



Industrial Hemp Harvest and Storage

Best Management Practices

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Adapted for UK Hemp usage July 2022 by Steve Glover. Please note for guidance only.

Hemp Seed Food Grade Requirements – Physical Properties

UK Hemp requires hemp seed that is of good food grade quality, dry and sound, and complies with the following standards:

Variety 2022: Finola only or by arrangement.

Colour and appearance: Grayish-brown seeds. Mature good quality hemp seeds will have dark markings on them.

Flavour and Odour: Slight nutty flavour and odour.

Size: Seed should be passed over a 2mm screen to create grade A quality. Grade B quality is also acceptable but at a lower price point.

Purity: Seed should be cleaned to 95 per cent purity. Weathered, immature or frozen seeds have a colourless light brown seed coat. All poor-quality seed must be removed through the cleaning process. The presence of gluten bearing seed, ergot or bindweed seed will not be tolerated.

Peroxide level is a grading factor carried out by the industry. Peroxide values are a measure of rancidity that may occur in the sample.

Industrial hemp processors prefer a grain sample with a peroxide value under 2 meg/kg. Growers can reduce the peroxide levels by minimizing seed injury during harvest, cleaning and handling. This can be achieved by harvesting at the higher range of the acceptable per cent seed moisture



content and by slowing down the speed of the augers, harvest and cleaning equipment and using belt conveyors where possible.

Toxins/mycotoxins: Must have acceptable levels of coliform and e-coli – ***please see details regarding testing on page 14***

Moisture content: Should not exceed eight per cent.

Note: *seed will be rejected if the moisture content is any higher than eight, producers should aim for 7%. If seed arrives into our machinery above 8% it plays havoc with our processes. It will be tested upon arrival and will be sent back to the supplier at his own cost if found to be above 8%. Moisture meters are for sale on our website www.ukhempltd.co.uk <https://ukhempltd.co.uk/products/draminski-twistgrain-pro-hemp-grain-moisture-meter> and we would strongly advise purchasing one.*



Photo 1a: Hemp seed in hull with some green



2. Assessing Maturity

Currently industrial hemp is grown primarily for seed for UK Hemp with varieties selected for short height and low fibre production.

Crop height is also influenced by photoperiod. Flowering and seed set is triggered by shortening daylength. In northern areas, the crop will grow taller with longer daylength prior to setting seed.

Most industrial hemp varieties are dioecious where male and female plants are separate in an approximate 50:50 ratio. The male plants flower and pollinate the female plants. After pollination, the male plants die off and the female plants continue to grow and set seed.

Some monoecious (male and female reproductive parts on same plant) varieties exist and are mainly bred for fibre production.



Photo 1b: Clean, high quality hemp seed in hull

2.1 Environmental conditions



Wind and hail are two important environmental conditions that need to be considered when assessing harvest timing. Hail can impact both seed and fibre production. The weaker male plants generally get damaged by these conditions more than female plants. Damaged plants will often branch out and regrow, which can minimize losses for fibre production. However the regrowth may cause staging problems for seed harvest. If growing for seed, assess female plants for seed production and harvest at the stage that provides optimum seed yield with minimal immature seed.

Hemp can tolerate mild frost down to -5°C for a short period without harm to mature seeds or crop growth. A killing frost will hasten maturity and can act like a desiccant. If a killing frost occurs, seed will mature rapidly and a harvest is recommended within a few days to prevent yield loss and harvest difficulties due to dry stem fibre. For taller, later maturing hemp varieties, a killing frost can be desirable as it can help to expedite harvesting. Like any crop, harvest timing must balance weather forecasts and the potential for yield and quality loss due to wind, wet weather and frost conditions.

2.3 Assessing maturity for grain and dual purpose varieties

Harvest timing for grain is aimed at maximizing seed yield and quality. Hemp has indeterminant growth. Seed maturation starts at the bottom of the seed head and moves upwards, resulting in mature seeds lower down and immature green seeds at the top of the seed head. Additionally, once mature, the seed bract that holds the seed dries out, and the seed can shatter quite easily, resulting in significant seed loss.

Birds can also damage seed crops. As the hemp seed matures, bird feeding may cause shattering and seed loss – an additional harvest timing consideration.

Consideration should be given to harvest capacity of both the combine and grain drying equipment. For larger acreages or lower grain drying capacity, start combining at higher seed moisture content so that the harvest can be completed before the crop becomes too mature and shattering losses occur.





