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STUDY OF THE BIOLOGICAL CHARACTERISTICS OF MANCHURIAN APRICOT (ARMENIACA MANDSHURICA (MAXIM.) KOSTINA) AND HAWTHORN (CRATAEGUS PINNATIFIDA BGE) IN THE CONDITIONS OF THE TASHKENT BOTANICAL GARDEN

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Abstract
The article analyzes the study and cultivation of Manchurian apricot (Armeniaca Mandshurica (Maxim.) Kostina) and pinnate hawthorn (Crataegus pinnatifida Bge). Information has been collected on the biological characteristics of these species in their natural habitat, and the results of studying the biology of specimens growing in the conditions of the Tashkent Botanical Garden are presented. These species are promising for introduction into the forestry of the Republic of Uzbekistan, due to their drought resistance.

Keywords: Manchurian apricot, pinnately cut hawthorn, information was collected on the biological characteristics, analysis, study, cultivation, biology of specimens.

Introduction

The description of Manchurian apricot is first given in the work of K.I. Maksimovich "Essay on the vegetation of East Asia, mainly Manchuria and Japan." In China, Manchurian apricot is widespread and is the hardiest of all other apricot species, which allows it to be used as a park and garden crop, as well as a winter-hardy scion for cultivated varieties [4]. Under natural growing conditions on the territory of the Russian Federation, it is found only in the southern part of Primorsky Krai [15,19].

In its natural distribution area, Manchurian apricot is a tree 8-10 (15 m) in height and 40-45 cm in diameter. It grows more often on dry southern slopes, among oak-broadleaf forests, in groups or singly [2,7,8,19].

Often the tree branches and has 3-4 trunks, approximately equal in height and diameter. In this case, the crown can reach up to 10 m in width and 5-7 m in length [5].

The bark is dark gray, soft, suberized, fissured. The shoots are bare, yellowish-green or reddish-brown [15]. When young, the bark is reddish-brown and smooth. The leaves are sharply serrated, broadly lanceolate or broadly oval, with an elongated apex, 6-9 cm long

and 3-4 cm wide, glabrous or having tufts of hairs at the corners of the veins on the underside. The leaf petioles of growth shoots are significantly shorter than those of Siberian and common apricots.

It blooms before the leaves bloom in April-May. The flowers are large (up to 25 mm in diameter), initially light pink, then gradually turn pale, on a relatively long, bare stalk (7-10 mm in length), bisexual, collected in bunches [1,8,9]. The fruits are oval-shaped, slightly laterally compressed, 2.32.8 cm long, orange-yellow or yellow, initially densely hairy, when ripe velvety, dryish or slightly juicy, with fibrous sweetish-sour or bitter pulp. Apricot fruits ripen in July-August. [3]. Fruit ripening, in its natural growing area, occurs from July 29 to August 20, and fruit harvesting occurs from July 30 to August 20. [5].

The seed is a stone, 15-19 mm long, 13-15 mm wide, 10-13 mm thick, the apex of the stone is pointed (sometimes rounded), the surface of the stone is finely pitted, the ventral suture is smoothed, the dorsal suture is closed, the lateral ribs are not developed, the seed is bitter, less often sweet. The weight of 1000 seeds is 800-1000 g, seed yield is 25-30%. Seed germination lasts up to two years and is 80-85% [7,16,19]. The frequency of fruiting is 1-2 years; it begins to bear fruit at the age of 5. The average harvest from 10-15 year old trees is 10-25 kg.

Light-loving, drought-resistant and frost-resistant. Grows best in deep, fertile, sandy loam, well-drained and moderately moist soils. The root system is powerful with deep tap roots and long lateral roots [17]. It grows quite quickly, the annual growth is 50 cm or more in height and width, especially in the first 10 years of life. Wind resistant. The tree lives up to 80-100 years or more. Decorative in early spring during flowering and in autumn, when the leaves turn bright pink. The shape of the crown is widely spreading, openwork. Tolerates pruning well. It is easily propagated by seeds and also produces abundant growth. Smoke and gas resistant. It is valued in fruit growing as a winter-hardy rootstock obtained by propagation from seeds. The wood is red-brown, heavy and durable. The shells of the seeds can be used to produce ink and activated carbon, as well as gum in the production of quality watercolor paints and pills [15,19].

