

# EXPERIENCE IN OIL SEED RAPE HARVESTING

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**Abstract:** In harvesting oil seed rape on family farm in Baranja unequipped foreign combine «A» and «B» were making equal losses on adapter (2,7 i 2,2%), bigger on divider (4,8-5,2 i 7,1%), but also on sieves 1,8%, apropos >2% which is determined for combine «B». Fully equipped inland combine «C» was making losses 16,1% on adapter and >2% on sieves. On IPK Osijek RJ Bara under harvesting treated crops of oil seed rape with Agrovital (adhesive) total losses at «A» combine are 7,0%, at «B» 12,85%, as well as inland unequipped combine 10,35%. In harvesting untreated, layed and convoluted crop with fully equipped foreign combine «D» was making loss by 26,0%, but inland unequipped combine 24,4% on adapter, 22,8% on divider and >2% on sieves.

**Key words:** combine, harvesting, losses, oil seed rape.

## INTRODUCTION

Rape growing (*Brassica napus sp. oleifera*) has been intensified in EU in the last 15 years whereas in Croatia it has still been represented on 13 to 16 thousand hectares, depending on the year (table 1). It is grown for oil, crushed seed, cake and seeds containing 40-48 % oil and 18-25 % proteins, [2] and [3]. Rape yields in Western Europe are on the average 3,5 to 4 t ha<sup>-1</sup>, whereas Croatian mean is 2.2 tons ha<sup>-1</sup>. Rape harvest in Croatia is mainly conducted by a combine with header for grain crops. Thus, losses occurring are unacceptable high, 10-30 % of the yield [4]. Harvest should be done when a crop is yellowish–brown in color, stem yellowish–yellow and leaves mostly dry or yellow-brown if not dry [1]. Husks are primarily yellow-brown in color on the side branches and only a little bit yellow-greenish. Central branch husks are grey-brown in color. They crack on the central branch if the husk stem is slightly tapped. On the basis of science, the rape grain losses have been poorly quantified in our country. Almost three decades ago, harvest grain losses of the rape was studied at the Faculty of Agronomy in Zagreb – Department of Agricultural Engineering [4]. On receiving results, extension of the grain header deck was suggested to be built-in on the total length of 60 cm. In the year of EU association, Croatia will be obliged to have a portion of bio-diesel fuel consumption at the level of 2 % of the total mineral originated fuel consumption [5]. A bio-diesel portion should, in the forthcoming years, be annually increased by 0.75 % until 2010. In 2020 Croatia should launch 20 % of bio-diesel to the market [6].

## MATERIAL AND METHODS

The research was conducted during the rape harvest on both the family farm in Baranya and IPK (agricultural and processing plant) Osijek, work unit Bara in 2005. The rape harvest in Baranya was done by the combines A and B with grain header including a combine C characterized by a special rape header (header deck length l=80 cm + cutter bar). In the work unit Bara the harvest was conducted by the combine A with the rape header (header deck length l=100 cm + cutter bar) and combine B (vertical cutter bar separator), as well as combine C with the grain header. Harvesting of the cultivar Express in Baranya was done on 29 June whereas of Navajo and Bristol cultivars on IPK Osijek work unit Bara on 1 and 5 July in 2005. Losses were collected on the header mid and separator by the tins of A=0,1 m<sup>2</sup> placed on the soil prior a combine has passed. A threshing machine loss was determined by five (5) PVC containers (produced by the Institute for agricultural engineering and the Faculty of Agriculture for crop production, Halle Germany), which were thrown into the plant residues mass falling from the combine. Plants height was determined by a meter whereas a stand by 1 m<sup>2</sup>. The crops status was determined

by the researcher estimation. Rape grain yield and moisture were quantified in IPK Oil factory Čepin p.l.c. [1] and [2].

