

# Cultivars, marketing and integrated production of apples in the Czech Republic

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**Summary:** Development in apple production in the Czech Republic has been adversely effected during a few recent years by escape of capital investment from the agrifood industry (due to privatisation, restitution and transformation). On the other way round the competition on the domestic market is much higher than it was before because of unlimited import of subtropical and tropical fruit and some import of traditional fruit species as well. Therefore fruit growers are very much concerned in any possible means (which are not economically feasible) to be more competitive. One of the most common approach is the use of new cultivars bred in the country which are resistant or tolerant to diseases and offer better quality both for fresh market and processing. Another way for increasing competition ability for fruit growers is the join and mastering of integrated production which also considerably improve the quality of fruit as far as aspects of health are meant.

## Introduction

Agricultural production has been substantial changed in Czech Republic since 1989. The process of privatisation, restitution and transformation together with the development of the state economy towards open market made some temporary destabilisation of fruit production including apple production. Typical was escape of capital investment, the lack of money for renovation of orchards and increasing prices of nearly of all inputs into this production. Also competition was increased mostly because of mass import of cheap subtropical and tropical fruits and even some apple supplies from other part of Europe. With an aim to be more competitive Czech apple producers started to change the traditional assortment together with renovation of orchards and have been trying to develop new ways of growing practices. These new possibilities are also given by recent releasing of series of new cultivars which are resistant to scab and promising because of high quality of fruit and high productivity of the trees.

## Changes in the assortment and new cultivars

The traditional apple production in Czech Republic was based on small farm gardens and road side alleys where apple trees were planted in diverse climatic and soil conditions on the most parts of the country. Therefore the assortment of apple cultivars was rather very large and not very suitable for requirements of the market. The majority of

the production was used for processing or for covering domestic needs. When large scale plantings were started at the early seventies only a few traditional cultivars were used (e.g. 'Jonathan', 'Cox's Orange', 'James Grieve') but mostly very new American or Canadian cultivars prevailed. With the aim to reduced the number of cultivars, all orchard projects had to be considered by experts of research institutes and the state administration. After the early failure of some newly introduced cultivars like 'McIntosh' or 'Starkrimson Delicious' (especially in colder regions of the country) practically only three cultivars were planted in the majority of apple regions: 'Idared', 'Golden Delicious' and 'Spartan'. Since the early eighties this very narrow assortment has been enriched by 'Gloster' from Germany and 'Šampion' and 'Rubin' from domestic breeding. These cultivars were planted before 1990 and they are decisive in the production at present time (Table 1).

After changes of 1990–1994 which reduced the scope of plant protection, cold storage capacity losses and higher demands of the consumer for high fruit quality the majority of apple producers was not satisfied with some main cultivars like 'Spartan' (rather poor quality and low yields) 'McIntosh' (short storage potential) and even 'Idared' (some over production). Therefore with the start of apple orchard renovation since 1995, a new assortment of standard apple cultivars has been proposed (tables 2 and 3). The most important change here is a rather high proportion of 'Jonagold' that is not based, unfortunately, on domestic experience but rather on propaganda and nursery tree

**Table 1** Production of apples in tons from commercial orchards of the Czech Republic with shares of the main cultivars in 1994–1998

Cultivar	1994	1995	1996	1997	1998	%
Idared	31.664	19.461	28.724	33.155	31.829	26.3
Golden Delicious	29.573	27.191	22.205	30.398	26.500	21.9
Sampion, McIntosh	18.863	16.701	20.738	27.822	19.850	16.4
Sampion, Rubin			7.450	10.307	8.950	7.4
Red Delicious strains	5.263	3.339	8.601	11.596	8.800	7.2
Gloster	2.877	2.918	4.778	4.593	2.833	2.3
Jonathan	2.565	3.107	3.375	3.321	2.980	2.4
Jonagold			1.806	1.145	2.500	2.1
Cox Orange	1.500	1.205	1.552	2.141	1.850	1.5
Other winter cultivars	21.634	25.155	9.756	14.628	7.300	6.0
Autumn cultivars			7.074	7.495	5.140	4.3
Summer cultivars			726	1.249	1.280	1.1
Total	113.939	96.077	116.785	147.850	120.879	100

