



MINISTRY OF AGRICULTURE
OF THE CZECH REPUBLIC

THE CZECH REPUBLIC **THE LARGEST PRODUCER OF BREADSEED POPPY**





1. GENERAL INFORMATION ON BREADSEED POPPY

Poppy seed has been grown in the territory of the Czech Republic since time immemorial, the archaeological research confirms its presence in Central Europe as early as almost three thousand years ago. The Slavs, who came in the 6th century, got to like poppy seed very much and it has gradually become commonly consumed food and also an integral part of their culture. In Czech, just like in majority of the other Slavic or other languages spoken in Central and Eastern Europe, the term “mák” is used for poppy. From this word a number of proper nouns (Mák, Makovský, Makalouš ...) and local names (Makov, Makotřasy, Makolusky municipalities, or Maková Street or Maková Mountain) were derived which testifies to the fact that poppy seed as a crop and food has become very popular among the population of Central Europe who used poppy seeds as a food ingredient and raw material for oil production. Motives of poppy seed (flowers, capsules) appear in folk visual arts, folk songs, fairy tales and proverbs.

Cultivated poppy is an ancient crop of great use to people, steeped in history. Because of its unmistakable unique flavour its seeds are used in food industry. The tissues, of capsules in particular, produce alkaloids which have been used by man for treatment of the most severe pain for thousands of years. Therefore, there is a consistent risk of its misuse by drug addicts. That is why only safe, non-opium poppy cultivars are grown in Europe, in the Czech Republic exclusively for food purposes (Vašák a kol. 2010).

The Latin name *Papaver somniferum* L. was introduced in 1753 by Linné who formally described its characteristics distinguishing it from other species of *Papaver* genus (Tétényi, 1997). Poppy seed (the whole *Papaver* genus) contains around 140 alkaloids, in *Papaver*



WHAT YOU MAY NOT KNOW ABOUT POPPY SEED IN THE CZECH REPUBLIC?

→ The Czech Republic has been the largest producer and exporter of blue poppy seed in the world since 2006. Ranking second is Turkey which produces both blue and (mainly) white poppy seed, which is exported primarily to the Indian market since no poppy seed is consumed in Turkey.

→ The Czech Republic produces on average 23 000 tonnes of poppy seed. The consumption in the Czech Republic accounts for approximately for 4 500 tonnes. The consumption of poppy seed per capita is 430 g which is most likely the highest consumption of poppy seed worldwide.

→ Since 2014 only food poppy has been grown in the Czech Republic (see Chapter 8)

→ Poppy seed ranks among the most important agricultural (agrarian) commodities exported from the Czech Republic

→ Fat contained in poppy seed, from a nutritional perspective, has a very favourable composition of fatty acids. Our analyses show that the proportion of the linoleic acid, ranking among Omega-6 acids – PUFAs, is the highest among the fatty acids (approx. 74%).

→ Czech Blue Poppy is a trademark which guarantees the Czech origin and food quality in line with the Czech Guild Standard “Czech Blue Poppy”

→ Archaeological findings give evidence about the cultivation of poppy in the territory of the Czech Republic back to the late Bronze Age (around 800 B.C.).

somniferum L. more than 40 alkaloids are described. The most important are morphinan alkaloids, which apart from morphine include also codeine, thebaine, oripavine, neopine and others (Novák a Preininger 1981).

Since the Middle Ages poppy seed has been grown in Europe as an ornamental and decorative plant. Culinary properties of the poppy seed have always been highly valued, and also, the narcotic effect of the milky fluid – latex – contained in capsules (poppy heads) of the plant, has been well known. However, this plant has not been misused in the Czech Republic or in Europe.

In the varieties grown in the Czech Republic the content of opium alkaloids in dry poppy capsules with the stem of no more than 15 cm under the capsule ranges from 0.3 to 0.7% (the statutory maximum limit is 0.8%). Globally, this content is up to 3%.

In 1970s, in the former Czechoslovakia, poppy seed started to be grown as a field crop in rows 12.5-25 cm wide, with no weeding carried out, with the application of herbicides and direct combine harvesting. Ever since that time, but especially thanks to the Czech Blue Poppy Association, the poppy seed cultivation technologies have been improved. At present, mostly the annual spring poppy seed, and to a lesser extent also winter poppy seed, are grown in the Czech Republic. The seeds of the prevailing majority of poppy seed varieties cultivated in the Czech Republic have the typical blue colour which guarantees its pleasant aroma and sweet flavour (Czech blue poppy = Český modrý mák). Besides blue-seed poppy, also white-seed poppy is grown in the Czech Republic, namely on approximately 3% of the area under this crop. Its flavour, however, is different.

2. POPPY SEED CLASSIFICATION

Poppy seed classification based on edibility:

→ **Food poppy** (oil, seed type varieties) belonging to the group of oil poppy have seeds of blue, white, ochre, but also brown, silver grey or grey colour. Blue seeds of poppy best guarantee the “poppy aroma and flavour“. The system of vascular bundles is underdeveloped, with almost no latex, low concentration of alkaloids. See Chapter 8 – Czech Blue Poppy.