2.4 Moisture content at harvest:

General harvest seed moisture content Finola 12 – 16%. To limit seed loss from shattering and birds, hemp is combined green at higher moisture content than is safe for storage. This harvest stage also helps minimize the difficulties in handling drier fibrous stems. Moisture content of seed at harvest varies, with shorter grain varieties generally harvested with a slightly hard kernel and taller varieties at higher seed moisture content with a softer kernel. **Please see note above regarding moisture meters on page 2.**

Hemp seed harvested tough (See Section 2.5) requires immediate aeration within three to four hours of harvest to maintain optimal quality. Heated hemp seed will oxidize resulting in poor quality oil and food products. Combine capacity should be matched with aeration and grain drying capacity. Safe storage moisture content is below 8%.

2.5 Visual assessment

When hemp seed is harvested tough, the seed heads (flowers) will still be mostly green. A few of the leaves on the seed head will be turning brown. The stem fibres will have shed most of their leaves, but have not completely matured, making the stem easier to handle with harvest equipment. The seed hull will become brownish and firm.

The seed head will dry from the bottom of the seed head towards the top. The seed at the junction of the stem and leaf stalk at the bottom of the seed head will ripen first and turn motley grey in appearance. The ripening of the seeds inside the seed head will start at the inside of the flower and move outwards. The bracts holding the seeds will dry out and shrink when the crop is ripening, exposing the seed and subjecting the seed head to shatter loss. Some of the leaves on the flower may turn purple as the crop matures.

3. Combining and Straight Combining

Prior to harvest, ensure all equipment, including combines, trailers, augers, grain cleaners and storage bins are dry and free of foreign material. Purity



standards are very high at 95 per cent, and contamination with other crops, especially wheat, weeds and foreign material can result in higher cleanout at the seed cleaner and reduced or rejected loads.

For most growers, straight combining is the preferred method of harvesting hemp for seed. The combine header is lifted to cut the crop just below the seed head, which typically is the top one-third of the plant (top 60 to 90 cm or 23 to 35 in.). This minimizes the volume of fibre moving through the combine, reduces fibre wrapping and increases harvest efficiencies. Often, shorter plants in the canopy may not have mature seed and are not worth cutting low to get the seedhead. Growers have reported that crops over eight feet high are difficult to harvest.

Seed moisture content determines straight combine timing.

Start harvesting when seed moisture content is 12 to 15 per cent (or less) for Finola.

3.1 Combine equipment requirements

Typically, shorter hemp crops like Finola can be harvested with most modern combines with little or no modification. Use draper headers for straight combining as they feed the combine more uniformly. Fibre stems may wrap on auger headers. New knives and guards are important to eliminate plugging.

Conventional and single rotary combines are preferred. Most growers use rotary or conventional John Deere or Case IH rotary combines. Larger capacity combines with conventional cylinders greater than 1.25 m (50 in.) help deal with the large, fibrous volume going through the combine. Dual rotary combines are less desirable as the risk of fibre wrapping and plugging of the opposing rotors is considerable. Straw walker combines have also shown promise and have been used successfully in the UK.



Feeder chains, shafts and exposed moving parts should be regularly checked for wrapping. Disable the straw chopper to drop the straw and prevent wrapping and plugging of the straw chopper.

Combine fires are a risk from wrapped fibre on moving parts and fine dust igniting on hot surfaces. Frequently monitor for fibre wrapping and keep hot engine surfaces clean. Some producers keep a water truck handy during harvest, certainly extinguishers should be available.

Combine speed should be set to provide uniform crop flow through the combine to prevent plugging and wrapping. Carpet knives are handy tools for cutting away wrapped fibre.

Clean all equipment out at the end of the day to prevent pockets of seed from heating and mixing with the next day's harvest.

3.2 Combine modifications

Growers have found that some modifications help to reduce or prevent fibre wrapping:

- Exposed moving parts can be shielded with puckboard or sheet metal to prevent wrapping.
- Deflectors can be added to keep the crop away from header reel ends and tonarrow the feed-house inlet to help keep fibre from wrapping on outer shafts and pulleys.
- ABS pipe can be placed over front drive shafts to prevent wrapping.
- Cables and hydraulic lines should be tied in close to the machine to help reduce fibre build-up.
- Extend header hydraulics by about 30 cm (1 ft.) to help raise the header higher for tall varieties.

3.3 General combine settings

Hemp seed is easy to thrash. The seed coat can be easily damaged, exposing the seed to oxidation of the oil, decreasing quality and risking possible rejection. Combines should be initially set to gently thresh the seed and adjusted as required to minimize seed loss out the back of the combine.



Cylinder speed: Initial settings should be similar to canola settings at around 450 to 500 RPM. Higher speeds may damage the seed and increase chaff going to the cleaning system.