imports from Holland and some other west European countries. Similarly, it is also the case of 'Gala' and 'Elstar' but their shares are not very large in the new plantations. Considerable increase is further in new domestic cultivars 'ampion', 'Rubin' and 'Bohemia' (all red mutant of 'Rubin'). Especially 'Rubin' is considered for an apple of top quality and has very good reputation and market potential in the country but, unfortunately, its yields are rather low.

**Table 2** Standard apple cultivar assortment recommended for present plantings located in the warmest growing areas

Slender spindle		Hedgerow forms	
Cultivar	%	Cultivar	%
Golden Delicious	35	Golden Delicious	35
Jonagold	25	Jonagold	15
Idared	15	Idared	18
Gloster	8	Red Delicious strains	10
Melrose	7	Rubin and Bohemia	9
Gala	3	Gloster	5
Elstar	2	Akane	3
Julia	2	Julia	2
Discovery	1	Discovery	1
Mio	1	Summerred	1
Summerred	1		

**Table 3** Standard apple cultivar assortment recommended for present plantings located in the typical apple growing areas except higher elevations

Slender spindle		Hedgerow forms	
Cultivar	%	Cultivar	%
Idared	25	Idared	20
Golden Delicious	20	Golden Delicious	15
Jonagold	18	Rubin and Bohemia	20
Sampion	14	Sampion	15
Melrose	8	Melrose	8
Lord Lambourne Red	5	Lord Lambourne Red	5
Elstar	3	Gloster	5
Akane	2	Jonagold	5
Julia	2	Glockenapfel	3
other cultivars	3	Julia	2
		other cultivars	2

A special and very new part of apple assortment for orchard renovation is a group of cultivars which are resistant or tolerant to scab (*table 4*). This group was originally supposed to be more or less used for orchards managed for integrated apple production or for biological ways of production but the present experience from first years of

renovation is that that these cultivars have been widely used for renovation of standard apple orchard as well. Some of them have already gained very good reputation among fruit growers because they need much less imputes in growing, reliable yields and fruit quality is at least comparable with other standard cultivars. Unfortunately, the majority of them cannot be justified by long time experience in commercial growing and also their number is for the time too large.

Here below, a short description is given on the varieties. The most promising of them are bred in the Czech Republic and are ready to be introduced.

**Table 4** Assortment of apples which are resistant or tolerant to scab recommended for present plantings located in the typical apple growing areas except higher elevations

Slender spindle		Hedgerow forms	
Cultivar	%	Cultivar	%
Akane	5	Akane	3
Angold	10	Angold	10
Florina	12	Florina	10
Melodie	10	Melodie	10
Prima	5	Prima	5
Resista	10	Resista	10
Rosana	10	Rosana	9
Selena	12	Rubinola	10
Topaz	12	Selena	10
Vanda	5	Topaz	10
Nabella	4	Vanda	3
Julia	3	Nabella	3
Mio	2	Discovery	2
		Julia	3
		Mio	2

### Angold

Origin: HL A 28/39 (Antonovka o.p.) x 'Golden Delicious' (Holovousy)

Fruit: large, shape is globose to globose-conical, regular; skin is smooth, medium thick, greenish yellow, with 50 to 80% bright red cover colour (striped and marbled). The pulp is cream, crisp and very juicy. Taste is harmonic subacid to sweet.

Tree: semi-vigorous; spreading shape; bearing habit INRA type III, suitable for slender spindle, very productive. Good cropper also on vigorous rootstocks.

Ripening: harvest time just before 'Golden Delicious', in normal cold store keeps well till May.

Diseases: field resistant to scab (Antonovka type resistance), slightly susceptible to mildew.

