



THE INFLUENCE OF NATURAL ENVIRONMENTAL CONDITIONS ON FRUITING OF SUBTROPICAL CROPS

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Abstract

Subtropical horticulture of Azerbaijan Republic has gone in very favorable conditions in dry subtropical climate zones, encompassing the entire territory of Kura-Araz lowland, Absheron peninsula, highland territory of Small Caucasus Mountains area and semi-humid territory of subtropical Great Caucasus mountain zone and also humid subtropical Lankaran-Astara territorial zone. There were cultivated in this territory since olden times olives, pomegranates, figs, Jujubes, Japanese persimmon, nuts (almond, pistachio, walnut, hazelnut, chestnut, Pecan), pineapple guava (feijoa), citrus fruits and etc.

Keywords: olives, pomegranates, figs, Jujubes, crops, productivity, plant breeding.

Materials and Methods

They contain not just useful but necessary substances-vitamins, organic acids, pectins, Phytoncides, various mineral and ballast substances (cellulose, gemizelluloza) to stimulate digestion.

Azerbaijan Republic has a rich of natural environmental great potential conditions for the cultivation of all subtropical fruits in the rank of industrial crops. Some crops such as figs, pistachio, jujubes, some species of almonds are now mainly cultivated in the private sector. And the main reason in limited distribution of them in the public sector is the lack of scientifically reasonable technologies for growing.

The ecological natures of major subtropical crops (olive, pomegranate, almond and pistachio) are still less studied. But the harvest is a complex product of the interaction of natural and economic factors, which reflects not only the influence the biological properties of plants, but also the weather, climate and other environmental conditions. Climate affects the plant not only directly, but has an impact on the soil formation and microbiological processes, foster or impede the spread of pests and diseases, and to a lesser extent, lends itself to artificial effects, than other environmental factors, which have biological significance.

The soil has a vital and a limited resource. Although it can spread infinitely long biological productivity (production and mineralization of organic matter in dead vegetation balances), but can quickly lose its natural potential, its fertility.

Therefore, we need deepest environmental analysis of soil by perennial crops for the proper explanation of the role of individual local factors in the origin of certain soil properties, to evaluate to what extent of the optimal rate of nature-forming components in this Agro system to reach the most proportional rate between them.

The elaboration of these specific technical actions will allow skillfully intervene to life of the fruit trees, specifically to manage its growth and development and it will ensure the longevity of the plantings.

The purpose of these works are doing a scientific cultivation technology basis of subtropical fruits through the study of the regularities of the development of their organisms depending on their origins, age and sorts properties, as well as to find ways to increase productivity, resistance and longevity (agricultural challenge).

The Experimental Part

Researches are conducted at the Azerbaijan Research Institute of Horticulture and Subtropical Crops according to the thematic plans. As an object of studies we have got subtropical fruit crops consisting at least five varieties of each (mostly from regions of Azerbaijan): the Olive tree-Azerbaijan-olive tree species:-Pikvalis, Askolano, Santa Caterina, Gordal species; the Pomegranate species: Guleysha red pomegranate species, Guleysha pink species, Bala-Mursal species, Red peel species, Kazake species; the Almond species:-Nikita 62, Langedoc, Princess, Hardy, Foothill species; on Pistachio species: seven Absheron sorts.

Research works conducted in Absheron area carried out in basis experimental stations of subtropical cultures Zikh and Hovsan Olive farms; in Shirvan zone -in Goychay and partly in the Goychay Sorting Place.

The studies have been carried by experimental field way method, by laboratory and analytical technical containing methods in four on-site sections:

1. The study of the thermal regime of growing subtropical fruit crops, taking into account other meteorological elements (relative humidity, precipitation, wind);
2. Evaluation and description of soil plot keys of genetic horizons with the definitions of the genesis of the soil horizons at the depth of the root systems of fruit plants (60-80 cm or more), physic-mechanical and chemical compositions;
3. Experimental verification of agronomic factors on the adaptation and optimization of the ecological requirements of fruit crops in four main links of farming care of their plantations;
4. Creation of Olive tree fertility soils plots.

Fruits of subtropical plants have high taste, dietary and medicinal properties and contain large amounts of easily digestible sugars, vitamins, minerals and organic acids. To the subtropical fruit crops growing in the dry subtropical zones of the Republic have applied including Olive, Pomegranate, and Almond with a great economic importance and the cultural perspective species - Pistachio.