Concave: With a seed size similar to wheat, standard small grain concaves are suitable. Set concaves similar to canola at 2.5 to 5.0 cm (1 to 2 in.).

Wider settings are used for drier crops to help reduce seed damage.

Fan Speed: Depends on crop maturity. More air is required for higher seed moisture to keep sieves clean and to help blow out immature kernels. Less air may be required if chaff is drier. Slightly less air is required than for wheat at 650 to 800 RPM but fan speed may range can up to 900 RPM.

Sieve/Shoe: Setting similar to wheat and slightly wider than canola (rapeseed). Try 8 mm (0.25 in.) bottom setting and 9 mm (0.375 in.) chaffer setting.

Rotor speed: Similar to canola recommendations of around 350–500 RPM at 17 to 25 per cent moisture content. Faster speeds for drier crops. Some growers report Massey combines may require slightly faster rotor speeds. Push the pitch of the flow bars to maximum slope to move fibre through the combine as fast as possible. Excess rotor speed may overload the cleaning system with green material.

Rotor concaves: Best results with wheat concaves in the front and slotted concaves in the rear of the rotor cage.

3.4 Hemp seed handling

Hemp seed can be easily damaged, resulting in decreased seed quality. Damaged seed hulls are more vulnerable to rancidity. When moving hemp seed from combine to dryer to bin to seed cleaner to processor, handle hemp seed gently:

- When unloading combines, reduce unloading speed. This will mean no unloading on the go.
- Conveyors are recommended.
- If using grain augers, run at lower speed and ensure augers are full.
- Use larger diameter augers of 25 to 32.5 cm (10 to 13 in.) rather than smaller 15 to 17.5 cm (6 to 7 in.) diameter augers.



3.5 Sampling

UK Hemp will require a bin grain sample after the grain has dried to their specifications. Hemp seed samples should be collected when moving grain into bin storage. Samples from each truckload should be taken at regular intervals and combined to create an overall representative sample for each bin.

4. Grain Storage

Hemp seed must be properly dried, stored and monitored to preserve grain quality. Heated or mouldy seed will result in the rejection of the seed for food use. Processors report that spoiled hemp is worth 44 to 55 pence per kg in the birdfeed market, substantially less than £1.50 per kg for conventional A grade seed.

Heating, sweating, evaporation and condensation may be excessive in parts of the bin leading to local pockets of mould growth (see Section 6.2). in the early stages of heating. seeds stick together and form lumps. This will lead to a rapid increase in free fatty acid content of the oil resulting in deterioration of oil quality. Heating in storage will lead to mould growth and, in some cases where the temperature is high, scorching of the seed will be obvious. Damage in the forms of heating or bacteria activity may also cause hot spots, fermentation and, in some cases, loss in weight.

Hemp seed may need to be stored for up to one year and even into subsequent years while processors source seed from their growers to meet their production demands. Properly dried and monitored hemp seed will store for one to two years without loss of food quality.

Note: *UK Hemp testing requirement enables us to confidently sell a top quality product into the UK market. Mycotoxin testing will detect any growth of fungus, peroxide testing will detect rancidity, microbiology*



testing will detect the presence of coliforms, ecoli etc. Please see detailed notes on testing on page 9.

When handling the seed, please remember that that ALL of our products are raw and have to be suitable for consumption raw.

5: Handling seed during harvest

Hemp seed can rapidly heat, within two to four hours of combining and must be immediately put under aeration or through a dryer to preserve seed quality. If harvest speed is slow, do not allow hemp seed to sit in the trailer at the side of the field for more than a few hours before getting it to aeration or drying facilities. Do not allow damp hemp seed to sit in the combine hopper or truck overnight.

The suitability of aeration or artificial grain drying will depend on the seed moisture content at harvest and ambient air temperature/humidity conditions.

It is essential to match grain drying and conditioning capacity to combine harvest speed. It is advisable to have excess grain drying capacity than to be under capacity and risk losing seed quality.

5.1 Storage type

When selecting storage systems for hemp, priority should be given to cleanliness, handling, conditioning and aeration capabilities. Hopper bins with aeration are the best choice. Flat metal bins with aeration flooring are also a good choice. Mini-bulk bags have been used to store hemp seed as long as the moisture content is eight per cent or less.

5.2 Grain temperature and moisture migration

More dried grain loses condition because grain temperatures are not controlled than for any other reason. Improper control of the temperature



inside the bin causes moisture to move or migrate from one part of the grain mass to another, where the moisture can accumulate and cause grain spoilage problems. When the air temperature decreases the grain along the bin wall cools down faster than grain in the middle of the bin. The difference in temperature starts air moving down the bin wall and toward the centre of the bin. As the air moves through the grain it becomes warmer and begins to pick up moisture from the grain. When the warm moist air hits the cool upper surface of the grain, condensation occurs. Moisture will concentrate on the sides of the bin and the cone at the top during autumn and winter. Flattening the cone can help prevent moisture build up.

