



FACULTY OF AGRICULTURAL SCIENCES AND ALLIED INDUSTRIES

Opium Poppy - Importance, chemical composition, origin, distribution, area, production, climate and soil requirements, varieties, propagation techniques, planting and after care, nutritional requirements, plant protection, harvesting, grading and processing.

Importance and chemical composition

- Opium poppy (*Papaver somniferum*) is an annual herb belonging to the family, Papavaraceae.
- It grows up to a height of 60-120 cm. It is an important medicinal plant, the source of over 40 alkaloids including psychoactive agents, a great boon to psychiatry for the treatment of mental and nervous diseases and to medical research.
- The commercial product 'Opium' is an addictive narcotic obtained from the latex of capsules of the opium poppy, the source of a number of very valuable alkaloids like **morphine, codeine, narcotine, papaverine and thebain**.
- Other minor alkaloids include **aporeine, codamine, cryptotopine, guoscopine, hydrocotarnine, laudanine, narcotoline, neopine, oxynarcotine and papayeramine**.
- The seeds do not contain any alkaloids, but are also reported to contain a high percentage of linoleic acid which lowers blood cholesterol in the human system.
- The alkaloids, morphine and codeine, are widely used as sedatives to relieve pain and induce sleep, in addition to their use against cough. Opium is a very valuable but dangerous drug.

- It should be used in very limited quantities and under the strict supervision of a physician.
- In India, this plant is mainly cultivated for its latex (opium) and the seeds come as a by-product.
- These seeds are quite a rich source of fatty oil and protein and, in many countries of Europe, employed as a major source of cooking oil.
- The seed is also an important culinary item in India.
- It is extensively used in the preparation of native confectionery, pastries and bread.
- In some places, the young plants are also consumed as a leafy vegetable.
- Its cultivation has to be done under the strict control of the Central Excise Department and it cannot be cultivated everywhere.
- It can be grown only in those areas specified by the Government of India.

Origin

- Opium poppy is supposed to have originated in the western Mediterranean region and from there it has spread through the Balkan peninsula to Asia Minor and India. Since antiquity, its cultivation has been in vogue in Italy, Greece and Asia Minor. It was during the 15th century that the herb was introduced in India.

First, it was cultivated along the sea coast and later penetrated into the interior of the peninsula.

Varieties

- The most popular varieties grown in the country remain in the field from 140 to 160 days. The following are some of the important varieties of which Talia, Ranghatak and Dhola Chota Gothia are popular varieties recommended for heavy black soils.

(i) Talia

It is sown early and it remains in the field for 140 days. Its flowers are pink and have large petals. The capsule is oblong, ovate, light-green and shiny (waxy).

(ii) Ranghatak

It is a medium-tall variety, maturing for lancing in 125-130 days after sowing. It bears white and light-pink flowers. It produces medium-sized capsules (7.6 cm x 5.0 cm), which are slightly flattened on the top. It yields opium of a comparatively thin consistency that changes to a dark-brown colour on exposure.

(iii) Dhola Chota Gotia

It is a dwarf cultivar (85-90 cm), bearing pure white flowers and light-green capsules which are oblong-ovate in shape. It is ready for lancing after 105-115 days of sowing and matures for seed in 140 days.

(iv) MOP-3

This variety has been developed at the Jawaharlal Nehru Krishi Vishwa Vidyalaya, Mandsaur, recently. It bears pinkish-white flowers comprising of large non-serrated petals. Its capsules are ready for lancing 120 days after sowing and the variety is recommended where adequate irrigation facilities exist in the later part of the season.

(v) MOP-16

This is another promising selection made at the Jawaharlal Nehru Krishi Vishwa Vidyalaya, Mandsaur. The plant bears white flowers with serrated petals and round, flat-topped capsules. This is comparatively drought tolerant and is ready for lancing 105-110 days after sowing. It is recommended where an early maturing crop is preferred.

(vi) Shama

This variety was released by the CIMAP, Lucknow during the year 1983. The main alkaloids like Morphine (14.51-16.75%), Codeine (2.05-3/24%), Thebaine (1.84-2.16%), Papaverine (0.82%) and Narcotine (5.89-6.32%) in this variety are reported to be on higher side than the existing commercially cultivated variety. It yields 39.5 kg of latex and 8.8 kg/ha of seeds.

