IOANA, A NEW FIBRE FLAX CULTIVAR

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ABSTRACT

Ioana is a fibre flax cultivar belonging to *Linum usitatissimum* L. species and was released at A.R.S. Livada, Satu Mare county. It was registered in 1997, for hilly submountain favourable regions. Ioana cultivar is characterized by a higher yielding ability and better yielding stability in comparison with the average yield of other cultivars as Rolin and Mãdãraº. Under experimental trials in six centres of Research Institute for Cereals and Industrial Crops of Fundulea and six locations of State Institute for Variety Testing and Registration (SIVTR), during 1994-1996, this cultivar gave an average yield over 15% and 11.9% respectively, in comparison with Rolin and Mãdãraº cultivars. The plants have, on an average, a height of 90-110 cm. The stem is flexible and resistant to lodging. Ioana cultivar has a good resistance to *Fusarium* sp. and a growth period between 98-101 days. It is a semilate cultivar with more than 24% fibre content.

Key words: fibre flax cultivar, high fibre content

INTRODUCTION

As part of fibre flax breeding programme from Livada Agricultural Research Station, in the last years, numerous lines which ensured a continuous progress as regards the yielding potential (assessed to 97 kg fibre/ha/year) as well as some qualitative traits which influence the yielding stability, have been released.

The breeding activity took place in the following main trends:

- the releasing of initial diversified material, superior to Romanian and foreign available forms;

- the selection of lines with high yielding value, superior fibre content and other traits better than those of the current cultivars.

The paper presents the morpho-productive characterization of Ioana fibre flax cultivar, released at Livada Agricultural Research Station, registered in 1997 for hilly submountain favourable regions.

MATERIALS AND METHODS

Ioana cultivar was obtained by individual recurrent selection in F_4 generation of a hybrid population resulted from crossing K6 and Lazurnîi cultivars.

The K6 and Lazurnîi cultivars originate from Russia and have a medium-tall height. The K6 cultivar was chosen for its good resistance to lodging. Both parental forms are characterized by field resistance to diseases and good yielding ability.

During 1989-1993, this cultivar was tested in orientation competitive trials at Livada Agricultural Research Station and seed multiplication was performed at the same time. Between 1994-1996, beside the Romanian cultivars Mãdãraº and Rolin, registered in 1984 and 1992 respectively, used as controls, Ioana variety was simultaneously tested under the R.I.C.I.C. Fundulea and the State Institute for Variety Testing and Registration network.

The plant population was established for 2,800 germinable grains/m^2 on a basic dressing of $N_{60}P_{80}K_{60}$.

During experimentation, the specific technology of the competitive trials was used. Under laboratory conditions, in order to estimate both specific traits and cultivar characterization, determinations and analyses were performed correspondingly.

On the basis of variance analysis, processing of the experimental results was per-

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formed, too (Ceapoiu, 1968; Snedecor, 1968). The resistance assessment to *Fusarium* was done after Kommedahl et al. (1970).

At the end of experimental cycle, in 1996, the cultivar was registered and extended into hilly submountain favourable regions.

Sistematically, Ioana cultivar belongs to *Linum usitatissimum* L. species.

RESULTS AND DISCUSSIONS

Phenotypically, the Ioana cultivar plants are characterized, in the first stages after emergence by a slow growth rhythm till little-pine stage, with a good vegetative vigour in the intense growth stage. The first three pairs of leaves are alternatively ordered and the following winding. The leaves are green lance-olate.

The plant height varies depending on both climatic conditions and crop technology, between 90-110 cm, higher than Mãdãraº cultivar and closer to Rolin. The stem is erect, without basal branches, the inflorescence is small, semierect, with 3-7 branches. The flo-wers have medium size and plate shape. The petals are intense blue and do not present longitudinal fold, the anthers are blue too, and the sepals without punctuation. The capsules are spherical, with glabrous false septa, non-dehiscents and have middle size.

The seed is chestnut with metallic shine, 1000 kernels weight is 4.6-4.8 g; mean seeds number per capsule between 7-10. The test weight, 68.7 ± 1.5 kg/hl, is equal to that of Rolin cultivar and smaller than that of Mãdãraº cultivar (Table 1).

