

Biological Properties of Precocious Forms of Walnut

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Abstract: *A variety of forms of walnut, primarily manifests in the morphological traits of the fruit. According to the shape of the fruit, nuts are very diverse - from round to elongated-oblong, in color from straw-yellow to dark brown, in size and weight of the fruit from large to small, in shell thickness from thin to hard-shelled, in taste from bitter to sweet and too oily, by recoverability - from hard to easily recoverable. Biologically, the forms of walnut can be divided into early and late flowering, resistant and not resistant to diseases, regularly and not regularly fruiting, fruitful and not fruitful.*

Keywords: walnut, biological trait, selected, plus trees.

1. Introduction

In Central Asia, both in artificial and natural orchards, Persian walnut is one of the main species among other trees. Its fruits, as the most valuable food product, are extremely useful for humans. Plantations of this species play a large water-protective, water-regulating and soil-protective role.

Adult walnut trees reach large sizes - up to 30 or more meters in height, 1,5-2,0 m of trunk circumference and a life expectancy of 200 or more years. With seed reproduction, they begin to bear fruit from 8-12 years old, and with vegetative reproduction from 4-5 years old. However, in the gene pool there are nut examples characterized by a small height (up to 8 m), a dense head, a life expectancy of up to 30 years, rarely 50, which are of great interest not only for breeders, but also for producers. And, they are known as precocious forms. Such forms begin to bloom in the first year of life after sowing the seeds, but bear fruit at the 2-3 years, they are capable of secondary flowering and fruiting, the fruits are often collected in the clusters. The varieties of this form are well-known, such as Ideal, developed by S.S. Kalmykov in 1947 year [1]. This variety inherits well the early entry of the tree into fruiting (fruiting from 1-2 years of age), the ability to bloom and set fruits twice a year and the carpal arrangement of fruits on the tree.

The selection of valuable forms of walnut can be carried out both in the forest and in the orchard in personal plots. However, selection in the forest is more promising, since the form diversity has been formed there over many millennia as a result of natural selection. These forms are distinguished by the highest degree of adaptation to local climatic and soil conditions and are the richest gene pool. At the selection the priority should be given to trees of seed origin.

2. Materials and Methods

The selection of valuable forms was carried out by means of an oral survey of the population or a route survey of walnut

orchards, where trees were distinguished at an age of at least 8 years or more (the age of the beginning of industrial fruiting). In this regard, the following external features of the trees, indicating their belonging to the precocious form have been considered:

The height of the tree was determined by direct measurement with a lath or an optical altimeter. The trunk diameter was determined at the height of the chest, and in trees with a low crown (head) to the soil surface - at the height of the crown base.

Valuable specimens of trees in the field were selected according to direct farm-valuable traits: the quality of nuts, the degree of fruiting or yield, the height of the tree, the shape of the crown and its size, age, the sign of early maturity - mass flowering was particularly taken into account.

3. Results and Discussion

Walnut is a heat-loving species. Its successful cultivation requires at least 150 days with temperatures above + 10°C, i.e. the sum of active temperatures is + 2200–2000°C. Winter freezing of one-year old shoots in Uzbekistan is observed at a temperature of minus 27-28°C. Vegetation begins early in spring, so even minor frosts (up to -3°C) damage young shoots, leaves and, mostly flowers. Because of this, the walnut is not suitable for cultivation in areas where there are late spring frosts [1].

The nut is a monoecious plant, i.e. one tree has both female and male flowers. The flowering dates of male and female flowers do not completely coincide, which contributes to cross-pollination. Flowering occurs, depending on the weather, at the end of March - at the beginning of April in the valley regions and in the second half of April in the mountainous zone. Flowering occurs annually, but with different intensities. The abundance of flowering depends on

the quality of orchard management and on the abundance of precipitation in the year preceding flowering.

The best fruit setting of a nut comes from cross-pollination. Self-pollination is possible in forms with mismatched flowering periods of male and female flowers, but up to 24% of the fruits are set. This circumstance should be taken into account when creating walnut orchards and forest culture. Several varieties with different types of flowering must be placed on one site.

In Uzbekistan, the studies were also carried out on the selection of precocious forms of walnuts, as a result of which Kalmikov created the "Ideal" variety. However, the propagation work on it has not been completed yet. Ukrainian scientists noted the resistance of the "Ideal" variety to fungal diseases [4].

The survey found that on this area, there are about 70 trees of precocious forms aged from 8 to 17 years among the common walnut trees.

