

MORPHOGENESIS OF WALNUT (*JUGLANS REGIA* L.) FLOWERS AND POLLEN QUALITY DEPENDING OF ROOTSTOCK AND WATER CONTENT OF SOIL

MORFOGENEZA FLORILOR FEMININE ȘI CALITATEA POLENULUI LA NUC (*JUGLANS REGIA* L.) ÎN DEPENDENȚĂ DE PORTALTOI ȘI CONȚINUTUL DE APĂ DIN SOL

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Abstract. There are presented data concerning the influence of rootstock species (*Juglans regia* L. and *Juglans nigra* L.) and water level of saturation of soil (70% of whole content) on the of organogenesis process and the development of embryological structures of female flowers and pollen within dichogamous walnut varieties. In spite of more prolonged terms of initiation there is detected favorable influence of irrigation on the development of flower structures during the first stage of organogenesis: July-August within all dichogamous types. The most accelerated processes of morphogenesis were established for protogynous genotype on rootstock *Juglans regia* L. Obtained results shows that the end of female flower structures differentiation (in spring period), pollen diameter and viability there not connected with the hydrophysical soil parameters as well as rootstock *Juglans regia* L. and *Juglans nigra* L.

Key words: walnut, flower morphogenesis, rootstock, irrigation

Rezumat. Sunt prezentate cercetări privind influența portaltoilor (*Juglans regia* L. și *Juglans nigra* L.) și a nivelului de asigurare a solului cu apă (70% din capacitatea totală) asupra proceselor de organogeneză și de dezvoltare a structurilor embrionare a florilor femele și a polenului în cadrul soiurilor dichogamice de nuc. La primele faze de inițiere a structurilor florale (iulie-august) s-au depistat termene mai prelungite de organogeneză în cazul irigații la toate tipurile dihogamice. Cel mai accelerat ritm de morfogeneză s-a evidențiat pentru genotipurile protogine, altoite pe portaltoiul *Juglans regia* L. Rezultatele obținute demonstrează că primăvara, sfârșitul diferențierii structurilor florii femele, diametrul polenului și viabilitatea lui nu depind de parametrii hidrofizici ai solului precum și de portaltoi *Juglans regia* L. sau *Juglans nigra* L.

Cuvinte cheie: nukul, morfogeneza florilor, portaltoi, irigare

INTRODUCTION

The problems of initiation and development of flower buds represent a major interest within fruit production of fruit trees. In the same time those are coherent aspects of genetics and breeding strategies of long and short terms creation of news varieties regarding adequate requirements of market, biodiversity conservation, etc. For apple, *Malus domestica* the most representative species of

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temperate zone, there are already published a lot of data regarding the above noted problem (Hanke et al., 2007). a special interest actually in the republic of Moldova is accorded to walnut culture. There are established a lot of new orchards. Some European varieties, created for different conditions of European country.

There are registered for promotion local varieties, well adapted to pedological and climatic condition of the country, as well as some European introduced varieties, created for different zones of walnut cultivation. Is it well known that walnut represent a south fruit tree species with high requirements to light, heat and water. In this context it is necessary to considering specific roots peculiarity (system of roots) of walnut trees, which could growing during almost all year: namely when the soil temperature is above $+5^{\circ}\text{C}$ (Mihăiescu, 1998), without obligatory rest period (for example like aerial part).

Therefore, water deficit of the period of flower buds initiation during July month, concomitantly with fruit development, and general programming of the yield for the next year play a special role for walnut. In the scope of diminish negative effects within walnut tree development, optimal tree loading for fructification, normal fruit set and its next development with the guarantee of quality formation, initiation of fruiting for the next year and generally insurance of stability in fruit production.

Establish of optimal irrigation scheduling is related with annual phenological stage of tree, with determination of period when water is more important for optimal development and fructification of walnut tree (Germain, 1999; Pîntea, 2004).

MATERIAL AND METHOD

Experimental investigations were effectuated in the fields of Experimental Station of Research Institute for Horticulture. Soil-ordinary chernoziom water level of saturation of soil (70% of whole content), irrigation - on furrow. Local registered walnut varieties Chişinevschi, Schinoschi, şi Costiujenschi, including all dichogamous types: protandrous, protoginous, homogamous were grafted on two rootstocks (*Juglans regia* and *Juglans nigra* L. Microscopical analysis were effectuated according standard methods (Cociu and Oprea, 1989; Mănescu et al., 1989).

RESULTS AND DISCUSSIONS

Investigations regarding the influence of rootstock and water insurant of soil under morphogenesis of flower buds there are very important for fruit trees species and particularly for walnut. In general until now there not formatted an unique conception regarding the influence of humidity of soil and air under the flower initiation at fruit tree species, especially for walnut. We could mentioned Mauget J.S. (Maughet, 1977), who during the experimentations of walnut variety Pedro with different degrees of water insurant of container soil, concluded that for the development of flower buds a high water insurance of soil is favorable.

