

The hungarian raspberry today and outlooks of its development (*Review*)

Papp, J. Z.¹, Kiss, L.¹ and Nyéki, J.²

¹University of Economic Sciences and Public Administration, Faculty of Horticultural Science, Dept. of Fruit Growing H-1118 Budapest, Villányi St. 35-43.

²Debrecen University Agricultural Center, Institute of Extension and Development H-4032 Debrecen, Böszörményi út 138.

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1. The importance of Hungarian Raspberry production, its beginning, history and environmental conditions

One of the small fruits, the raspberry, is one of the most favoured and esteemed fruits. Its pleasant taste, brilliant colour, sweet-sour fruit since as a wild growing plant met the approval of mankind became a favoured food of today. Its unrivalled chemical composition causing a delicate flavour cannot be substituted by any other fruit. Composition of the

average raspberry is presented in *Table 1*. Raspberry consumption is of an exhilarating effect. The carbo-hydrates are represented relatively in low quantities, but the composition is harmonic, whereas acids and fibres as well as minerals and vitamins are contained in favourable rates.

In the statistic of fresh fruit consumption, raspberry is moderately represented by the reason of its relatively high price and partly of perishable nature. In Hungary as well as all over the world, the majority of the yield is processed or used for deep freezing. Food industry offers a wide scale of

Table 1 Chemical composition of raspberry fruit

Chemical components (100 g fruit)							
energy kJ	(kcal)	proteins	acids	carbo-hydrates	water	ashes	rough-fibres
		gram					
122	(29)	1.2	0.8	5.4	86.4	0.6	5.6

Carbo-hydrate and sugar-alcohol content (g/100 fruit)					
sacharose	glucose	fructose	total carbohydrates	sorbit	xylit
3.1	2.0	2.7	7.9	0	0

Mineral substances (mg/100 g fruit)													
ashes g/100 g	Sodium	Potash	Calcium	Magnesium	Iron	Phosphorus	Cuprum	Zinc	Manganese	Cobalt	Chrom	Nickel	Alcality of ashes
0.6	3.9	172	27.3	24	0.40	45	0.095	0.214	0.083	0.003	0.003	0.033	+4.1

Content of vitamins (100 g fruit)									
carotene A	tokoferol E	thiamin B ₁	riboflavin B ₂	niacin PP factor	pantotenic- acid	piridoxin B ₆	biotin	folic acid	ascorbic acid C
mg	mg	µg	µg	mg	mg	mg	µg	µg	mg
0,08	1.4	20	30	0.4	0.16	0.05	2.3	-	30

Source: Biró, Gy. & Lindner, K., 1999 (*Table of nutrients*) *Tápanyagtáblázat, Medicina Kiadó*

raspberry products (juice, concentrate, puree, jam, marmalade, soft-drink, liquor, syrup, etc.). Deep-frozen, the so called "rolling raspberry", is one of the most demanded products, because of the complete omission of preservatives and of good transportability. The deep-frozen raspberry is consumed, preferably, as dessert, and its secondary exploitation is gradually growing (dairy- and sweets industry, ice-cream products, etc.)

Advantageous is the easy planting and early bearing of raspberry, therefore, the return of investments takes a short time. The longevity of raspberry plantation is relatively short, i.e. lasting 7–8 years. Compared with other fruit species, the change of raspberry varieties is easy.

The intense raspberry culture is the most labour-intensive fruit. The most labour is required in the harvest and it is considered to be the most limiting factor of raspberry growing. It's the high labour-intensity, which is deeming raspberry growing to be a tool to resolve problems of unemployment in remote rural regions of the country.

Ecological conditions in many parts of Hungary are favourable for raspberry growing, but economic production is feasible in regions of most suitable eco-social conditions only.

No reliable information is available on the beginning of raspberry growing in Hungary. The designation of raspberry "málna" is supposed to be adopted from the slavonic language by the ancestral settlers, according to Raymund Rapaics, the renown historian of horticulture. Hungarian raspberry growing, as a production of special commodity called "Hungaricum" started in the XVth or XVIth century (Móhácsy et al., 1965). The first reliable communication upon raspberries stems from János Lippai in his book, 1664 "Pozsoni kert" 1664. Improved raspberry varieties have been introduced from England, France, USA and Germany since the second part of the XIXth century (Kollányi, 1990).

