

## Basic information on FINOLA Agronomy

### Crop Description

The FINOLA variety of industrial hemp (non-drug *Cannabis sativa* L.) is a short, rapidly maturing, dioecious, auto-flowering oilseed crop that was developed in Finland for hempseed grain production. FINOLA is correctly spelled with capital letters. The grain can be harvested with a modern combine. The resulting fiber/biomass from this variety is best chopped and lightly plowed into the soil. FINOLA is cultivated like other industrial oilseed crops, such as rapeseed. The typical seed weight for this variety may range from 12- 14 grams /1000 seeds, with smaller seed in cooler northern latitudes (>50° N) and somewhat larger seed in warmer climates (<50° N). Potential grain yields also vary; up to 1000 kg/ha in maritime climates near latitude 60° N and 2000 kg/ha in continental climates near 50° N. Over 3000 kg/hectare of conventional grain has been harvested under irrigation in Alberta, Canada. As latitude decreases, so does the height. This variety is short and not so productive between 30°N and 30°S. When soil, moisture and fertilization are optimal, the rate of development and grain yields are primarily dependent on sufficient fertilisation, moisture and the amount of thermal energy during the growing season.

**Field Selection:** For best results, sow FINOLA in warm, moist, well-drained soils that are rich in organic matter with high nutrient availability. Soil temperatures should be above 15 °C at the time of sowing. Many failures occur by sowing this crop too early, when soil and night air temperatures are still too low. Well-drained, sandy loams are best. Clay, heavy, compacted soils and low, poorly drained areas should be avoided (see the soil triangle at the end of this document). High microbiological activity in the soil will support vigorous growth through mycorrhizal symbioses under organic cultivation. A light to medium textured soil is preferable, between pH 6.0- 6.5 is best. Other oilseed crops, oats, rye and wheat can be vectors for disease, and are not recommended as fore crops for this reason. FINOLA is best preceded by perennial alfalfa/grass breaking crops, green manure plow downs, legumes, potatoes, or soybeans. Spice crops, such as cumin and caraway are also not recommended as fore crops, as volunteers can impart unwanted flavors into hempseed oil and other grain products.

**Weed Management:** Given a good start, FINOLA can be an effective weed suppressant. A quick, even emergence is the key to effectively compete with weeds, by rapidly creating a dense leaf canopy within the first month of growth. FINOLA will self thin to an optimal density, and it is better to have this crop compete with itself, rather than weeds. First time farmers should consider a sowing density between 30-35 kg/ha. Existing weed pressure should be minimised in the autumn, by harrowing and possibly herbicides, and (at least) with spring tilling and sufficient harrowing. Most herbicides will kill or damage hemp, if applied just before sowing. Perennial forages or green manure plow downs are good fore crops. Problem weeds include black bindweed or wild buckwheat (*Fallopia convolvulus*), wild oat (*Avena fatua*), pigweed (*Amaranthus* species), fat hen (*Chenopodium album*), rapeseed, caraway, coriander and other volunteer crops. *Fallopia convolvulus* seed is especially difficult to clean away from hempseed.

**Seeding:** The seedbed must be raked evenly and uniform; sow or drill seed 1 cm deep in warm, moist, weed free soil. Most failures can be explained by deep sowing (>2cm), especially in poorly suited soils. Lightly roll if heavy rains are expected after sowing. Late May to early June is an optimum-sowing window near 50° N, and mid May near 60° N. FINOLA can be sown earlier at lower latitudes. Expect germination in 2 to 4 days, and emergence within 4 to 7 days, depending on soil moisture and temperature. An optimal plant density of 100 plants/m<sup>2</sup> should be achieved for grain production by sowing 25-30 kg/Ha. First time farmers of this variety should consider a sowing density between 30-35 kg/ha. Cold nights can be detrimental, but not fatal. A higher sowing density (30-35 kg/ha) is recommended if your soil tends to form a crust after rain.

**Fertilisation:** Under good conditions, FINOLA will grow vigorously and requires sufficient amounts of nutrients. Apply fertilisation as for rapeseed (*Canola- Brassica napus*) with 15% additional nitrogen. A conventional NPKS (nitrogen, phosphorous, potassium and sulphur) fertiliser is recommended for FINOLA, applied at the same levels required to grow rapeseed; for example NPK (23-3-6) at 295-330 kg/ha, with an additional 10-20% N as urea or animal urine. These “fast” forms of nitrogen will accelerate vegetative growth during the first month. Apply additional K and S wherever soils are deficient in these elements. FINOLA will grow somewhat taller and produce more biomass with increased nitrogen fertilisation. Increasing fertilisation may also delay seed maturation, which is a concern at higher latitudes with short growing seasons. For environmental reasons, very high amounts of N and P are not recommended. Amounts up to 150 kg N/Ha may cause the crop to exceed 2 meters in height.

