Special Issue on Basis of Applied Sciences and Its Development in the Contemporary World
Published in Association with
Department of Technology and Organization of Construction, Samarkand State Architectural and Civil Engineering Institute, Uzbekistan
Department of Mechanization of livestock, Samarkand Institute of Veterinary Medicine, Uzbekistan
Novateur Publication India's International Journal of Innovations in Engineering Research and Technology [IJIERT]
ISSN: 2394-3696, Website: www.ijiert.org, 15th June, 2020

RESISTANCE OF ALMOND AND PISTACHIO CROPS IN THE FOOTHILLS OF THE SURKHANDARYA REGION TO DROUGHT AND HIGH SUMMER TEMPERATURES

Xamzaev A. X.,

Director of Uz Research Institute of Forestry, Doctor of Agricultural Sciences, Professor.

Butkov E. A.,

Senior Researcher (Candidate of Agricultural Sciences) Uz Research Institute of Forestry,

Eshankulov B. I.

Senior Researcher (PhD) Uz Research Institute of Forestry.

bobomurodovich@mail.ru

Abstract

There is a significant area of pistachio species in the natural zone of plant growth in Uzbekistan. The high consumption of pistachios by the population indicates that interest in them has always been high. Pistachio belongs to the group of xerophytic plants, grow in arid foothills. It serves to meet the growing population demand for pistachios at a time of global warming by seeking and breeding drought-resistant forms of nut plants.

Keywords: almonds, pistachio, the natural range of almonds and pistachios, xerophytic plants, environmental requirements, soil, gardens, plantations, cultivated plantations, healthy foods, human nutrition.

Introduction. Almonds and pistachio have long been included in the range of healthy foods that serve to feed people. The natural area of these plants occupies the territory of Central Asia, which includes Uzbekistan. The sweet-core forms of common and Bukhara almonds, which are occasionally found among the bitter-core forms in the wild stands of these species, have been domesticated by humans since the Neolithic. Pistachio fruits in the entire population have high taste and were collected in vast wild thickets that had formed long

before the territory was populated by humans. For this reason, pistachio was not domesticated until recently, until its natural thickets were destroyed and the need arose to create high-yielding varieties. These species are among the wild relatives of cultivated plants, which were formed in the natural and climatic conditions, which are also typical for our republic and, therefore, are well adapted to them [1].

The genus Pistacia (Anacardiaceae) consists of at least 11 species of trees and shrubs, of which P. vera L. (2n = 2x = 30) is the most important for its edible nuts. Pistachios are one of the best nut crops in California, producing approximately 98% of pistachios in the United States. All types of pistachios are dioecious, pollinated by the wind and oblige to go beyond [4].

The ecological requirements of these breeds roughly coincide, which caused the coincidence of their natural ranges. For thousands of years, both breeds occupied a natural niche between the arid zone with a desert climate and the zone of humid steppes and forests, relatively well provided with moisture in atmospheric precipitation. In terms of the height of the terrain, it occupies from 500 m to 1500 (1800) m above sea level, and in terms of the amount of annual atmospheric precipitation - from 300 to 700 mm [2, 3].

Materials and methods

In former times, before the settlement of the territory of Central Asia by humans, or rather, before the emergence of civilizations, this zone, which is part of the system from low foothills to low mountains of mountain ranges, was covered with vast almond-pistachio forests, which were later destroyed by humans. At present, only small stands or small groves remain of them. The vacated land is currently used extremely unproductively, mainly for grazing. Due to the unlimited overgrazing of livestock, in the place of almost completely grazed herbage during the precipitation season, surface runoff is formed on the unprotected soil surface, washing away the fertile layer and causing ravines and mudflows.

At present, due to the rapidly growing population of the republic, the question of increasing food products has become acute, among which almonds and pistachios are not the last. They are also valuable because they can grow well on rainfed lands, which formerly occupied the

natural stands of these species, without the cost of growing them valuable irrigation water. But in modern conditions, the cultivation of all crops, including almonds and pistachios, should be economically viable and bring an income attractive to a farmer or other producer. The orchards and plantations of these crops should at the same time give high annual yields, which depends not only on the variety, but also on their adaptation to the specific soil and climatic conditions of the area in which they are grown. These conditions depend on many factors - the mechanical composition of the soil, the thickness of the fine-earth layer, the steepness and exposure of the slopes, etc., but mainly on the height of the terrain, on which the amount of atmospheric precipitation depends.