→ **Industrial poppy**, mainly grey-, black- or blue-seed The product of the poppy seed growing is poppy straw for pharmaceutical in-

dustry. It is used to extract alkaloids, mainly morphine, from poppy straw. The poppy seed cannot be used for food purposes due to its higher content of alkaloids and unpleasant flavour and aroma.

→ **Opium poppy** have a very well-developed system of vascular bundles, their lactiferous vessels produce latex with high alkaloid content. It is typically grown in Asia, particularly in Afghanistan, with usually unregulated, illegal opium production.

→ **Ornamental poppy** – varieties with decorative flowers, or also decorative capsule shapes.

Classification based on the time of sowing:

→ **Spring poppy:** cultivated on approximately 90 – 100% of areas under this crop in the Czech Republic, in dependence on the particular year.

→ **Winter poppy:** cultivated on 0 – 10% of areas under this crop in the Czech Republic. It is characterised by intensely hairy young leaves with milky spots.

Classification based on alkaloid content:

→ With low morphine content of up to 0,3% in poppy straw. Poppy straw cannot be used in industry. Misuse of these varieties for illegal opium production is impossible. The seed is intended for food purposes (e.g. Zeno, Przemko varieties)

→ With medium morphine content of 0.3 to 0.8 % in poppy straw. Seed is intended for food purposes (majority of currently grown varieties). Pharmaceutical companies show no interest in this poppy straw because the content in poppy straw is usually below 0.5% (now majority of varieties grown in the Czech Republic).

→ With high morphine content in poppy straw (usually 1.5 - 3%). The crop is intended for production of poppy straw for industrial use. The seed is not suitable for food purposes (poppies grown especially in Spain and Australia).

→ Poppies with different alkaloid content, e.g. thebaine poppies (Norman, Tasmánie varieties) or botanically different poppy species (*P. bracteatum*, *P. orientale*)

Classification of poppy based on capsule opening:

- Open-capsule poppy (“Hledák”) creating openings under the crown. Seeds are falling out of the openings (e.g. in common poppy). Open-capsule poppies are not suitable as food poppy.
- Closed-capsule poppy (“Slepák”) has no openings under the crown. The breeders of food poppy varieties aim to achieve the highest possible share of closed-capsule poppies.

Classification based on the colour of the flowers:

- White-petal (majority of varieties grown in the Czech Republic)
- Pink-petal
- Red-petal
- Lilac-petal (winter varieties)

Classification used in literature based on the colour of the seeds:

- Blue-seed (Czech Blue Poppy – see Chapter 8),
- White-seed (used mainly in the Indian market)
- Yellow-seed
- Grey-seed
- Pink-seed
- Lilac-seed
- Brown-seed
- Black-seed



3. WORLD USE OF POPPY SEED

Poppy seed is a popular food among virtually all the Slavic peoples and population of neighbouring countries such as Austria, Romania, Hungary, Germany. In the Central and Eastern Europe, as far as we know, poppy seed, mixed with sugar and/or other ingredients is used as a filling in pastries, strudels, pies etc. In the other European countries and in Northern America, on the other hand, poppy seed is used in bakery industry primarily as sprinkle on breadstuff, basically for decoration.

The way in which poppy seed is used also determines the poppy seed consumption per capita in individual countries. Note that poppy seed consumption is not very high anywhere, it is comparable to the consumption of various types of spices, among which poppy seed is sometimes included in commercial practice, or to the consumption of some other types of food.

Absolutely the highest consumption of poppy seed, namely almost exclusively of seeds of white poppy, is reported by India, namely around 25 thousand tonnes per year. The per capita consumption of poppy seed in India, however, is only 20 grams which equals the content of five poppy capsules (poppy heads). No poppy seed is grown in India, the entire volume of consumed poppy seed is imported.

When it comes to the Central and Eastern European countries, probably the highest consumption is reported by the Czech Republic which is also the largest grower and exporter of poppy seeds. Each Czech citizen consumes approximately 400 grams of poppy seed per year. The Czech Republic is followed by other Central and Eastern European countries. In many countries of the world, however, poppy seed as food remains unknown, poppy seed is neither imported to these countries, nor cultivated there for food purposes.

In the Czech cuisine, poppy seed is used mainly as a filling in bakery products – pies, buns, strudels etc. An alternative to poppy seed in fillings in these products can be cream cheese, plum or other jams. Poppy seed can also be used, together with sugar and butter, as toppings on cooked meals made of flour such as fruit dumplings or small potato dumplings. Poppy seed is almost always added to sweet meals, but only exceptionally to other than sweet meals.

WORLD POPPY SEED PRODUCTION

Poppy is currently grown in several dozens of countries – in some of them illegally. In roughly twenty-five countries poppy is grown legally – in a number of them, however, poppy seed is primarily used not for food purposes, but for poppy straw processing in pharmaceutical industry. Poppy seeds as a waste product from poppy straw harvested in these countries also enter the world markets.

In recent years, the Food and Agriculture Organisation of the United Nations (FAO) has listed 15 poppy seed growing countries.

