

**COMMISSION RECOMMENDATION****of 10 September 2014****on good practices to prevent and to reduce the presence of opium alkaloids in poppy seeds and poppy seed products****(Text with EEA relevance)**

(2014/662/EU)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 292 thereof,

Whereas:

- (1) Poppy seeds are obtained from the opium poppy (*Papaver somniferum* L.). They are used in bakery products, on top of dishes, in fillings of cakes and in desserts and to produce edible oil. The opium poppy plant contains narcotic alkaloids such as morphine and codeine. Poppy seeds do not contain the opium alkaloids or contain only very low levels, but can become contaminated with alkaloids as a result of insect damage, or through external contamination of the seeds during harvesting, when particles of dust from the straw (including capsule wall) adhere to the seeds.
- (2) The Scientific Panel on Contaminants in the Food Chain (Contam) of the European Food Safety Authority (EFSA) has provided a scientific opinion on the risks for public health related to the presence of opium alkaloids in poppy seeds intended for human consumption <sup>(1)</sup>.
- (3) Estimates of dietary exposure to morphine from foods containing poppy seed demonstrate that the Acute Reference Dose (ARFD) can be exceeded during a single serving by some consumers, particularly children, across the Union.
- (4) It is therefore appropriate that good practices are applied to prevent and to reduce the presence of opium alkaloids in poppy seeds and poppy seed products,

HAS ADOPTED THIS RECOMMENDATION:

Member States are recommended to take the necessary measures to ensure that the good practices for preventing and reducing the presence of opium alkaloids in poppy seeds and poppy seed products, as described in the Annex to this Recommendation, are implemented by all operators involved in the production and processing of poppy seeds.

Done at Brussels, 10 September 2014.

*For the Commission*

Tonio BORG

*Member of the Commission*

---

<sup>(1)</sup> EFSA Panel on Contaminants in the Food Chain (Contam); Scientific Opinion on the risks for public health related to the presence of opium alkaloids in poppy seeds. EFSA Journal 2011;9(11):2405. (150 pp.) doi:10.2903/j.efsa.2011.2405. Available online: [www.efsa.europa.eu/efsajournal](http://www.efsa.europa.eu/efsajournal)

## ANNEX

**I. Good agricultural practices to prevent the presence of opium alkaloids during growing, harvesting and storage**

The presence of morphine and other alkaloid compounds is mainly due to external contamination especially through inappropriate plant protection and harvesting-cleaning procedures. Other factors influencing the alkaloid contamination of poppy seeds and products are, e.g. the variety of poppy plant and growth conditions like drought and fungi as stress factors. In addition, insects play a major role in the contamination of poppy seeds.

*Choice of poppy plant variety*

Poppy plant varieties can be grouped into two categories:

- (a) poppy plant varieties which are cultivated for the production of poppy seeds for food use only. These varieties contain a low level of opium alkaloids;
- (b) poppy plant varieties which are cultivated for pharmaceutical purposes but of which the seeds, as by-product, are used for food. Compared to the pod and straw, the poppy seeds contain relatively low levels of opium alkaloids.

*Adequate pest and disease control*

Not all pests and diseases referred to in this section do occur in all production regions in the Union. Therefore the control measures for those pests and diseases are only relevant for the production regions where they occur.

There are two important diseases of poppy plants: *Peronospora arboresces* (downy mildew) and *Pleospora papaveracea*. The mycelium of those fungi penetrates the capsules, thus leading to a poor quality crop which results in prematurely ripened dark to black seed. The diseases also cause deterioration of sensory properties of poppy, i.e. taste and colour, and this mouldy seed, different in colour, cannot be completely separated by the cleaning line.

Substantial decrease in food quality is also brought about by poppy pests attacking the poppy growth at later development stages. Most often it concerns the capsule weevil (*Neoglyciinus maculalba*) and capsule midge (*Dasineura papaveris*). The capsule weevil lays eggs inside the young green capsules. The larvae hatched inside poppy heads feed on the inside of capsules (developing poppy seeds) and make the inside of capsules dirty, damage poppy seed and finally leave the capsule through the gnawed out holes. This hole is used by capsule midge to lay eggs. The ripe capsule contains up to 50 orange larvae which ultimately complete the destruction of the capsule. The seeds are black, underdeveloped and inedible.

