

# ONIX – EARLY SOYBEAN CULTIVAR WITH SUPERIOR QUALITATIVE TRAITS

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## ABSTRACT

The cultivar Onix, registered in 2002 year, was obtained by recurrent individual selection from the hybrid population Maple x Evans and represents one of the latest cultivars released by the soybean breeding staff of A.R.D.S. Turda. The new cultivar is characterized by a vegetation period adequate to the zone requirements, high yielding potential for its maturity group, a very good resistance to bacterial blight and a good resistance to downy mildew. The high insertion of the basal pods (19 cm) and the very good resistance to lodging and husking ensure an increased adaptability to mechanical harvesting. The Onix cultivar is recommended for this area due to its very good qualitative features such as the average protein and oil content and protein and oil yield per hectare.

**Key words:** early cultivar, protein and oil content, soybean

## INTRODUCTION

Among leguminous for grain, soybean is one of the most important due to its high oil content (over 60% of seed weight), carbohydrates, mineral salts, vitamins and enzymes (Bilteanu et al., 1991).

It is very difficult or even impossible to find another plant which, during a relatively short period of time, would be able to synthesize so a great quantity of valuable substances.

The specific soybean protein is glycinin, characterized by a high solubility into water (61-92%) and high digestibility degree as well as a high content of essential aminoacids, which determine a nutritive value close to that of animal protein (Craciun, 1983).

The fundamental content which has stimulated the interest for soybean yield and trade, determining in this way the extension of cultivated areas, has been its oil rich in unsaturated fatty acids (75-85%).

During the last years, a greater attention has been paid to the achievement of proteic food, as textured protein, derivatives from soybean milk, the

role of soybean products being well recognized (Muresan et al., 2000, 2001).

The quality represents one of the most important objectives of any soybean breeding programme. Among the early soybean cultivars released at A.R.D.S. Turda, the new Onix cultivar has qualitative traits superior to previous ones.

The Onix cultivar is one of the most recent variety released by soybean breeding staff of A.R.D.S. Turda, which diversifies the current soybean assortment.

## MATERIAL AND METHODS

The Onix cultivar, registered in 2002, has as genitors the Canadian cultivar Maple Presto and American cultivar Evans. The Maple Presto cultivar is characterized by a very short vegetation period and an yielding potential good enough for its maturity group. The Evans cultivar has a very good yielding ability associated with a good yield stability, the only deficient feature being the longer vegetation period. Based on recurrent selection from the hybrid population Maple Presto x Evans, the Turda-8110 line was extracted representing a favourable recombination regarding the majority traits of those two genitors. The line is characterized by yielding potential, insertion height of basal pods and quality indices better than both parental forms, shorter vegetation period similar to that of Maple Presto cultivar, a very good resistance to lodging and husking specific to Evans cultivar.

This line, successfully tested in control and competitive trials, was registered as the Onix cultivar in 2002, based on the good results obtained during 1999-2001.

The estimation of yield stability was performed based on variability coefficients (Ceapoiu, 1968). The determination of protein and oil content was done by Infrapid 61 equipment, on the

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basis of diffuse reflection of electro-magnetic radiation from near infrared (N.I.R.).

## RESULTS AND DISCUSSION

The new Onix cultivar has a compact and an erect shrub and a semideterminate growth. It is a cultivar with a height of 102 cm similar to Agat one, with variation limits between 84 and 130 cm. The average insertion height of basal pods is of 19 cm, with variation limits between 16 and 23 cm. The high basal pods insertion ensures the mechanical harvesting without losses. In this aspect, the new cultivar is similar to Agat one, recognized as the Romanian cultivar with the highest basal pod insertion. The pubescence is grey similar to Agat and Safir cultivars. The leaf is oval sharpened, light - green. The flower is violet similar to Diamant, Perla and Safir cultivars but during vegetation the pubescence colour is different as compared to the first two cultivars. The pod colour at maturity is brown. The kernel is spherically flattened, yellow. The hilum colour is brown similar to that of Perla and Agat cultivars. The difference versus Perla cultivar is the pubescence colour and versus Agat one is flower white colour. On an average, TKW is of 153 g similar to that of Perla cultivar and very close to Safir one (Table

1).

