

AN ASSESSMENT OF CURRENT STATUS, FUTURE TRENDS AND OPPORTUNITIES FOR IMPROVING EXOTIC AND UNDERUTILIZED POME FRUIT SPECIES PRODUCTION IN ROMANIA

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Abstract

*With changing climatic conditions, some of the subtropical and tropical species adapt to the Northern regions finding more favourable conditions for growth and reproduction. In such context, fruit growing in the temperate regions is undergoing an important change in zoning of the species and introducing new ones that can adapt in the new ecological conditions. Species as: goji berry (*Lycium chinense* Mill.), saskatoon berry (*Amelanchier alnifolia* (Nutt) Nutt. ex M. Roem), pawpaw (*Asimina triloba* (L.) Dunal), kiwi (*Actinidia deliciosa* (A.Chev.) C.F. Liang & A.R.Ferguson), pomegranate (*Punica granatum* L.), kaki (*Diospyros kaki* Thunb.), ziziphus (*Ziziphus jujuba* Mill.), fig (*Ficus carica* L.) and medlar (*Mespilus germanica* L.) have a high ecological plasticity and potential to adapt in the new environment. Also, an opportunity for growing these species into culture is that the Romanian consumers tend to be more curious and willing to try new fresh products so, there are emerging new opportunities for local producers and marketing these pome fruits with high nutritional potential and taste appeal.*

Key words: climate change, zoning, fruit growing, ecological plasticity.

INTRODUCTION

Climate change significantly contributes to the change of agriculture in our country and thus new species of plants are introduced into culture.

On the other hand, increasing population and consumption in the last century are placing unprecedented demands on agriculture and natural resources (Padulosi S. et al., 2013). In the last decades fruit consumption is becoming more and more varied and this trend leads to the necessity for a more various fruit assortment available on the market (Kariuki L.W., 2013).

Romania is a rich source of genetic variability and diversity of different horticultural crops that refers to plant type, morphological and physiological characteristics and their variations in term of reactions to diseases and pests (resistance, tolerance), adaptability and distribution through the country (Gupta S., 2011). With an area of 238.397 km², Romania develops most diverse conditions for fruit growing in terms of soil types and slopes, altitudes, climatic conditions and insolation.

All these diversity drives to great climatic variations from North to South and from East

to West and implicit a great variability among fruit crops. Generally, the Romanian soil is rich in organic matter and has all the necessary characteristics for agriculture.

According to FAO, the total harvested area in Romania, year 2022 is 7457490 ha, from which 142340 ha consist of fruit growing species (2%) (FAOstat, 2024).

Romanian fruit production mainly consists of temperate fruits species as apple, plum, cherries, pear, apricot, peach, berries and dry fruits (walnut, almond, hazelnut, chestnut). A serie of species with high ecological plasticity as ziziphus, medlar, goji, saskaton can also be found in different regions of our country but they are underutilized. These plants are also very important because of their medical value, melliferous potential and are highly decorative. In the last decades due to the climate change some of the subtropical species find proper condition for cultivation (kiwifruit, persimmon, kaki, pawpaw etc).

These fruits are a valuable source of nutrients as they have important medicinal properties and great potential to contribute to the location specific food chain production. In addition to ensuring the diversification of the food base, different indigenous fruit species produced at

different times of the year, are ensuring the supply of fresh consumption but also raw material for processing throughout the year (Jones M.P. et al., 2009; Thillakawardane T.U., 2009).

The aim of the present study is to analyse the current state, the trends and future opportunities for introducing exotic and underutilized fruit species in Romanian production.

MATERIALS AND METHODS

In order to fulfil the general purpose of the present study we focused on:

- general documentation from specialized literature;
- collecting and centralizing data from the competent authorities;
- data analysis from available data base: FAO (Food and Agriculture Organization) USDA (US Department of Agriculture).

We took into study nine species and they are listed in Table 1.

Table 1. The list of studied species

Popular name	Scientific name	Number of available varieties (Official Catalogue of Cultivated Plants in Romania-2023)
Goji berry	<i>Lycium chinense</i> Mill.	6
Saskatoon berry	<i>Amelanchier alnifolia</i> (Nutt) Nutt. ex M. Roem	1
Pawpaw	<i>Asimina triloba</i> (L.) Dunal	5
Kiwi	<i>Actinidia deliciosa</i> (A. Chev.) C.F. Liang & A.R. Ferguson	4
	<i>Actinidia arguta</i> (Siebold & Zucc.) Planch.	1
Pomegranate	<i>Punica granatum</i> L.	-
Kaki (persimon)	<i>Diospyros virginiana</i> L.	5
	<i>Diospyros kaki</i> Thunb.	1
Ziziphus (Chinese date)	<i>Ziziphus jujuba</i> Mill.	5
Fig	<i>Ficus carica</i> L.	3
Medlar	<i>Mespilus germanica</i> L.	-

RESULTS AND DISCUSSIONS

It is known that horticultural activity improves the quality of life for all people of all ages by

beautifying neighbourhoods, stimulating social inter-action, producing healthy nutritious food, encouraging self-reliance, conserving resources, and creating opportunities for recreation and education (Abukutsa-Onyango, M.O., 2009) but in the same time these activities are considered economically viable ways of production.