Apart from countries, included in the FAO statistics, poppy seed is cultivated also in other countries such as Australia, China, United Kingdom or Ukraine and Poland, mostly as a by-product in the production of raw material (poppy straw) for alkaloid production, but the data on seed production in these countries is not commonly available. The volume of poppy seed production in

World Poppy Seed Production, 2009–2018, in metric tons

↓

Country/Year	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	Среднее
Austria	1799	2464	1734	1293	1078	1098	1614	1740	1504	1567	1589,1
Bulgaria	608	607	584	500	525	500	500	1000	600	500	592,4
Croatia	2681	2899	3541	4308	3198	1509	2256	4421	3349	1710	2987,2
Czech Republic	20048	28574	26743	24665	13911	12814	26918	23690	32692	49248	25930,3
France	5204	5822	6000	6000	6000	6000	6000	6311	7658	5702	6069,7
Germany	3104	3083	2836	3000	3200	3200	3000	2874	2828	2807	2993,2
Hungary	3000	3356	9866	9350	4850	4700	8156	7410	3458	3362	5750,8
Netherlands	541	560	562	448	303	311	461	655	700	1010	555,1
North Macedonia	32	90	64	75	63	91	233	297	504	186	163,5
Palestine	1683	1664	1645	1627	1608	1661	1404	590	2100	2099	1608,1
Romania	1849	1835	1820	1806	1791	1777	1762	1747	1823	1708	1791,8
Serbia	1039	1040	1015	1000	1000	1000	1000	1000	900	1000	999,4
Slovakia	1958	3354	2707	1827	853	296	887	878	832	1215	1480,7
Spain	11900	11800	12000	11000	12000	11000	8000	7850	7000	6500	9905
Turkey	15244	18205	30730	16223	19244	3844	45077	36910	34194	10834	23050,5
Total	70690	85353	101847	83122	69624	49801	107268	97373	100142	89448	85466,8

each of these countries is estimated at several hundreds to several thousands of tonnes. The total world production of poppy seed ranges around 100 thousand metric tons annually.

As for the area under poppy seed globally, the same source (FAOSTAT) states that in the last decade poppy seed is grown on average on roughly 115 thousand hectares (i.e. about 286 thousand acres, while there are huge differences in individual years – from 72 thousand hectares up to almost 150 thousand hectares. In the sample composed of the above mentioned fifteen countries, the yields range around 0.73 tonne per hectare (0.294 mt/acre). When factoring in producing countries not included in the FAO statistics, the average total area under poppy in the world can be estimated at approximately 140 thousand hectares. It concerns, however, only legally cultivated poppy seed, the area of poppy fields in countries where poppy is grown illegally (illicit production) as a source of narcotics is not included in these estimates.

Poppy seed, originating in countries where varieties intended primarily or exclusively for pharmaceutical purposes are cultivated, does not achieve the quality of food poppy produced in the Czech Republic. Therefore, poppy seed for pharmaceutical purposes is in many cases unsuitable for human consumption, in the best case it can be used as sprinkle for bakery products. The reason behind is the unsuitable flavour of such poppy seed. The seeds of pharmaceutical (or industrial varieties) are characterised by dull to woody flavour, often rough and bitterish. Contrary to that, poppy seed varieties grown in the Czech Republic were bred specifically for food purposes. Apart from their usual very low alkaloid content on seeds (seeds as such do not contain any alkaloids), their flavour is sweet and pleasant. The alkaloid content of the so-called pharmaceutical poppies is usually many times higher both in the capsule (head) and on the seeds.

4. WORLD POPPY SEED MARKET AND THE POSITION OF THE CZECH REPUBLIC

The world market of poppy seed represents the annual volume of roughly 100 thousand tonnes of goods. The market is supplied with poppy seed grown for food production, intended for human consumption, as well as poppy seed obtained as a waste product in production of raw materials for pharmaceutical industry (the so-called industrial or pharmaceutical poppy). It is

estimated that approximately 60% of poppy seeds traded in the world market can be classified as food poppy. Its major growers are the Czech Republic, producing mostly blue-seed poppy, and Turkey, focusing mainly on white-seed poppy. The Czech Republic, beyond any doubt, has been growing the largest volume of food poppy in the world ever since the beginning of this century.

Other producers are smaller poppy seed growing countries, the products from which are mostly consumed in the country of origin (Austria, South-eastern European countries, Germany, Ukraine, Poland). The Turkish poppy seed production is at the same time intended also for pharmaceutical production, i.e. the poppy straw from Turkish poppy is also used to obtain alkaloids that are further processed in the production of medicinal products. Industrial poppies, intended primarily to obtain poppy straw with high alkaloid content, are cultivated in countries such as Australia, or Tasmania (the largest producer of pharmaceutical poppies), and Spain (the second largest world grower of pharmaceutical poppies), France, United Kingdom, China and others. Hungary and Slovakia grow both food and pharmaceutical poppy varieties, with industrial poppy prevailing in both these countries. And it is the seed of industrial poppies which is offered in the world market basically as a lower quality substitute for food poppy.