In nature, the range of pinnate hawthorn (Crataegus pinnatifida Bge) covers the Far East of Russia (the basin of the middle and lower Amur and Ussuri); Korea; China (northern regions, including Manchuria. Pinnate hawthorn (C. pinnatifida Bge.) tree or tall branched shrub up to 6 m high. The bark of the trunk and older branches is dark gray, the branches are yellowish-gray, slightly ribbed, the shoots are bare or initially slightly pubescent. Spines are absent or few in number, straight, 1–2 cm long. Leaves are ovate or oblong-ovate, with an acute or somewhat truncated apex and wedge-shaped, deeply pinnately incised, lobed. At the base of the leaf are separate or almost dissected, rarely in 2–3 pairs of oblong-triangular , acute, membranous lobes, on short shoots up to 6–8 cm long and 5–6.5 cm wide, bright green above, glabrous, shiny, somewhat paler below, petiole 2–6 cm long, stipules sickle-shaped, up to 1.5 cm long. Inflorescences 5–8 cm in diameter, penetrating 12–20 flowers. Flowers 0.8–1.2 cm in diameter, with white petals, pointed sepals, 20 stamens, with pink anthers, 3–5 styles. Fruits are almost spherical or several pear-shaped, up to 17 mm long, 15

mm in diameter, bright red, shiny, with whitish warts and red dense flesh. The seeds are yellowish-brown, 3-5 in number, about 6 mm long, 4 mm wide. There are about 1,700 fruits, or 27,000 seeds in 1 kg. The weight of 1 thousand seeds is 33-42 g [11,12]. In the conditions of the south of the Far East, it blooms in May - June for 8-12 days. Fruits in August - October. Hawthorn pinnately grows along the banks of rivers, on rocky slopes of valleys as part of shrub thickets. One of the most decorative types of hawthorn, distinguished by its bright green, split leaves and shiny red fruits. The fruits are edible. In the northern regions of China, it is used as a fruit plant; for this purpose, Crataegus pinnatifida var. major N.E.Br. It is photophilous, picky about soil, tolerates replanting and pruning well, and tolerates urban conditions [9]. Hawthorn is propagated by seeds, which are sown after 7 months of stratification. Forms numerous shoots and root suckers. Decorative throughout the season. Recommended for wide use in all types of plantings. The wood is very hard, suitable for various turning products. Secondary honey plant, but good pollen plant. Flowers are well visited by bees who collect pollen and sometimes nectar. The pollen productivity of the flower is 2.3-4.5 mg. The pollen is pale yellow and sticky. Nectar productivity per 100 flowers is 28.1 mg of sugar. Honey productivity from conditionally clean plantings is 30-40 kg/ha. [12,13]

Hawthorn is a valuable medicinal plant. The parts of the plant used are flowers, fruits, leaves, bark.

Pharmacological action - antispasmodic, vasodilator, hypotensive, antiatherosclerotic, diuretic, sedative, analgesic. Aqueous infusions and liquid extracts from fruits and flowers are used for heart diseases. The bark contains tannins and a brownish-brown dye, suitable for dyeing coarse fabrics [18].

MATERIAL AND RESEARCH METHODS

The research is based on a systematic approach and generally recognized and proven methodologies used in scientific research of fruit crops. Research on introduction, morphology, bioecological characteristics, phenological observations, biology (growth and development) and shrubs were carried out using general scientific research methods: N.A. Aksenova; R.V. Vafin, V.P. Putenikhin; T.P. Dedenko, E.P. Khazova; S.V. Zalesov, E.P. Platonov and others; S.V. Kolmukidi, E.A. Kryukov; P.I. Lapin, S.V. Sidneva; M.A. Mingaeva G.E. Schultz; and others.

The study of exposure phenology was carried out according to the method of G.E. Shultz and N.A. Aksenova. Studies were carried out to determine the beginning of the growing season of plants. On these dates, the beginning of flowering was noted. About 5-10% of the trees of the studied varieties had flowers; at the end of flowering, up to 90% of the flowers, most of them are marked by a faded, already destroyed period. During this period, the beginning of fruit ripening is noted, reaching normal size and appropriate color. A cessation of kidney growth was also noted. The beginning of leaf fall is considered to be falling when more than 25% of the leaves and most of the trees have already dropped their leaves (up to 75%).

Long-term observations of its behavior in new natural conditions are necessary to assess the prospects of the introduced culture and its reasonable zoning. The result of such observations is an assessment of the most important ecological and biological characteristics of the plant and determination of the level of its adaptation to new conditions. Currently, many methods are used in introductory work. When preparing the report, the main available methods were analyzed, and directions of research in the field of implementation are reflected in the list of references used.

