

Papaver somniferum L.



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Introduction

The *Papaver somniferum* L. is a world known plant but you might now know it for its scientific name. This plant is also known as the Opium poppy. A type of poppy that is known as the only source of opium in the world and this makes this plant one of the most controversial plants in history. Many centuries ago, around the neolithic era, it has been traced back to that time and it has been seen as a medicinal plant due to its capability of reducing pain but later on, it became extremely popular on the eastern side of the world, especially in China and the in spread onto the rest of the eastern world into countries like afghanistan, turkey and others.

The first section of the monograph is about The ecological factors of the opium poppy. They include the distributional factors of the poppy and here we can see aspects like the affinities, its fossil record, its origin, then the present day distribution. After this, the environmental factors and this includes the elevation and climate where the poppy can be found, the rainfall potential, the types of soils and the temperature are discussed. The Second section is about the biology of the opium poppy. In this section, it talks about the Chromosomes of the poppy, the life cycle which includes the seed stage and leaf growth. On the third section of the monograph, it shows the propagation and management of the opium poppy and this section includes the natural regeneration, the planting and the management. In the final section, emerging products and markets are discussed.

Chapter 2: Ecology

2.1 Distributional context

2.1.1 Affinites

The Opium poppy comes from the family of poppies also known as the Papaveraceae which is then divided into two categories, and the one the the opium poppy comes from is the *Papaver* L. which gives it the name *Papaver somniferum* L. There are over 50 types of species of poppies and they all have different purposes and uses. Some are just used to get the seeds for certain dishes others just as plants to decorate like the remembrance day poppies

Kingdom	Plantae – plantes, Planta, Vegetal, plants
Subkingdom	Viridiplantae - green plants
Infrakingdom	Streptophyta – land plants
Superdivision	Embryophyta
Division	Tracheophyta – vascular plants, tracheophytes
Subdivision	Spermatophytina – spermatophytes, seed plants
Class	Magnoliopsida
Superorder	Ranunculanae
Order	Ranunculales
Family	Papaveraceae – poppies
Genus	<i>Papaver</i> L. – poppy
Species	<i>Papaver somniferum</i> L. – opium poppy

(ITIS, 2011)

2.1.2 Fossil record

There are records of the poppy family that have been traced all the way back to the Cretaceous period (Salavert; Martin; Antolín; Zazzo 2018) The poppy nowadays is different from the Cretaceous poppy which was called the *Palaeoaster inquirenda*. They have been traced to around 74.5 million years ago in some deposits while in others they said that they are from about 64.5 million years ago. There are also studies that connect the *Papaveraceae* with the German *Papaverites* which is another plant but share similarities and both can be traced to the Eocene period.

2.1.3 Origin

It is confirmed that the opium poppy also called *Papaver somniferum* L is the only source of opium. It is believed that this plant has been a mutation or born from the *Papaver setigerum* which is native to the costal áreas of the mediterranean sea and it has kept evolving and changing until today which is known as the *Papaver somniferum* L or the Opium Poppy. The origin of the name is that *Papaver* means

poppy in greek and somniferum means that it's sleep inducing in latin. The effects of opium have been known for many years now since around 4000 BC by the Sumerians, in which the poppy was the symbol of joy for them. There are also stories about the Egyptians and Greeks using the plant in which it is also referenced in many stories like Homer's *The Odyssey*. (Homer, 7th century)