### Melodie

Origin: 'Šampion' x PRI 370-15 (Mr. O. Louda, Strážovice)

Fruit: size is medium, shape globose-conical to truncate conical, weak ribbing, regular; skin is smooth, medium



thick, greenish- yellow or yellow, with about 50 to 75% bright red cover colour (striped and mottled). The pulp is yellowish, medium firm and juicy. Taste is rather acid and slightly aromatic; suitable also for processing and cooking.

Tree: semi-vigorous; well formed; bearing habit INRA type II, very productive. Good bearing also on vigorous rootstocks.

Ripening: harvest time 2 or 3 weeks before 'Golden Delicious', in cold store keeps well till March.

Diseases: resistant to scab, slightly susceptible to mildew.

### **Nabella**

Origin: 'Mother' x 'Starking Delicious' (Holovousy)

Fruit: is generally very attractive in regard of their above average size, mainly red colour of crimson tone and regular highly spherical shape. The pulp is creamy yellow, fine and juicy. It has distinguished sub-acid sweet taste and pleasant flavour.

Tree: growth is medium with tendency to build up highly spherical crowns. Shoots have a spur-type pattern of growth habit. Productivity is medium early, fairly high and regular. Trees bear well even on more vigorous rootstocks. They do not suffer by scab nor by mildew. Nabella' cv. regarding to all its characters seems to be very suitable for an ecological system of apple growing without or reduced spraying by chemicals for plant protection

Ripening: Fruits are ripe for a harvest at the second half of September or at the beginning of October and the cultivar is classified as a autumn or early winter one. For a good storage performance of fruits a proper time of a harvest is important and is indicated by well coloured fruits.

### **Resista**

Origin: 'Prima' x NJ 56 (Holovousy)



*Resista*

Fruit: medium to large, shape is globose to globose-conical, regular; skin is smooth, medium thick, green yellow to full yellow, sometimes with slight orange blush. The pulp is cream-yellow, crisp, medium coarse-textured and firm. Taste is harmonic subacid to sweet with a pleasant flavour.

Tree: vigorous, growth habit upright with horizontal side branches; bearing habit INRA type III, precocious, productive and regular cropping.

Ripening: harvest time like 'Golden Delicious', in normal cold store keeps well till March, in CA storage till May.

Diseases: resistant to scab and slightly susceptible to mildew.

### **Rosana**

Origin: 'Jolana' x 'Lord Lambourne' (Institute of experimental Botany, Střížovice).

Fruit: size is medium to large, shape is globose-conical, very regular; skin is smooth or with a low amount of russet, medium thick to fine, green yellow, about 30 to 70% of light red cover colour (striped and mottled or washed). The pulp is cream, semi-firm, fine textured and juicy. Taste is subacid, full aromatic flavour.

Tree: medium size, moderately erect, moderately branched and well spurred; bearing habit INRA type III, precocious and productive.

Ripening: harvest time 2 or 3 weeks before 'Golden Delicious', in a cold store keeps well till March.

Diseases: resistant to scab, slightly susceptible to mildew.

### **Rubín**

Origin: 'Lord Lambourne' x 'Golden Delicious' (Mr. O. Louda, Střížovice)

Fruit: large, shape is globose and regular; skin is smooth, thin, yellow with about 40 to 70% bright red cover colour (striped or washed). The pulp is cream, fine, crisp and juicy. Taste is harmonic subacid to sweet, pleasantly aromatic, excellent.

Tree: vigorous, spreading shape with much of bare wood; bearing habit INRA type IV (similar to 'Granny Smith') it is not suitable for slender spindle and very dense plantings, moderately precocious, yields are moderate but regular.

Ripening: harvest time 3 or 4 weeks before 'Golden Delicious', in a cold store keeps well till February.

Diseases: medium susceptible to scab, moderately resistant to mildew.