Ours investigations are consecrated to attend during all annual cycle the influence of water insurant of soil upon the stages of flowers differentiation

depending on rootstock *Juglans regia* and *Juglans nigra* L. and type of dichogamy at varieties: Chişinevschi (homogamous), Schinoschi (protogynous), and Costiujenschi (protandrous). Two conditions of soil humidity maintenance in different period (experimental irrigation of orchard on furrow during the months June – September and its absence) there are experimented the following ones: 70% of total water insurant of soil and 30-40% of total water insurant of soi – without irrigation. There by ours researches demonstrate that initiation and differentiation of main female flowers are proceed during more than nine months.

According our general scheme, elaborated on the basis of cytological, histochemical and integral embryologic approaches (fig. 1) it is necessary to distinguish 9 stages, 3 of them are related to the summer-autumn period of bud development. Average obtained data, concerned the dynamic of all initial meristematic formations demonstrate that in summer-autumn period irrigation slow down rhythm of organogenesis at all dichogamous varieties in comparison with the absence of irrigation (tab.1). In the same time we notice that all differentiated structures are 2 times bigger. There are evident favorable influence of irrigation on formation of the respective structures.

Table 1

The influence of flowering type and soil WTE at the level of 70% on differentiation of female flowering buds during summer-autumn seasons.

Variety/rootstock	Chişineovschi		Costiujenschi		Schinoschi	
Experimental variants: „+”-with irrigation; „-” without irrigation, Developmental stages of flowers structures	+	-	+	-	+	-
Initiation of generativ primordium	12.06	17.06	20.06	22.06	05.06	10.06
Formation of floral bracteal primordium	13.07	01.07	05.07	05.07	20.06	25.06
Elongation of bracteal primordium	29.07	15.08	10.09	30.07	26.06	30.06
Apparition of perigonal primordium	29.08	10.09	07.09	19.09	18.07	03.09
Initiation of primary ovarian tissues	In spring			20.09	28.09	20.09

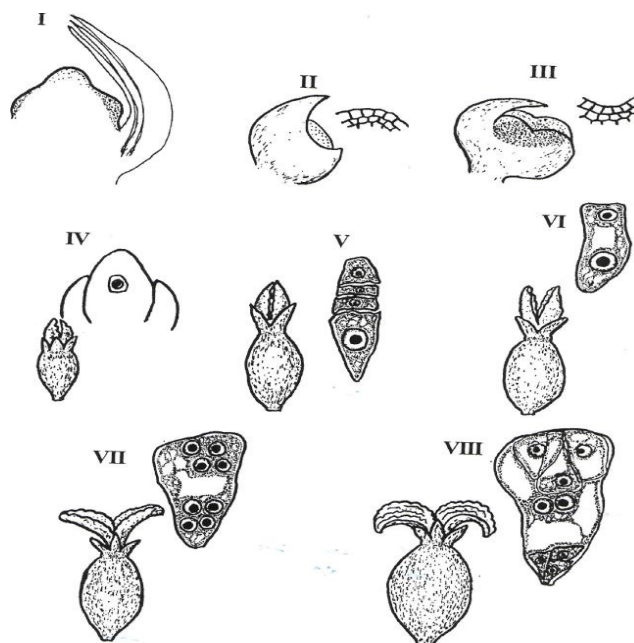


Fig. 1 - Schematic aspect of stages of female flower development. I-initiation of generative primordium; II-formation of floral bracteal primordium (f.p.); III- elongation of f. p. and initiation of perianth foliols; IV-appearance ovule primordium, stamens, ovary; V-meiosis; VI-binucleate embryo sac (e.s.); VII-8-nucleate e. s.; VIII- mature e. s.

CONCLUSIONS

1. There is detected favorable influence of irrigation on the development of flower structures during the first stage of organogenesis (July-August).
2. The most accelerated processes of morphogenesis were established for protogynous genotype on rootstock *Juglans regia* L.
3. The end of female flower structures differentiation (in spring period), as well as pollen diameter and viability there not connected with the hydrophysical soil parameters within rootstock *Juglans regia* L. and *Juglans nigra* L.

REFERENCES

1. Cociu V., Oprea Șt., 1989 - *Metode de cercetare în ameliorarea plantelor pomicele*. Ed. Dacia, Cluj, p. 29, 124-129.
2. Hanke M.V., Flachovski H., Peil A., Hattasch C., 2007 - *No flower no –fruit-genetic potentials to trigger flowering in fruit trees*. Genes, Genomes and Genomics 1(1), p. 1-20.
3. Germain E., -1999 - *Le noyer*. INRA (France). 274 p.
4. Maughet J. S., 1977 - *Dormans de bourgeons vegetative de noyers (Juglans regia L.), cultivees sous differentes conditions climatiques*. Comptes rendus Acad. .Ser. D.-Vol. 284, p. 2351-2354. ;
5. Mănescu C., Georgescu M., Dejeu L., 1989.-*Controlul biologic al producției în pomicultură și viticultură*. Ed. Ceres, București, 244 p.
6. Pîntea M., 2004 – *Nucul. Biologia reproductivă*. Chișinău. 366 p.