The very good resistance to lodging and husking together with the very high insertion of basal pods ensure the mechanical harvesting with minimum losses, this cultivar being on the second place after Agat. Onix cultivar is also characterized by a very good resistance to *Pseudomonas glycinae* attack under natural infection conditions, exceeding the other cultivars released at Turda, having at the same time a good resistance to *Peronospora manshurica*, the most frequent pathogens of this area. The vegetation period is of 123 days, more precocious with four days than Agat cultivar (Table 2).

The testing performed in competitive trials at A.R.D.S. Turda during 1995-2002 emphasized the average yielding potential as very high, of 3,080 kg/ha, superior with 27% to Diamant control. The yield gains versus Agat and Safir cultivars were of 7% and 6% respectively. As regards the yield stability, the new cultivar manifests a good behaviour too (Table 3).

The very good behaviour of the cultivar Onix regarding the yielding capacity has been also pointed out by the remarkable results obtained in the competitive trial carried out at Kompolt (Hungary), where the new variety exceeded the Hungarian variety Tarna, utilized as check, with

Table 1. Morphological traits of Onix cultivar compared with other soybean cultivars released at A.R.D.S. Turda during 1995-2002.

Traits	Cultivars				
	Onix	Diamant	Perla	Agat	Safir
Stem: - shrub shape - plant port - growth  - plant height - insertion height - pubescence	-compact -erect -semi-determinate 102 (84-130) 19 (16-23) grey	-compact -erect -semi-determinate 87 (68-109) 9 (7-11) reddish	-compact -erect -semi-determinate 85 (73-105) 11 (9-13) reddish	-compact -erect -semi-determinate 101 (84-118) 21 (18-23) grey	-compact -erect -semi-determinate 93 (81-110) 14 (10-17) grey
Leaf: - leaflets shape - leaflets colour	oval-sharpened light-green	oval dark-green	oval-sharpened light-green	oval dark-green	oval light-green
Inflorescence: - flower colour	violet	violet	violet	white	violet
Fruit: - colour at maturity	brown	brown	light-brown	light-brown	light-brown
Kernel: - shape  - colour - hylum colour - TKW (g)	spherically flattened yellow brown 153	spherically flattened yellow black 165	oval  yellow dark-brown 153	oval  yellow light-brown 161	spherically flattened yellow black 157

19%, ranking the second place in the frame of the soybean genotypes released at A.R.D.S. Turda,

Table 2. Physiological features of Onix cultivar compared with Diamant, Perla, Agat and Safir, Turda, 1995-2002

Features	Specification	Cultivars				
		Onix	Diamant	Perla	Agat	Safir
Resistance to:						
- lodging	Note*1-9	1.0	1.0	1.1	1.0	1.0
- husking	Note*1-9	1.0	1.1	1.0	1.1	1.1
- bacterial blight	Note*1-9	1.3	2.1	1.7	2.0	2.0
- downy-mildew	Note*1-9	2.0	1.2	1.7	1.7	1.5
Vegetation period	Days	123	119	122	127	124

\* Notes 1-9 : 1- very resistant; 9= very sensitive

Table 3. Yield and its stability at Onix cultivar compared with other soybean cultivars recommended for Turda area, 1995-2002

Cultivars	Yield					s%
	Average kg/ha	Variation limits kg/ha	Relative %	+Difference kg/ha	Significance	
Diamant	2430	2260-2570	100	-	check	4.99
Atlas	2530	1940-2930	104	100	-	16.48
Onix	3080	2730-3420	127	650	***	10.49
Perla	2780	2630-3070	114	350	*	6.88
Agat	2010	2590-3070	120	480	***	6.46
Safir	2540	2650-3270	121	510	***	8.95

LSD 5%

LSD 1%

LSD 0.1%

10.9

264

14.1

358

19.8

480

Table 4. Results obtained in competitive trials at Kompolt – Hungary in 2000 year, with some cultivars and lines released by A.R.D.S. Turda

Code	Combinations	Yield			Plant height cm
		kg/plot	t/ha	relative (%)	
1	Safir	1.75	2.19	124.07	67
2	Onix	1.69	2.11	119.65	70
3	Opal	1.66	2.08	117.52	58
4	Agat	1.60	2.00	113.10	62
5	Diamant	1.57	1.96	111.33	55
6	T-7291	1.50	1.88	106.19	58
7	Perla	1.44	1.80	102.12	56
8	Tama (check)	1.41	1.79	100.00	63
9	T-7354	1.34	1.71	96.81	58
10	T-8131	1.28	1.60	90.44	62
11	T-8136	1.27	1.59	89.56	63

tested perspective cultivar test (Table 4).