In the spring moisture migration is reversed. The warming action of the sun on the outside of the bin causes moisture currents to move up the bin walls and then down the centre of the bin. Moisture condensation occurs at the centre of the bottom of the bin.

Hemp should be rotated when seasons change, fall to winter, and winter to spring, to minimize moisture migration and spoilage. This is done by removing the grain from the bin and rotating it back into the bin. The grain temperature equalizes and moisture fronts are broken up to help stabilize air movements.

5.3 Aeration

Full floor aeration or rocket systems in hopper bins are suitable for aeration to cool and dry hemp seed. Hemp seed is large, similar to wheat, and air moves through it easily.

One to three weeks of aeration is required to dry grain, depending on ambient conditions, grain moisture, fan and bin capacity. For nearly dry seed under 12 per cent moisture, a tube aeration system with medium fan capacity may be adequate. If ambient conditions are unfavourable, the addition of artificial heat with a propane heater can help dry grain down more quickly.



At higher seed moisture, a grain dryer may be required to dry the grain down to mid-teens and then a good aeration system using a full floor screen and high capacity fan, plus turning or moving the grain once or twice may be required to keep the grain cool and conditioned.

For aeration systems, a hopper bottom bin with a large capacity fan of five to 10 hp and a 100,000 BTU propane burner to add artificial heat is one of the best systems for drying hemp seed. Caution must be used when applying supplemental heat. Use low heat less than 35C to ensure the seed does not overheat.

Do not overfill aeration bins as the hemp seed may heat before the grain is dried and cooled to safe storage conditions. For seed below 20 per cent moisture, fill to less than 50 per cent capacity. Fill to no more than one-third bin capacity if seed moisture is above 20 per cent.

5.4 Artificial heat drying

In many installations a continuous drying system will not be able to handle the seed at the same rate at which it is being combined. Temporary holding of the wet seed will be necessary and it is very important to make provision for cooling in the pre-drying stage. Ventilation with ambient air at the rate of 0.6 to 0.8 m³/min/tonne should be adequate. At a depth of 1.5 m this would require a pressure of 2.5–5cm w.g.

For growers with artificial heat grain dryers, hemp seed can be quickly dried down to safe storage levels. Batch and continuous flow grain dryers are suitable. Batch dryers have an increased risk of developing hot spots during drying. Continuous flow grain dryers are recommended.

Use moderate heat. Plenum temperatures around 45C and air temperature in grain of about 35C. Overheating the seed can cause the seed to turn yellow and degrade the oil quality.

The seed should be cooled down to ambient air temperatures after drying prior to bin storage.



5.5 Monitoring

As a high-value crop, hemp seed should be frequently monitored during the first six weeks in storage to ensure the crop retains its quality. Continue to regularly check until delivery. Hot spots may develop that could mix with the entire bin and result in the complete loss of the bin.

6. Seed Cleaning

Once the processor calls for delivery, hemp seed must be cleaned prior to delivery.

In the case of smaller producers, seed can be cleaned after harvest and drying and kept on site ready for delivery. Storage should be in cool dark conditions away from strong odours.

Before commencing cleaning, ensure all grain handling equipment is cleaned, including augers, conveyors and trailers. Seed cleaning equipment will also need to be thoroughly cleaned to ensure cross contamination with other grains, especially wheat, does not occur.

Most seed cleaning equipment, including air and screen, indent and gravity tables, are suitable.

7. Rodent Control

Suppliers should have adequate rodent control measures in place and records should be available for inspection.

8. Storage

Seed should be stored in a cool dry place away from strong odours. If in bags they should be no more than 500kg.

Please note: Purity is a key issue with hemp seed, as UK Hemp have to meet gluten-free status.

This document should be read in conjunction with the UK Hemp Seed Specifications.



9. Testing:

Before seed can be accepted into processing the following tests should be completed at Eurofins. Please contact us for Eurofins code.

1: Mycotoxin

2: Microbiology

3: Peroxide

4: Heavy metals

5: Pesticide residue

6: Herbicide residue

10. Documentation required

Along with test certificates the following documents will be required

Copy of accreditation (red tractor etc)

Modern day slavery policy

Product liability insurance

Copy of Home Office cultivation license

Allergens statement

11. Transportation

Seed should be transported in 500kg grain bags on sound pallets. There should be no splits or holes and no evidence of rodent, insect or bird contamination/ingress.