**Organic producers** are recommended to precede a FINOLA crop with a perennial breaking crop, such as clover or green manure plow down, with added urine or manure to increase nutrient availability for rapid initial growth. Reduce any weed pressure by plowing and harrowing prior to sowing. The seedbed must be as fine and even as possible. **Note!** Good soil, farming experience and proper nutrient levels are essential for successful organic oilseed hemp production. **Be sure to have enough nitrogen (N)!**

### **Disease and Pest Management**

Hemp has very few disease and pest problems in most places. Under wet conditions, *Sclerotinia sclerotiorum* (stem rot) and *Botrytis cinera* (gray mold/ bud blight) can be a problem. Early harvest is recommended to avoid fungal damage. Grasshoppers, gophers, the Bertha Army Worm, the Hemp/Corn Borer and Lygus plant bugs have been known to attack hemp in some regions. Note; there are no pesticides or herbicides that are registered for oilseed hemp in Europe. Pesticides and herbicides should not ever be used on FINOLA grain crops. Flocking migratory birds will be attracted to the mature seed in late autumn. Ideally, hempseed should be harvested just before birds begin to visit the field. Birds spread disease as they sit on the buds to eat the mature grain.

### **Sampling the field for THC**

FINOLA is a rapidly maturing variety of hemp, which requires some vigilance to recognise the correct sampling time. The beginning of flowering is typically 30 days after sowing, when male flowers begin to shed pollen, and flowering is sooner at latitudes below 50° N. The end of flowering for FINOLA is typically no later than 50 days after sowing under normal conditions, and even sooner at lower latitudes, also

under stressful conditions caused by drought or competition with weeds. According to the field sampling methodology described in EU regulations, the earliest sampling interval begins 10 days after the onset of flowering, which is about 30-40 days after sowing FINOLA. Flowering ends near 50 days after sowing. The latest possible sampling time begins 10 days after the end of flowering (about 60 days after sowing). Thus, field sampling may begin 40-50 days after sowing, and the latest possible sampling time can be no later than 60 days after sowing. Sampling times will begin earlier at lower latitudes (<50° N), especially under hot and dry conditions. Late field samples may sometimes result in THC levels over 0.2%. For more information, please download our 2.6 MB pdf, which has specific information and pictures of FINOLA's morphology and development: <http://www.finola.fi/>

### **Harvest conditions**

Approximately 100-130 days after sowing, the top third of the crop may be combined for grain while the plants are still “green” (70-90% seed head maturity). Harvesting while the crop is partially green will help minimize cutting and wrapping problems.

The main disadvantage at harvest is plugging the combine with stems and other moist vegetative material. Dry field conditions are essential for a good harvest. However, a dead and desiccated crop will be more difficult to cut, more prone to wrapping and subsequent fire hazard.

Mature grain can be harvested after 100 days near latitude 50° N and after 130 days near 60° N. Crops near latitude 40° N may be harvested after 70 days. Harvest should begin soon after birds are noticed in the field. Grain moisture should be at least 10-15% at the time of harvest. FINOLA should not be swathed. However, swathing can be successful in dry autumn climates, and if there is sufficient stubble to hold the swath up, off of the ground at sufficient stubble density (ca. 100 plants/m<sup>2</sup>).

### **Harvest methods and machinery**

The mature grain can be harvested with a standard grain combine, preferably with straight cut headers. Chop the remaining stalk and return the harvested biomass to the field, to decompose and contribute to the soil structure. A threshing drum and straw chopper work surprisingly well for this crop. While our grain producers use all types of harvesters, CIH rotaries, JD & NH conventional combines with draper headers seem to work best. Some minor modifications can be made to limit fibre wrapping, to speed up harvesting. Modest ground speeds and input rates, with initial high engine speeds, should help to limit potential problems.

Hemp fibres will wrap around everything and may burn, if left unchecked. Previous harvesting experience with flax (linseed) may be helpful. As always, careful attention by an experienced operator is the best way to prevent mechanical problems. In any case, the cutting knives must be sharp. Combines with straw walkers are recommended, while rotor models are not, because of wrapping problems and subsequent fire hazard. Machines that have a cross shaker on top of the straw walkers are easily blocked and difficult to unplug. Occasional checks should be made of the front beater, front drum, feeder chain, sprockets, drive axle, grain elevator axle heads and *any other moving parts*, inside and outside of the combine.