Under S.I.V.T.R network, in comparison with Atlas control, the new cultivar Onix achieved yield gains which ranged between 3% at C.T.S. Ludus and 8% at C.T.S. Galda de Jos. The absolute yield average values achieved at C.T.S. Galda de Jos (3,080 kg/ha) and C.T.S. Satu Mare (3,470 kg/ha) proved the special behaviour of

for the respective areas (Figure 1).

The majority of cultivated soybean cultivars are characterized by a low insertion of basal pods, which leads to significant yield losses with values till 220 kg/ha on flat fields or even 660 kg/ha on fields with a slope of 12% (Ardelean, 1976, 1979). The Onix cultivar belongs to early soybean breeding programme which beside the short vegetation period adequate to local conditions, high

yielding potential and special quality features should have an increased adaptability to mechanical harvesting. Thus, Onix cultivar presents a very high insertion of the first basal pods which, on an

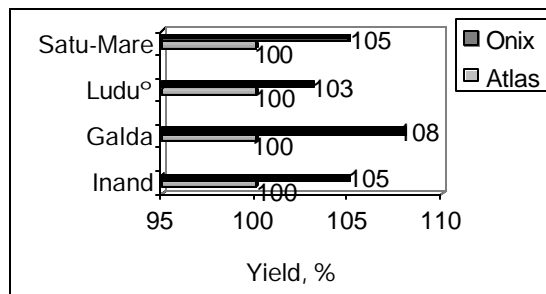


Figure 1. Onix cultivar yield compared with Atlas cultivar in S.I.V.T.R. network, (1999-2001)

average during 1995-2001 was of 19 cm, slightly inferior to Agat insertion height (21 cm) known as a cultivar with the highest insertion of the first basal pods superior to average insertion height of Safir (13 cm), Perla (11 cm) and Diamant (9 cm) cultivars. Annually, the insertion height of Onix cultivar ranged between 16 and 23 cm, variation limits very close to those of Agat cultivar. The results emphasize the very high insertion of the new cultivar which together with the very good resistance to lodging and husking confer to Onix cultivar a very good adaptability to mechanical harvesting, ranking the second place after Agat. The year 1999 was not included in this study, due to adverse climatic conditions, especially the hail-storm on 19<sup>th</sup> June, which significantly affected the insertion of the first basal pods. The differentiation of cultivars under this aspect was practically impossible (Figure 2).

The new cultivar Onix has also special qualitative features. The average protein content of 41.1%, with variation limits between 39.9 and 42%, shows that the Onix cultivar occupies the first place in the group of cultivars recommended for this area. Also, the value of very low variation

coefficient in the case of protein content proves a very good stability. The Onix cultivar emphasized a high oil content of 21% with variation limits between 20.0 and 22.2%, being on the first place

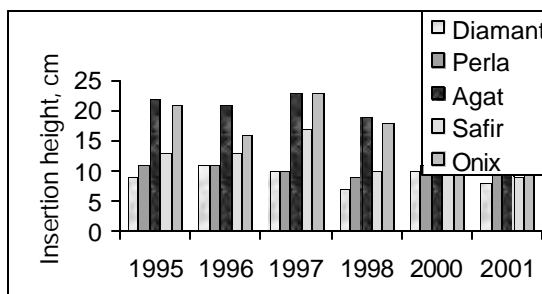


Figure 2. Insertion height of basal pods at Onix cultivar, Turda, 1995-2001

too, among the tested cultivars (Table 5).