The Czech Republic produces up to one third of all poppy seed placed on the world market. The exports of Czech poppy seed are presented in the table below:

Czech Republic: Export of Poppy Seed Crops 2009–2018 (Sep–Aug)

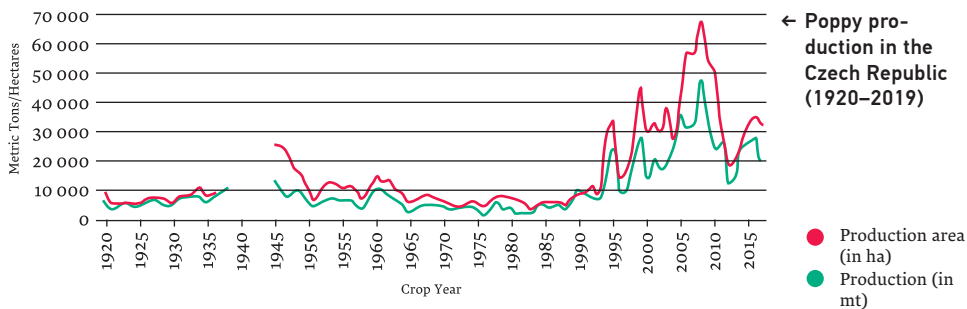
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Country/Crop Year	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	Total (2009–18)
Russian Federation	3191	6024	6408	6759	7152	4962	5302	6633	5120	3995	55545
Austria	3503	3828	4081	4135	4468	4127	3477	5515	5209	6963	45306
Poland	1927	2426	4457	3138	4118	3349	2267	4264	3094	7662	36702
Germany	1252	1862	2985	3087	3429	1035	848	1927	1760	2906	21092
Ukraine	621	700	1817	1412	2095	2130	3021	4465	2316	533	19110
The Netherlands	668	850	1838	799	1472	426	507	1656	1149	2051	11417
Slovakia	1490	1442	1400	1397	1414	1496	1259	1321	1058	995	13273
Romania	318	308	496	670	666	466	584	730	645	845	5727
Hungary	471	233	363	503	663	517	455	1162	429	855	5652
Lithuania	143	118	267	264	239	160	254	439	343	733	2961
Belarus	79	272	356	293	249	302	357	252	266	366	2791
Kazakhstan	308	435	741	480	359	20	240	91	193	222	3088

United Kingdom	84	175	167	149	221	128	238	286	301	484	2216
India	553	608	689	260	172	170	99	0	0	0	1999
Others	573	288	131	94	107	86	118	504	189	200	1861
Total	15179	20228	27286	24431	28059	19978	19924	30754	22939	30676	239454

The table gives the largest buyers of poppy seed from the Czech Republic, i.e. those who during the last ten years imported at least two thousand tonnes of poppy seeds. At the same time, Czech poppy seed was exported to approximately 50 countries in total, but some of the buyers appeared only sporadically in the statistics and their imports were limited only. The number of regular Czech poppy seed buyers is between thirty and thirty-five countries. However, taken into consideration must be the fact that in many countries poppy seed as food has no tradition and in many other countries its use is explicitly prohibited. Besides the aforementioned major customers, regular, though smaller deliveries of poppy seed go also to Latvia, Serbia, Turkey, United Kingdom, France, Denmark, Uzbekistan, Israel, Bulgaria, Sweden, Canada, U.S. and other countries. To some countries the Czech poppy seed is also exported through intermediaries. Roughly 60% of poppy seed from the Czech Republic is exported to the EU Member States. About one third is exported to the Russian Federation and the former Soviet Union countries (except for the EU Member States). The remaining several per cents of the Czech exports of poppy seed is delivered outside these two large groups of buyers. Among them, an important place is taken by India which imports almost all white-seed poppy.

Roughly until 2010, ranking among the top importers in the table of the largest importers of the Czech poppy seed were Austria and Poland, which were later replaced by Russian Federation that has become the largest buyer of poppy seed from the Czech Republic.



Of the total volume of poppy seed, produced in the Czech Republic, on average 85% is exported, due to which this commodity has become one of the most important items of the Czech agrarian export. Approximately 4 000 – 4 500 tonnes are consumed domestically, i.e. around 400 grams of poppy seed per inhabitant annually.

Period	1920 – 38	1946 – 70	1971 – 89	1990 – 99	2000 – 09	2010 – 19
Area harvested (thousand ha)	5,4 – 10,7	6,0 – 25,6	4,4 – 7,9	8,8 – 45,5	27,6 – 69,8	18,4 – 51,1
Seed yield (t/ha)	0,68 – 1,01	0,36 – 0,77	0,24 – 1,04	0,43 – 1,13	0,46 – 0,90	0,46 – 0,91
Seed production (thousand tonnes)	3,9 – 10,6	3,1 – 13,6	1,1 – 7,9	6,9 – 28,5	13,6 – 49,4	12,8 – 28,6

↑

Development in poppy cultivation in the Czech Republic in 1920–2019 (CZSO) – minimum and maximum values for individual periods

As indicated by the chart, until mid-1990s poppy was grown in the territory of the Czech Republic primarily for domestic consumption. Only a negligible part of poppy seed was exported. Only at the end of the 20th century the areas sown to poppy seed rapidly increased, which was made possible due to the end of state planning and thanks to market liberalisation. The reason behind the increase of areas of poppy fields was first and foremost a higher demand for quality food poppy expressed by European countries on the one hand and a decline in production in some other countries growing poppy seed on the other hand. Finally, of importance was also the fact that made available were the areas formerly sown by disappearing crops and crops traditional in the past such as potatoes, sugar beet, fodder crops, fibre flax...

