

# *Walnut (*Juglans Regia*) Damage Indicators Under The Cold Air Flow In The Western Tyan-Shan Mountain System*

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**Abstract** – Walnuts are important among deciduous forests in mountainous areas. Soil protection and water management properties of these forests contribute to the various economy sectors development. In earlier times, walnut forests occupied a large area. But anthropogenic impacts: deforestation and livestock grazing are leading to a decline in the natural forests regeneration. As a sharp drop result in weather, trees are more susceptible to frost damage. In mixed forests, frost damage was less common on the side and lower branches of the walnut tree, mainly on the upper branches.

**Keywords** – *Forest Protection, Restoration, Rainfed, Deciduous Forests, Walnuts, Anthropogenic, Geobotanists, Natural Resources.*

## I. INTRODUCTION

At present, the main focus is on the efficient use of forests, water, soil and other natural resources, their protection, security, restoration and increase of productivity.

Forestry has a very favorable climatic significance for arable horticulture, viticulture, animal husbandry and afforestation. This will create opportunities for the forestry and agriculture development in the region. Walnuts are important among deciduous forests in mountainous areas. Soil protection and water management properties of these forests contribute to the various economy sectors development. [2] In earlier times, walnut orchards occupied a large area. But anthropogenic impacts: deforestation and livestock grazing are leading to a decline in the natural regeneration of forests. Existing forests remain unforested, with only a forest-park character.

Walnut (*Juglans regia*) belongs to the walnuts family (*Juglandaceae*), a walnuts category (*Juglans*). The Latin name of the walnut is composed of the words Juvis and Clans, which means "Jupiter nut - acorn of Jupiter". In the historical past, walnuts were called walnuts because they were brought to Russia from Greece, but the word regia means "royal nut". [1]

Beginning in the 1970s, walnuts began to be grown on industrial plantations in Central Asia. The increase in demand for walnuts has highlighted the need to grow walnuts on industrial plantations. Natural walnut field grows mainly in the middle zone of the mountains - in areas with precipitation of not less than 800 mm. Walnut plantations and cultivated forests also produce good yields at the same altitudes.

Given that walnut is heat-loving, it is recommended to establish its cultivated forests at altitudes up to 1800 m.

The services of such scientists as Alkesandrovsky, A.Ya.Butkov, R.S.Vernik, V.Tolipov, Sh.Kamolov, S.N. Giasov in the preservation and restoration of walnut groves, walnut culture forests establishment on mountain slopes, new, large and fertile forms and varieties creation of walnuts are noteworthy.

The average density of walnut forests in southern Kyrgyzstan is 0.4-0.6, and their forest reclamation functions are performed by 50-60%. Walnuts with 0.7-1.0 fullness must be thinned, sanitary cuts must be made [3].

Tree pruning in walnut orchards is mainly aimed at caring for them and increasing their productivity. In such forests, mainly sanitary felling, low-value tree felling is carried out. In this case, methods such as thinning, rejuvenation are used. There are 24 m<sup>3</sup> of wood reserves per hectare and 14 m<sup>3</sup> of pure walnut wood. Tree pruning in such walnut groves increases their yield by 100 kg/ha.

One of the most effective ways to increase the walnuts yield is the use of mineral fertilizers. The mineral fertilizers application in the coconut groves of "Burch Mullakh" forestry has accelerated the walnuts yield for 10 years [5].

One of the main tasks of Uzbek foresters and geobotanists is to preserve, restore and increase the natural mountain forests productivity. One of the economic ways of forest regeneration is to study the natural regeneration process from its seeds and to develop measures of great scientific, theoretical and national economic importance.

## II. RESEARCH OBJECT AND METHOD

Our study focused on the natural regeneration effects from walnut seeds (prevalence of self-regeneration, quantitative and qualitative characterization, relationship to herbaceous plants and parent species), composition of mountain deciduous trees and shrubs, various walnut formation components and structures.

To carry out this research, we set up experimental sites in the upstream areas of the Chirchik River. The experimental plots size was 4,000 m<sup>2</sup> in natural walnut fields and 10,000 m<sup>2</sup> in other areas.

Selection assessments of walnut forms were carried out on the basis of the method "Program and methodology for the variety study of fruit, berry and walnuts crops" developed in 1973.