The Onix cultivar registered a protein yield of 1,061 kg/ha, being also on the first place among the cultivars recommended for its area. The Onix cultivar registered also an average oil yield of 554 kg/ha, clearly superior to other cultivars. The obvious superiority of Onix cultivar is also given by the useful yield (1,615 kg/ha) and useful energy (9.6 Gcal/ha). The variation coefficients indicate a very good stability (Table 6).

The graphic presentation of the main traits and features of Onix cultivar in comparison with Diamant control, underlines the obvious superiority of Onix as regards the some basic traits such as: yielding ability, average plant height, insertion height of the first basal pods, protein yield per hectare, oil yield per hectare, resistance to lodging and husking. These two cultivars had a similar reaction to lodging, both presenting a very good resistance. The inferiority of the new cultivar was evident only regarding the resistance to downy mildew.

Compared with Safir, the most recent registered cultivar, the Onix superiority was noticed as concerns yielding ability, vegetation period, plant

Table 5. Protein and oil content of Onix cultivar, Turda, 1995-2002

Cultivars	Protein content, %			Oil content, %		
	Average	Variation limits	s%	Average	Variation limits	s%
Onix	41.1	39.9-42.0	2.1	21.0	20.0-22.2	3.9
Diamant	38.5	36.8-40.0	3.0	20.2	19.5-20.7	2.4
Perla	39.9	38.9-40.8	2.1	20.6	20.0-21.3	2.3
Agat	39.4	37.5-40.9	3.5	19.7	18.7-20.4	3.7
Safir	39.3	36.8-41.0	5.4	20.3	19.2-21.8	4.8
Atlas	38.9	36.9-40.7	3.4	20.6	20.0-20.8	2.3

*Table 6.* Protein and oil yield, useful yield and energy per surface unit at Onix cultivar  
Turda, 1995-2002

Cultivar	Protein yield		Oil yield		Useful yield		Useful energy	
	Average kg/ha	s %	Average kg/ha	s %	Average kg/ha	s %	Average kg/ha	s %
Onix	1061	10.2	554	7.5	1615	9.2	9.6	8.6
Diamant	805	7.9	422	3.7	1228	6.3	7.3	5.5
Perla	954	8.1	492	5.6	1446	7.2	8.6	6.7
Agat	985	8.7	493	6.1	1478	7.5	8.7	6.9
Safir	992	7.1	515	9.4	1507	7.0	9.0	7.5
Atlas	969	8.3	499	8.1	1468	8.2	8.7	8.2

height, average insertion height of the first basal pods, protein and oil yield per hectare, resistance to husking and bacterial blight. The Safir superiority manifested only regarding the downy mildew resistance but with very small differences between the two cultivars.

Comparing the main traits and features of Onix cultivar with Atlas used as control in S.I.V.T.R. network, the superiority of the new cultivar was established as regards the yielding ability, vegetation period, average plant height, insertion height of the first basal pods, protein and oil yield per hectare, resistance to lodging and bacterial blight.

### CONCLUSIONS

The new cultivar Onix is adequate to the zone requirements by its superior traits and features in comparison with the previous ones. The short vegetation period makes possible its harvesting in the first part of September constituting in this way a very good preceding crop for winter

small grains. The high insertion of the basal pods associated with a very good resistance to lodging and husking give to Onix cultivar an increased adaptability to mechanical harvesting.

The high protein and oil content associated with a high yielding potential ensure a superior output regarding the protein, oil and useful yield per surface unit.

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Table 1

Average yield of experiments with winter wheat cultivars, under irrigation and dry-land in six localities from the South of Romania (2002)

Locality	Average yield under:		Yield percentage diminution
	irrigation (kg/ha)	dry-land (kg/ha)	
Caracal	8560	5601	34.6
Marculesti	4716	3075	34.8
Teleorman	5963	3594	39.8
V. Traian	6941	3794	45.3
Fundulea	4858	1918	60.5
Simnic	(8560)	380	95.6

Table 2

Percentage diminution of some plant features under water stress conditions as compared to irrigation

Locality	Plant number	Plant height	Grain filling period	Spike number	Grain/ear	TKW	Test weight
Caracal	0	14,9	15,0	7,9	10,2	14,1	0,9
Teleorman	0	10,0	19,2	12,0	12,0	11,9	1,0
V.Traian	34,9	21,0	16,9	42,5	12,2	2,9	8,1
Fundulea	4,9	28,8	24,9	6,9	28,9	29,5	3,9
Simnic	27,6	61,7	30,0	65,0	64,5	53,1	10,7
Media	13,5	27,3	21,2	26,9	25,6	22,3	4,9