RESULTS OF RESEARCH

In the conditions of the Tashkent Botanical Garden, this species is represented by 2 specimens aged about 70 years. This is a deciduous tree with a height of approximately 12 ± 1.5 m and a trunk diameter of 37 ± 2 cm. The crown is spreading, approximately 8 m in diameter. The bark is brown-gray, fissured. Last year's shoots are bare, greenish, young ones are red-brown in color with pubescence. Leaves are 8.3 ± 1.6 long and 3–4 3.5 ± 0.3 cm wide, glabrous, oval, with an elongated and elongated apex, doubly serrate along the edge, petiole length ≈0.44 cm. Flowers up to 38 ± 13 mm in diameter, at first light pink, then pale, collected in bunches. The fruit is an orange-red oval drupe, weighing 3–6 g, measuring 2.2±0.3 cm. Blooms before the leaves bloom (Fig. 1). The fruits ripen in the first ten days of June.

Picture 1 . Manchurian apricot (Armeniaca Mandshurica) blossoming

In 2023, abundant fruiting was observed, compared to previous years (Fig. 2).

Figure 2. Fruiting Manchurian apricot (Armeniaca Mandshurica) in the Tashkent Botanical Garden

Despite the high winter hardiness of this species, due to abnormal weather conditions this year, slight freezing of the branches of annual growths was observed, although to a lesser extent than in cultivated apricot. According to observations of Manchurian apricot in the Tashkent Botanical Garden in 2023, the growing season began on April 4 at an air temperature of +20⁰ C and ended on October 23 at an air temperature of +14⁰ C, the average long-term duration of the growing season is 165 days. Flowering was observed from April 8 at an air temperature of 23⁰C to April 21 at an air temperature of 21⁰C (Fig. 3). On average, flowering time is 10-12 days. The growth of shoots was observed from April 12 to May 29. Fruit ripening was observed from June 5 at an air temperature of +36⁰C. Leaf coloring was observed from October 7 at an air temperature of +21⁰C.

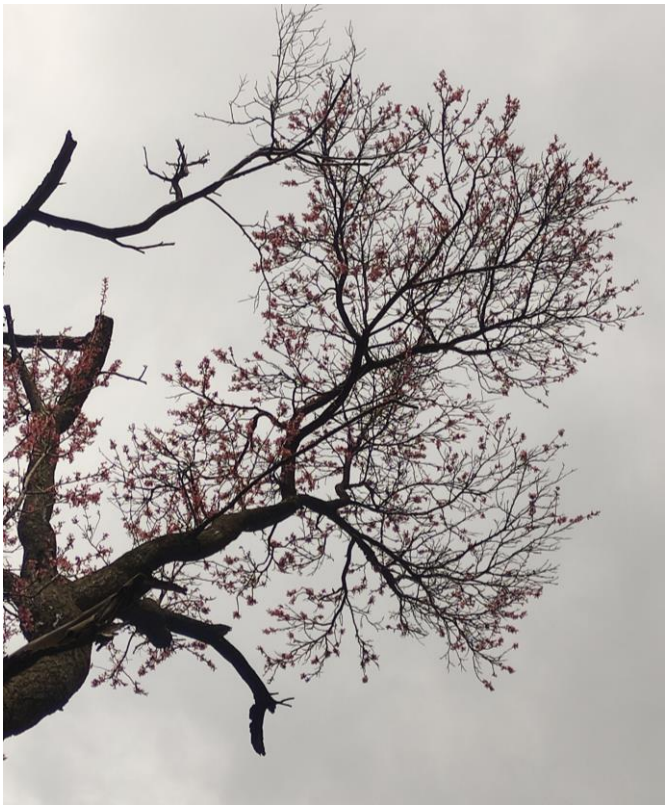

Figure 3. The beginning of the flowering phase of Manchurian apricot (Armeniaca Mandshurica) in the botanical garden

DISCUSSION OF THE RESULTS

Studying the characteristics of the cultivation of Manchurian apricot

Manchurian apricot seeds are collected in early July, when they acquire a yellow color. Fruits must be collected immediately if more than half of them have acquired a characteristic color. After harvesting, the fruits are stored in a ventilated area for no more than 2-3 days, and then the seeds are cleared of the pericarp and dried to a free-flowing state. Seeds with a humidity of 6 - 7% should be stored in hermetically sealed glass containers (filled with paraffin) at a low positive temperature (1 + 8 - 10 ° C). In this form, apricot seeds retain high germination capacity for more than three years.

Stratification of Manchurian apricot seeds lasts 40-60 days. If there is no time for stratification, apricot seeds can be scarified. To do this, the seeds are immersed in water at a temperature of 80 0 C for 30 seconds, after which they are cooled. This operation is repeated 3-5 times. At the same time, laboratory germination is 94, and soil germination is 87%.

Stratified apricot seeds are sown in spring, at the end of April, on ridges. Autumn stratification and sowing does not always give positive results. When growing apricot seedlings, one of the decisive factors is sowing density. The recommended seeding rate is about 25 g per 1 linear meter, which corresponds to 35 seeds, sowing depth 4 cm.