Table 1: Characteristics of selected trees of precocious walnut forms

No.	Forms	Age, years	Height, m	Diameter at height 1,3 m, cm	Crown projection, m	Attachment height of the first skeletal branches, m
1	Khumsan-5	13	6,0	43	5,0×5,8	1,5
2	Parkent-2	14	5,3	38	3,0×5,3	1,5
3	Khumsan-1	8	2,7	21	3,0×3,9	0,5
4	Khumsan-2	16	6,9	58	5,8×7,8	1,0

The selected trees are characterized by good growth and development, they are mostly healthy, with the exception of single nuts affected by the codling moth (1 point) on some trees, as well as the presence of single dried 1-2 year old shoots inside the crown.

The crown of these trees is more branched and thicker than that of common nuts, and begins at a height of 0,25-1,0 m from the ground. The crown of the trees, in which it begins at a height of 1,3-1,4 m, is artificially formed, as indicated by the covered marks of the cut off lower skeletal branches of the trunk.

The walnut forms that begin to bear fruit in the second and sometimes in the first year are of great scientific and practical interest, and therefore, in recent years, interest in the culture of such walnut forms has sharply increased.

In this regard, in recent years, a large amount of precocious forms has been found in walnut forests of the Ukraine [2], Moldavia [3], Azerbaijan and Georgia [4], Uzbekistan [1, 5] and Kyrgyzstan [6].

In the reporting year, phenological observations were carried out for previously selected trees of precocious walnut forms, of which 3 were plus forms, 13 were registered as plus forms. They grow in the flat zones on the territory of the Akhangaran forestry enterprise under artificial irrigation.

The flowering of the trees under the recording, although they grow in different soil conditions, in general, began in the second half of April and ended at the end of the month. The duration of flowering of trees ranged from 3 to 13 days on average. Blooming duration of female flowers was observed for 4-10 days, and for male flowers - 3-13 days. The coincidence of the periods of flowering of female and male flowers in one tree was observed in 2 forms (Khumsan-1, Khumsan-5), partially in 2 (Khumsan-2, Parkent-2) cases. The conducted observations showed that the surveyed trees, in general, belong to the protogenic type (Khumsan-2, Parkent-2) of flowering, with the exception of 2 forms (Khumsan-1, Khumsan-5), which had a protandric type.

Table 2: Flowering of selected trees of precocious forms

№	Forms	Flowering, date			
		female		male	
		beginning	end	beginning	end
1	Khumsan-5	18.04	28.04	16.04	28.04
2	Parkent-2	20.04	24.04	23.04	25.04
3	Khumsan-1	17.04	25.04	13.04	19.04
4	Khumsan-2	16.04	23.04	21.04	25.04

Further observations showed that the secondary (summer) flowering of the selected trees began, in general, in the second half of May and ended (the flower stalks dried out) at the end of June under the conditions of the Akhangaran forestry enterprise, and not in August, as noted in the literature for this form.

At the end of August, on three forms, a second wave of secondary (summer) flowering was observed, but only in male inflorescences, which lasted until the end of September. Such a development of the generative part of precocious trees is observed for the first time; this is the first time that we have observed the second wave of summer flowering of these forms, however, the literature has not got data about it.

Observations have shown that precocious trees are affected by codling moth, other pests and the presence of diseases on them are not found. In the literature, there are indications that annual short shoots of precocious trees dry out after fruiting. Observations carried out for the surveyed trees showed that among 16 trees, only 6 of them experienced drying out of single short shoots, inside the crown, and not throughout the crown.

References

- [1] S.S. Kalmikov, M.K. Sabirov. Precocious forms of walnut. Priroda. pp.11-12, 1960.
- [2] F.L. Shepotyev. Walnut. Walnut forest culture. Moscow, Forest industry, 1978.

- [3] M.M. Timko. Some features of the biology of a walnut from germination to the entry into fruiting. Diss.abst..cnd.biol.sci. – Moscow, 17 pp, 1963.
- [4] G.A. Nazarov. Precocious forms of walnut, growing in Nakhichevan ASSR. Coll. “Complexity of natural resources of the Nakhichevan ASSR”. Baku, pp. 101-108, 1984.
- [5] E.A. Butkov. Recommendation for cultivating walnut plantations in the orchard type in Uzbekistan. Tashkent. Bioversity International /UNEP-GEF project, 2009, 25 pp.
- [6] N.S. Bolotova, A.S. Bolotova, K. Mirzaeva, T.M. Kozhobekov. Bioecological peculiarities of walnut and the importance of nut in human life. Bulletin of JalsU, Jalal-Abad, №1, pp.129-132, 2006.