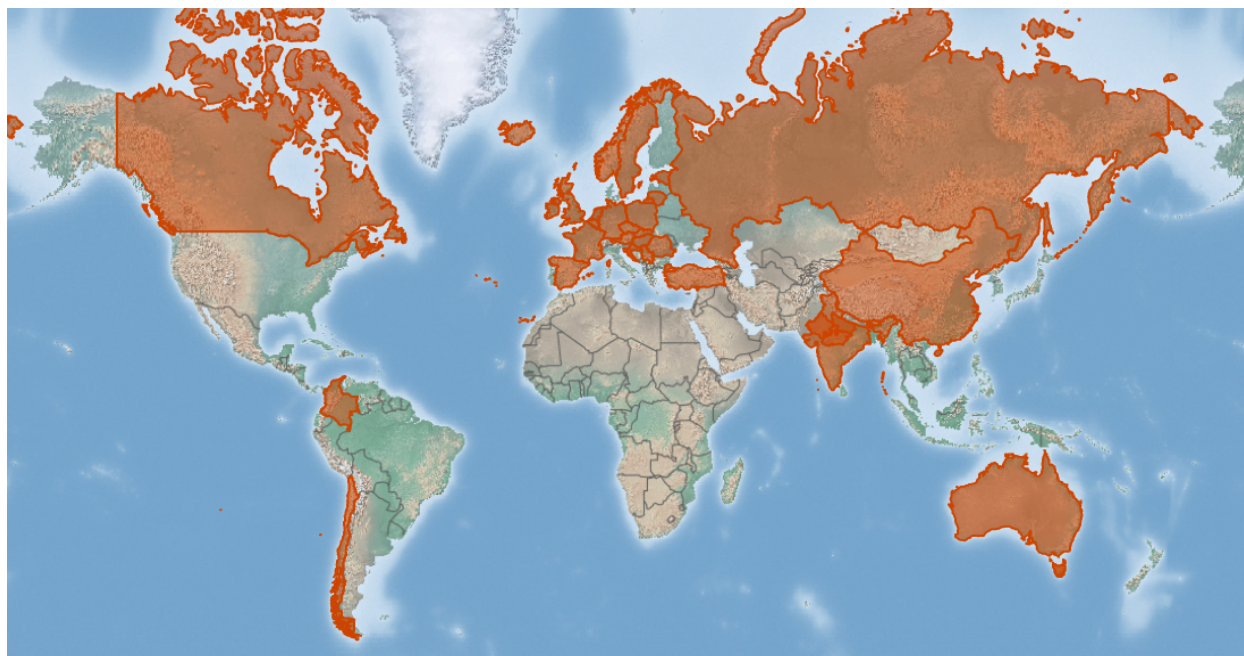
The poppy most likely reached China around the 7th century AD through the Arab traders at that time which they really sold it as a medicinal plant and not as Opium yet but there are some cases in which the poppy can be seen in earlier times in which it was used by doctors on patients before doing surgery. But the most widespread and known use of the Poppy in China came in the 17th century in which the poppy became very popular and resulted in an increase of smoking opium. (DEA, 1992)

In the year 1803 there was a German Pharmacist called Serturner described the alkaloid in the poppy which he called morphium after the Greek god Morpheus which was the god of dreams. After this discovery, other alkaloids were discovered like codeine and papaverine which they became more common to use in medical procedures than raw opium. (DEA 1992)

Opium in the united states became popular in the 19th century since it was widely used in various preparations like Morphine which was used by the army to help as a painkiller during the civil war which led to an opium addiction which can also be seen in other wars like the vietnam war which also led scientists to discover a less addictive painkiller that didn't have anything to do with opium. Nowadays we can see the effects that opium has left in the world and how many countries still have farms that develop this plant and drug. (DEA, 1992)

2.1.4 Present distribution

The opium poppy is native to Turkey and can be found in many middle eastern countries. There is a big concentration of the poppy in afghanistan nowadays. There are also farms in Mexico and some in Colombia. These are used mostly in drug production and trafficking. It can also be seen in the great majority of Europe, a big portion of Asia and more (UNODC 1950; DEA 1992)



CABI, 2022. *Papaver somniferum*. In: Invasive Species Compendium. Wallingford, UK: CAB International. <https://www.cabi.org/isc>

● CABI Summary Data

Papaver somniferum L growth and distribution locations
(the red symbolizes the áreas the the opium poppy can be found)
(Cabi, 2022)