The flowering period is 12-14 days, depending on both sunshine period and stronger cloudiness degree, till 60%.

The differentiation between Ioana cultivar and the two controls occurs after the end of flowering when takes place the stems and seeds maturation process, so that at technical maturity the vegetation period of Ioana cultivar is longer than that of Mãdãraº cultivar with 10-11 days and closer to Rolin, with a difference of three-four days. Therefore, Ioana cultivar belongs to semilate cultivar group.

Physiological and qualitative features

During the experimentation period, Ioana cultivar had a good resistance to lodging, being less affected by the unfavourable environmental conditions (rainfall with gales). During the testing period, because of its root system and stem elasticity, Ioana cultivar proved to be more resistant to lodging than Mãdãraº and Rolin (note 1 and 2 versus 3-4 and 4-5 respectively on FAO scale) after three days from the first rain (Table 1).

Under both infection field and field experiments, Ioana cultivar proved to be more tolerant (note 1-2) to *Fusarium oxysporum* f. sp.*lini* (one of the most damaging and frequent disease) than the controls Mãdãraº and Rolin (note 3-4). It also manifests a good tolerance to the spring drought of May.

As regards its qualitative features, Ioana cultivar presents at technical maturity, pale yellow homogeneous stems. During the experimentation period, depending on both climatic and crop conditions, it achieved a medium fibre content of 24.7 + 0.4% with 1.3% and 2.9% more than Mãdãraº and Rolin respectively (Table 1).

Yielding ability

In three years of experimental trials and six research centres belonging to R.I.C.I.C. Fun-

Table 1. The main morphological traits of Ioana cultivar in comparison with Mãdãraº and Rolin (1994-1996 average)

Attributes	Measure	Ioana	Mãdãraº control 1	Rolin control 2
Plant height	cm	90-110	85-95	90-100
Technological length	cm	80-95	70-100	80-90
Flower -colour	Intensity	Blue	White	White
-size		Middle	Middle	Middle
Flowering period	Days	14+2	14+2	14+2
Vegetation period	Days	98-101	88-90	94-98
1000 kernels weight	g	4.6-4.8	4.8-5.2	4.8-5.3
Test weight	kg/hl	68.7+1.5	69.4+1.3	68.8+1.3
Resistance to:				
-lodging	1-9	1-2	3-4	4-5
-*Fusarium*		Tolerant	Sensitive	Sensitive
Fibre content	%		23.4	21.8

dulea and other six centres of S.I.V.T.R., the obtained results regarding the yield of stems without capsules showed that Ioana cultivar could be situated among the registered cultivars as a variety with stable yielding potential.

During three years, in R.I.C.I.C. experimental network (six centres) under different climatic conditions (Table 2) Ioana cultivar achieved an average yield of 7260 kg/ha, exceeding the yield of the best control with 15%, which represents, in absolute values, 965 kg stems/ha.

In all six research centres, Ioana cultivar achieved great yield increases, from 3.7% at A.R.S. Turda to 32.8% at A.R.S. Târgu Mureº.

In the six experimental localities of S.I.V.T.R. network from fibre flax favourable area, between 1994-1996, Ioana cultivar achieved an average yield of 7.055 kg/ha, exceeding the average yield of both Mădărаº and Rolin controls with 6.1%. In all localities, Ioana cultivar proved to be superior for stems yield in comparison with the control cultivars average, with 1.3% to 11.9%, registering increases from distinctly to very distinctly significant at Rădăuþi (6.6%), Tg. Secuiesc (8.5%) and Târgoviºte (11.9%) (Table 3).

In order to estimate the ecological stability, the yield variation limits were calculated too. During three years, as an indicator of yield stability, the amplitude (y max-y min) was distinct from a locality to another. The highest yield amplitude was registered at Târgoviºte and Tg. Secuiesc, 55.6% and 43% respectively. Another indicator of yield stability is minimum yield (y min.) in comparison with average yield (yx) which shows that the cultivar is less tolerant to the unfavourable conditions from certain years at Târgoviºte and Tg. Secuiesc.