Cold resistance of walnut forms was assessed on the basis of a 5-point damage scale to the vegetative and generative organs:

**5 points** - no damage from the cold;

**4 points** - 1/3 of annual branches are damaged by cold;

**3 points** - biennial branches are damaged. Yields are partially reduced;

**2 points** - no growth indicators, and 2–3-year-old branches are completely damaged;

**1 points** – 1-3 year old branches are completely dry. There are damage cases to the main body.

### III. RESEARCH RESULTS

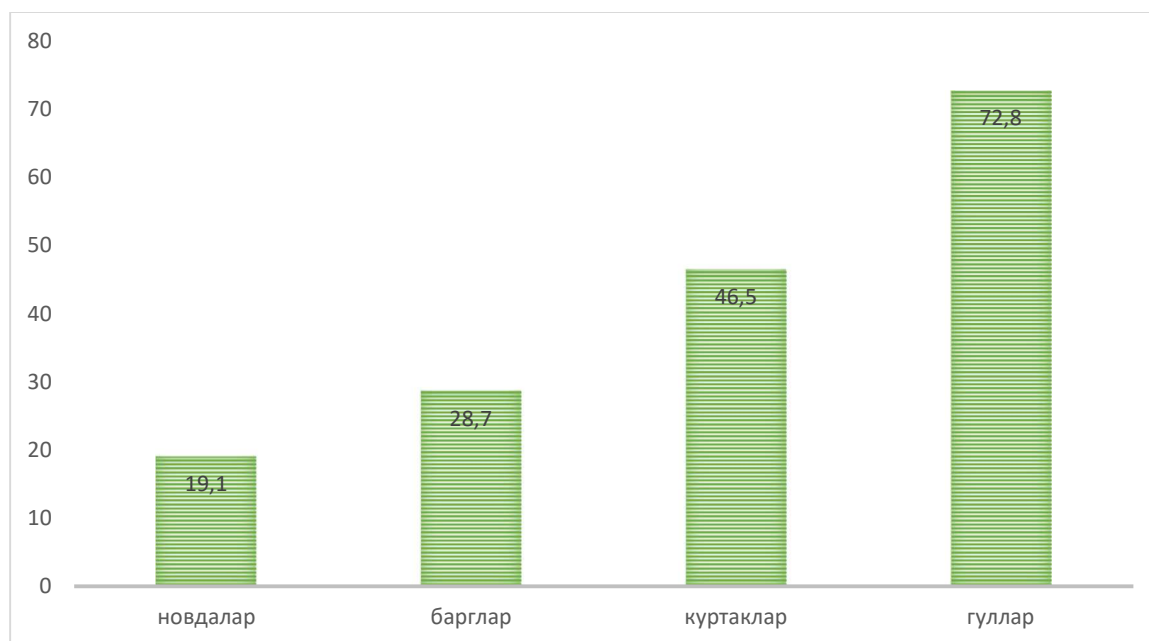
Walnuts grow well only in fertile and moderately moist soils. It cannot withstand either land or swamp. It tolerates high temperatures only when the soil moisture is sufficient. It can also grow well in rocky soils. [1] It is a heat-loving species, but in Central Asia the young branches freeze at minus-27-28°C and the young seedlings freeze at minus -25°C, sometimes grows well in mountainous areas without damage even when the temperature is -30°C.

On April 8-9, 2020, walnuts were severely damaged as a sharp drop result in weather. The drop in air temperature fell to -3°C, and 70-72% of the walnut leaves and flowers were damaged by frost. (Table 1)

Table 1. The result of frost damage in natural walnuts

| <b>№</b>  | <b>Number of trees in the experimental plot.</b> | <b>Cold damage rate in%</b> | <b>The walnut height<br/>Nm</b> | <b>The walnut diameter<br/>Dm</b> |
|-----------|--------------------------------------------------|-----------------------------|---------------------------------|-----------------------------------|
| <b>1</b>  | 3                                                | <b>31-42</b>                | <b>12-13</b>                    | <b>0.6-1.1</b>                    |
| <b>2</b>  | 4                                                | <b>35-45</b>                | <b>14-15</b>                    | <b>0.5-1.3</b>                    |
| <b>3</b>  | 2                                                | <b>40-55</b>                | <b>14-15.5</b>                  | <b>1.0-1.8</b>                    |
| <b>4</b>  | 1                                                | <b>50-60</b>                | <b>15-16.5</b>                  | <b>0.6-1.1</b>                    |
| <b>5</b>  | 1                                                | <b>60-77</b>                | <b>17-20</b>                    | <b>0.9-1.3</b>                    |
| <b>6</b>  | 3                                                | <b>30-35</b>                | <b>14-16</b>                    | <b>0,5-0,8</b>                    |
| <b>7</b>  | 3                                                | <b>40-44</b>                | <b>18-20</b>                    | <b>1.5-2.0</b>                    |
| <b>8</b>  | 2                                                | <b>30-40</b>                | <b>17-19</b>                    | <b>0.9-1.0</b>                    |
| <b>9</b>  | 3                                                | <b>9-15</b>                 | <b>15-17</b>                    | <b>0.5.1.0</b>                    |
| <b>10</b> | 2                                                | <b>20-25</b>                | <b>16-18</b>                    | <b>0.5-1.2</b>                    |

