

LAVINIA F - THE FIRST ROMANIAN WINTER PEA CULTIVAR CREATED AT NATIONAL AGRICULTURAL RESEARCH AND DEVELOPMENT INSTITUTE FUNDULEA, ROMANIA

Ancuța BĂRBIERU

National Agricultural Research and Development Institute Fundulea, 1 Nicolae Titulescu Street, Calarasi, Romania, Phone. 004-021-311.07.22, Fax. 004-021-3110722, E-mail: office@incda-fundulea.ro

Corresponding author: cringasuancuta@yahoo.com

Abstract

Lavinia F is a winter pea (*Pisum Sativum* L.) cultivar created at National Agricultural Research and Development Institute Fundulea (NARDI), registered in 2020 and obtained through sexual hybridization and selected by pedigree method from Dorica/Checo hybrid population. The new entry is of aphyla type, with an early vegetation period, of 213-216 days. It was released based on superior agronomic adaptation, winter hardiness and tolerance to harsh winter condition. The plant height ranges between 70 and 90 cm, with a good resistance to lodging, better resistance to diseases, drought and pests. The flower color is white, with spherical, smooth grains and yellow pericarp. It is a high yield variety with an improved level of quality. A good yield potential was estimated in newly developed *Lavinia F* cultivar 4210 kg/ha in 2018 and 4017 kg/ha in 2019, in Ludus. The Thousand Grains Weight (TGW) of the winter pea cultivar analysed during 2018-2019 varied between 204 g (Cogealac) and 235 g (Luduș) in 2018, and in 2019 between 166 g (Negresti) and 229 g (Inand). The objective of the present study was to describe a new culture in Romania, which is sowed in autumn, namely *Lavinia F* the new cultivar of winter pea. The results presented in this paper show that the first cultivar of winter pea is adapted to climate conditions in Romania and will be a new challenge for farmers.

Key words: winter peas, cultivar, yield, winter hardiness

INTRODUCTION

Pea (*Pisum sativum* L.) is the second most important food legume worldwide after common bean (*Phaseolus vulgaris* L.). Currently, Canada is one of the world's major pea producers. The increasing demand for protein-rich raw materials for animal feed or intermediary products for human nutrition have led to a greater interest in this crop as a protein source [8]. Selection for high yield, high seed protein concentration and early maturity has been extensively practiced by pea breeders to develop cultivars with superior performance [11].

Pea is an important annual legume crop grown in temperate regions for its high seed protein concentration. It leads to environmental benefits due to its capacity to acquire nitrogen via atmospheric N₂ symbiotic fixation [5, 6, 7], nevertheless it is particularly sensitive to abiotic stresses. By climate change, heat stress and drought are very detrimental to the yield,

especially for spring pea [1, 12]. Breeders are now developing winter pea varieties, more likely to avoid these stresses occurring at the end of the crop cycle, because they flower earlier. However, the high level of frost risk in winter could limit the extent of peas even in a warming climate.

The benefits of the autumn-sowing in such environments are a longer vegetative growth and an increased biomass production and grain yield, while the larger plants produced under these conditions are more suitable for mechanical harvesting [10]. Growth under cool conditions can result in an increase of grain yield ranging from 50 to 100 % [4, 10]. Winter peas (*Pisum sativum* L.) could be considered as an alternative. The late summer to early autumn planting, confers to winter peas all of the advantages of spring-planted peas as: a relative low water request and conventional crop management practices with existing farm equipment. In addition, their greater yields as compared with spring peas

seems to be more economic, while the late-summer planting avoid the vagaries, narrow planting window, and variable conditions that constrain spring-planted peas.

Winter pea has a greater yield potential than the spring sown pea. Regrowth or branching habit in pea has the potential to increase seed production. Earlier spring growth and flower initiation enable the pea crop to avoid heat and water stress later in summer that also improve the yield potential [2]. Plant survival as effect of drifting snow or other overwintering conditions [9] may differ across a field from a full survival in some locations to a reduced or no survival in others. Winter peas are broadly adapted to dryland production in all regions where winter wheat is grown, and the improved cold hardiness of winter peas rivals that of winter wheat. Early maturity is an essential attribute for dry area crop adaptation, especially when the majority of precipitation falls in winter [6]. The winter forage pea varieties are suitable for arid regions. The utilization of winter forage pea under a high water deficit results in higher and more stable aboveground biomass and protein yields, enhancement of the ratio between symbiotic and fertilizer nitrogen in organic farming and a more economic use of the agricultural land.

Winter peas may become a more reliable and profitable alternative for canola crop [3]. The winter peas breeding program has started at NARDI Fundulea in 2010, by using a germplasm originated from USA (Specter and Windham) and Austria, (Checo).