**Table 1.** Total rape production in the Republic of Croatia and worldwide(fao.org)

Year	Republic of Croatia		Production (t)	
	reaping	Yield	Republic of Croatia	World
	(ha)	(t ha <sup>-1</sup> )		
1992	11.743	2,06	24.183	26, 716.865
1993	13.010	2,20	28.665	26, 149.145
1994	13.889	2,04	28.341	29, 654.969
1995	10.982	2,23	24.472	34, 178.196
1996	7.651	1,52	11.661	30, 421.211
1997	5.356	2,09	11.181	35, 061.083
1998	8.949	2,45	21.967	35, 744.416
1999	16.234	2,01	32.581	43, 172.675
2000	12.886	2,28	29.436	39, 511.417
2001	10.319	2,18	22.456	35, 915.962
2002	13.041	1,96	25.585	33, 999.990
2003	15.524	1,84	26.000	35, 931.652
2004	14.299	2,33	33.167	42, 000.000
Average	11.837	2,09	24.591	34, 515.384

## RESULTS AND DISCUSSION

The trial field of the rape growing season in the period from September 2004 to June 2005 was known for total precipitation of 638.2 mm i.e. 12.5 % higher compared to the longtime mean. It is characterized by precipitation deficiency in September (sowing month) and pronounced excess in November of 2004 and June of 2005. Logged plants and prolong harvest were considerably affected by the storm weather known for 44 mm of precipitation on 1 July and 42.6 mm on 4 July.

**Table 2.** Precipitations (mm) in the rape growing season in 2004/05 and 10-year mean of the period 1995-2004.

Name	IX 2004	X	XI	XII	I 2005	II	III	IV	V	VI	Total
2004/05	44,7	80,1	120,7	39,9	33,3	65,9	45,3	56,0	60,2	92,1	638,2
1995- 2004	83,5	58,5	69,8	55,0	48,3	34,8	32,4	57,9	69,7	57,6	567,5

**Table 3.** Mean monthly air temperature (°C) during the rape growing season in 2004/05 and 10-year mean of the period 1995-2004.

Name	IX	X	XI	XII	I	II	III	IV	V	VI	Average
2004/05	15,8	13,0	6,0	2,1	0,0	-3,6	3,9	11,6	17,4	20,1	11,24
1961- 90	16,6	11,2	5,4	0,9	-1,2	1,6	6,1	11,3	16,5	19,5	9,9

Mean monthly air temperature in the last four months of 2004 and first six months of 2005 is higher by 14% compared to the longtime mean. October and December were warmer unlike February and March which were colder.

Crop of the cultivar Express was on the Baranya family farm upright, slightly lodged characterized by the stand of the 24 determined plants  $m^{-2}$ . Table 4 shows the harvest rape loss. While harvesting, loss of 1.8%  $ha^{-1}$  was reported on the threshing machine of the combine. A whereas not sufficiently adjusted combines B and C resulted in the loss of >2%. Namely, combine B was known for the average of 38 grains/PVC containers whereas combine C for 30 grains on the average. Calibration graph of the PVC containers doesn't anticipate more than the average of 10 grains/container for it is already 2% loss. Thus, larger number of the container grains is an obvious indicator of the combine threshing machine being not properly adjusted. Header loss of 9.2%  $ha^{-1}$  and 6.9% on the combine C equipped with a special rape header is the consequence of unskilled work of the reel combine operator.

**Table 4.** Losses (%  $ha^{-1}$ ) of the rape harvest on the family farm, neutral yield of 3.060 kg  $ha^{-1}$  and grain moisture of 11,0 -11,5%

Name	Combine with the wheat header		Combine with the rape header C
	A	B	
Header	2,7	2,2	9,2
Depositor	4,8-5,2	7,1	6,9
Sieves	1,8	> 2	> 2
Total	9,3 – 9,7		

The work unit Bara was known for both the harvested rape Navajo treated (24 June) with Agrovital in a dose of 0,7 l + 80 l water  $ha^{-1}$  and mostly lodged and unprotected rape crop of the cultivar Bristol. The determined stand on the table was 26 plants  $m^2$ . Harvest losses for this site can be seen in Table 5.

