

## SOME BIOLOGICAL AND AGRONOMICAL CHARACTERISTICS CONCERNING WALNUT GERMPLASM EVALUATION IN THE CONDITIONS OF REP. MOLDOVA

### UNELE PARTICULARITĂȚI BIOLOGICE ȘI AGRONOMICE PRIVIND EVALUAREA GERMOPLASMEI DE NUC ÎN CONDIȚIILE REP. MOLDOVA

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**Abstract.** *There are presented some biological and ecological peculiarities of local walnut varieties and new selections in the conditions of Rep. of Moldova. Main evaluated genotypes are characterized by large ecological plasticity and high adaptability to variable local climatic and edaphic conditions. There are demonstrate that formation of lateral pistillate buds there are present within all dichogamous type. But an important percent of fruit (nuts) set in the lateral positions there are rare events. We suppose that type of initiation of pistillate flower buds both in terminal and lateral positions with sustainable fructification of dichogamous of some selected Moldavian walnut selections shows a large biodiversity reserves for the future breeding programs.*

**Key words:** *walnut, biology, breeding, promotion, Republic of Moldova*

**Rezumat.** *Sunt prezentate unele caracteristici ale soiurilor și selecțiilor noi de nuc în condițiile Republicii Moldova. Genotipurile de bază evaluate se caracterizează printr-o largă plasticitate ecologică și adaptabilitate înaltă la condițiile microclimatice și edifice variabile locale. S-a demonstrat că la toate tipurile dichogamice are loc formarea mugurilor laterali de rod (femeli). Dar legarea unui procent important al fructelor (nucilor) este un fenomen rar. Tipul de inițiere a mugurilor de rod atât în poziția terminală, cât și în cea laterală cu producerea sustenabilă de fructe la unele selecții moldovenești evaluate ne permite să considerăm că biotipurile locale reprezintă o rezervă de biodiversitate largă, necesară pentru viitoarele programe de ameliorare varietală a nucului.*

**Cuvinte cheie:** *nucul, biologie, ameliorare, promovare, Republica Moldova*

## INTRODUCTION

In spite of variable pedoclimatical conditions of different agricultural microareals, Republic of Moldova there are favorable region for walnut (*Juglans regia* L.) culture. Therefore for Moldavian peasants nuts always were and will remain a valuable product for food and trade. As a result of realisation of walnut

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breeding programs of the Institute of Horticulture there are evaluated new promising varieties, with late leafing, higher fruit quality and a better shell-meet ratio. Moldavian registered for industrial culture walnut assortment (Catalogul soiurilor de plante al Republicii Moldova, 2015) includes 14 local varieties with high level of resistance to winter and spring temperature stresses and low sensibility to blight); trees productivity increases rapidly and reaches 2-2.5 tones of kernel per hectare in 8-9 years after plantation (Comanici, 1980, Țurcanu and Comanici, 2004). Registered varieties have higher level of resistance to temperature stresses and main diseases of walnut and low sensibility to blight. But the principal trials are: sustainable high productivity and nuts qualities. For temporary testing in orchards there are included also 15 foreign and local varieties. Main trials of its promotion are: sustainable productivity and nuts qualities. For new period of walnut culture it is indispensable to promote varieties with high percents of lateral bearing. The new perspectives for walnut culture in the Republic of Moldova was done after adoption of the Walnut Law (Official Monitor of the Rep of Moldova, Nr. 658-XIV, 29.12.1999.), which sets as the goal preserving and development of the existing patrimony, as well as the promotion of industrial “grafted walnut orchards” .

### **MATERIAL AND METHOD**

As material for researches were used 36 main important varieties and selections from national collections of walnut germplasm, established through complimentary research programmes of the Moldavian Research Institute of Horticulture and Alimentary Technologies, Botanical Garden of ASM etc. As a result of walnut breeding programs (1966-1998 years, 2000-present), based on hybridisation and evaluation of the best genotypes (including selection from local seedling populations) there are good perspectives of improvement of local varieties with new ones, first of all with late leafing (Kishinau variety), higher fruit quality and high percent of fructification from lateral buds (Pescianskii var. and 3 local selections). For investigations there are employed methodical and methodological principles which are approved for breeding and genetics (including embryological ones) of fruit trees species (Cociu and Oprea, 1989, Pîntea, 2004).

### **RESULTS AND DISCUSSIONS**

According our comparative investigations Moldavian varieties are characterized by high adaptability to diverse local environmental edaphical and microclimatical conditions. In comparative collaborative scientific researches there established good ecological plasticity and adaptability of the main Moldavian varieties also in the neighbor countries Ukraine, Romania, Hungary, Serbia etc.

Type of formation of pistillate flower buds (in terminal and lateral positions) and good fructification of dichogamous of selected Moldavian walnut varieties and selections shows a large biodiversity reserves for the future breeding programs concerning fructification (Tab. 1, Fig. 1, 2, 3). It is evident that formation of lateral

pistillate buds there are present within all type dichogamous type. But fruit set in the lateral positions usually there are rare phenomenon (Tab. 1).

