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SUMAR - CONTENTS

V. Popescu	Instalarea răsăduțel și semănatul răsăduțelor	
	Hotbed setting up and seedling sowing	1
Angela Popescu	Replacatul și pregătirea răsăduțelor pentru plantare	
	Pricking out and preparing seedlings for planting	4
V. Popescu	Înființarea culturilor legumibile în câmp	
	Setting up field vegetable crops	6
Beatrice Iacomi	Bolile răsăduțelor de varză	
	Diseases of cabbage transplants	10
M. Berindei	Pregătirea cartofului de sămânță pentru plantarea timpurie	
	Preparing seed potato for early planting	12
x x x	Fertilizarea cartofului	
	Potato fertilisation	16
N. Mateescu	Noțiuni utile în cultura ciuperelor <i>Pleurotus</i> (VII)	
	Useful notions for growing <i>Pleurotus</i> mushrooms (VII)	18
Eisabeta Frâjiță, Beatrice Iacomi	Boli frecvente în culturile de garoafe	
Elena Alina Posețaru	Frequent diseases in carnation crops	20
x x x	Ce este și cum putem obține un bosai	
	What is and how to obtain a bosai	22
M. Diaconasa, Jenica Bălăceanu Gr. Mihăescu	Fertilizarea pomilor și arbuștilor fructiferi	
	Fertilisation of fruit trees and bushes	24
	Cultura prunului pe terenuri în pantă	
	Plum-tree culture on slope grounds	26
	Formarea coroanelor la nuc	
	Crown training in walnut tree	28
Gh. Bernaz	Cultura viței de vie sub formă de bolți (I)	
	Training grapevine as vine harbour (I)	30

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TYPES OF TREE GROWTH AND FRUIT SETTING IN F₁ APPLE HYBRIDS

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Abstract.

R. SESTRĂȘ, M. ARDELEAN, V. GHIDRA, MIRELA CORDEA, LUCIA COSTIN, AGNES BORS, 1998. *Types of tree growth and fruit setting in F₁ apple hybrids* (In English). Not. Bot. Hort. Agrobot. Cluj, XXVIII

1656 F₁ hybrid apple seedlings, belonging to 127 combinations, have been screened according to their growing and fruit setting types, as it was phenotypically expressed. LESPINASSE (1977; 1992) amalgamated these two traits into a single one which was named "ideotype". The screened F₁ individuals have been considered as resembling one of the following four ideotypes indicated by LESPINASSE: columnar, spur, standard and weeping.

Different ratios of spur, standard and columnar F₁ individuals were obtained depending on genitors and on the fact that a certain genitor had been used as a maternal or paternal partner in direct/reciprocal crosses.

The monogenic inheritance of the columnar ideotype, proposed by KELSEY and BROWN, 1992; LANE, 1992, does not seem to be the only genetic mechanism involved in the inheritance of this trait. Our experimental results suggest the polygenic determination of this ideotype as more probable than the monogenic one.

Keywords: growing type, ideotype, apple, F₁ hybrids, inheritance

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Growing type of trees and type of fruit setting in apple, were considered by LESPINASSE (1977; 1992) as a single trait denominated as "ideotype". According to this author, four main ideotypes are distinguished in apple: columnar, spur, standard and weeping (Fig. 1). None of them could be considered "the best" since each of them might be the most suitable for a certain type of orchard.

MATERIAL AND METHOD

1656 F₁ individuals, belonging to 127 F₁ apple families, have been screened according to their type of growing and fruit setting (ideotype). It should be noted that this screening had been performed solely based on the phenotypic appearance of the F₁ individuals.

Attempts have been made to clarify the inheritance of these ideotypes in the analyzed F₁ families.

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46
RESULTS AND DISCUSSION

As it can be noted in Fig.1, in direct crosses of standard x spur genitors most of the F₁ individuals (75.7%) fell into the standard ideotype and only 10.3% into the spur one. A rather high proportion of F₁ individuals showed a weeping ideotype (13.3%) while only 0.8% of F₁ were of columnar ideotype.

In the reciprocal crosses (spur x standard) the proportion of standard F₁'s decreases a little bit (66.7%) while that spur one increases (19.4%). These results suggest rather obvious maternal effects in the inheritance at least of spur ideotype in apple.

As far as the columnar ideotype is concerned, in the discussed experiment only 0.3% of the F₁ individuals truly resembled this type of growth, results which are very similar to those reported by BLAZEK (1992) based on a screening of 28.000 F₁ apple individuals. Table 1 shows accurately the genitors used and the number/proportion of columnar F₁ individuals observed. Based on these results, a polygenic inheritance of the columnar ideotype is considered more probable than the monogenic one which was suggested by KELSEY and BROWN(1992) and LANE(1992).