Raspberry growing took a new impetus after the Peace Treaty of Trianon, when wild growing raspberry from the Carpathian mountains could not find access to the Hungarian markets, and demands rose in Budapest and in other towns. First commercial plantations appeared on the slopes of the "Danube knee" north to Budapest and around Győr where the Rába and Danube rivers meet. After World War II, the end of 50-es and 60-es witnessed a vivid expansion in production as well as in relevant research activities. Breeding at the Research Institute of Fertőd of the 1980–1990-es produced successful new varieties, which were recognised to be more adapted to local conditions and to the demands of the market.

Most foreign raspberry varieties are derived from wild populations of cool and more humid climates, therefore their adaptation to Hungarian conditions was insufficient, because Hungary is on the southern border of raspberry growing.

The moderate, cool, humid climate of the hilly sites are more favourable than that of the Great Plain. The traditional growing regions are mirroring the better conditions for raspberry growing.

The rest period of raspberry is ending early during the mid of the winter. During the induced dormancy, the buds loose

their frost resistance, therefore cold spells after some warm periods may cause injuries in conductive tissues and flower buds of the branches. Most damages are attributed to the temperature fluctuations of the winter. Raspberry require an even supply of water during the whole vegetation period. As the water content of the upper 30 cm layer of soil is decisive, practically, raspberry plantations should be irrigated.

Original sites of wild raspberry are woody areas with humid, slightly acidic, medium heavy, well aerated, organic soils. Lime content above 5% causes chlorotic discoloration of the leaves. During the summer no, even temporary, water flooding is tolerated. Best plantations are thriving on sandy loam and loam with a well balanced water- and nutrient supply.

2. A review of the status of raspberry growing of the world and of Hungary

Raspberry represents a rather modest ratio of the world's fruit growing with 0.6%. Within the group of small fruits, its contingent reaches about 7–8%, internationally.

Data of the world's raspberry production is shown in Table 2. A clear dynamic development has been experienced until the end of the 1980-es. The majority is produced on the northern hemisphere with moderate climate, mainly European countries. Recently, an important capacity is growing on the southern hemisphere too, e.g. in Chile exportation has started. The last thirty years witnessed a profound reorganisation of raspberry growing in Europe. In Western Europe, the traditional production declined or keeps stagnant. Meanwhile, some East-Central European countries, as Poland, Yugoslavia and Hungary developed their export substantially. In the world trade of raspberry, those countries are representing a decisive part.

On the world market of fruits, raspberry appears mainly by its products or deep frozen items. Also the East-European export is utilised by the industry.

Hungarian raspberry growing developed dynamically from the 1960-es until the 1980-es. In Hungary, raspberry became the most important small fruit, which represented between 1991 and 2000 some 40% volume of small fruits and 50% of value. Since the last decennia, raspberry is one of the most favourably sold fruits of the market (Table 3).

The crisis of fruit growing after the mid of the 1980-es scarcely impaired Hungarian raspberry production. The most important component of the favourable conditions was the fact that in the trade of raspberry the laws of the free market prevailed since a considerable time. Hungarian raspberry has been sold since the 1970-es, decisively, on the West-European markets, so the development went on without disturbances. In spite of temporary difficulties in the trade, economic conditions changed more favourably than in other fruits. Hungarian raspberry productions has been since many years oriented to the export markets. The same tendency is expected to be continued in the future too.