2.2 Environmental Factors in distribution

2.2.1 Elevation and climate

The poppy can grow in between 300 and 700 meters but there are recorded cases of the poppy being found at 60 meters and up to 1300 meters. The poppy grows best in temperate climates since they originated in the mediterranean but it can also be grown in subtropical climates. Around 60 to 70 percent of the poppies grown are planted around Autumn and 30 to 40 are planted in spring. (DEA 1992)

2.2.2 Rainfall potential

In the middle east where it is grown, there are three main areas where it is grown.. All of them get different amounts of rainfall throughout the year. The first is the Iraninan Plateau or the central plateau were they get around 300 to 700 mm of water

In the Coastal Area it has a temperate climate in the winter and in the summer it has rain up to 2000 millimeters. In the west, it is a very mild and humid climate during the winter and during the summer it is dry and warm. In the south it is always warm.

The third and last area is the transitional area. It is in between the past ones and it varies between 300 and 700 meters in altitude. The rainfall varies between 500 to 800 millimeters and in the summer is dry like before and in the winter it is cold and snowy. (UNODC, 1950)

2.2.3 Soils

The opium poppy is known for being able to grow everywhere but in farms, they use specific types of soil depending on the location of the farm. There is a region in turkey called Afyonkarahisar which is the most important region in Turkey for the cultivation of poppy, it has a clay ish type of soil but it isn't that heavy so it's just right for the poppy while in another region of Turkey called, Amasya-Tokay which is also an important poppy region, it has a sedimentary and sandy soil which is rich in humus. It gives the poppy a soft touch making it the best for morphine. (DEA, 1992)

2.2.4 Temperature

The ideal temperature to grow opium poppy is around 16 and 20 degrees celsius, but there have been cases where the mean temperature was around 15 to 20 or 19 to 24. The soil temperature is to be kept at 12 degrees celsius to avoid damaging the plant. (DEA 1992)

Chapter 3: Biology

3.1 Chromosome Complement

3.1.1 Chromosome number and data

- The opium poppy has a total of 11 chromosomes.

3.2 Life Cycle

The cycle of life of the poppy begins with the seedlings like most plants due, then the formation of the first leaves, then the budding, then the flowering, then it is checked for ripeness to see if the poppy is ready to be cut and then it is checked to see if the seeds to produce more poppies are ready. The poppies are a yearly plant which means they are planted and cultivated in the same year.



Figure 1: The poppy in different stages

3.2.1 Seed stage

- The poppy is grown from tiny kidney shaped seeds that are usually a grayish color. These are gathered from dried poppy seeds pots and are used for many things including the making of narcotics, many food recipes and oil. A single seed weighs around 0.45 or 0.60mg which means that in 1kg there are about 2 to 3 million seeds. These seeds begin to germinate in temperatures from 3-4 degrees celsius. These seeds will begin to germinate after about 8 to 10 days of being in 5cms of soil. (DEA 1992)



Figure 2: Dried up poppy pod ready to extract seeds

3.2.2 Leaf growth

- The opium poppy after germinating, it grows two sets of true leaves which then it is thinned and then later on grows more true leaves which are around 5 or 6 pairs of leaves before they are cut again.

Chapter 4: Propagation and management

4.1 Natural Regeneration

The opium poppy is a plant that has been domesticated since around Neolithic times and it is said that it is hard to distinguish between the natural and domesticated poppies so little information is really known about the poppy being naturally planted by an animal or from letting its seeds drop. Little to no differences are noticed between poppies but it's not enough information to tell if it's natural. (DEA 1992)

4.3 Planting

Before the opium poppy is planted, the fields need to be prepared in order to secure a nice and good quality poppy. So by the end of the rainy season which is around August or September, the farmers prepare the land and they also use parts of soil from the past dry season which can provide more nutrients to the ground. Then weeds and stones are to be removed in order to level out the fields. It is said that traditional farmers don't use fertilizers but in recent years it has been observed that farmers are buying natural and chemical fertilizers in order to further increase the poppy yield. The natural fertilizers include chicken manure, human manure or bat droppings since depending on the area, there might be more bats than in other places or sections. The planting needs to be completed by October since the region has "longer days" in the months of November and December. The seeds can be planted in many ways, by hand, by broadcast or by being placed into shallow holes made by a metal pole. It is said that around 1 pound of poppy seeds is enough to plant one acre of land. (DEA, 1992)