The aim of this work was to evaluate the yield potential and other agronomic traits of the first Romanian winter pea cultivar created at NARDI Fundulea, and registered in 2020.

MATERIALS AND METHODS

Lavinia F is the first Romanian winter pea (*Pisum sativum* L.) cultivar released at NARDI Fundulea. The new cultivar it is a *F5* line selected by the pedigree method from Dorica /Checo cross, the parental lines being of Romanian (Dorica) and Austrian (Checo) origins. By creating the new winter pea cultivar *Lavinia F* we have tried to combine

the high TGW of Dorica (spring pea cultivar) with the good winter hardiness and earliness from Checo (winter pea).

Following the selection process, was identified a genotype with good winter hardiness, associated with high yield and a good adaptability to the climatic conditions from Romania.

Experimental results obtained in centers of the State Institute for Varieties Testing and Registration (SIVTR) during the period 2018-2019, and also those obtained at NARDI Fundulea, were accessed to characterize the new cultivar *Lavinia F*, in comparison to Nicoleta used as control variety.

The statistical analyses of data have been evaluated by ANOVA.

RESULTS AND DISCUSSIONS

Agronomic and quality traits of *Lavinia F* winter pea variety, analysed in the centres of SIVTR and NARDI Fundulea in period 2018-2019 compared to the Nicoleta control cultivar are presented in Table 1.

Table 1. Agronomic and quality characteristics of *Lavinia F* cultivar in comparison with Nicoleta control cultivar

Characteristics	Lavinia F	Nicoleta
Plant: anthocyanin pigmentation	Absent	Absent
Plant: height (cm)	70-90	60-75
Leaf: colour	green	green
Leaf: leaflets	Absent	Absent
Leaf stipule: size	Medium	Medium
Plant: time of beginning of flowering	early	early
Flower: colour	White	White
Pod: length	medium-long	medium-long
Pod: colour	green	green
Seed: shape	spherical	Spherical
Seed: ground colour of testa	Yellow	Yellow
Seed: hilum colour	Yellow	Yellow
Vegetation period (days)	213-216	215-219
Protein content (%)	22.1% -23 %	23.8 % - 24.5 %
Winter hardiness (1-9)	1	4
Resistance to lodging (1-9)	1	3
Resistance to Erisiphe pisi (1-9)	1	1
Resistance to Ascochyta pisi (1-9)	2	2

Source: according to the questionnaire The International Union of the Protection of new Varieties of Plants (UPOV).

Lavinia F, an aphyla type, with an early vegetation period, of 213-216 days, is the first winter pea cultivar created at NARDI Fundulea and registered in 2020.

The plant height ranges between 70 and 90 cm, with a good winter hardiness and lodging, better resistance to diseases, drought and pests. The flower color is white, with spherical, smooth grains and yellow pericarp. In the most yield trials carried out between 2018 and 2019 in the SIVTR network,

characterized by a high variability of environmental conditions, yield performances of *Lavinia F* overcome those achieved by the *Nicoleta* (Table 2).

The yield of *Lavinia F* cultivar varied between 1,681 kg/ha at Cogeaalac and 4,210 kg/ha in Luduș, in 2018. On average, over the two years of testing, the winter pea cultivar *Lavinia F* recorded yields which ranged between 2,743 kg/ha and 4,114 kg/ha. With an average yield increase between 22% and 59%.

Table 2. Yield of the winter peas cultivar from NARDI Fundulea tested in SIVTR network during 2018-2019

Test center	Cultivar	Yield				Average (2018-2019)	
		2018		2019		kg/ha	%
		kg/ha	%	kg/ha	%		
Negrești	Nicoleta (control)	2,913	100	1,777	100	2,345	100
	<i>Lavinia F</i>	4,156	143	2,099	118	3,128	133
Luduș	Nicoleta (control)	4,041	100	2,656	100	3,349	100
	<i>Lavinia F</i>	4,210	104	4,017	151	4,114	122
Inand	Nicoleta (control)	1,682	100	2,388	100	2,035	100
	<i>Lavinia F</i>	2,843	169	2,868	120	2,856	140
Cogeaalac	Nicoleta (control)	269	100	3,186	100	1,728	100
	<i>Lavinia F</i>	1,681	625	3,804	119	2,743	159
Average for all centers	Nicoleta (control)	2,226	100	2,502	100	2,364	100
	<i>Lavinia F</i>	3,223	145	3,197	129	3,210	136
LSD 5%		3,904	-	2,051	-	1,815	-
1%		5,549	-	2,916	-	2,580	-

Source: the results obtained in centers of the SIVTR.