### **Rubinola**

Origin: 'Prima' x 'Rubín' (Institute of experimental Botany, Střížovice)

Fruit: size medium, shape is globose, slightly flattened, regular; skin is smooth, thin, lightly greasy, yellow, with about 30 to 70% bright red cover colour (mostly washed). The pulp is yellow, fine, crisp and juicy. Taste is harmonic subacid to sweet, pleasantly aromatic, excellent.



Tree: vigorous, spreading shape with much of bare wood; bearing habit INRA type IV (similar to 'Granny Smith') it is not suitable for slender spindles and very dense plantings, precocious, moderate yields but regular.

Ripening: harvest time 3 weeks before 'Golden Delicious', in a cold store keeps well till end of March.

Diseases: resistant to scab, slightly susceptible to mildew.

### *Selena*

Origin: 'Britermac' x 'Prima' (Holovousy)



### *Selena*

Fruit: size is medium to large even if thinning is not practised. The shape is globose and regular. Skin is smooth, medium thick, about 40 to 75% dark red (striped and washed) cover on a cream ground. The pulp is white-cream coloured, medium firm, fine textured and juicy. Acidity is low, while aroma and sweetness are moderate. In both appearance and quality 'Selena' is rated very good to excellent.

Tree: moderately vigorous with a spreading shape; bearing habit INRA type III, suitable for slender spindle, very precocious and productive.

Ripening: harvest time 3 or 4 weeks before 'Golden Delicious', at the same time as 'Spartan'. Storage life keeps to January or February.

Diseases: scab resistant, slightly susceptible to powdery mildew.

### *Topaz*

Origin: 'Rubin' x 'Vanda' (Institute of experimental Botany, Střížovice).

Fruit: size is medium (130–160g), shape is regular globose-conical to flat globose, slightly ribbed around the calyx end (open eye); skin is smooth, thin, yellow with about

30 to 70 % orange red over colour (striped and mottled). The pulp is yellow, medium coarse, crisp and juicy. Taste is harmonic subacid to sweet pleasantly aromatic, excellent.

Tree: vigour medium to vigorous, spreading, well branched and spurred; bearing habit INRA type III, very precocious and productive, regular yields.

Ripening: harvest time 1 week before 'Golden Delicious', in a cold store keeps very well till April or longer.

Diseases: resistant to scab, slightly susceptible to mildew.

### *Vanda*

Origin: 'Jolana' x 'Lord Lambourne' (Institute of experimental Botany, Střížovice).

Fruit: size is medium to large, shape is flat globose, regular; slightly ribbed around the calyx end (eye), skin is smooth or with a low amount of russet, medium thick, greenish-yellow, with about 30 to 60% of light red cover colour (striped with blush). The pulp is cream, crisp, fine textured and juicy. Taste is subacid, full aromatic flavour, excellent.

Tree: medium size, moderately spreading, moderately branched and very well spurred; very precocious and very productive, even on vigorous rootstocks.

Ripening: harvest time 3 weeks before 'Golden Delicious', in a cold store keeps till January or later.

Diseases: resistant to scab, slightly susceptible to mildew. Very susceptible to bitter pit.



### *Julia*

## Present production and apple market

Development of production of apples and its marketing in the Czech Republic after 1989 is given in table 5. Some stagnation is typical for the period but renovation of apple

**Table 5** Total commercial and integrated production of apples and their marketing in the Czech Republic

	1990	1992	1994	1996	1998
Total production in thousands of tons	268	236	244	251	283
Production from commercial orchards	80	90	114	117	121
Share (%) of production from com. orchards	29.8	38.1	46.7	46.6	42.8
Area (ha) of commercial orchards	10.512	9.677	10.170	10.415	10.087
Area under integrated production	0		1.357	1.769	1.762
Production from integrated management	0	9.503	19.811	18.110	22.816
Share (%) of integrated production	0	10.5	17.3	15.5	8.1
Exported apples in thousands of tons	60	31	105	82	67
Processed apples in thousands of tons		61	33	69	53
Imported apples in thousands of tons	24	19	21	38	40
Farmer price (CZC/kg) for fresh market	5.9	8.1	6.4	11.7	8.0
Farmer price (CZC/kg) for processing	1.7	1.9	1.9	2.7	1.5
Retail price (CZC/kg) for fresh market	10.2	14.8	16.4	26.1	22.0