More relevant is the fact that the penetration by the mycelium and weevils means the 'poppy tears' and the milky latex released contaminates the seeds. Those problems are inherent to all poppy plant production.

Therefore it is recommended to control those diseases and pests adequately in case they occur.

*Prevention of bad harvesting conditions caused by lodging of plants*

Lodging can be avoided by a large extent when sowing of poppy plants at an appropriate density.

In the period of elongation growth, the growth regulators can be used in poppy for food use to reduce stem elongation. Growth regulators are generally not used in the production of poppy for pharmaceutical use as their use changes the biosynthetic pathway of the alkaloid. Growth regulation ensures not only stem shortening, but also strengthening of the lower part of stem. Short and robust plants are lodging-resistant, especially during the period of green capsules and their ripening.

Lodging causes an uneven ripening and leads to a contamination with alkaloids at harvest. The lodged plants mostly start branching again. The capsules on these young branches ripen later. When poppy is harvested, the process of ripening should be regulated since immature poppy capsules contain latex. When harvested, these capsules are crushed and the latex is oozing out from lactiferous vessels causing direct contamination of poppy seed surface by opium alkaloids which later dry up on seed surface. Also the seed from immature capsules, which is of rusty colour, degrades the quality of poppy, its appearance and sensory properties in particular.

A desiccant can be applied in accordance with national rules on authorisation of plant protection products and their conditions of use to ensure that all capsules are full senesced when harvested.

#### *Harvesting*

The poppy for food use is harvested at the moisture of not more than 10 %. The seed moisture at harvest usually ranges around 6-10 %. If for climatic reasons the poppy seed cannot be harvested under the conditions mentioned above, the poppy should be harvested with poppy straw and immediately air-dried with heat no more than 40 °C. Under these circumstances, however, any delay gives rise to a risk which can have an adverse effect on seed quality, both in terms of its sensory properties and physical, chemical and microbiological parameters of seed as foodstuff for human consumption.

Poppy grown for pharmaceutical use is sometimes harvested at higher moisture content levels but immediately dried after harvest and, more importantly, cooled. After drying and cooling the seed contains about 8-9 % moisture.

The poppy for food use is harvested using combine harvesters which are adjusted to harvesting small seeds. The poppy requires special adjustment of individual parts of machinery since the poppy seed is extremely vulnerable to mechanical damage. The food poppy seed contains 45-50 % of oil. When poppy seed is damaged, the surface of the seed is stained with oil which attracts the dust from crushed capsules. The adhered dust increases the concentration of opium alkaloids on poppy seed. Moreover, the poppy oil has short durability and oxidises very quickly. The damaged seed thus considerably decreases both the sensory quality of food poppy and its durability along with causing contamination and increasing opium alkaloid levels.

For the harvest of poppy for pharmaceutical use it is essential that only the pod and some straw are collected. Therefore a forage harvester with a specially adapted header which only harvests the top of the plant should be used for the harvest. The use of the forage harvester means that only the necessary part of the plant is harvested therefore lessening the chance of contamination.

#### *Post-harvest conditioning*

Poppy seeds do not or contain relatively low levels of opium alkaloids. When reference is made to opium alkaloid levels on poppy seed, this refers to tiny particles of dust from the straw (capsule wall). Therefore post-harvest cleaning or processing is essential, irrespective of whether this dust is high or low in opium alkaloids.

After the harvest, and before the use of poppy seed for food, the seed should be cleaned, dust particles should be removed by an aspirator and any other impurities should be removed, finally achieving a purity of more than 99,8 %.

#### *Storage*

Where the poppy seed is to be stored before final conditioning, it should be harvested with poppy straw and the harvested mix should be appropriately aired on grids with active ventilation, to ensure that the moisture content does not exceed 8 % to 10 %.

For long-term storage with ventilation, the untreated air, i.e. the air that has not been pre-heated, should be used. Poppy seed that has been treated in this manner can be easily stored for the period of 12 months with no substantial change in quality.

Once the poppy seed is cleaned, it should be stored in ventilated containers, or big-bags or bags certified for packaging of bulk foodstuffs, with no direct contact with the floor of the storage place.

