

# Agroclimatological properties of growing sites assigned to apple and pear production in Hungary

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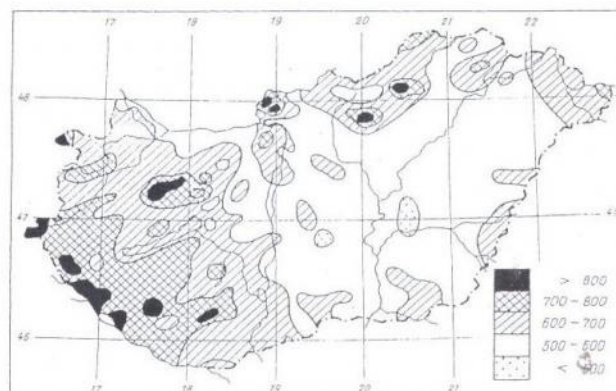


**Key words:** precipitation, micro-environments, hydro-thermic coefficient, cultivar-region

**Summary:** Apple and pear growing sites in Hungary are classified into four regions according to the Hydro-thermic Coefficient: dry, moderately dry, moderately humid and humid. Most of the plantations of apple and pear are located in regions considered as moderately dry and moderately humid. Within that category, the two respective species have different preferences, i.e. the ecological features of Hungary give different opportunities for apple and pear growing. Apple is grown almost everywhere in the country, successfully. The selection of cultivar-regions is needed mainly for increasing competitiveness on the market. Main apple growing regions are listed in 3 large groups. For the definition of cultivar-regions, mainly the configurations of soil and precipitation, i.e. conditions of the soil and opportunities of gaining water were decisive. Market factors are also considered. The area assigned to pear is much less than that of apple, in Hungary. Some well known and popular varieties would require high air humidity which cannot be presented in most of Hungary. Therefore, the possibility to establish regions for pear varieties is restricted, we have to create a particular micro-environment. Two groups are potential. The first one comprises sites where the annual precipitation is 700 mm, at least. There, apple and pear production would compete each other. In more dry habitats (less than 700 mm annual precipitation), micro-environments should be found and only drought-resistant, mainly summer-ripe cultivars should be chosen with, preferably, low tendency of sclereid formation. In that case, neither irrigation could help to produce adequate quality in varieties sensitive to low air humidity.

## Introduction

Hungary's geographic position is defined by the 16-23 ° longitudinal and 45-49 ° northern latitudinal position. Climatic conditions are suitable for the successful production and for excellent fruit qualities of an abundant diversity of fruit species. Nevertheless, a careful choice of the proper growing sites is absolutely necessary, because the annual precipitation, agro-climatic and soil conditions are variable throughout the country. The spatial diversity of annual precipitation is rather characteristic, mostly less than 700 mm. There is only the SW strip of the country where precipitation of 700 and 800 mm/annum is registered (Figure 1). An additional specification of agro-climatological conditions is actual in all cases of exploring growing sites.



**Figure 1** The annual precipitation in the different regions of Hungary according to the figures measured in mm units (after Varga-Haszonits, 1977)

## Material and methods

The agro-climatological classification of areas of Hungary follows the principles set by Varga-Haszonits (1977). The thermic zones are determined by the sum of temperature during the growing season defined as above 10 °C daily mean temperatures. The hydro-thermic coefficient is a quotient of the sum of precipitation during the growing season defined above and the tenth of the sum of temperature during the same period. On the sites classified as dry, the sum of temperature is more than 3400 °C, and the value of hydro-thermic coefficient is equal or less than 1. Moderately dry areas are defined as sum of temperature between 3200–3400 °C and hydro-thermic coefficients of 1 to 1.3. Moderately humid zones show 3000–3200 °C and 1.3–1.6 of the respective values, whereas humid zones are below 3000 °C and above 1.6.

## Results and conclusions

Humid areas eligible for pear and apple production are restricted to the western border of the country, elsewhere the soil conditions prohibit fruit production. Figure 2 shows that moderately humid and moderately dry zones represent approximately equal areas. For pear and apple production those areas are suitable as far as soil conditions are satisfactory.

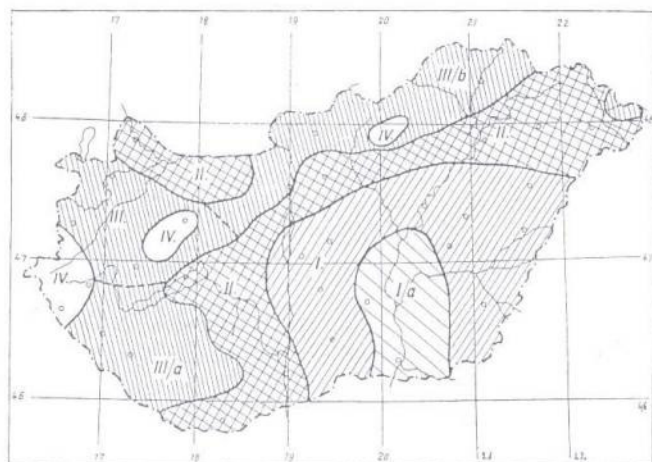


Figure 2 The agro-climatological classification of the regions of Hungary (after Varga-Haszonits, 1977)

I Region: dry, I/a Region: particularly dry, II Region: moderately dry, III Region: moderately humid, IV Region: humid

In Table 1 apple and pear varieties are listed which are recommended mainly for moderately humid areas. Those varieties are safely yielding under moderate climatic conditions, only. Some varieties which require high atmospheric humidity ('Doyenné du Comice', 'Beurré d'Anjou') do not well on the moderately humid areas either. We have to warn also from the use of the derivatives with red cover colour of the same varieties, as 'Red Comice', 'Regal Red Comice', 'Crimson Gem', 'Nicon', 'Red Silk', or 'Red Anjou', 'Columbia' and 'Gebhard'.