**Table 6** Retail prices and per capita consumption of apples, citrus fruits and bananas in the Czech Republic

		1990	1992	1994	1996	1998
Apples	retail price (CZC/kg)	10.2	14.8	16.4	26.1	22.0
	consumption in kg per capita	21.3	18.3	20.5	17.8	18.2
Citrus fruits	retail price (CZC/kg)	23.5	19.6	20.7	26.9	25.5
	consumption in kg per capita	10.3	11.5	15.3	15.4	12.6
Bananas	retail price (CZC/kg)	24.8	22.4	23.4	23.1	25.3
	consumption in kg per capita	3.8	8.6	11.7	15.6	11.4

orchards took place since 1995 about 500 ha per year. This new orchards are mostly the most modern, high-density plantations and with cultivars of better fruit quality. These new orchards should be a new and more competitive basis of the apple industry in the future. However, in the recent years, the most critical points were some losses of capacity of the processing industry, losses of storage capacity and increase of competition because of imports of cheap subtropical and tropical fruits (table 6) and apples for fresh market as well. Nevertheless there was also positive development because of the growing share of commercial orchards on total apple production in the country.

## Integrated apple production

Development of integrated fruit production is also typical for the recent period. The beginning was in 1990 when the Union for integrated systems of growing (SISPO) was

**Table 7** Union for integrated systems of fruit growing (SISPO) in the Czech Republic

	1990	1996	1998
Union for integrated systems of fruit growing	established	trade mark SISPO	
Number of members	9	35	38
Hectares of orchards	2.000	3.586	3.560
Hectares of apple orchards	1.200	1.769	1.762
Size of fruit orchards (ha)	6.4-620	0.5-424	0.5-43
Number of fruit farms over 100 ha	7	14	13
Number of fruit farms below 10 ha	1	10	10
Membership fees (Kè)	0	1000-6000	1000-6000

**Table 8** Main guidelines and regulations of apple growing under integrated production SISPO

Items	Main guidelines and regulations
Establishment of new orchards	Cultivars which are resistant or tolerant to scab are recommended
Planting material	Virus free nursery stock is recommended
Disease and pest control	Minimal use of chemicals and preferable use of biological agents (under monitoring, most effective timing, above threshold numbers, with the most ecologically friendly chemicals only, minimal dosage, new application machinery)
Soil management	Minimal use of herbicides (mulching grass in tractor alleys, cutting of weeds or shallow cultivation below trees, narrow herbicide strips, selected herbicides and their rotation, minimal dosage in proper timing, new application machinery)
Fertilisation	Use of fertiliser and their limited dosage on the basis of analyses of soil, leaves and fruit only, with maximum annual dosage of 100 kg N per ha divided into three application
Pruning of trees	Harmonisation of amount of pruning (with more pruning in summer time) toward physiological balance of annual new growth and cropping
Fruit thinning	Only by hand as soon as possible, no chemical regulators are allowed
Irrigation	Analysis of the water used for irrigation (contamination of some chemicals or elements are excluded or limited)
Contamination of fruits by heavy metals	Analyses of fruits from selected places for heavy metal content every year
Checking system	Special commission of specialists from SISPO members visits every producer at least once a year checking items cited above and also a documentation of all treatments which is obliged for every producer as well. The commission supply suggestions regarding the trade mark to be given by chairmanship of SISPO to its members



established in the Czech Republic (*table 7*). First, 9 rather big producers started activity in this respect. The present union has 38 members with different size of orchards and on the total area of 1762 ha produces nearly 23 thousand tons of specially labelled apples, being about 19% of total apple production from commercial orchards. The main guidelines and regulations for apple growing under integrated production in the Czech Republic are given in *table 8*.

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