. 3). The rotary combine Case 1666 damages the seed to a lesser extent as compared with Don-1500 A and Claas Dominator 108 SL, "MAXI". The sound seed with Case 1666 reached 96 %; the broken one - up to 1.0 %, while the naked seed - up to 0.2 %. That was due to the comparatively "softer" operating regime of the axis-rotor thresh - separating apparatus.

Table 3. Results from the analysis of threshing mass
(on the average for 1993-97)

Machines	Operating speed km/h	Whole sound seed %	Broken seed %	Naked seed %	Inert admixture %	Other admixture %
Claas Dominator 108 SL "MAXI"						
- I regime	4.1	89.5	1.8	1.2	2.7	4.8
- II regime	5.7	90.9	1.6	1.1	1.9	4.5
- III regime	6.9	91.4	1.5	1.0	2.7	3.8
Don 1500 A						
- I regime	4.2	86.5	2.3	1.2	4.9	5.1
- II regime	5.6	86.8	2.0	1.2	5.2	4.8
- III regime	7.2	88.3	1.8	1.0	4.4	4.5
CASE 1666						
- I regime	4.5	93.5	1.0	0.1	1.1	4.3
- II regime	5.6	95.9	0.9	0.1	0.5	2.6
- III regime	7.0	95.4	0.9	0.2	0.8	2.7

The sound seed with Don-1500 A was in the range from 86.5 to 88.3 % depending on the loading of the combine, while with Claas Dominator 108 SL, "MAXI" it was from 89.5 to 91.4 %, and the broken seed varied from 1.8 to 2.3 % and from 1.5 to 1.8 %, respectively. Naked seed with both combines was from 1.0 to 1.2 %.

Over the years the results obtained did not considerably differ, therefore, in the tables those are presented on the average for the investigating period. There is a tendency towards improving the loading of the combines (Tab. 3). An increase of the broken and naked seed was also observed.

Conclusions

When harvesting sunflower it is necessary to aggregate the grain harvest combines with devices possessing active gripping - transporting operating mechanisms being of the MA 922, PSP-10 and PSP-1.5 type. Devices Case 1030 designed for sunflower have passive lifter operating mechanisms do not meet the agrotechnical requirements. Regarding the threshing quality the results suggest, that in certain conditions the combines Claas Dominator 108 SL, "MAXI" and Don-1500 A coned comply with the purpose they are designed for. Very good results were obtained from the rotary combine Case 1666. Sound seeds reached 96 %, broken seeds - up to 1.0 %, and the naked ones - up to 0.2 %. There is a tendency towards decreasing the mechanical seed damage when increasing the loading of the combine.

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BERBA SUNCOKRETA

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Rezime

Tokom perioda od 1973-97, na Institutu za Pšenicu i Suncokret "Dobrouđa" kao i u proizvodnji, u novim agroekološkim uslovima, vršena su istraživanja kvaliteta berbe suncokreta pomoću nekih novih kombajna za b - klasa Dominator 108 SL, "MAXI", Don-1500 A, kao i pomoću rotacionog kombajna sa kućištem 1666, zajedno sa uređajima za berbu suncokreta MA 922, PSP-10, kućište 1030 odnosno PSP-1.5.

Ispitivanja su vršena pri berbi hibrida suncokreta Albena.

Pri berbi suncokreta, neophodno je nadopuniti kombajne berače uređajima koji imaju aktivne mehanizme za hvatanje i transport, tipa MA 922, PSP-10 i PSP-1.5. Uređaji kućišta 1030, projektovani za suncokret imaju pasivne mehanizme za dizanje koji ne ispunjavaju agrotehničke zahteve. U pogledu kvaliteta vršidbe, rezultati pokazuju, da u određenim uslovima, kombajni klase Dominator 108 SL, "MAXI" i Don-1500 A konusni, odgovaraju nameni za koju su projektovani. Veoma dobri rezultati su dobijeni sa rotacionim kombajnom kućišta 1666. Dobijeno je 96% zdravog, 1.0% izlomljenog i 0.2% praznog semena. Cilj je smanjivanje mehaničkog oštećenja semena pri povećanom opterećenju kombajna.