4.4 Management

The poppies are allowed to grow until they are around a foot high and their first stage or the leave stage (also known as the lettuce stage), some plants are removed from the field in order to allow others to grow since they need more space. This process is called the Thinning. The ideal space between plants is 20 to 40 centimeters per square meter which is around eight to twelve plants per square meter but there are records of there being up to 18 plants per square meter. Around the first two months, those plants that have been damaged or those that have been permanently stunted by the lack of sunshine or by excessive rain or by bugs or pests are to be removed. The important care of these plants is around the first two months and the third there isn't much maintenance or management to be done. Around three to four months after being planted, most plants are in their full bloom and each plant has around 3 to 5 seed pods and each poppy field has around 60,000 to 120,000 plants in them and they have around 120,000 to 275,000 pods that can produce opium. The yield usually depends on natural factors and the care given by the farmer. (DEA, 1992)



Figure 1: Poppy farmer tending to it's crop

Chapter 5: Emerging Products, Potential Markets, Medicine

5.1 World Trade

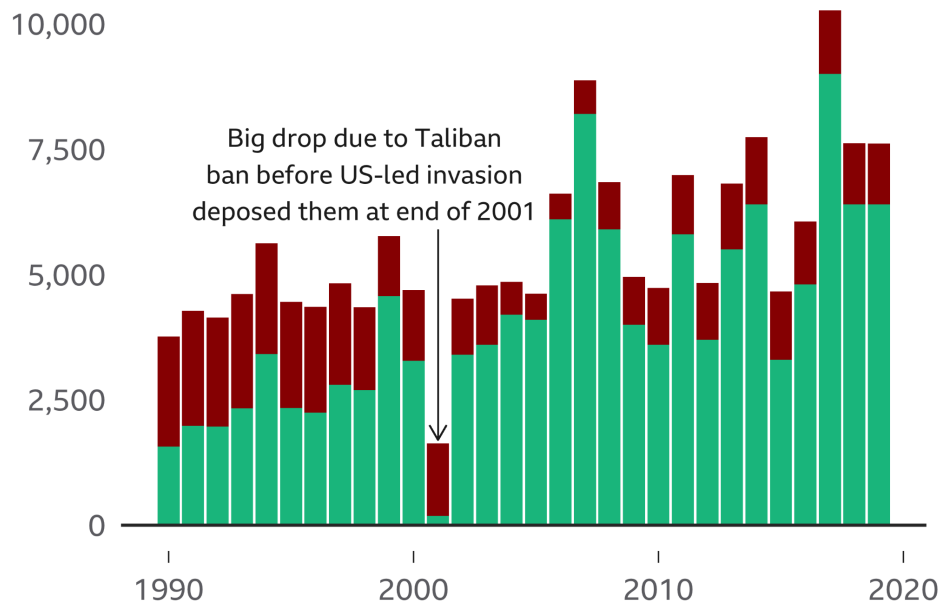
5.1.1 Exports

Afghanistan is the world's biggest producer of opium in the world. It is said Afghanistan has produced over 80% of the total opium or illicit heroin production. This number has been maintained and it has increased and decreased from time to time. It is said that Afghanistan has used more land growing opium than Latin America has used land growing coca.