Table 1

Apple hybrid combinations in which F₁ individuals with columnar ideotype have been observed, Cluj-Napoca, 1996

Type of crossing	Hybrid combination	No. of F ₁ individuals	Out of which of columnar ideotype	
			No	%
Standard x spur	Ardelean x Starkrimson	4	2	50.0
Spur x standard	Starkrimson x Ancuta	5	1	20.0
Standard x standard	218/2 x Mutzu	22	1	4.5
	X - 5 - 71 x Ancuta	17	1	5.9

The weeping ideotype was obtained in rather high proportions (7.2-13.3%) no matter of genitor types and of their position as maternal or paternal parent.

47

Ideotype	Parental combination		Total hybrid combination		Total F ₁ individuals analysed		Total general	
	Standard x spur	Spur x standard	No	%	No	%	No	%
"Columnar"	2	1	2	0.76	1	2.78	5	0.30
"Spur"	27	7	27	10.27	7	19.44	90	5.43
"Standard"	199	24	199	75.66	24	66.67	1201	88.50
"Weeping"	35	4	35	13.31	4	11.11	137	8.27

Cluj - Napoca, 1996

Figure 1. The observed ideotype in F₁ apple individuals, depending on the type of parental combination

REZUMAT

TIPUL DE CREȘTERE ȘI FRUCTIFICARE (IDEOTIPUL) LA HIBRIDII F₁ DE MĂR

În anul 1996, au fost analizați 1656 indivizi F₁ aparținând la 127 combinații hibride de măr, în privința tipului lor de creștere și fructificare, așa cum s-a manifestat el fenotipic. LESPINASSE (1992) reunește aceste două trăsături într-un singur caracter pe care îl denumește "ideotip". Conform autorului citat, la măr ar exista patru ideotipuri distincte: columnar, spur, standard și plângător.

Hibridările directe și reciproce (standard x spur; spur x standard) au dat proporții diferite de indivizi F₁ care manifestau ideotipurile parentale și pe cele columnare și plângătoare. S-a tras concluzia că, cel puțin în ereditatea caracterului spur, sunt implicate evidente efecte maternale.

Ideotipul columnar apare în proporții foarte scăzute și, aproape în toate tipurile de combinații, aceste proporții se abat de la segregarea monogenică așteptată, conform determinismului genetic sugerat pentru acest caracter de KELSEY și BROWN (1992) și LANE (1992). Pe baza rezultatelor obținute se consideră ca mult mai probabilă determinarea poligenică a ideotipului columnar.

Ideotipul plângător a apărut în descendența F₁ a tuturor tipurilor de combinații, în proporții relativ ridicate (7-13%).

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ARCHITECTURAL IDEOTYPE OF PEAR SEEDLINGS IN FIVE
HYBRID COMBINATIONS

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Abstract.

V. GHIDRA, M. ARDELEAN, R. SESTRĂȘ, ELENA TĂMAȘ, MIRELA CORDEA, MARIANA DEJEU, LUCIA COSTIN, AGNES BORS, 1998, *Architectural ideotype of pear seedlings in five hybrid combinations* (in English). Not. Bot. Agrobot. Cluj, XXVIII.

The architectural ideotype - type of growing - was studied in a topcross experiment with five hybrid combinations in which Cluj 72-2-100 selection, typical spur, was used as a maternal tester. The analyzed seedlings were at the end of their sixth year of vegetation.

There were no significant differences among the five hybrid combinations concerning the distribution of F₁ seedlings in the four accepted ideotypes (columnar, spur, standard, and weeping). A high variability was found for ideotype (between 18.8% in Cluj 72-2-100 x Napoca and 34.4% in Cluj 72-2-100 x Red Bartlett).

The participation rate of genotype in the phenotypic manifestation of this character is relatively low. The coefficient of heritability in broad sense was 0.29 and the coefficient of heritability in narrow sense was very low, 0.001.

Keywords: pear, architectural ideotype, F₁ hybrids

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In pear breeding, the type of growing and fruit setting of trees is considered an essential selection goal since it can seriously affect the level of yields and their economic efficiency.

LESPINASSE (1992) has suggested, for apple, four main growing types which were named as architectural ideotypes: columnar or compact, spur, standard and weeping. The present paper is analyzing the distribution of F₁ pear seedlings belonging to five hybrid combinations into the four architectural ideotypes mentioned above, considered as fit for pear trees, as well.

MATERIAL AND METHOD

282 F₁ pear seedlings, in their sixth year of vegetation, have been analyzed concerning their architectural ideotype. The F₁ individuals originated in five hybrid combinations, all of them having as maternal genitor Cluj 72-2-100 selection which is a typical spur. The paternal genitors have been Conference, Red Bartlett, Countess of Paris and Napoca pear varieties.

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