(vii) Shweta

This variety was also released by the CIMAP, Lucknow, along with Shama. However, it is reported to be superior to Shama in the content of the main alkaloids-morphine (15.75-22.38%), codeine (2.15-2.76%), thebaine (2.04-2.5%), papaverine (0.94-1.1%) and Narcotine (5.94-6.5%). It gives an average yield of 42.5 kg of latex and 7.8 kg/ha of seeds.

(viii) BROP 1 (Botanical Research Opium Poppy-I) (NBRI-3)

It is a synthetic variety developed at the National Botanical Research Institute, Lucknow, by crossing selections from Kali Dandi, Suyapankhi and Safaid Dandi. This variety is highly adaptable to varied agroclimatic conditions and gives a higher yield than national checks. It is moderately resistant to diseases. It yields about 54 kg/ha of opium and 10-13 q/ha of seeds. The morphine content is 13% and above pose a problem, since they remain wet during the rains and are too difficult to cultivate in the dry period.

(ix) Kirtiman (NOP-4)

It was developed at the Narendra Dev University of Agriculture and Technology, Kumarganj, Faizabad, through selection from local races. The variety is moderately resistant to downy mildew. It yields 35-45 kg/ha of latex and 9-10 q/ha of seeds. The morphine content is up to 12%.

(x) Chetak (U.O.285)

This variety was developed at the Rajasthan Agriculture University, Udaipur. It is moderately resistant to diseases. The opium yield is up to 54 kg/ha and the seed-yield is 10-12 q/ha and contains up to 12% morphine.

In general, the crop needs long cold season (20°C) with adequate sunshine in the early season for a healthy vegetative growth; heavy rains after sowing cause loss in seed germination. Warm, dry weather with a temperature of 30-35°C is required during the reproductive period. Cloudy weather, frost, hailstorms and high gusty winds, particularly during lancing, causes immense damage to the growing crop. Dry, warm weather conditions in February-March favour a good flow of latex and results in higher yields.

(xii) Jawahar Aphim 16 (JA-16)

It is a pure line selection of 10Callandraces developed at the Jawahar Lal Nehru Krishi Vishwa Vidyalaya, College of Agriculture, Mandasaur (Madhya Pradesh). It is moderately resistant to downy mildew. It gives 45-54 kg/ha of latex, 8-10 q/ha of seeds and contains up to 12% morphine.

Recently, another three varieties: 'NBRI-3' of opium, 'Sujatha' an opium-free poppy for the production of oil and seed and 'Shubhra' for high morphine and seed yield have been released from the NBRI, Lucknow, RRL, Jammu and CIMAP, Lucknow.

• **Soil**

- The opium crop needs deep clay loam, highly fertile and well – drained soils with a pH range of 6.0 to 7.5. Such soils, containing adequate organic matter, retain moisture and there is no need of irrigation during lancing. However, with adequate manuring and use of fertilizers even light, loam to

sandy-loam lateritic soils can give high yields under good management. Heavy clay or fine sandy soils generally sowing for correcting zinc deficiency 12-30 kg/ha of zinc sulphate should be added.

Sowing

Poppy seeds should be sown in a well prepared soil. The field should be given 5-6 cross ploughings followed by planting. The land should be divided into small plots to facilitate irrigation. The seeds should be treated with thiram (405 g/kg of seed) to protect the seeds against soil borne pathogens. The seeds are sown between late October to mid November. After sowing, seeds are covered by a thin layer of soil followed by a light irrigation.

Fertilizer application

The crop requires nutrients required for flowering and capsule formation. A fertilizer recommendation of 90:50:30 kg NPK/hectare is followed.

Irrigation

The first irrigation is given, immediately after sowing, if there is not enough moisture available in the soil. For subsequent irrigations, 7-10 days irrigation schedule is the optimum depending upon the weather and soil conditions. A total of 10 to 15 irrigations are required for this crop.

Flowering and fruit set

After about 90 to 100 days of sowing, the plants which are waist-high begin to flower, i.e., flowering will take place during first week of March, if the crop was sown during the second fortnight of November. Usually after 3 days of flowering, the petals fall off and after another 10-14 days the capsules are ready for lancing.

Pest and diseases

Insects

1. Cutworms (*Agrotis suffuse*): This insect can be controlled by flooding the field water and dusting the crop with 2% Carbaryl.
2. Weevils (*Stenocarus fuliginosus*-root weevil and *Cautorhynchus maculalba* – capsule weevil).