Table 1 Apple and pear cultivars for plantation in moderately humid regions of Hungary

Moderately Humid Regions	
Apple cultivars	Pear cultivars
Alkmene	Bergamotte d'Esperen
Cox's Orange Pippin	Beurré d'Hardenpont
Elstar and its mutants	Beurré Durondeau
Empire	Bonne Luise d'Avranches
Golden Delicious	Conference
Jerseymac	Doyenné d'Hiver
Jonagold and its mutants	Général Leclerc
Karmijn de Sonnaville	Olivier de Serres
McIntosh	Passe Crassane
Sampion	
Spartan	

Table 2 shows the apple and pear varieties which are recommended for moderately humid areas too. There are, however, further conditions to be considered. One of them is a regular supply of water and anti-freeze irrigation, especially for plantations of high density trained to intensive crown forms. In pear, the use of quince as rootstock should be avoided, especially, if the Ca content of the soil is higher than 4%. According to Dibuz (1994), pear varieties of summer and autumn maturity, drought tolerant and less inclined to form sclereids are preferred, e.g. 'Clapp's Favourite', 'Beurré Bose', 'Devoe', 'Williams' and 'Packham's Triumph'. Varieties of sclereid formation are to be avoided in spite of their relative tolerance towards drought.

Table 2 Apple and pear cultivars for plantation in moderately dry regions of Hungary

Moderately Dry Regions	
Apple cultivars	Pear cultivars
Akane	Abbé Fétel
Batul *	Aromata de Bistrita
Charden	Bella di Giugno
Close	Beurré Bose
Egri piros *	Beurré Giffard
Eva *	Bohusné vajkörtéje *
Fertődi teli *	Butirra precoce Morettini
Florina	Clapp's Favourite
Gala and its mutants	Devoe
Gloster	Flemish Beauty
Granny Smith	Ilonka *
Húsvéti rozmaring	Jules Guyot dr
Idared	Kornélia *
James Grieve	Madame Favre
Jonager *	Napoca
Jonathan and its mutants	Packham's Triumph
Julyred	Williams' Bon Chrétien
Kovelit *	
Melrose	
Mutsu	
Nyári fontos *	
Prima	
Red Rome	
Redchief Delicious	
Redspur Delicious	
Stark Earliest	
Staymared	
Vista Bella	

\* Hungarian cultivar



Pear varieties recommended to moderately dry growing sites (*Table 3*) are eligible to be grown on more humid habitats too, but each variety should be considered individually. Varieties of late flowering date and summer maturity should not be planted on cool and humid sites except if tolerant to fire blight disease (*Erwinia amylovora*). Varieties especially inclined to bloom at the end of season should not be planted on sites where the hot dry summer turns to cool and rainy weather in the autumn. The rest period induced by summer drought increases the incidence of burst and blooming of mixed buds which is a dangerous opportunity of bacterial infection. It is true, first of all, for pears which develop, lately, mixed buds preferably on the long shoots and sprout easily at the end of the season.

The spur mutants of the apple variety 'Red Delicious' doing especially well under dry conditions, when planted to cool sites, develop unfavourable cover colour and pulp characteristics. Controversial are, however, the indications for 'Granny Smith'. As an extremely late ripening variety, it should be grown on moderately dry sites, in Hungary, however, the higher probability of red colour on the skin is unfavourable from the point of view of market quality.

Apple and pear varieties recommended to the moderately dry zone may do well also in the dry zone (*Table 3*). Apple varieties, however, require in that case irrigation, obligately. Prominently drought resistant pear varieties may produce well but the quality of fruit allows their use for local and industrial (alcohol) purposes, only.

**Table 3** Apple and pear cultivars for plantation in dry regions of Hungary

In Dry Regions	
Apple cultivars	Pear cultivars
Ceglédi piros *	Arabitka
Pirtóspur Red Delicious *	Árpával érő *
Starking	Búzás körte
Starkrimson Delicious	Kieffer
Summerred	

\* Hungarian cultivar

Apple has in Hungary more chances to be grown safely than pear. Pear production is deemed to be concentrated into micro-centres. The same centres are suitable also to apple production, i.e. the two crops will compete with each other even there. All growing operations, especially the picking time of the respective apple and pear varieties will likely interfere. The coordination of the crops may cause problems on the farm level. As a solution, specialisation favouring either apple or pear, seems to be practised in most of the micro-centres.

## References

- Dibuz, E. (1994):** Sclereid formation at the pear cultivars. Horticultural Science 26 (2), 38-41
- Varga-Haszonits Z. (1977):** Agrometeorológia. Mezőgazdasági Kiadó, Budapest