Table 3

Minimum, maximum and average yields registered at Fundulea in 2002 in international trials

WWEERYT with genotypes grouped depending on the originating country

Source	Average yield of the tested genotypes (kg/ha)	Maximum yield of the tested genotypes (kg/ha)	Minimum yield of the tested genotypes (kg/ha)
Romania	2368	2953	2073
Russia	2327	2453	1980
Ukraina-Odessa	2224	3013	1287
Hungary	2181	2780	1320
Ukraina-Mironovka	2108	2753	1500
Moldova	1927	2560	1293
Bulgaria	1898	2873	1313
Turkey	1893	2420	1487
Azerbaijan	1460	1553	1367
Kazakhstan	1422	1833	853
LSD 5%		243	275

Table 4

Correlations between yield under water stress conditions and different traits

Locality	Average yield diminution because of water stress (%)	Correlation coefficients between yield under water stress conditions and:						
		yield under irrigation	plant height under stress conditions	plant height under irrigation	heading time	spike/m <sup>2</sup>	grain/ear	TKW
Caracal	34,6	<b>0,48</b>	0,29	-0,31	-0,12	0,20	0,11	-0,30
Teleorman	39,8	<b>0,80</b>	0,35	0,31	<b>-0,85</b>	<b>0,58</b>	-	-
Valu Traian	45,3	0,04	0,33	0,20	<b>-0,40</b>	<b>0,42</b>	<b>0,40</b>	0,22
Fundulea	60,5	0,00	<b>0,46</b>	-0,31	<b>-0,46</b>	<b>0,52</b>	0,30	-0,17
Simnic	95,6	-0,01	<b>0,41</b>	<b>-0,62</b>	-0,04	<b>0,40</b>	<b>0,50</b>	0,15

The bold characters are significant at the probability level of 0.05

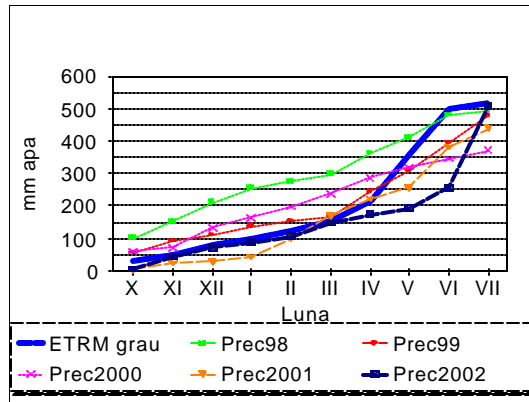


Figure 1. Average evapotranspiration and rainfall during 1999-2002 at Fundulea (mm water; month; wheat evapotranspiration; rainfall)

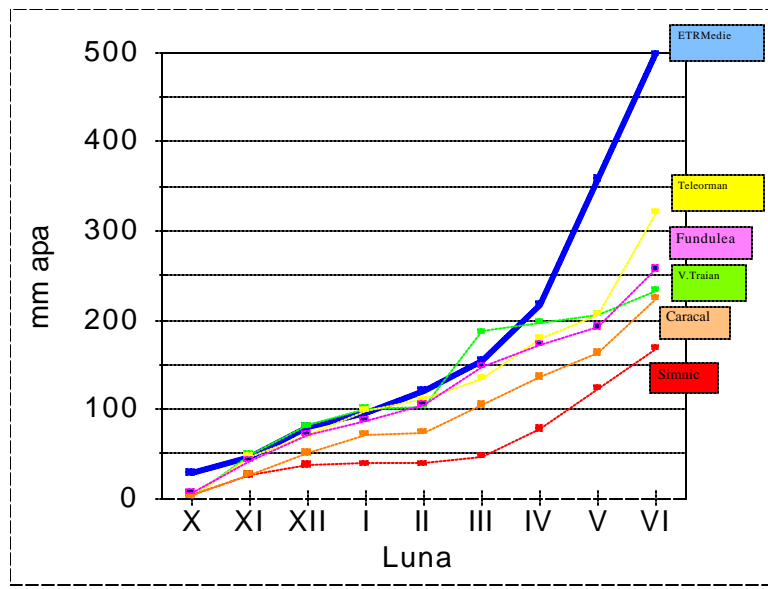


Figure 2. Average evapotranspiration and rainfall during the vegetation period in six locations of Southern of Romania in 2001-2002 year (mm water; month).



