



STANDARDS/GRADING PLAN

Recommendations for CHTA to self-regulate for the protection
of the hemp industry in Canada

CTA Standards Committee
9/27/2017

STANDARDS/GRAADING PLAN

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DRAFT

BACKGROUND

Industrial Hemp; i.e., low THC (tetrahydrocannabinol) cultivars of *Cannabis sativa*, has been grown, processed and exported legally in Canada since 1997. In the intervening years, a thriving, vertically integrated industry worth an estimated \$Can 500 Million has developed (Stats Can export data plus domestic sales estimate and industry multiplier).

The primary economic driver has and continues to be hemp production for grain – the product grown by farmers for eventual processing into food for humans. Presently the hemp industry is multi-faceted and well established including: varietal development; development of seed stocks; cultivation and harvest; cleaning; transport; processing; distribution and sales.

The Canadian Hemp Trade Alliance (CHTA), established in 2003 to guide the growth and sustainability of the industry, recognizes that to ensure its members and their customers, in all levels and aspects of the industry, are kept safe both economically and health-wise. More recently, the CHTA has decided that a set of standards and grading need to be established and adhered to by all stakeholders. Standards need to protect and insulate the industry, and all our consumers, of all Canadian hemp products from the threat of recall, contamination and most certainly illness or death.

Considering nutritional products derived from hemp are, in general, packaged and served raw, the potential for microbial contamination is considerable. In terms of food, fiber and potential therapeutic quality and the huge potential for products to enter the international supply chain, the need for quality standards is paramount.

The Board of Directors of CHTA deemed that establishment of a set of standards and grading for all stakeholders of the hemp industry as a priority for 2016/2017. A Standards Committee was established and over a period of eight months, met regularly to discuss the needs of the industry and to determine the best means to present resulting standards and grades.

The Mandate of the Standards Committee

- a. To continue to address food safety during the handling, transport and storage of seed, grain and processed hemp products (and in time, fiber and chaff) by developing

- i. SOP for grain/batch sampling (and later, fiber and chaff) sampling
- b. Identify and establish the minimum microbiological (and physical) parameters to form the basis of an industry standard template for a Certificate of Analysis (C of A)(first for incoming grain and outgoing processed products and then later, for fiber and chaff) with the idea of meeting and or exceeding minimum health (and product quality) standards
- c. Provide rational and education/understanding of the various tests and results covered in a C of A
- d. Provide a clear understanding that the Canadian hemp industry produces both conventional and certified organic outputs.

STANDARDS/GRADING - MEMBERSHIP FEEDBACK FROM 2016 CONVENTION

A major focus of the committee was to determine if the standards and grades were to be considered as guidelines or as strong, self-regulated requirements.

I believe the quicker CHTA gets a consistent set of standards that everyone in Canada follows.....the quicker Health Canada can put us in the Agri sector vs substance control. So, if the CHTA posts standards for spec requirements, everyone in this industry must get on board. Perfect. Forces change from seed to shelf.

Has anyone done research on standards worldwide? I have tried many times to find standards in other countries, but is not as easy as one thinks. I will reach out again to a few contacts I have. I'll throw that in when/if they come.

No consensus was reached before the committee began compiling a draft plan for presentation at the 2016 CHTA AGM and Conference held in Saskatoon, SK, – November 14 to 17, 2016, with the goal to inform CHTA membership about standards and grading options, the direction to be taken and to achieve support for:

- 1.) A staged plan (standards for nutritional hemp first, then fiber, followed later by standards for chaff (flowers and leaves) as each of the later industry sectors mature

I HIGHLY disagree with this flow of events. As the new government is considering the allowance of CBD's, and we have hopes that Hemp can tag along to get placed into the Agri sector, it only makes sense to do both hemp

foods and Chaff simultaneously. Imagine CBD rules passing in what ...a few months, and there are NO standards? Canada does not need to be the last in the world when we have ALL the raw materials. There should be a loosely based standard set now (based on other countries, like Germany or the Netherlands who are far more advanced).

- 2.) An overall goal to strive for consistency in product handling, batch sampling and laboratory testing achieved by CHTA partnering with an agency that could provide Good Agricultural Production Practices (GACP) training such as Herb, Spice and Specialty Agriculture (HSSA) leading to a requirement for production and processing membership to be trained in GACP
- 3.) A direction to make standards self-regulated by CHTA Yes, until Health Canada gets on board. We need to be prepared and practicing quickly with a set of standards.
- 4.) The CHTA to take on some responsibility for “holding to account” the various commercial laboratories that conduct THC and other physical parameter testing to insure “consistency in both precision and accuracy” for their members (a responsibility that could be shared with the Canadian Grain Commission in the event CHTA moves toward having hemp registered officially as a grain).

The response from membership was highly positive. At the November Convention the Standards Committee structured discussion groups around the topics of:

- Minimum Standards for Food Safety
- Grading and ‘Nice to Haves’
- THC/Sampling
- Seed Growers/Seed Grades

Following the outcome of the Standards/Grading related symposia presented at the conference, the standards committee pledged to prepare a draft standards/grading document to be presented to the CHTA board by ~~May 01, the end of 2017~~ for review and ratification. The draft document would cover the committee’s attempt to achieve consistency in sampling, testing, product handling.