The volume of poppy seed production in the Czech Republic has increased mainly thanks to the extension of areas under this crop. The yields per hectare, which in 1920s and 1930s reached 0.86 tonne per hectare on average, after the World War II, despite the technological progress (or rather because of it since the effectiveness of machine harvesting was far from reaching the effectiveness of manual labour) dropped (to about 0.65 t/ha), and only after 2010 started to slightly go up again. It has to be said, however, that at present the areas under poppy seed are 5x larger, compared to the area under poppy seed in 1920s to 1930s.

Unfortunately, the climate change affected the poppy seed production in Central Europe. In the last two years, poppy seed growing was strongly impacted by drought and high temperatures, therefore e.g. in 2018 the average yields per hectare dropped to mere 500 kg. The 2019 harvest did not rank among the best either, even though the situation has somewhat improved.

The results of the 2020 harvest are now in the lap of the gods; all we can hope for is more rain than in previous years and no other disasters affecting the poppy seed crops (written in June 2020).

Crop Year	Sowing area (ha)	Yield (mt / ha)	Total Production (mt)	← Poppy Seed Production in the Czech Republic 2001–2019
2001	33 235	0,64	21 294	
2002	29 637	0,57	16 918	
2003	38 147	0,51	19 544	
2004	27 611	0,90	24 821	
2005	44 613	0,82	36 418	
2006	57 785	0,55	31 591	
2007	56 914	0,58	33 101	
2008	69 793	0,71	49 428	
2009	53 623	0,61	32 692	
2010	51 103	0,46	23 690	
2011	31 495	0,85	26 918	
2012	18 363	0,70	12 814	
2013	20 250	0,70	14 100	
2014	27 020	0,91	24 588	
2015	32 650	0,82	26 891	
2016	35 543	0,80	28 574	
2017	32 586	0,62	20 048	
2018	26 608	0,51	13 666	
2019	35 778	0,66	23 606	
2020	40 255 ^{*1}	0, 73 ^{*2}	29 326 ^{*2}	

Source: Czech Statistical
Office, Prague, 2020
Obs.:

*1. Published by the
Czech Statistical Office
on July 3, 2020

*2. Published by the
Czech Statistical Office
on September 15, 2020

Poppy seed is grown almost across the whole territory of the Czech Republic, with the exception of the driest regions and mountainous regions, at altitudes up to 700 metres. The largest growers have traditionally been the Central Bohemia (Central Bohemian Region), Vysočina Region, Eastern Bohemia (Pardubice Region, Hradec Králové Region), and Central and Northern Moravia (Olomouc Region, Zlín Region and Moravian-Silesian Region). Every year poppy seed is grown by 800 – 1000 growers on areas of more than one are (i.e. 100 m²= 0.0247 acre). The average area under poppy seed thus totals approximately 40 hectares per grower, which is much more than in other countries – e.g. in Turkey the average area is around a half of the hectare and in the neighbouring Poland about 1.5 hectares per grower.



6. LEGAL REGULATION OF POPPY CULTIVATION IN THE CZECH REPUBLIC

Throughout centuries of poppy growing in the Czech Lands, varieties intended almost exclusively for food purposes have been bred. This means that poppy grown today in the Czech Republic has the minimum content of alkaloids that would otherwise cause unpleasant bitter flavour of poppy seeds. The Czech poppy is thus characterised by delicious flavour and pleasant aroma. Thanks to the long-established and uninterrupted tradition of growing quality food poppy the Czech Republic has worked its way to the top among the countries in which poppy for food purposes is cultivated. Moreover, the Czech Republic is the only major grower of poppy seed intended exclusively for food purposes. The other producing countries with legal cultivation of poppy seed, it is usually used not only as food, but also as a raw material for the pharmaceutical industry, and often times it is grown primarily



for the production of medicinal products, while the seeds are the by-product sold outside the country of origin.

In compliance with the international obligations, the Czech legislation stipulates the conditions for poppy growing. The grower must meet the requirements of the Act No 167/1998 on dependency producing substances, namely the provisions of Section 24 of the Act, stipulating the maximum content of alkaloids in poppy straw (crushed poppy capsules) of cultivated varieties (i.e. no more than 0.8 %) and defining the method of liquidation of poppy straw after the harvest. Besides, Section 29 stipulates that “the farmer growing poppy seed on a total area exceeding 100 m² (0.0247 acre) shall be obliged to submit a report on growing to the locally competent customs authority (no later than on 31 May of the respective year)“.