Table 1

**Types of pistillate flower buds formation of and fructification of dichogamous main moldavian walnut varieties and selections**

Nr.crt..	Variety, type of flowering	Type of formation of pistillate buds (T-terminal, L-lateral)	Type of fructification (T-terminal, L-lateral)	Nr.crt..	Variety, type of flowering	Type of formation of pistillate buds (T-terminal, L-lateral)	Type of fructification (T-terminal, L-lateral)
HOMOGAMOUS				19.	M-101	T,T-L	T
1.	I-33	T,T-L	T, partially	20.	G-48	T,T-L	T
2.	D-5, Pescias kii	T,T-L	T-L T, partially T-L	21.	I-69	T,T-L	T
				22.	Iv4/5	T	T
				23.	Is-67	T,T-L	T
				24.	I-28	T,T-L	T
PROTOGINOUS				PROTANDROUS			
3.	Ti-23	T	T	25.	T-19	T	T
4.	B	T,T-L	T	26.	I-29	T,T-L	T
5.	I-69	T	T	27.	D-10	T,T-L	T,T-L
6.	I-57	T	T	28.	I-24	T,T-L	T
7.	P-21	T	T	29.	Iv.4/7	T,T-L	T
8.	S-65	T	T	30.	I-25	T	T
9.	Cr-66	T-L	T	31.	G-51	T	T
10.	I-72 2/1	T,T-L	T,T-L	32.	G-50	T	T
11.	I-34	T,T-L	T	33.	D-12	T	T
12.	P-112	T	T	34.	I-30	T	T
13.	I-60	T	T	35.	D-I	T	T
14.	I-58	T,T-L	T, partially	36.	D-	T,T-L	T, partially T-L
15.	D-17		T-L				
16.	G-47	T,T-L	T				
17.	I-62	T	T				
18.	D-18	T	T				

Based on cytoembryological studies of walnut intraspecific hybridization the degree of compatibility and the capacity of compatibility of all dichogamous types was established.

It was also studied the morphohistochemical peculiarities of pistillate flower receptivity to pollination depending on flowering stage. Experimental studied of the terms of more effective pollination of dichogamous varieties in condition of Republic of Moldova shows that walnut embryo sac functional activity in lateral flowers is more long for protogynous early flowering genotypes, and short for early flowering protandrous one (Table 2).

Table 2

**Average period of walnut embryo sac functional activity in relation with dichogamous type and flowering period of genotype**

Dichogamous type and flowering period	Duration of flowering (days)		Period of active functioning of embryo sac	
	Terminal flowers	Lateral flowers	Terminal flowers	Lateral flowers
Simultaneous				
Early	8	8-9	5-6	4-5
Protogynous				
Late	6	6	5-6	4,5
Early	6	7	3-5	5-6
Protandrous				
Early	4	5	2-3	2-3
Late	6	6	3-4	3-5



**Fig. 1** - Simultaneous type of flowering: Homogamous variety Kishinau



**Fig. 2** - Terminal flowering/ fructification of Skinoskii variety in central pomological zone



**Fig. 3** - Lateral fructification of introduced French Fernor variety in central pomological zone

From its basic biological and ecological features of Moldavian varieties, it should be noticed the high exigency given the light, which is well seen due to its rare crown. It means the light should get in its crown so high, as well as from the lateral parts for optimization of floral buds induction. It should be noticed also that in inadequate luminosity conditions, the fit of the most dangerous disease which provokes the harvest loss is possible. Thus, in the hillock areas (which is characteristic for Moldova), moist enough, the walnut tree should be planted in southern expositions, south-western or eastern, while in the droughty areas, firstly will be used the following expositions: north-western, north-eastern, and even the northern one, where the soil humidity is better maintained, and the scorching heat is weaker. Walnut, as well as other nut cultures like the heat, producing permanently optimal harvests in the areas with annual medium daily temperature of 8-9 degrees (Germain E., 1999). Even if the walnut trees in the rep. of Moldova during the winter supports normally the temperatures of minus 20-25 degrees, the tardy spring frosts represent a permanent danger for buds and annual shoots. That is why, while choosing the varieties for the orchards setting up, it is necessary to

choose the varieties with a tardy disburgeoning and late flowering of pistillate flowers. This will assure avoidance from the respective frosts. Preliminary agrotechnical experiments show that using biannual pruning systems it is possible to stimulate formation not only of additional annual shoots, but initiation of lateral formation of pistillate buds. In the same time, fruit set in lateral positions depends a lot of optimization of soil water requirements etc.

As a result long time establishment of orchard by seeds, walnut bearing plantations represent a pronounced polymorphism, which does not always correspond to practical, especially marketing requirements. Non-homogeneous production of walnuts is realised in form of walnut kernels remain a problem. From the other hand, preservation of local domestic biotypes represent a sustainable way for long time biodiversity conservation within the species *Juglans regia* L.

### CONCLUSIONS

1. Studies of the initiation and development of pistillate walnut flowers demonstrate that type of formation of pistillate flower buds (in terminal and lateral positions) and sustainable fructification of dichogamous selected Moldavian walnut varieties and selections shows a large diversity reserves for the future breeding programs.

2. Following local breeding program should be axed on creation and promotion of perspective genotypes with high potential of both terminal and lateral types of bearing, especially protandrous ones.

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