**Table 5.** Losses (%  $ha^{-1}$ ) of the harvest rape on the work unit «Bara», natural yield of 2.602 kg  $ha^{-1}$  and grain moisture of 11,36 %, 2 % of foreign matter

Name	Combine with the rape header (desk+vertical cutter bar) A <sup>1</sup>	Combine with the vertical cutter bar B <sup>1</sup>	Combine with the wheat header C <sup>1</sup>	Combine with the rape header (desk+cutter bar) D*	Combine with the wheat header E*
Header	2,7	10,8	7,5	14,7	24,4
Depositor	4,0	1,7	2,2	10,3	22,8
Sieves	0,3	0,35	0,65	1,0	>2
Total	7,0	12,85	10,35	26,0	-

<sup>1</sup> Crop treated with Agrovital

\* Crop treated with no Agrovital (sticky substance)

The lowest losses were attributed to the combine A equipped with the extended deck of 100 cm and vertical cutter bar. This combine was characterized by the lowest total losses of 7.0 %  $ha^{-1}$  i.e. 182 kg  $ha^{-1}$ . The combine B equipped with only vertical cutter bar was reported to have the header loss of 10.8 % being 4 times

higher compared to the combine A. The combine C was characterized by the header loss of 7.5 % ha<sup>-1</sup>, header separator 2,2 % ha<sup>-1</sup>, threshing machine 0.65 % ha<sup>-1</sup> and total of 10,35 % ha<sup>-1</sup> i.e. 269 kg ha<sup>-1</sup>. Very high losses were reported to be with the combine E while harvesting untreated and mainly lodged crops (margin table parts of 70-80%, within the table 30-40%). The same table was known for the well equipped combine D characterized by high losses on the header (14.7 % ha<sup>-1</sup>), separator (10.3 % ha<sup>-1</sup>), and 1.0 % ha<sup>-1</sup> on the threshing machine i.e. unacceptable total of 26 % ha<sup>-1</sup> i.e. 677 kg ha<sup>-1</sup>. However, even such high losses are considerably less compared to the combine E losses known for almost half of yield left on the soil while harvesting.

## CONCLUSION

Based upon the annual research on the grain loss while harvesting rape on Baranya and IPK Osijek area in 2005 the following conclusions can be drawn:

- minimal losses harvest can be conducted only by the well equipped and adjusted combine i.e. rape header (extended header deck + right vertical cutter bar);
- special consideration during the harvest should be dedicated to the reel operation regime (position and reel edge speed);
- harvest of the lodged and interweaved crops conducted by an unequipped and partly equipped combine should be avoided, if possible;
- only a skillful person possessing an appropriate accessory (metal tins and adequate PVC containers) should determine loss;
- the research should, by all means, be continued aiming to approve former knowledge and acquire new experiences while harvesting rape.

## REFERENCES

- [2]. Jeroch, H. 2005. Prehrambena vrijednost proizvoda od uljane repice i njihova primjena u prehrani goveda, svinja i peradi, IPK Tvornica ulja Čepin d.d. (authorized call paper), Čepin, Croatia.
- [3]. Jurišić, M. 2005. AG Base, expert system - Tehnologija ratarskih i povrćarskih kultura, izrađeno za VIP projekta, Zagreb, Croatia.
- [4]. Komunjer, D., et al. 1984. Kvalitet rada i učinak kombajna u žetvi uljane repice, Simpozij Aktualni zadaci mehanizacije poljoprivrede, Opatija 1984., pp. 211-216.
- [1]. Grosse, F. 2005. Odlučujući faktori za uspješno zasijavanje zimskih 00 kultivara uljane repice. IPK Tvornica ulja Čepin d.d. (authorized call paper), Čepin, Croatia.
- [5]. Tavčar, B. 2004. Prihaja čas biogoriva, Kmetijski Inštitut Slovenije, Seminar, Ljubljana, Slovenia.
- [6]. \*\*\*2005. Najjači «vozni park» na biodizel u – dvorištu, Večernji list 13.08. 2005, Zagreb, Croatia.

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