The Olive belongs to a spread family Oleaceae, widespread in the Old World at tropical and subtropical latitudes. Cultural species is the only one *Olea Europaea* L., the wild species are unknown. The only source for the species of *Olea Europaea* L. is a sort of *Olea Chrysophylla* Lam. [1]. The Olive cultural species (olive tree) has a fairly large or medium size (from 8.5 to 22 m), are the ever-green tree.

The Olive has an economic-valueable property. The Olive wood has a high specific weight (1.2-1.3), it has a high technical characteristics: toughness, durability, well-handled, well-polished and it is valued for the production of expensive furniture and in making of art turnery products. The Olive tree is widely used in landscape architecture for its very beautiful evergreen view. Their dense coronas with silver-green foliage combination with the bright green view of other genus have created a very decorative landscape design.

The Pomegranate belongs to the family of Punicaceae, which has only one genus *Punica*, including two species: *Punica protopunica* Balf., *Punica granatum* L. Species of *Punica granatum* L. introduced in cultivated and in wild forms [2-3].

The Pomegranate is in natural growing view-a small tree or large shrub to 3-5 m in height, with a curved trunks and highly branched crowns.

The Pomegranate is a valuable cultural plant in ornamental horticulture. There are very beautiful shapes with its double flowers of different colors - from white to bright red, monochrome or multicolored. Ornamental view of pomegranate plants enhanced with long flowering period, an abundance of large flowers in original forms.

The Almond ordinary of *Amygdalus communis* L. family is a tree of 6-10 m tall or shrub (in wild form) of 4-8 m height [4]. The crown of tree is branchy or splayed, sometimes pyramidal, with a strong root system; with sword shaped curved trunks and branches without thorns. Shoots have elongated, shortened view. Leaves are elongated lantceolate shaped with palmate edges, light green on petioles, equal in length or longer than the plate or stipules. Flowers are large, white or light pink, plane: sepals and petals are 5; stamens are 30, pistils are above stamens, ovary is unilocular, hanging, with one (or less two) ovules. They have fruit drupes, 1-6 cm length, and hanging or sometimes bare stalk up to 1 cm in length.

The Pistachio belongs to the genus *Pistacia*, family Anacardianceae and has around 20 species distributed in the northern hemisphere. Genus was once associated with subtropical forests of the ancient Mediterranean zone [5]. It has been suffered to severe Xerophytization and there have been survived remnants of subtropical deciduous forests of modern islands of pistachio forests in Central Asia. *Pistachio vera* L. is the only one edible fruit of Pistachio species. *Pistacia atlantica*, *Pistacia nutica* Mey. species have value as a rootstock for common pistachio species of turpentine tree *Pistacia terebinthus* L., growing wild near the Mediterranean Sea coast.

Therefore there are existed all the necessary conditions for the spread development of pomegranate culture in Azerbaijani country.

Based on many years of comprehensive researches we have received a great amount of experimental data, which will make evidence-based conclusions based on ecological and biological aspects of the study of soil and subtropical crops (olives, pomegranates, almonds and pistachios) under condition of dry subtropical climate of the Azerbaijan republic, to solve some problems for the effective application of basic agronomic techniques for their cultivation, to develop models for fertilization of irrigated gray-brown and gray soils as standards for effective potential fruiting in ensuring the high plant productivity.

As considering the different relations being studied in research works of subtropical fruit crops to various factors of climate we can say that the leading factors are playing in their ability to live and in accumulation of the crops humidity, supplying plants with water during the growing seasons.

According to the basis of long-term phenological observations of olives, pomegranates, almonds and pistachios we have obtained average timing of phenophases, compiling of phenological spectras, reflecting of the seasonal development of plants bud break up to harvest.