On 1 January 2014, the Decree of the Ministry of Agriculture of the Czech Republic No 399/2013 came into force, which specifies the conditions of **food poppy** growing. In line therewith, it is permitted in the Czech Republic to produce and place on

the market only such poppy seed that meets the set-out quality requirements – moisture content, content of admixtures and impurities, maximum content of heavy metals, maximum content of alkaloids on the seed etc. The product is naturally also subject to other requirements for cleanliness and health and safety in accordance with the Czech Republic and EU legislation. Poppy seed suppliers must also satisfy the requirements of countries to which the poppy seed is exported.

In the Czech Republic, as defined in the statutory regulations, it is prohibited to cultivate the so-called industrial (pharmaceutical) poppy varieties with a higher alkaloid content.

7. THE SPECIFIC QUALITY CHARACTERISTICS OF THE CZECH BLUE POPPY SEED

The uniqueness of the Czech blue poppy rests upon its qualitative properties. The Czech blue poppy as a foodstuff is intended exclusively for human consumption, namely both for





direct use in meal preparation and for production of top-quality vegetable oil.

The Czech growers sow predominantly the Czech and Slovak poppy varieties, which are the result of many years of breeding. At present, these are the blue-seed varieties Major, Aplaus, Marathon, MS Harlekyn, Opál, Onyx, Bergam, Opex; and white-seed varieties (particularly Orel). In the National catalogue of varieties 11 spring varieties and 3 winter varieties of blue, white and ochre poppy are registered. Other varieties, not included in the National catalogue, but listed in the Common catalogue of varieties of agricultural plant species of the EU, can be used provided they meet the requirements laid down in the Decree No 399/2013.

The most important requirement is the low alkaloid content on the surface of seeds and an emphasis is placed also on the sensory properties of the product, i.e. the flavour, aroma and colour of seeds.

Bearing in mind the uniqueness of the Czech blue poppy, the Czech Republic has applied for the registration of the name Czech Blue Poppy (**Český modrý mák**) as the protected geographical indication in the EU. The specifications requested by the application



comply with the aforementioned Decree and describe the Czech Blue Poppy as follows:

Colour: blue, clear coloured seeds

Flavour: sweet, palatable, typical for blue poppy

Aroma: strong, typical for blue poppy

These very properties distinguish the Czech blue poppy from poppy seeds produced in other countries, especially in those where poppy seed is grown for its high content of opium alkaloids in poppy straw and where seeds are not used for food purposes.

The Czech blue poppy thanks to its quality has become popular among consumers particularly in the Slavic and Central European countries, where the culinary use of poppy seed is fairly popular and common. The Czech blue poppy has regular customers in a number of countries that regularly import poppy seed, some of them in large quantities.

8. CZECH GUILD STANDARD OF CZECH BLUE POPPY

The Czech Guild Standard named “Czech Blue Poppy” guarantees the food quality of blue-seed poppy. It can be granted only to seeds of annual blue-seed poppy (*Papaver somniferum* L.). Currently, it covers 14 varieties which also fully meet a more

stringent limit for opium alkaloids than that set out in the Decree No 399/2013 Coll. and that can be grown in the Czech Republic.

In the Czech blue poppy labelled as the Czech Guild Standard, (*see the logo*), a lower content of morphine alkaloids (less than 20 mg/kg) is guaranteed. Also, thermal stabilisation (treatment of seeds by high temperatures) is prohibited. This treatment is applied for speculative reasons in industrial non-food poppies.

The logo “Made at Czech Guild Standard“ born by the seeds guarantees the traders, processors and consumers 100% Czech origin and food quality!

The Czech Guild Standard called Czech Blue Poppy has gained momentum not only in the Czech Republic, but mainly when poppy seed is exported abroad since the trademark is promoted also in foreign markets and it is expected that these customers will shortly demand it. The standard is guaranteed by the Federation of the Food and Drink Industries of the Czech Republic (*see the logo*) and the grower who registers the standard. Other quality certificates can also be provided upon request.

The Czech Blue Poppy Association (Český modrý mák z.s.) applied for the protected geographical indication “Český modrý mák”. The Commission has published an application and a 3-month deadline for possible comments at Member States level is running. ([https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020XC0925\(03\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020XC0925(03)&from=EN))

The Czech Guild Standard, named “Czech Blue Poppy”, logotype (registration number in the Czech Republic: 2019-01-14-0415, see: <https://www.cechovninormy.cz/norma/cesky-modry-mak/>):



9. NUTRITIONAL VALUE OF POPPY SEED

Nutritionally speaking, food poppy seeds contain an interesting mix of nutrients, among which fat constitutes the largest percentage up to 47%. From the nutritional perspective, however, not only the fat content, but mainly its composition is important.

As to the fat contained in poppy seed, the nutritional value of fatty acid make-up is very favourable. Saturated fatty acids represent only about 11% of all present fatty acids, while 85% is made up by unsaturated fatty acids. **Saturated fatty acids (SFA), i.e. acids containing no carbon-carbon double bonds, have adverse health effects, increase the total cholesterol levels in the body.** Saturated fatty acids, the total content of which in poppy seed oil ranges only around 10%, are mostly represented by palmitic acid (8 – 9%) and stearic acid (around 2%).