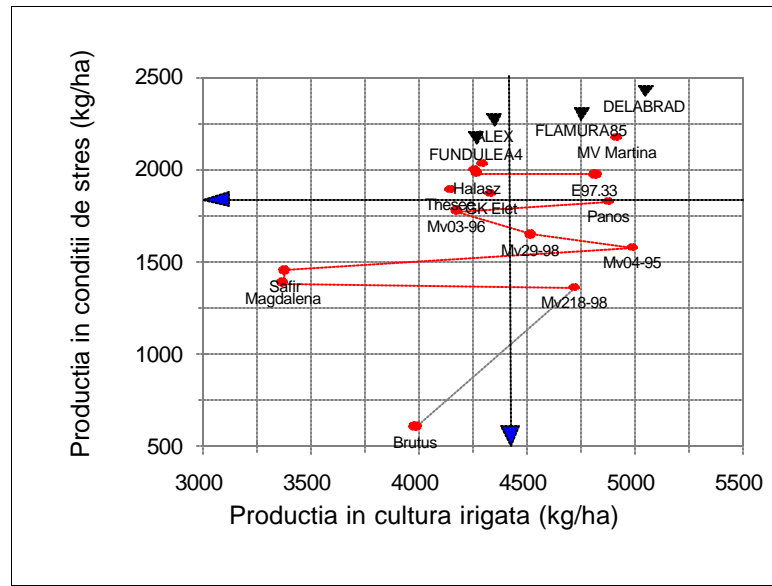


Figure 3. Yield obtained by some Romanian and foreign cultivars under irrigation and non-irrigation, in 2002 at Fundulea (arrows indicate the experiments average yield)(Yield under stress conditions; yield under irrigation).

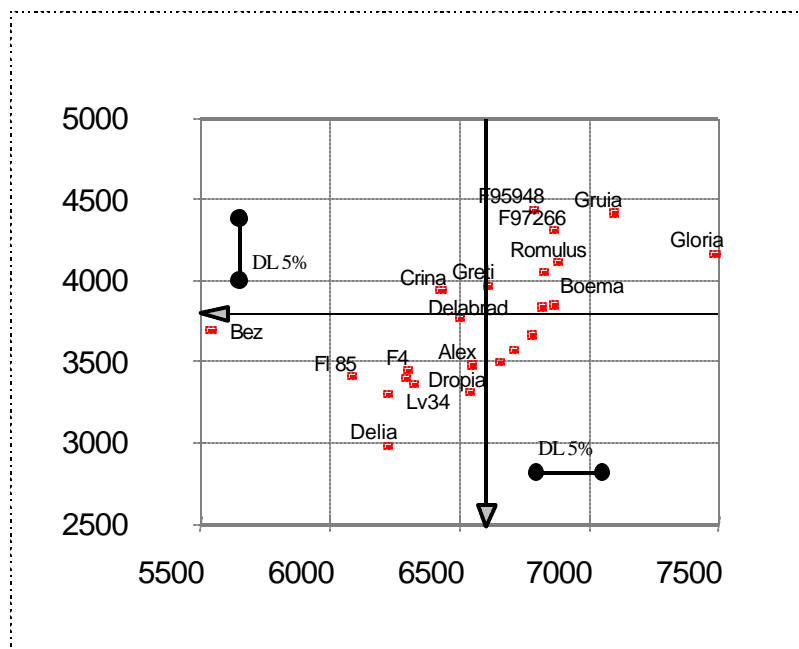


Figure 4. Average yields in four locations, obtained in 2002 by Romanian new lines and cultivars under irrigation and non-irrigation (arrows indicate experiments average yield)(Yield under non-irrigation; Yield under irrigation; LSD).