Romania has favourable conditions and old traditions in fruit growing. Even so, there is a continuous need to set up some essential directions for fruit growing (Chitu E. et al., 2023). Among these could be mentioned:

- application of a modern growing technology;
- introduction of new competitive cultivars and planting compact large plots;
- popularization in culture of underutilized fruit growing species, increasing awareness;
- a new zoning in fruit growing species.

There are already a number of varieties (Table 1), listed in the Official Catalogue of Cultivated Plants in Romania, available for culture (www.istis.ro).

Another advantage is the easy production of planting material in nurseries of these species (Paşcu, R. et al., 2018).

Current Status

According to FAOStat, data for 2022, Romania reported 700 ha cultivated with “other berry fruits”, category where part of these species enter.

In southern Romania there are appropriate natural conditions for Chinese date, kiwi, fig and pawpaw cultivation (Chitu et al., 2023). Medlar, goji and saskatoon berry have a larger area of favourability throughout Romania.

There are several places in Romania where the *Chinese date* exists in naturalized populations in Dobrogea area, where it is called Dobrogean date. Trees are extremely drought resistant, and, until now, they seem to have no natural pest enemies and cultivation is not complicated. Advantage of Chinese date culture is that it has no problems with frost, because due to late flowering. Produces small brown olive-like fruits, rich in vitamin C.

In our country it interests as an ornamental species, being planted isolated or in groups, more like an exotic specie.

Medlar is already known to have good adaptation to our temperate continental climate

conditions and also has natural resistance to pest enemies.

Medlar is a traditional medicinal plant from which the fruits, leaves, bark and wood have been used over time. Fruits rich in tannin, proteins, natural organic acids and pectin, promote immunity.

It was used as rootstock for quince. Presently, medlar is used mostly for its ornamental value, healthy aspect of the leaves until late autumn.

Goji berry has become an important fruit crop in the last decade in Europe, due to its sanogenic properties and in this context is becoming more and more popular also in Romania for both producers and consumers.

Saskatoon berries have a high content of antioxidants, flavonoids and vitamin C. It does not require special care, totally resistant to frost, unlike blueberry, it grows well on a much wider range of soils.

Pawpaw is one of the most exotic plants that have been acclimatized in Romania. Is a rustic species that can be successfully cultivated in temperate regions, originating from the eastern part of the United States.

The fruits have a unique taste, a combination of banana, pineapple and mango, but you can also feel flavors of vanilla or chocolate, depending on the variety and degree of ripeness.

Kaki it is grown in many corners of the world, but the largest production of persimmon is in China, where its leaves are also used for tea and anti-aging products.

Fruits contain vitamins, minerals and other beneficial compounds for health, of which we only mention vitamin C, magnesium and zinc (Table 2).

In Romania, persimmons can be cultivated in orchards but also for ornamental purposes, in parks and private gardens, where the temperatures allow it. It is a species sensitive to frost, which is why it is planted in sheltered places in areas of the country where the risk of frost is reduced. Plants are affected by low temperatures below – 18°C but varieties were also created that withstand up to – 32 Kaki ‘Rosseyanka’ (*Diospyros kaki* x *Diospyros virginiana*).

Kiwi it is easy to maintain, it has no diseases and pests and it bears fruit quickly, in one year. Temperature is a limiting factor for kiwi culture in our country, being a species very sensitive to

frost and being planted in areas where the risk of frost is reduced.

Fruits are already appreciated on the market but the possibility of growing them locally is increasing on the recent years.

Fig, being an old Mediterranean species, it requires a mild climate and lots of sun. In Romania is cultivated in south and southwest (Moisescu et al., 2022).

It is a long-lived species, resistant to drought, multiplying without much difficulty, has high economic and ornamental value.

Pomegranate native to Iran, cultivated and naturalized throughout the Mediterranean region, can be cultivated in Romania, especially in areas where the climate is a bit milder in the south and southwest. although sensitive to low temperatures, it blooms between June and August, escapes the danger of late frosts.

The consumption of fresh fruit has many therapeutic indications (Table 2).

it interests as an ornamental species, having a spectacular flowering.

In conclusion, these species resist drought, have no diseases or pests, and the fruits are special both in terms of appearance, taste and phytonutrient components.

Future Trends

As results of the last programs that support fruit growing and ongoing National Strategic Plan (2023-2027) a series of strategies could be highlighted:

- Increasing consumer interest in products obtained in organic farming and through other environmentally friendly agricultural practices. The studied species can be cultivated in small farms, easily assimilated to ecological practices.