Diseases

- **Downey mildew and powdery mildew** : This disease can be controlled by the application of Dithane Z-78 (0.4%)
- **Other diseases** : Root rot ,leaf blight, cabbage ring spot virus, beet yellow virus and bean yellow mosaic virus

Lancing and latex collection

The lancing operation is performed by skilled labour (an average of 6 persons to a plot), usually on bright sunny days between noon and 4 p.m. The hottest part of the day is chosen, since the pellicle is said to form on the surface of the freshly exuded latex due to the hot sun, resulting in a greater degree of evaporation and quicker thickening. This also helps prevent the latex from falling off the capsule. The lancing operation is started at the edge of the field and the person works backward to avoid contact with the exuding latex. The hand is quickly passed over a capsule with the exuding latex. The hand is quickly passed over a capsule and a subjective decision is made as to whether it is ready for incision or not.

The lancing instrument, called “Nastar” or “Naka”, comprises of four lines about the dimension of ordinary needles spaced at 1.5 to 2mm apart and affixed to a holder about 18cm long. The nester is held carefully, as one holds a pencil while writing and the incision is made by a swift downward stroke starting just below the stigmatic rays. The depth of the incision is controlled by the affixation of the lines to the holder, for if incisions are too deep the latex is exuded to the interior of the capsules and is thus lost. If the cut is too shallow the yield of latex will be low, usually, an incision with a depth of 0.4 cm is considered ideal. About 150-200 capsules can be lanced per hour by an experienced worker.

Immediately on lancing, the latex exudes; it is initially milky and

gets accumulated in the outer wall of the capsule. It quickly darkens and dries during the course of the day and is generally collected the next day before 10a.m. by scraping with a trowel called the Seetoah. The collection may also be delayed for one or two days, depending upon the 'appearance' of the capsules and the vigor after the latex flow. In other words the interval is subjectively determined by the collator. The lancing process is usually repeated twice, making a total of series of vertical incisions. The spacing of the incisions on the capsule is generally even. If the capsules are exceptionally, large, four to five lancing can be done. The air dried latex, which has now become blackish in colour, is scraped from the capsules into small earthenware pots which are lined with polythene sheets. Scraping is carried out by grasping the capsule between the thumb and forefinger of the left hand and including it gently, the scraper is then drawn upwards. The capsule is finally 'cleaned' with the thumb.

The semi-dry, blackish latex is then transferred to wooden trays and dried further, upon arrival at the factory, appropriate samples are drawn from each grower's produce and their quality is determined in the laboratory of the Chief Opium Chemist. The material is graded according to morphine content as follows:

A = With morphine content more than 12%.

D1 = With morphine between 11 and 12%.

B2 = With morphine between 10 and 11%

B3 = With morphine between 8 and 10%

Processing, Harvesting of seeds and Yield of crude opium and seed

The crude opium is transferred to the appropriate storage vats capable of holding 3 to 30t. The opium of variable consistency contained in these tubs is removed as require and is carefully air-dried in the sun to 70° consistency. The drying generally takes 21 days and is carried out in wooden trays, by turning the latex 3-4 times a day. Sun drying is considered a critical process, since artificial drying causes a substantial loss in alkaloid content. Each processed tray comprises of 36kg of opium with 70° consistency. The opium is then packed in polythene bags, each containing 5 kg of the product, which is then shipped in wooden chests; 60 kg chest for sir-freight and 50 kg/chest for surface shipment. In addition to export, a small amount of 90° consistency opium is prepared for domestic quasi-medical purposes. This is called 'Government Excise Opium' and is available in cubical cakes. These are wrapped in 'butter paper' tied and stamped and shipped to various states where the opium is taxed and sold to those who are duly registered as addicts and consumers.

Harvesting of seeds

The capsules, after the lancing operation and collection of opium latex, are allowed to dry on the plant itself. The drying process takes about 15 days after the lancing is completed. In India, the capsules are plucked by hand and the seeds are separated after breaking the capsules. Are plucked by hand and the seeds are separated after breaking the capsules. A dry capsule weighs about 7g and it contains 11 to 12 thousand weighing about 3.5 to 4g.

Yield of crude opium and seed

On an average 25-30 kg/ha of crude opium and 400-500 kg/ha of seeds are obtained in India.



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