Hungary is one of the most important raspberry producing and exporting countries of the world with 20 thousand tons of yearly output. Regarding the 50%

Table 2 Raspberry production of the world in 1000 tons (FAO-statistics)

	1948-1952	1976-1980	1981-1985	1986-1990	1991-1995	1996	1997	1998	1999	2000	2001
World total	93	211	277	351	322	315	317	326	361	358	363
North American total:	29	21	26	36	45	43	56	56	56	54	55
USA:	21	19	13	18	28	25	38	38	39	39	39
Europe total	60	114	142	173	173	171	156	168	187	177	184
Great Britain:	18	21	22	23	20	12	9	9	11	11	11
Germany:	15	21	23	26	31	26	27	32	30	30	30
Poland:	4	25	30	33	32	36	40	45	43	40	46
Yugoslavia FR:	4	15	23	48	-	-	-	-	-	-	-
					45*	55	40	40	60	56	56
Hungary:	0.5	18	21	24	21	20	18	18	22	20	20
Soviet Union:	65	90	106	138	-	-	-	-	-	-	-
Russia:					74*	90	94	90	100	102	100
Ukraine:					8*	8	9	10	14	20	21

Explanation: * = 1993-1995 yearly means

Source: FAO Production Yearbooks, Rome

Table 3 Raspberry production of Hungary (1.000 tons)

Years	Small fruits total	Raspberry	Ratio of raspberry related to the total
1938	28.3	3.3	11.7
1950	3.3	0.5	15.0
1955	6.0	1.2	20.0
1960	15.6	7.4	47.4
1961-1965 yearly means	22.8	9.8	43.0
1966-1970 yearly means	39.1	11.5	29.4
1971-1975 yearly means	47.5	17.2	36.2
1976-1980 yearly means	58.6	15.8	27.0
1981-1985 yearly means	73.0	21.3	29.2
1986-1990 yearly means	66.3	24.2	36.5
1991	66.2	27.8	42.0
1992	61.1	22.7	37.2
1993	53.5	18.7	35.0
1994	47.8	18.1	37.9
1995	46.0	19.0	41.3
1996	50.0	20.0	40.0
1997	46.5	18.1	38.9
1998	51.9	20.7	39.9
1999	52.7	22.3	42.3
2000	46.7	19.8	42.4
1991-2000 yearly means	58.9	23.1	39.2

commercialisation of the production, raspberry belong to the group together with apple and sour cherry, of our most economic fruit species.

The export of fresh raspberry combined with blackberry shows heavy fluctuation, which has been caused by the

Table 4 Export of fresh raspberry and blackberry in Hungary (a) and export of deep frozen fruit specified also for raspberry, blackberry, currants and gooseberry (b) between 1995 and 2001

a) Export of fresh raspberry and blackberry (tons)						
1995	1996	1997	1998	1999	2000	2001
968	4.001	2.074	2.941	5.483	1.106	2.437
b) Export of deep frozen fruit (tons)						
1995	1996	1997	1998	1999	2000	2001
total of fruits						
16.841	20.437	20.636	20.498	20.717	18.589	19.224
raspberry, blackberry, currants and gooseberry together						
8.352	12.283	11.584	11.720	12.995	9.934	10.145

fluctuation of demand and actual yields. The ratio of raspberry in the export of deep frozen small fruits is more than 50%, thus raspberry is decisive in volume as well as in value. Majority of exported raspberry is destined to Germany, Austria, Holland and to the Scandinavian countries.

The main raspberry growing districts have been settled and developed where the ecological conditions, growing traditions and commercial presence were given. Advantageous coincidence with available capacities of labour are found in Hungary for growing small fruits. *Table 5* presents the distribution of raspberry growing between 1900 and 2000 according to the counties in question.

Traditionally, the most important districts are on slopes of northern part of the Central Mountains: Börzsöny, Cserhát and Mátra. Counties of Pest, northern part, most of Nógrád, NW parts of Heves are meant. More than one half of raspberry production is represented by those counties as well as 60-70% of trade. The second district is the region of Győr and the northern foothills of the Bakony mountains with a center of Ménfőcsanak. The third district is the SW part of Hungary, Somogy and Zala counties. Most of those growing

Table 5 Distribution of raspberry production in Hungary according to the counties (tons)