- Increasing consumer interest in products obtained in these farms and through other environmentally friendly agricultural practices.

- Development of partnerships for innovation, creation of knowledge bases and new methods in agriculture including new crops and technologies (<https://www.afir.info/>).

These species have great potential to extend into culture in arid regions because of their resistance, since temperate species face problems of adapting to the new climate changes. Fruit growing is undoubtedly affected

by climate change in terms of the decrease in economic yield, in terms of quantity but especially in terms of quality.

Fruits quality is affected mainly by the high temperatures in summer and autumn, cumulated with the effect of lack of precipitation. Symptoms appear more and more often, such as: decalation of fruiting phenophases, russetting, damage due to sunburn, incomplete staining, cracks on the fruits, accelerated ripening of fruits, unevenness of

fruits and their reduced growth (Zlati et al., 2021; Leposavić et al., 2009).

- Implication and implementation in a wide range of research projects involved in surveying, collecting, conserving and studying the genetic diversity of target species to farmers contributing to their maintenance in situ/on-farm, from breeders and experts working to develop new cultivars and technologies to different user groups (Padulosi, 2013).

Table 2. Nutritional facts and health benefits of the species

(www.fs.usda.gov/database)

Popular name	Health Benefits	Predominant		Proteins (g/100 g)	Carbo-hydrates	Energy (kcal/100 g)
		Vitamins	Minerals			
Goji	Promoting immunity, Improving eyesight, Protecting the liver	A, C	Fe, Ca	4.0	21.6	98
Saskatoon	Antioxidant, Anti-inflammatory	C, A, E, PP, Biotin	Ca, Mg, Fe, Mn, K, Na	1.5	11.4	85
Paw paw	Antioxidant, Anti-inflammatory	A, B, C	Ca, Fe, Mg, Mn, P, K	1.2	18.8	80
Kiwi	Aiding digestion, Improving sleep, Cardiovascular health, Boosting the immune system	C, K, E, B	Cu, K, Mg, Mn, Ca, P	1.2	14.7	61
Pomegranate	Gastrointestinal problems, Supporting cardiovascular health	C, K	K, Mg, Fe, Zn	1.7	18.7	83
Kaki	Lowering blood pressure, Delaying age-related diseases	A, B, C, D, K	Ca, Cu, Fe, Mg, K, Zn	0.6	18.0	71
Ziziphus (Chinese date)	Antioxidant, Immune-boosting, Improve sleep, digestion and brain function	C,	K,	1.0	20.0	79
Fig	Relieving constipation, Managing blood sugar levels	B, K, C	Cu, Mn, K, Mg, Ca, Fe	0.8	19.2	74
Medlar	Forms haemoglobin, Function of muscles, Brain health, Prevent restless leg syndrome, Regulates body temperature	B, A	Ca, Fe	0.5	24.0	88

Opportunities

These species, according USDA Database have important nutritional compounds with significant health benefits due to their high content in antioxidants, carotenoids, pectin etc (Table 2).

The wider implication of this category of phytonutrient-rich fruits consumption could be significant for health promotion, disease prevention and food security at national and international level and (Clevidence B.A., 2010).

New species can be attractive in rural areas from the perspective of the availability and good quality of natural resources (biodiversity, water, soil, landscape, some of these species have melliferous potential.

Could be useful for a future use as rootstocks.

The new direction is towards niche crops, which can be established on small areas, and the incomes obtained from the exploitation of productions are clearly superior.

New species-new plantation-new challenges-new opportunities.

Increasing Awareness

One direction of increasing awareness is by popularizing these species by including them in family organic farms, and also in small private gardens.

Fruit trees have also ornamental value and are well represented by a great diversity of species and varieties while ensuring decor spread throughout the year (Figures 2 and 3).



Figure 2. Including studied species in landscape compositions-proposal 1 (photo: Ina Asiminei)



Figure 3. Including studied species in landscape compositions-proposal 2 (photo: Ina Asiminei)

In addition, activities around the garden (pruning, harvesting) can be a relaxing practice which pleases the viewer on all levels.

Admiring a flowering tree and generally outdoor activities have positive effect on children and in the same time bring them knowledge about nature, raising awareness and connection with nature.

CONCLUSIONS

The material presents valuable growing, yielding and fruit quality characteristics which make them valuable and useful in many aspects.

Based on the analysed data and according to results of this research, the study indicates that the investigated species are valuable sources of desirable genetic characteristics including important morphological and nutritional characteristics of the fruits with significant health benefits.

Taking into consideration our results, we emphasize that the analysed exotic and underutilized pome fruit species are promising for Romanian cultivation. Their cultivation should be extended in integrated and organic farms, and also in small private gardens.

The use of these species for landscape design will bring major benefits to environment in terms of healthy and economic aspects of life.

Even so, there are needed specialized institutions to analyse and monitor climate change long term impacts in this area, especially to track the diversity in terms of loss and movement.

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