Within each of these species, due to genetic differences in the process of evolution, many forms have formed that differ from each other in a variety of biological and morphological indicators, including adaptability to changing conditions, on which their successful growth under certain conditions depends. The selection of the best economically valuable forms from which various varieties of almonds and pistachios are formed is based on this principle from ancient times to the present day. In this regard, it is of interest to determine the differences between wild forms of almonds and pistachios according to their adaptability to extreme growing conditions and for use in further breeding.

Research results and their discussion

For the study, plantings of almonds and pistachios were used in the Sherabad district of the Surkhandarya region in the hilly foothills of the Kugitang ridge at altitudes from 900 to 1200 m above sea level, where a small amount of precipitation falls in the late autumn-winter-early spring period, and in summer under drought conditions are observed extremely high air temperatures. Plantings of almonds and pistachios were created from seed planting material and therefore included a variety of forms according to their adaptability to natural conditions. During the measurements, almonds in two plots were between 5 and 7 years old, and pistachio in two plots: one at the age of 6 and the other 2 years. The plantings were located on the slopes of the western and northern exposures, the soils were typical and dark gray soils on loess-like loam of great thickness. The observations were carried out for two years in

2018 and 2019. 2018 was extremely dry, and the summer was dry with air temperatures in the hot months reaching 410 C. In 2019, an increased amount of precipitation fell in the winter-spring period, but in the summer, higher air temperatures were observed, reaching 430 C. Observations for drought and heat resistance of almonds and pistachios were carried out in the hottest summer period - at the end of July. At the same time, morphological changes in the crowns and trunks of trees were visually taken into account - the formation of apical buds of annual growth of shoots or the continuation of their growth, the presence of bark burns on the trunks and shoots, a change in the color of leaves, wilting or shedding of leaves, burns on leaves, a change in the timing of the formation of lateral buds on shoots.

The temperature of the leaf surface was also measured with a device - a non-contact thermometer "IR thermometer" on illuminated places of tree crowns, which depends on the intensity of transpiration of water by leaves (the higher the level of transpiration, the lower the temperature of the leaf surface, since significant energy is spent on transpiration). The leaf surface temperature was determined separately on strong plants with high growth rates and on weak plants lagging behind in growth. For measurements, 20 trees of each group were taken, then the indicators of each group were averaged, and the average values were compared with each other. Soil moisture meter "Soil Moisture Meter MO750" determined the moisture content to a depth of 1.0 m in pre-dug pits in three places at each site in the soil horizons every 20 cm of depth - 20; 40; 60; 80 and 100 cm. Moisture readings from each horizon were also averaged.

Observations of plants in mixed plantings of almonds and pistachios showed the following.

In the dry and dry 2018, trees in rainfed almond plantations showed unequal adaptability to drought and high air temperatures. Conventionally, they are divided into three groups. In some of the trees, extreme conditions did not externally affect their condition in the hottest period - the third decade of July. Their crowns were dense, and the leaves were green or dark green. In another part of the trees, the state was in varying degrees of depression - the leaves were spoon-shaped, and the color of the leaves was green-brownish. In a third of the trees, the leaves have partially or completely crumbled and the trees have already gone into winter dormancy. This trait did not affect the annual growth of shoots and the initiation of lateral

and apical buds, since in all three groups the height of the trees varied 5 years after planting from 120 to 210 cm.The trees had already stopped growing shoots by the time of observations and apical buds were laid on them ... As is known from the literature, the ability of almonds to shed their leaves in drought conditions and leave prematurely in winter dormancy does not affect their development in the next year. One of the negative consequences of this method of adaptability was the ease of provoking secondary flowering during a long warm autumn, which leads, accordingly, to crop losses the next year.

Measurements of the leaf surface temperature associated with transpiration showed that in the daytime at an air temperature of 380 C and an air humidity below 20%, it averaged 32.70 C on trees that preserved foliage, and 36 in trees with depressed foliage. 80. After 16 hours at an air temperature of 35.00, it was 25.60 and 31.50, respectively. Measurement of soil moisture showed that up to a depth of 40 cm it corresponded to the moisture content of stable wilting (less than 9%), and from a depth of 60 cm it increased from 10 to 11%, that is, it was available for tree nutrition, but was in limited quantities.