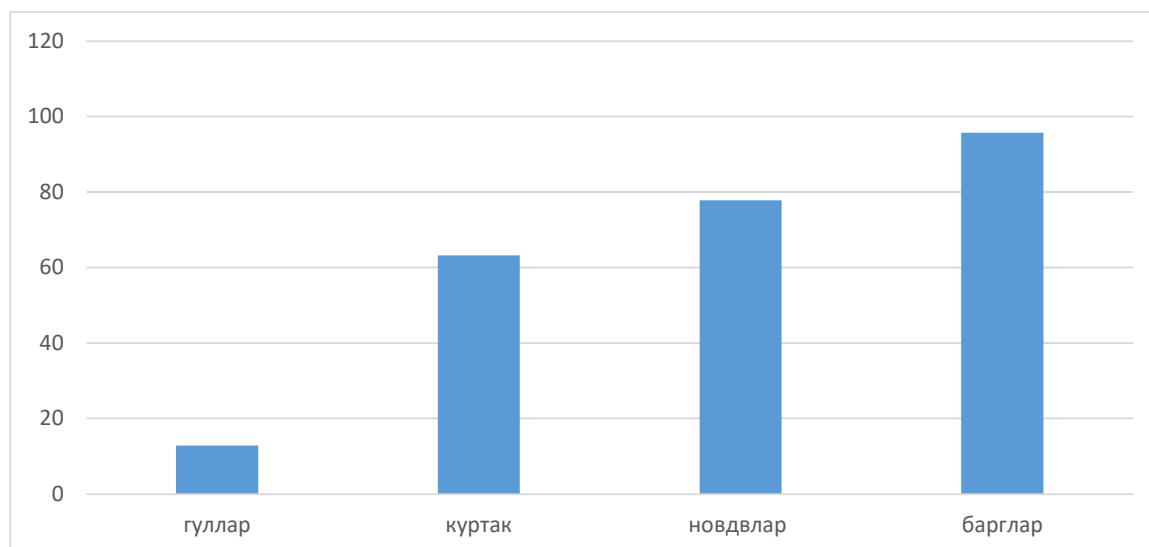
Damage to the tree can be observed in Diagram 1 only if the air temperature returns to minus degrees after the sap moves into the trunk and the buds and leaves begin to change shape.



(branches, leaves, buds, flowers)

Diagram 1. Indications of cold damage.

Observations show that during the dormancy period, the trees are not damaged even at minus  $-25^{\circ}\text{C}$ . As can be seen from the table, the buds and ashes were badly damaged. The recovery of the tree organs after the cold continued as follows. In mixed forests, frost damage was rarely observed on the side and lower branches of the walnut tree. After cooling, walnut regeneration accounted for 17–18% in flowers, 60–63% in buds, 77–79% in braches, and 97–98% in leaf regrowth. (Diagram 2).



(flowers, buds, braches, leaves)

Diagram 2. Recurrence indicators after cooling

As walnuts get older, their resistance to cold also increases. Walnut is an average light-loving species, but light is one of the important conditions for high yields. The root system of the walnut is wind-resistant because it has an energetic deep arrow root and horizontal branches branched in it.

In irrigated lands, well-cared walnut trees yield 120-150 kg at the age of 30-40 years. 60-70 walnut trees growing per hectare yield 5-6 tons of walnuts. However, the yield of walnuts in the natural state is very low, 70-100 kg/ha. [4]

Walnuts growing alone form a large, well-developed branch and occupy 150-200 m<sup>2</sup>. The leaves are intricate single-stemmed, arranged in series, of various lengths.

60-70 year old trees reach 30 meters height. Such trees create a timber reserve of 300 m<sup>3</sup>/ha. In Central Asian conditions, walnuts are resistant to drought, heat, and a significant drop in temperature in winter (-30<sup>0</sup>), but annual young shoots are damaged by cold. In walnut forests, their branches are much smaller and higher, and their trunks are erect.

### IV. CONCLUSION

It will be necessary to preserve the walnut orchards, to promote their regeneration, to establish walnut cultivated forests on the mountain slopes, to select new, large and fertile forms and varieties of walnuts. The present-day walnut is considered a relict forest and is believed to have come down to us from past geological periods and adapted to the arid climate.

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