Afghanistan is responsible for more than 80% of global opium production

Opium production in tonnes, 1990-2019

■ Afghanistan ■ Rest of world



Source: UNODC

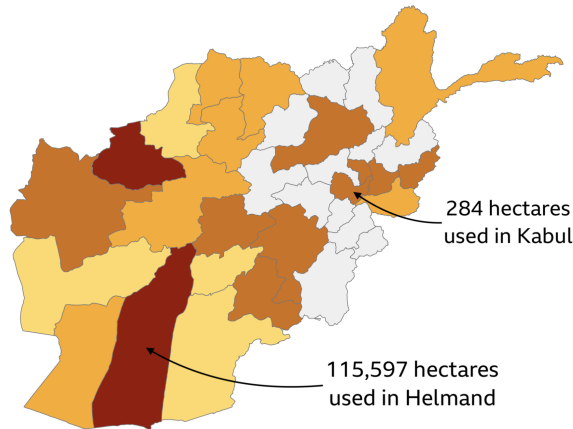
BBC

Figure 1. Graph which shows the total number of tonnes showing both Afghanistan and the rest to the

Opium poppy cultivation in Afghanistan

Hectares used by province, 2020

- Fewer than 1,000
- 1,001-10,000
- 10,001-20,000
- More than 20,000
- Poppy free



world. Source: UNODC



Figure 2. The hectares of land used for opium cultivation

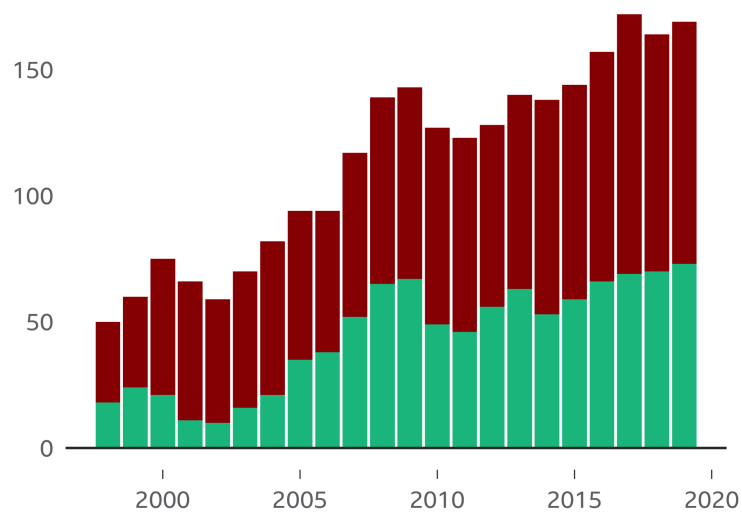
5.1.2 Imports

Since the opium poppy is a bit of a controversial plant and it has been banned in many different countries, the actual number of poppy imports is hard to track down or to know off. But what is actually known is the amount of tonnes of opium being seized around the world.

Amount of opium and heroin seized globally

Seizures in tonnes, 1998-2019

- Opium
- Heroin



Source: UNODC



5.2 Food items

The poppy seeds are mostly used in cuisine as a spice and as decoration to certain plates. These certain items include muffins, bagels, cakes and in some cases they are used in place of sesame seeds like in hamburger buns. Some people say that the presentation or the color of seeds is also important to the dish since it might look better with some and in some others it might not look as good. The poppy seeds are also used to make a paste in addition to other ingredients. Oil can also be obtained from the poppy seeds. They have been used in cuisine around the globe and from different cultures like Jewish cuisine and Indian cuisine. A side effect from eating big amounts of poppy seeds, you might get a false positive drug test when it comes to opiate drug tests.



Figure 1. Poppy seed Roll Makowiec (Roleck, 2022)

5.3 Medicine

The opium poppy plant has been used in medicine many times. These medicines are called Opioids and these opioids can be naturally found inside of the opium poppy plant. They create an effect in the brain which can produce different effects which include painkillers or illicit drugs like heroin. These opioids block off pain signals between the brain and the section of the body. This reduces the pain that the person or patient feels but they also start feeling relaxed and like any other drug, they can feel “high” which can often lead to addiction. If they are regularly prescribed, your tolerance to them can increase which means that higher and more frequent doses are required which leads to what doctors call opioid use disorder which is addiction. Some other side effects may include respiratory depression which slows down the rate in which you breath or in some cases can even stop your breathing or it can increase if you haven't consumed any opioids beforehand or if you are taking other drugs which might interact with the opioid. (Butanis, 2018)

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