Observations and measurements carried out in the plantings of pistachios showed that some of the trees had leaf burns in the form of brown spots of dead tissue, but extreme conditions also did not affect the growth of annual shoots. The height of all trees in 6-year-old plantings varied from 90 to 170 cm. The conditions did not affect the length of annual shoots and bud formation either, since pistachios have a short growth period, which ends in June, when the dry period has not yet begun. Measurement of the leaf surface temperature at an air temperature of 35.00 showed that in healthy plants it averaged 31.10, while in plants with burned leaves - 36.00 C. On the leaves that received burns, it varied from 38 , 0 to 40.90 C.

In 2019, soil moisture conditions were more favorable than the previous year. Observations of the amount of precipitation showed that during the moisture accumulation period from October last to May this year, coinciding with the hydrological year, 850 mm of precipitation fell in the form of rain and snow. Separate rains of the spring period had a torrential character, which even caused the formation of mudflows. Such a significant amount of precipitation made it possible to accumulate moisture in the soil of rainfed lands, on which almond and pistachio orchards are created.

Observations showed that in irrigated home gardens, no wilting or yellowing of leaves was observed on almond trees. There were also no sunburns on the leaves, although the daytime air temperature exceeded 430 C.

In a rainfed garden in mixed plantings of pistachio and almonds of 7 years of age, no sunburns of leaves were noted on any tree of both breeds (although last year they were observed on pistachios), and on almonds, weak leaf shedding was noted on forms susceptible to this phenomenon ... Measurements of soil moisture to a depth of 1 m showed that it gradually increased with increasing depth: at a depth of 20 cm - 2%, 40 cm - 7%, 60 cm - 8%, 80 cm - 10%, and at a depth of 1 m - 14% , that is, up to a depth of 60 cm, wilting moisture was observed in the soil, but already from a depth of 60 cm there were sufficient reserves of moisture available for plants to use.

In almond trees, the leaf surface temperature on strong and weak plants was approximately the same - 30.4 and 31.20, respectively. Leaf fall was practically not observed on either strong or weak trees.

In pistachio, the surface temperature of leaves on strong plants and on small, weak plants was approximately the same - 29.20 and 28.40 C, respectively, although in the past, dry year, sunburns of leaves were observed on some weak plants at their surface temperature above 400. Air humidity during measurements it was below 20% (the device does not show below this value), and the air temperature was 370. In another area, with a 3-year-old pistachio planting, at an air temperature in the tree crowns of 41.70, the leaf surface temperature was much lower, than in the previous dry year - 20.20 for strong plants and 22.10 for weak plants. Soil moisture is the same as in the previous plot.

The current increments of shoots in both pistachio and almonds ranged from 20 to 70 cm in the first section and in pistachio from 15 to 45 cm in the second. 7-year-old almond trees have already reached a height of 1.8 to 3.5 m, and pistachio trees - from 1.3 to 1.8 m.The height of pistachio plants in the second plot was at 3 years of age from 45 to 120 see Part of the pistachio plants bushes (about 40%), and the rest grow with one trunk.

Conclusions

Thus, almonds grown from seed planting material are well adapted to the dry, dry conditions of the Surkhandarya region, but they have different forms of adaptability to them - with the preservation of a full leaf apparatus throughout the growing season, apparently due to deep root systems, and with the dropping of leaves with smaller root systems, going into winter dormancy even in summer.

When breeding new varieties, it is preferable to select forms that retain the leaf apparatus, as more resistant to premature flowering and, thereby, capable of producing regular fruit yields.

Pistachio under the same conditions also showed good adaptability to arid conditions and high air temperatures, being exposed only in dry years to burns of an insignificant part of the leaves, which do not noticeably affect the general condition of trees, but the selection of new varieties should be carried out in dry years and preference should be given quickly growing forms that form single-stemmed trees.

References

1. Chernova G.M. Bioecological bases of selection of true pistachio (Pistacia vera L.) in Central Asia. - Bishkek, 2004 .-- 125 p.

2. Akhmatov K.A. Adaptation of woody plants to drought. Publishing house "Ilim", Frunze, 1976. - 199 p.

3. Field V.V., Salamatova T.S. Physiology of plant growth and development. Ed. Leningrad. University, Leningrad, 1991 .-- 240 p.

4. Jacygrad E. et al. Phenotypic segregation of seedling UCB-1 hybrid pistachio rootstock // Trees. - 2020. - T. 34. - No. 2. - S. 531-541.