As an estimate indicator of yield stability, the rapport between maximum and minimum yield shows that the Ioana cultivar recorded in the six experimental localities, values from 1.25 at Rădăuþi and Dej to 1.69 at Târgoviºte. Therefore, Ioana variety belongs to cultivar group with good general stability, not exceeding the rapport value of 2.

The main elements as regards the flax fibre conditioning for fabric industry, are yield quality, fibre quantity, physical-mechanical and other organoleptic traits. Although these traits are genetically controled, all these elements

Table 2. The yield of stems without capsules (kg/ha) under R.I.C.I.C. ecological network during 1994-1996

Cultivars	Livada		Miercurea Ciuc		Secuieni		Suceava		Tg. Mureº		Turda		Area average	
	kg/ha	%	kg/ha	%	kg/ha	%	kg/ha	%	kg/ha	%	kg/ha	%	kg/ha	%
Rolin (control 1)	6745		5543	82	7902		5162		5037		7380		6295	
Mădărаº (control 2)	6821		5943	100	7147		5090		4188		7900		6182	
Average (control 1+2)	6783		5743	85	7524		5126		4612		7640		6238	
L62691 / Ioana	7480*		6762	113.8	8372*		6064*		6689*		8192		7260	
LSD 5% kg/ha	412		498		462		544		503		815		539	

Table 3. Ioana cultivar behaviour under State Institute for Variety Testing and Registration ecological network testing during 1994-1996

No.	S.I.V.T.R. network	Ioana	% ± in comparison with mean controls	Signif.	Variation limits	$\frac{y\,max - y\,min}{0.01y}$	$\frac{ymax - y}{0.01y}$	%	$\frac{y - y\,min}{0.01y}$	%	$\frac{y\,max}{y\,mn}$
1	Bacău	6167	104.2	-	5278-6643	22.1	7.7	35	14.4	65	1.26
2	Dej	7955	104.9	-	7151-8936	22.4	12.3	55	10.1	45	1.25
3	Luduº	7784	101.3	-	6802-8765	25.2	12.6	50	12.6	50	1.29
4	Rădăuþi	7471	106.6	*	6657-8331	22.4	11.5	51	10.9	49	1.25
5	Târgoviºte	6381	111.9	***	5155-8705	55.6	36.4	65	19.2	35	1.69
6	Tg. Secuiesc	7205	108.5	**	5460-8554	43.0	18.7	43	24.3	57	1.56

Three years average x six localities / control average 7055/6649 = 106.1%

LSD: 5% = 5.5%; 1% = 7.2%; 0.1% = 9.1%

could be significantly influenced by the environmental conditions.

gression coefficients for both traits close to 1 (0.978 and 0.974 respectively) suggest that Ioana cultivar was superior to the controls, under both favourable and unfavou-rable conditions.

Table 4 . Fibre yield (kg/ha) of Ioana cultivar in comparison with Mădăraº and Rolin controls. Average S.I.V.T.R. ecological network, 1994-1996

S.I.V.T.R. network	Mean control	%	Ioana	%	± Diff. kg	Variation limits, kg/ha Ioana cultivar	± Diff. kg
Bacău	1275	100	1525	119	250	1325-1623	298
Dej	1635	100	1967	120	332	1486-1968	482
Ludu°	1652	100	1925	116	273	1680-2139	459
Rădăuþi	1507	100	1847	122	340	1664-2033	369
Târgoviºte	1487	100	1578	106	91	1696-2124	428
Tg. Secuiesc	1433	100	1782	124	349	1490-2113	643
Area average	1498	100	1770	118	272	1557-2000	443
Fibre content	21.5	100	24.73	115	3.23	-	-

LSD 5% = 6.1% ; 1% = 7.8%; 0.1% = 10.2%

Besides the specific morpho-physiological traits, Ioana cultivar presents a fibre content higher than the controls - 24.73% in comparison with 21.5% - so that, on an average, it achieved an yield increase of 15%, equivalent with 323 kg fibre/ha (Table 4). In relative values, Ioana cultivar achieves yield increases between 6% (Târgoviºte) and 24% (Tg. Secuiesc).