Claas and New Holland combines have worked well. The Sampo combines, especially the older models produced in Finland, are easily blocked, because there is no plate between the upper and lower chains inside the feeder house. For this reason, the header may need to be removed and checked, to unblock the feeder house every 2 hectares (5 acres). Concerning the concave; check the losses and quality in the hopper for air and screen settings and change the adjustments accordingly, as with other crops. Use rapeseed settings initially, with a slightly wider screen opening as a good starting point. Run without the vertical knives.

Reduce cylinder, rotor and unloading auger speeds to prevent seed damage while harvesting. Aerate grain *immediately* off the combine, down to about 9% moisture – this is critical to prevent seed heating, reduce mould growth and to preserve seed quality.

### **Drying and Cleaning**

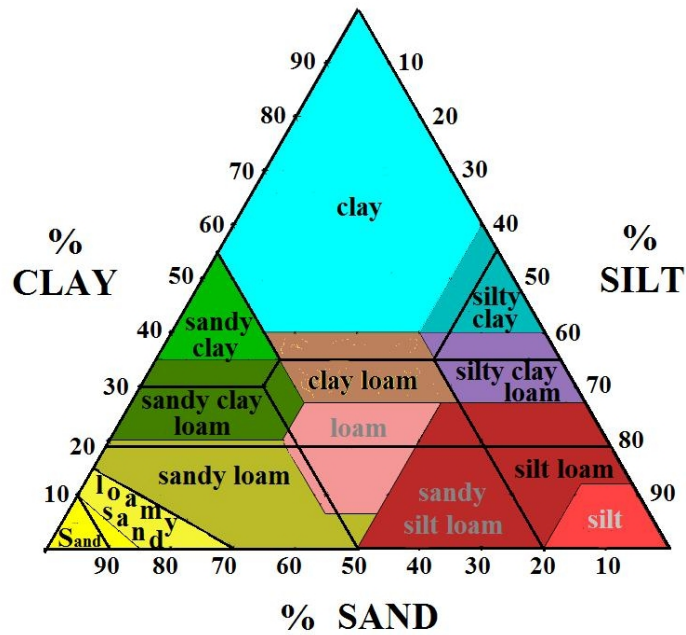
Drying facilities must be nearby and ready to *immediately* receive the harvested grain. In maritime climates, transfer combined grain to a heated trailer bed with ventilation. For the highest quality grain, *slowly* dry hempseed down to 9% moisture in a grain dryer, immediately after harvest, at *very low* temperatures (30-40° C max) and high volumes of airflow, for 10-14 days. Faster drying temperatures can be used for lower quality grain and animal feed. Grain moisture should be checked with a calibrated meter. Rapeseed moisture calibrations may overestimate hempseed moisture by about 2-3%. FINOLA grain can be effectively cleaned with the following sieve sizes; 1.60-3.25 mm oblong and 2.50- 5.00 mm round. A gravity table may be necessary to remove some unwanted weeds seeds.

### **Storage**

Do not store the grain for any amount of time without sufficient drying! Mould problems can ruin a good harvest within a few hours. Be sure that your drying facility is nearby and available at your harvest time, and be sure that your moisture meter is pre-calibrated for hempseed! Store dried grain in bins or 500 kg tote bags, away from birds, rodents and any other seed eating animals. Good quality hempseed should keep well for 2-3 years, if properly dried and stored.

**FINOLA grain and meal** are excellent sources of oil and vegetable protein for human foods and animal feed. Hempseed is lacking in the typical anti-nutritional agents that are found in rapeseed (glycosinolates), soya (protease inhibitors) and linseed (cyanogenic glucosides). Laying hens will produce *omega-3* eggs when feed hempseed, hempseed oil, oily sediment or the seed cake (meal) that remain after oil pressing. Pigs and all ruminants will enjoy 10-20% hempseed cake added to their normal rations. Horses will greatly appreciate one cup of hempseed cake as part of their daily rations. Seed-eating birds, squirrels and other rodents show a strong preference for hempseed over other foods. Most dogs will gladly eat hempseed products, but cats do not appreciate a vegetarian diet.

A soil textural triangle showing the subtle differences between the USDA (colours) and UK- ADAS (black lines) soil classes



For basic information on soil texture, visit:  
[http://en.wikipedia.org/wiki/Soil\\_texture](http://en.wikipedia.org/wiki/Soil_texture)