The fatty acids most abundant in poppy seed oil is linoleic acid (PUFA, up to 74%) and oleic acid (MUFA, 13 – 18%).
The content of α -linolenic acid is usually around 1%.

Table 1: Content of higher fatty acids (%) in oils made from selected seeds and nuts

Oil	Saturated (SFA)	Oleic acid (MUFA)	Omega-6 (n-6 linoleic) (PUFA)	Omega-3 (n-3 Alpha-linolenic) (PUFA)
Poppy seed	11,2	14,2	73,6	1,0
Flaxseed	9,4	15,8	16,5	58,3
Walnut	3,8	17,5	59,7	13,2
Rapeseed	4,8-6,0	50-60	16-22	7-10
Hazelnut	4,5	45,7	7,8	0,1
Pumpkin	19,4	14,9	61,3	1,2
Sunflower	11,2	23,2	37,9	0,2
Sesame	13,1	37,6	47,2	0,5
Olive	14,9	73,1	7,0	1,0
Chia seed	10,4	6,0	18,8	64,1
Almond	3,9	32,2	12,2	0,0
Peanut	6,8	24,4	15,6	0,0
Palm	48,8	36,6	9,1	0,0

Source: Zehnálek 2016, Ros a Mataix 2006, Were et al. 2006, Peiretti a Gai 2009, Erol et al. 2011, Lewinska 2015, www.pbd-online.sk and Český modrý mák z.s.

Polyunsaturated higher fatty acids (PUFA) – i.e. acids with at least two carbon-carbon double bonds – linoleic acid and α -linolenic acid (ALA) belong to the group of omega-6, or omega-3 fatty acids. They cannot be synthesised by human body, therefore the only source of them for the human body is the diet. They are called indispensable (essential) fatty acids.

Omega-6 fatty acids reduce pain, swelling and morning stiffness of joints (rheumatism), decrease hypersensitivity to allergens, in combination with omega-3 acids lower high blood pressure. Lack of omega-6 fatty acids causes hair dryness and hair loss, impaired wound healing, bone marrow loss – osteoporosis, more severe ADHD symptoms.

Omega-3 fatty acids, e.g. ALA (α -linolenic acid) help prevent heart diseases – lower blood pressure, cholesterol levels, reduce “vascular plaque buildup” (atherosclerosis), have anti-inflammatory effects, prevent blood clots, protect skin. Lack of ALA causes eyesight worsening, weakness, leg pain, higher cholesterol levels, inflammation.

As a general rule, the benefits of the poppy seed oil or poppy seeds are not mentioned on the Internet or in the literature or the

stated figures are outdated, based on the analyses of “nonfood” poppies. The reason behind may be the lack of knowledge of the use of poppy seed for food purposes in the world. The absence of this information is also obvious in the scientific community. Nonetheless, **poppy seed oil contains up to 75% of essential fatty acids and can be an easily accessible source of healthy diet.**

Oil extracted from poppy seeds has the highest content of linoleic acid across all the commonly grown plants used for food purposes. The linoleic acid (PUFA) belongs to the group of omega-6 essential fatty acids.

Moreover, poppy seed also contains approximately 22 – 24% proteins. Poppy seeds have a fairly low content of carbohydrates (about 3.3%), but are quite rich in fibre (14%).

Poppy seed is a source of vitamins (vitamin E in particular) and minerals (especially calcium, magnesium, zinc and iron). For the content of vitamins and minerals in the Czech blue poppy harvested by combine harvesters in a friendly manner and in the manually harvested white-seed poppy variety see Tables 2 and 3.

Table 2. Content of vitamins in food poppy seeds
[source: Český modrý mák z.s.]

Vitamin	White-seed poppy	Blue-seed poppy
Vitamin E	18,3 mg/kg	22,8 mg/kg
Vitamin B1	11,6 mg/kg	5,8 mg/kg
Vitamin B2	0,58 mg/kg	0,35 mg/kg
Vitamin B3	7,88 mg/kg	1,7 mg/kg
Vitamin B5	15,7 mg/kg	15,3 mg/kg
Vitamin B6	3,3 mg/kg	1,6 mg/kg
Vitamin B7	0,24 mg/kg	0,21 mg/kg
Vitamin B9	28,2 mg/kg	30,6 mg/kg

Table 3. Content of minerals in food poppy
[source: Český modrý mák z.s.]