1. Vegetation of Olives in Absheron peninsula begins from the second half of April and ends depending on the weather conditions with early maturing species in October, with the late maturing species in December and later. Regarding to the growing seasons of species the vegetation period is completed in the early grades in 194 days (by Gordal species), but in others 253 days (by Azerbaijan-Zeitun species). The need in active temperatures is provided to summarize from 4108 to 4660 $^{\circ}$ C, including for the formation and ripening are required to 3240-3765 $^{\circ}$ C.
2. Vegetation of Pomegranates under climate condition of Shirvan region zone are beginning with vegetative buds break up in the first half of April. Its duration is near the same in different varieties to 230-235 days, according to summarize of active temperatures required for completion of all Phenophases, close to each other's in size and forms to 5040 and 5140 $^{\circ}$ C, including the formation and maturation of the fruits reaching in 1475-1560 $^{\circ}$ C.
3. Vegetation of Almonds in Absheron climate zone condition are beginning with breakup of leaf buds in many species, whilst in others they are occurring at the same time with blooming of vegetative and generative buds, but in third part they are breaking up first with their vegetative buds. The entire growing season period takes in different species various from 220 to 242 days, the need in active temperatures is provided to summarize from development of generative buds and fruit ripening are completed in early-flowering species to 3300 $^{\circ}$ C, at second flowering species to 3400 $^{\circ}$ C, at late flowering species to 3480 $^{\circ}$ C.
4. Vegetation of Pistachio species in Absheron climate zone conditions are beginning on late March to early April. The fruits are ripening at the second half of July and at early September, but the most of the tree nuts are ripe at the first half of August. The entire vegetation season period is near 7 months in male species, 10 days later in female species, averagely from 183 to 200 days and more. The need in active temperatures is provided to summarize in amount of 4000 $^{\circ}$ C.

By the study of the biological characteristics of subtropical fruits has been researched that each species in the process of formation of a crop has its main critical periods the most responsible for the effective implementation of their potential productivity in the real harvest.

Growth of shoots by length is decreasing in Olives during aging in the same species. Accordingly they are decreasing in development on vegetative and generative buds.

The major role at the Pomegranate shoots formation is playing the new growth one or two-year branches, in which appears about 90% of all shoots. The basis of the harvests are playing long pistils flowers that compiling total of 10-20% flowers on bushes.

There are applied to shoots of the Almond ordinary providing a tree with a thick leafy surface: their woods, whirligigs and early shoots. In fruiting is important short bouquet like branches and strong mixed shoots, which are located on the skeletal and growing branches.

By existing origin of sexes of Syngamy properties in Pistachios has related in adverse conditions in mixing of "male" and "female" trees shifting upward pollinating trees up to 2: 1. Therefore there are observed Phenomenon in timing of male flowering trees in outrunning of female trees flowering that must be considered in cultivation of pistachio horticulture species and there are observed various forms in declining in the sequence and in duration of flowering of male and female trees.

The research work is considering the result of 20 years of investigations. There are presented the results of multiple studies of different varieties of Olives, Pomegranates, Almonds and Pistachios. The ecological and biological bases of development and productivity of planted subtropical fruits, there are studied soil and environmental factors in forming their harvest, elaborated the technology of their cultivation. In particular there are identified methods in acceleration and increasing fruiting trees in young orchards, there are selected biocompatible ways in forms of establishing of the crowns and their optimal parameters content between rows and row crops, set the optimal timing and dose rate of irrigation and mineral (especially nitrogen) supply of trees, definitely optimal parameters and limiting factors of soil fertility in different soil zones, enabling a more rational and efficient use of land soil, as well as more effectively and consistently development measures to improve their fertility and protection. There are researched an optimal model of soil fertility for the culture of Olives in the area of its industrial cultivation, which is possible to properly and further placement of the issues of the rational cultural species, to forecast and plan their crops.

Using of morphogenetical or morphophysiological methods in analysis of plants has allowed to establish on the basis of a combination of phenological observations and research stages of organogenesis of biological control of the process of forming their crops. As a result of the regularity in shoots, flowering and fruiting, which depending on the effectiveness of selected crowns, the types of pruning, maintenance of row spacing, irrigation and mineral nutrition in the formation of a unit mass of biological and economic yield were the basis for developing a set of activities that contribute to the full expression of potential the capacity of these crops in plantations. This control has allowed figuring out due to which link in productivity increases or decreases their harvest.

Soil and environmental analysis processes occurring in the soil allowed to develop methods of soil management events and create the optimal parameters of the ecological model of high fertility, serving the theoretical basis and practical guidance in the development of measures to improve soil fertility and create the best conditions for subtropical fruit crops.

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