Considering the mean values of yield obtained in 2018 and 2019, at NARDI Fundulea, for the both cultivars, yields realised by the new

winter pea cultivar *Lavinia F*, in comparison to the control variety were significantly higher. (Table 3).

Table 3. Average yield of cultivar *Lavinia F* compared to the cultivar *Nicoleta*, during two years of testing at NARDI Fundulea

Test center	Cultivar	Yield		Average (2018-2019)	
		2018	2019	kg/ha	%
		kg/ha	kg/ha		
Fundulea	Nicoleta (control)	1,925	3,133	2,529	100
	<i>Lavinia F</i>	4,156	2,099	3,128	151

Source: the results obtained at NARDI Fundulea.

The vegetation period of the winter peas cultivars tested in the SIVTR network varied according to the local and the year climatic conditions.

Thus, in 2018, the vegetation period of *Lavinia F* varied between 199 days in Luduș and 240 days in Negrești, and in 2019

between 149 in Cogeaalac and 243 days in Negrești (Table 4).

On average over the two experimental years, the vegetation period of cultivar *Lavinia F* varied between 185 days and 242 days.

Table 4. The vegetation period of the winter peas cultivar from NARDI Fundulea tested in SIVTR network during 2018-2019

Test center	Cultivar	Vegetation period (days)		Average (2018-2019)
		2018	2019	
Negrești	Nicoleta (control)	241	248	245
	Lavinia F	240	243	242
Luduș	Nicoleta (control)	212	240	226
	Lavinia F	199	235	217
Inand	Nicoleta (control)	204	222	213
	Lavinia F	204	223	214
Cogealac	Nicoleta (control)	220	149	185
	Lavinia F	220	149	185
Average for all centers	Nicoleta (control)	219	215	217
	Lavinia F	216	213	215
LSD 5%		47	120	66
1 %		67	171	94

Source: the results obtained in centers of the SIVTR.

The TGW of the winter pea cultivar analysed in the SIVTR network during 2018-2019 varied between 204 g (Cogealac) and 235 g (Luduș) in 2018, and in 2019 between 166 g (Negrești) and 229 g (Inand) (Table 5).

Table 5. TGW of the winter peas cultivar from NARDI Fundulea tested in SIVTR network during 2018-2019

Test center	Cultivar	TKW (g)		Average (2018-2019)
		2018	2019	
Negrești	Nicoleta (control)	255	171	213
	Lavinia F	220	166	193
Luduș	Nicoleta (control)	230	145	188
	Lavinia F	235	207	221
Inand	Nicoleta (control)	246	232	239
	Lavinia F	223	229	226
Cogealac	Nicoleta (control)	185	212	199
	Lavinia F	204	210	207
Average for all centers	Nicoleta (control)	229	190	210
	Lavinia F	220	203	212
LSD 5%		65	91	54
1 %		92	130	77

Source: the results obtained in centers of the SIVTR.

On average, over the two years of testing, the TGW and the test weigh of the cultivar *Lavinia F* is approximately equal to those of the cultivar Nicoleta (control) (Table 6).

Table 6. The test weigh of the winter peas cultivar from NARDI Fundulea tested in SIVTR network during 2018-2019

Test center	Cultivar	MH(Kg)		Average (2018-2019)
		2018	2019	
Negrești	Nicoleta (control)	76	76	76
	Lavinia F	79	76	78
Luduș	Nicoleta (control)	73	81	77
	Lavinia F	75	81	78
Inand	Nicoleta (control)	75	80	78
	Lavinia F	75	79	77
Cogealac	Nicoleta (control)	80	84	82
	Lavinia F	79	83	81
Average for all centers	Nicoleta (control)	76	80	78
	Lavinia F	77	80	79
LSD 5%		7.2	8.6	6
1 %		10	12	8.7

Source: the results obtained in centers of the SIVTR.

CONCLUSIONS

Lavinia F is the first winter pea (*Pisum sativum* L.) cultivar released at NARDI Fundulea, in 2020, characterized by desirable agronomic traits as superior adaptation to crop conditions, earliness, a good level of winter hardiness associated to a higher yield potential.

Experimental trials carried on in four centers of the SIVTR network during 2018-2019, revealed the very high yield potential in *Lavinia F* raising to 3210 kg /ha on average, exceeding the yield of control (cultivar Nicoleta) with a percentage of 36%. In conditions from NARDI Fundulea the results for this parameter were even higher, respectively of 51 %. The quality in *Lavinia F* cultivar was found as being inferior when compared to this of the control, suggesting a negative correlation between the both traits, that yield and protein content. The improved desirable agronomic traits of the Romanian winter pea cultivar *Lavinia F*, are suited for an efficient field cropping in the farming system.

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