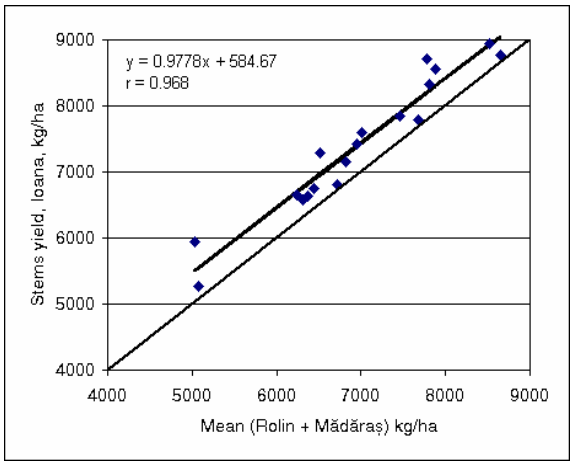

Figure 1. Stems yield regression (without capsules) at Ioana cultivar, in comparison with Rolin and Mădăraº cultivars average (S.I.V.T.R., 1994-1996)

Both Ioana yield value and stability, in comparison with Rolin and Mădăraº controls average, are well pointed out in figures 1 and 2, which express the stems and fibre yields regression, during three years in the six localities, under different pedoclimatic conditions. The re-

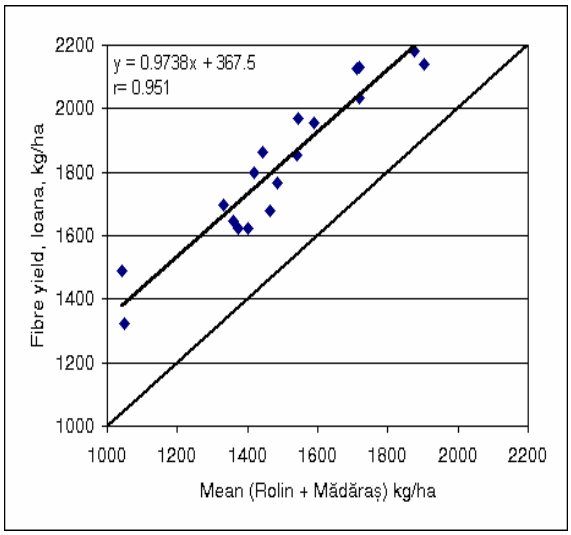

Figure 2. Fibre yield regression at Ioana cultivar, in comparison with Rolin and Mădăraº cultivars average (S.I.V.T.R., 1994-1996)

CONCLUSIONS

Ioana fibre flax cultivar, released at A.R.S. Livada, exceeded the control cultivars average, with mean increases up to 15% in R.I.C.I.C. network and 11.9% in S.I.V.T.R. network, under 18 environmental conditions (three years x six localities).

This good behaviour is due to its traits such as increased resistance to lodging, *Fusarium* and tolerance to drought.

In comparison with other cultivars, Ioana variety is later, arriving at maturity after 98-101 days.

Ioana cultivar was registered in 1997 and recommended in all favourable areas for fibre flax, because of its valuable traits, fibre content up to 24% and fibre yielding ability superior with 15% to Mãdãraº and Rolin controls.

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Table 1. Influence of aluminum ions, in reaction mixture, on the level of saccharasic activity in a reddish-brown soil fertilized with compost with different quantities (glucose+fructose-mg/100 g soil dw/24 hours)

A- Factor	B – Factor – COMPOST (t/ha)								Average (A)	
	b1-0	%	b2-0	%	b3-0	%	b4-0	%		%
a1–without Al^{3+}	b 3287	100	b 4028	100	b 2579	100	b 3472	100	b 3341	100
a2- with Al^{3+}	a 4228	129	a 5019	125	a 3472	135	a 4528	130	a 4312	129
Average (B)	3757 c		4523 a		3025 d		4000 b			
LD P	5%	1%	0,1%							
A	291	673*	2143							
B	101	142	201*							
AB	302	628*	1799							
BA	144*	201	284							

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