Fertilization is carried out in the spring; mineral fertilizer N50P100K50 is applied to the soil in liquid form; it is recommended to apply organic fertilizers in the fall.

Figure 4. Pinnate hawthorn (Crataegus pinnatifida) in the Tashkent Botanical Garden

At the exhibition of the Far East there is 1 copy. A small tree ≈ 5.2 m, trunk diameter 12.5 cm, with a loose spreading crown and dark gray bark (Fig. 4) Leaves are rugged, three-lobed, gray-green below, somewhat paler, hairy along the veins, 7.4 ± 1 .2 cm long and 5.5±0.3 cm wide.

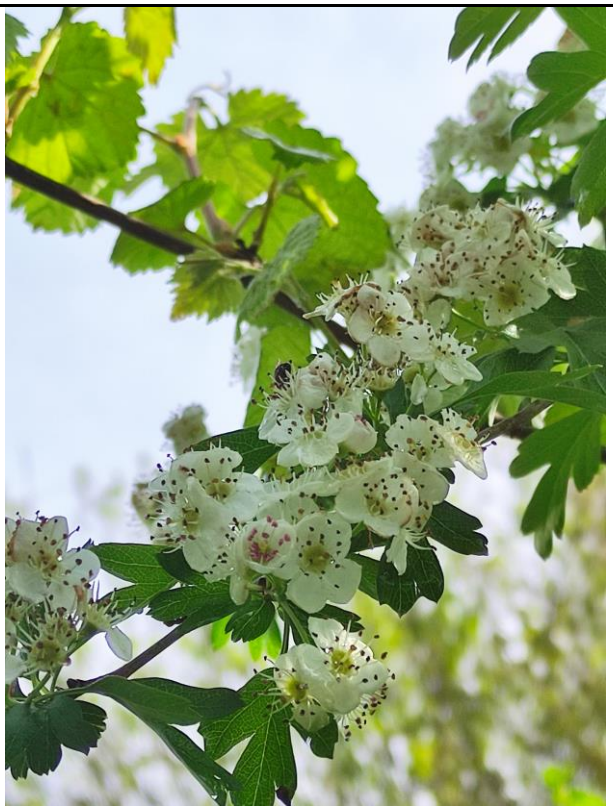

Figure 5. Flowering of pinnate hawthorn (Crataegus pinnatifida) in the Tashkent Botanical Garden

The flowers are white with a pink tint, 6.1±0.5 in diameter, collected in inflorescences of 10-20 pieces. The fruits are spherical, bright red, shiny, sweetish, measuring 11±3 mm. The seed is a yellowish-brown stone, 3 pieces in one fruit, slightly ribbed on one side, 5±1 mm long, 3±1 mm wide.

The growing season this year took place from March 23 at an air temperature of +22^{0}C to October 31 at a temperature of +14^{0}C, the average long-term growing season is 257 days. The growth of shoots is observed from April 9 to May 20. Flowering was observed from April 6 at an air temperature of +18^{0}C to April 22 at an air temperature of +25^{0}C. Fruit formation began on July 30 at an air temperature of +38^{0}C, ripening began on August 25 at an air temperature of +35^{0}C (Fig. 5). The coloring of the leaves began on October 13 at an air temperature of +7^0 C. In garden conditions, pinnate hawthorn grows well, does not suffer from dry air, and is quite winter- and frost-resistant.

Figure 5. Fruiting of Hawthorn (Crataegus pinnatifida)

Studying the characteristics of the cultivation of Manchurian apricot

Seeds require long-term, two-stage preliminary stratification: Stage I - at 20-25°C for 3-4 months, Stage II - at 4-7°C for 7-9 months. They are mixed with peat soil mixture, moistened and left indoors at a temperature of 4-7 C, moistening regularly. After time, the box with sprouted seedlings is transferred to the light and cultivation begins.

Sow the germinated seeds under a greenhouse. When the seedlings become stronger, they are transplanted into separate containers. It is recommended to plant seedlings that are 2-3 years old in open ground. Until this time, the plants need to be replanted as they grow into larger containers.

CONCLUSION

Having studied the biological characteristics of plants of the genus apricot and hawthorn introduced into the Tashkent Botanical Garden, the following conclusions were made:

- The growing season of this species is 257 days and 165 days, which is several weeks longer than in its natural range;

-Despite the weather conditions, cold winter and hot summer, both species produced abundant fruit, which indicates the success of the introduction.

Based on the research conducted, we can conclude that seeds must be used to propagate these species. To increase germination, the collected seeds undergo cold stratification and sowing is carried out in the spring of next year.

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