Counties yearly means	1990–1995	1996	1997	1998	1999	2000	1990–2000 yearly means	
							tons	%
Baranya	116	88	75	72	75	45	71	0,4
Fejér	62	44	39	40	51	30	41	0,2
Győr-Moson-Sopron	3546	3.323	2.389	2.428	3.290	2.068	2.700	14,0
Komárom-Esztergom	198	66	47	45	48	45	50	0,3
Somogy	2252	2.000	1.364	1.400	1.519	1.201	1.497	7,0
Tolna	57	37	30	28	30	15	28	0,1
Vas	159	105	90	110	120	80	101	0,5
Veszprém	983	1.501	1.600	2.000	2.000	1.804	1781	9,0
Zala	1106	750	754	968	987	590	810	4,0
Total of Transdanubia	8479	7.914	6.388	7.091	8.120	5.878	7.079	35,0
Bács-Kiskun	123	106	90	95	130	90	102	0,5
Békés	49	22	23	24	25	20	23	0,1
Csongrád	39	28	21	16	17	8	18	0,1
Hajdú-Bihar	102	310	225	245	220	110	222	1,1
Jász-Nagykun-Szolnok	42	30	31	34	35	25	31	0,2
Pest, Budapest	4505	4.110	4.110	4.210	3.850	4.580	4.172	21,0
Szabolcs-Szatmár-Bereg	33	250	200	128	250	350	236	1,2
Total of the Great Plain	5197	4.856	4.700	4.752	4.527	5.183	4.804	24,0
Borsod-Abaúj-Zemplén	443	330	363	410	1.500	1.340	789	4,0
Heves	3023	825	1.050	1.500	1.920	1.800	1.419	7,0
Nógrád	4585	5.930	5.634	6.081	6.210	5.603	5.892	29,0
Total of the North	8051	7.085	7.047	7.991	9.630	8.743	8.100	41,0
Altogether	21.727	19.855	18.135	19.834	22.277	19.804	19.983	100,00

Source: KSH Mezőgazdasági és Élelmiszeripari Statisztikai Zsebkönyvek 1990–2000.

districts are favourable from the point of view of raspberry growing as well as of livelihood of the local population.

The intensity of the raspberry growing enterprises is representing a medium level. The mean yields of 4 to 5 tons per hectare are about one third or half of the real possibilities. Most of the plantations are not irrigated, therefore, security of yields depends on the casual weather conditions. Irrigation may at least double the yields of raspberry.

Raising yields and quality are key tasks of raspberry growing. The choice of growing site, up to date varieties, phytosanitary measures in plantations and nursery practices (control of viruses, fungi and pests) should be combined with modern growing technologies.

3. Main objectives of developing raspberry growing in Hungary

Successful growth is based, decisively, on a suitable growing site. As ecological requirements of raspberry are limited by several conditions, cultivation of raspberries is proposed to be concentrated on the foothills and hilly counties. The forest soils of northern Central Mountains and the hills of Transdanubia are recommended as being less favoured for other types of agricultural exploitation, but favourable climatic and eco-social conditions may offer

successful raspberry cultivation considered to be optimal from the point of view of national economy.

The choice of the site for new plantations ecological, mainly climatic, conditions should be carefully considered because those are limiting factors. The main concern of the choice of varieties is the fact of the short rest period of most of the current varieties. Cold spells after warm periods beginning with the mid of the winter may cause heavy frost damages. Excesses of the continental type of climate could be avoided by higher altitudes and northern exposition of slopes. Moderate temperatures and higher relative humidity improve the conditions.

Raspberry is, according to new results, especially vulnerable to virus diseases. Reduction of yield may attain 30–40%, which is prevented by the use of healthy nursery stocks. Pre-basic and basic multiplication material should be virus-free as furnished by the Research Institute for Fruit Growing Fertőd Station.

Raspberry is susceptible to soil-diseases caused by parasitic fungi. Therefore the sequence of crops has to be observed, and the use of some legally admitted soil disinfectants is recommended.

One of the major weaknesses of raspberry growing is the lack of watering establishments in most of the plantations. An intense technology cannot exist under Hungarian

climatic conditions without irrigation. Most technical and economic arguments are in favour of a dripping system of water distribution. One of the actual research objectives is the adaptation or elaboration of a regime of "fertigation", i.e. irrigation with nutrient solution.