#### *Labelling*

In case the poppy seeds need to undergo an additional treatment to reduce the presence of opium alkaloids before human consumption or use as an ingredient in foodstuffs, those poppy seeds should be labelled in an appropriate way indicating the need to subject the poppy seeds to a physical treatment to reduce the opium alkaloid content before human consumption or use as an ingredient in foodstuffs.

## II. Good practices to prevent the presence of opium alkaloids during processing

The opium alkaloid content of poppy seeds can be reduced by several means of pretreatment and food processing. It has been shown that during the processing of food, the alkaloid content may decrease by up to about 90 % and with pretreatment and heat processes combined even almost totally.

The most effective methods include washing and soaking, heat treatments using temperatures at least above 135 °C, but preferably above 200 °C, lower temperatures (e.g. 100 °C) in combination with moisture or washing as well as grinding and combinations of the multiple treatments.

Poppy-seed-containing foods usually go through several processes before being served.

In the case of bread and rolls, often whole, untreated poppy seeds are used mainly as decoration and no other treatment than baking takes place.

In other foods, poppy seeds are commonly ground before adding on top of a dish or before using in bakery products. Poppy seeds are also used as poppy seed filling, which is a combination of ground poppy seeds, sugar, liquid (water or milk) and possible additional ingredients and spices. The poppy seed filling is usually heat treated before use in the food preparation. In certain cuisine traditions, poppy seeds are used raw, whole or ground, without any heat treatment as important part of the meal.

Thus, poppy seeds in foods often go through a combination of different processing steps including grinding, mixing with liquid, heat treatment and sometimes even with several heat treatment steps. Although a single processing step may not have a major reducing effect on the poppy seed alkaloid content, a combination of pretreatment (e.g. processing of the poppy seed filling) followed by heat treatment (e.g. baking) may reduce the poppy seed alkaloid content to non-detectable quantities. By the combination of washing and drying on a technical scale, reductions of morphine concentrations were achieved also in highly contaminated batches of raw poppy seeds (original concentration varying from 50 up to 220 mg morphine/kg) down to concentrations below 4 mg morphine/kg without loss of quality and organoleptic properties.

The recommended pretreatments and processing methods reducing the alkaloid content of poppy seeds and poppy seed products are shown in the table below.

However the following observations need to be made:

- heat treatment before final food processing is not to be recommended because it contributes to the destruction of fats and can cause rancidity and loss of the typical poppy seed flavour,
- if the washing or soaking with water is required to reduce the alkaloid content of poppy seeds, it should be carried out shortly after the harvest. However it should be taken into account that this might reduce the quality and/or shelf-life of the poppy seeds.

Table

### Recommended pretreatments and processing methods reducing the alkaloid content of poppy seeds and poppy seed products

Pretreatments and processing methods	Additional conditions	Effect	Quantity of effect
Washing or soaking with water	Time (5 min) Increased time and temperature (30 s — 2 min — 30 min) in water of	Reduction in alkaloid content	46 % ↓
	15 °C 60 °C 100 °C		60 % -75 % ↓ 80 % -95 % ↓ 80 % -100 % ↓
	Single washing, slightly acidic conditions		40 % ↓

Pretreatments and processing methods	Additional conditions	Effect	Quantity of effect
Temperature/heat treatment	Bread baking 135 °C 220 °C 200 °C + grinding	Reduction in alkaloid content	~10-50 % ↓ ~30 % ↓ ~80-90 % ↓ ~90 % ↓
Grinding	Oxygen (large active surface) Increased pH	Accelerated degradation rate of morphine, formation of pseudomorphine, improved aroma of the product	~25-34 % ↓
Light		Minor influence on the degradation rate	
Combined pretreatment	Washing, 100 °C, 1min + roasting 200 °C, 20 min Washing, 100 °C, 1min + drying (90 °C, 120 min) Moisture with steam 100 °C, 10 min + drying (90 °C, 120 min) Moisture 100 °C, 10min + grinding + drying (90 °C, 120 min)	Reduction in alkaloid content	98-100 % ↓ 99 % ↓ 50-75 % ↓ 90-98 % ↓
Pretreatment + baking	Grinding + baking Combined steam pretreatment + grinding + baking Combined washing pretreatment + grinding + baking	Major reduction in alkaloid content with combination of moisture and heat pretreatment followed by dry heat treatment	80-95 % ↓ 90-95 % ↓ 100 % ↓