Minerals	White-seed poppy	Blue-seed poppy
Phosphorus	1060 mg/100 g	1010 mg/100 g
Potassium	780 mg/100 g	830 mg/100 g
Calcium	1480 mg/100 g	1500 mg/100 g
Magnesium	370 mg/100 g	380 mg/100 g
Sodium	< 10 mg/100 g	< 10 mg/100 g
Iron	10,6 mg/100 g	9,7 mg/100 g
Copper	2,6 mg/100 g	2,0 mg/100 g
Zinc	11,9 mg/100 g	8,7 mg/100 g
Manganese	8,4 mg/100 g	7,3 mg/100 g
Cadmium	0,02 mg/100 g	0,05 mg/100 g

Poppy is rich primarily in iron, zinc and calcium. Standard content of calcium in 250 ml of drinking milk equals the content of calcium in approximately 40 g of poppy seed. [Czech Industrial



Health Insurance Company]. The calorific value of poppy seed is 495 - 552 kcal, i.e. 2043 – 2396 kJ [www.nutridatabase.cz, USDA, www.kaloricketabulky.cz]

10. POPPY SEED AS FOOD

The **poppy seeds** as such **do not contain alkaloids**. A certain quantity of alkaloids can be found in the form of dust on seed surface. It consists of particles of dust from the poppy straw which adhere to the seeds due to abrasion during harvest and other handling (cleaning) if the harvested mix contains straw residues. Particular role is played by the method of harvesting (manual harvest = lower contamination, harvest by combine harvesters and subsequent cleaning = higher contamination).

An exception, according to the literature (Kubík a Cuhra 2015; Dostálová 2020), is the partial contamination of seeds with alkaloids as a result of seed damage (by pests, seed damage during handling). This way of contamination is not significant in food poppy varieties.

The Czech Republic is one of a few countries where strictly food poppy varieties are grown, characterised by minimum content of alkaloids in poppy straw. Hence, also the content of alkaloids detected on poppy seeds is negligible. Low alkaloid content is guaranteed by the Czech Guild Standard label (see Chapter 8).

According to the monitoring performed in 2013 by the Czech Agriculture and Food Inspection Authority (CAFIA), the content of alkaloids (morphine, codeine, thebaine, papaverine, noscapine) in 12 samples of food poppy seeds collected at Czech producers was 7.44 mg/kg, while in the same number of samples collected in retail network it was 36.71 mg/kg (Kubík a Cuhra 2015). This confirms that poppy seed grown in Czech fields has a very low content of alkaloids on seed surface, whereas in retail network the seeds are mixed with imported poppy seed, often times intentionally thermally stabilised. The resulting alkaloid content in poppy seed mix in retail network is thus higher.

The content of alkaloids on seed surface is influenced by poppy seed processing. During washing, heat treatment, but also grinding the content of alkaloids may be reduced by 25 – 100% (EFSA Scientific Opinion 2018).

According to the EFSA Scientific Opinion, the main issue is the consumption of poppy seed for pharmaceutical purposes, in which the recommended safe daily intake is exceeded up to 30-fold.

In food poppy, the safe content of opium alkaloids¹ may be exceeded by consumers who *consistently consume large quantities of poppy seeds* in food containing fresh poppy seed not treated by heat, e.g. in the form of poppy seed drink or pasta (noodles) with poppy seed (Czech typical meal).

It is very unlikely that opium alkaloids are contained in a poppy seed product and that one could consume more opiates than it is safe or even feel their effects by consuming poppy seed for food use.

On the other hand, it shall be noted that the use of poppy seed in bread, pastries and desserts has a long-standing tradition especially in Slavic countries, Bavaria, Austria, Hungary and Romania also because of its favourable nutritional profile. It is characterised by its plentiful supply of fat with favourable composition of essential fatty acids and it can also be a source of proteins, fibre, vitamin E and minerals, calcium in particular (Sabolová 2020) – see Chapter 9.

As concerns poppy seed bearing the Czech Guild Standard label, there is no reason to be afraid of alkaloid effects even when fresh seeds are used. As to poppy seed of unknown origin, though, it would be more appropriate to use it as an ingredient for heat treated products.

1. Safe content of opium alkaloids:
According to the opinion of the European Food Safety Authority (EFSA) considered a safe quantity of morphine (Acute Reference Dose, ARfD) consumed over the period of 24 hours or less without any apparent health risks for the consumer (dose not expected to have any pharmacological effects) is 10 µg of morphine/kg body weight, while the concentration of codeine shall also be taken into account (by converting codeine to morphine equivalent, using a factor of 0.2) (EFSA Scientific Opinion 2018).

11. CZECH BLUE POPPY ASSOCIATION

[Český modrý mák z.s. *in Czech*]

There is an association in the Czech Republic dedicated exclusively to breadseed poppy. In this national association, fair growers, processors, consultants and traders in food breadseed poppy for food purposes (*Papaver somniferum* L.) are associated. It was established in 1999.

Objectives of the Association:

- To foster good repute of the typical Czech (blue) poppy seed both nationally and globally, to promote economic, commercial, legal and professional interests of its members
- To provide professional **services** to growers with respect to **poppy seed growing and post-harvest treatment**
- **To seek to improve growing technologies**
- To emphasize strict compliance with laws and regulations governing **legal cultivation of poppy seed**
- **To cooperate with universities, breeders, producers and suppliers of agrochemical products**
- To protect the Czech market from imports of industrial poppy seed with the above-the-limit content of opium alkaloids, to highlight the health risks

Contact:

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www.czechbluepoppy.com

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FB: [CzechBluePoppy/](#)



Český
modrý mák z.s.

THE CZECH REPUBLIC PRODUCER OF BREADSEED POPPY



Посольство Чешской Республики
в Москве

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