Integrated system of plant protection has been initiated, but with modest progress yet. The requirements of the EU market need more environmental considerations.

Mechanisation of harvest in raspberry plantations progressed on a world-wide scale. In Hungary, harvesting machines are tested, which may improve the chances of the processing industry. However, manual harvest will be decisive during the next ten years of the Hungarian production because fresh consumption and deep freezing will equally prefer hand-picked raspberry.

In raspberry plantations, the choice of varieties is based on two valuable attributes. Ecological adaptation of raspberry is most important in Hungary in addition to the qualities of the fruit. Quality of the fruit has been upgraded by the abundance of raspberry the world market. Fresh consumption prefers attractive appearance, regular form, firm consistence and good taste. Deep freezing is to be supplied with medium red, bright, firm, aromatic and medium size varieties, which will maintain its form and consistence after having been warmed up. For processing, deep red fruits with intense flavours, high soluble solids are preferred. Ever (twice) bearing varieties are required in home gardens and pick-yourself orchards.

The assortment of varieties is actually drastically changing. During the last twenty years, an English variety, *Malling Exploit*, dominated the production, and recently, *Fertődi zamatos*, a Hungarian breed started its expansion. *Fertődi zamatos* is in many respects superior, in technology as well as in fruit quality, to *Malling Exploit*. There are some other varieties bred at Fertőd, which are eligible to be utilised in new plantations. Mechanical harvest will stimulate the expansion of new varieties, which are easy to shake and their ripening is more concentrated. Advantages are expected from the firmness of the fruit too.

4. Consequences and tasks

Raspberry production is rightly considered to be a successful branch of Hungarian fruit growing. Outputs of raspberry increased continuously, from 1950 until the end of the 1990-es – with some yearly variation. At the middle of the 1980-es, raspberry became the leading species among small fruits.

Raspberry production has been since long export-oriented, and it will continue to be in the future. In the established districts of production, within the country, the most economic horticultural enterprise is invariably raspberry growing. The same regions are more or less hit by unemployment too, so that type of providing livelihood and raising additional income as well as promoting rural development are continuing to be important issues of

governmental intervention. It is the best example of the necessity of regional horticulture. In the most important districts of production, raspberry growing keeps on the long run to be the sole economic agricultural activity.

During the next couple of years, raspberry production will be stabilised on the present technological level because of its high labour intensity and the security of sale, however, new varieties and the gradual development of the growing system will improve the situation. A more intense expansion is conditioned by the adoption of mechanical harvesting and the extension of markets.

Profitability of raspberry growing will continue after the fusion with the EU. The leading position of raspberry in the export of among small fruits should be maintained and completed with the development of that of blackberry. Hungarian raspberry should be offered with labels of decisive designations of origin, because its outstanding quality, taste, flavour and soluble solids are already recognised and esteemed on the foreign markets. Raspberry should become one of the privileged "Hungarica".

Market positions of raspberry are enhanced by the fact that West-European countries are already familiar with it since the introduction of the years of the 1970-es and 1980-es. The main import-markets of the Hungarian raspberry are Germany, Austria, Holland and Sweden. At the moment no restrictions of growing and sale of raspberries are valid within the European Union.

The promotion of Hungarian raspberry production is largely dependent on state intervention as far as commercial structures are to be developed. Family enterprises and complementary husbandries are utterly delivered to ups and downs of the market as many small scattered enterprises, thus the organisation of growers producing an integrated offer is an indispensable condition of prosperity. The large number of entrepreneurs need an organised extension service, which keeps them aloft the flood of information and innovations concerning up to date varieties, new technologies, technical know how, etc. It is also a reason to increase the capacity of research, which endeavours the development of integrated systems of fertilisation and plant protection (phytosanitary) measures, to enable the offer of an outstanding quality, healthy fruit, safe of environmentally prohibited substances and fitted out with a label of origin and trade mark. After having been joined to the EU, one of the conditions of successful marketing will be a controlled, environmentally safe, consumer oriented growing method also for raspberry.

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