RECOMMENDATIONS AND REQUIREMENTS

In the case of industrial hemp grain and fiber, developing a set of standards/grades was not deemed to be a difficult proposition as most of the up-front work was already in place with templates available from other processors, agencies and associations. These templates, ready electronic access to the original references and the minimum standards deemed necessary by the committee will be presented in a staged manner (i.e.; grain, fiber, chaff). The difficulty will come in getting these three conditions met:

1. Generalized industry acceptance,
2. Implementation of standards and grades, and
3. Enforcement of the grades and standards.

To achieve the three conditions, it is incumbent on the committee to recommend that;

- CHTA members, in good standing, adopt and adhere to the standards and grades established.
 - Best achieved by production and processing members being mandated to receive training and regular updates as it relates to GACP from an agency certified to provide the training such as, Herb, Spice and Specialty Agriculture (HSSA). Proceeding with the overall goal of establishing and maintaining consistency for grades and standards, and doing so by self-regulation.
 - The Standards Committee determined that CHTA could consider reaching out to all laboratories providing THC, microbial and general physical parameter testing to confirm that they were following accepted analytical procedures and using certified test standards.
 - ~~The Standards Committee would be required to draw up a draft RFP to choose a laboratory to screen (by means of round robin testing, to be repeated annually) all other commercial laboratories who wish to be listed on a “preferred service providers list”.~~
 - ~~In order to be listed and to remain in good standing (through annual reviews), accredited labs must show close adherence to accepted analytical procedures and documented use of inventoried test standards and standard solutions.~~

This recommendation will require significant:

1. Budget expenditure consideration.
2. Board involvement in terms of formulation and ongoing support for a self-regulatory oversight committee.
3. **This should not be as costly as it seems. You have 3 large manufacturers of Hemp in Canada that started together 18 years ago,**

that info should be given freely to add to the alliance. Discussion with labs are free. Gather other countries standards so that we are not missing possible pigeon-holed issues with certain types of tests demanded by other countries. Yes, to the yellow crossed out below ☺ This is an alliance, we all must contribute for the industry. Period. No exceptions. Like the old days when guilds were started. All for the greater good of the industry.

4.

~~Note: The expense and heightened level of responsibility to CHTA for the last two features can be minimized if CHTA resolves to have hemp registered officially as a grain crop under the auspices of the Canadian Grain Commission.~~

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HEMP STANDARDS

Seed Varietal Purity

Seed varietal purity for hemp, as for other seed crops in Canada, falls under the auspices of the Canadian Seed Growers' Association. As a result CHTA would have no requirement for establishing standards or grades as it relates to hemp planting seed.

The CSGA is responsible for the certification of seed crops in Canada, for crops other than seed potatoes. Its *Canadian Regulations and Procedures for Pedigreed Seed Crop Production* (Circular 6) sets out the requirements to produce pedigreed seed crops in Canada. Specific requirements include limitations on previous land use, isolation of the crop from contaminating pollen sources, absence of harmful contaminants, relative freedom from weeds that have seeds which are difficult to separate from hemp planting seeds and varietal purity. A pedigree hemp seed crop, for planting seed, must be inspected by an authorized seed crop inspector at least twice prior to swathing or harvest.

http://seedgrowers.ca/wp-content/uploads/Circ6-ALL_ENGLISH_Rev01.11-2016_20160127_Final_Complete.pdf

Rationale for sampling, sampling technique, sample testing, lab technique and method verification

Presently, the major economic driver of the Canadian Hemp industry is grain production and processing. In the near future fiber and chaff processing expected to also become significant economic drivers.

As a food source, and one that is largely sold raw to the consumer, there is a significant consideration to keep the products safe from microbial contamination. **This point should be mandatory: there MUST be a kill step that will not destroy the natural factors of the food implemented. Not every country has demanded this in the past.....but they are now.** There is also a considerable effort to maximize/maintain the natural aesthetics of the numerous hemp food products so that the look, taste, feel and smell of the product can be replicated and standardized. In every case, from grain in farm bins to finished product going into packaging and then out on to store shelves, regular sampling is required. Sampling done for the purposes of

microbial and physical property analyses, if done correctly and with reliable consistency and verification, can lead to clear results. Done improperly, sampling can be seen to add bias, inaccuracy and even lead to microbial contamination of a sample batch. When test results from sampling often determine if a seed lot or product batch is to be purchased or not, there is a significant economic incentive to ensure that sampling is done correctly, every time, by all participants. Getting it wrong can spell disaster – setting in motion a chain reaction of questionable decisions made on bad information.

We see this problem as well in our own business; farmers need standards first to comply with, as that is where most of the issues come from like Enterobacteriaceae which presumably is harmless but customers in the USA only know their standards have limits. This particular bacteria may be from the plant laying in water for too long without being taken off the field.

- **IN AGRICULTURE, SAMPLING IS LIKELY ONE OF THE MOST IMPORTANT OBJECTIVE INDICATORS OF LOT STABILITY, HEALTH AND IN MANY CASES, PRODUCT VALUE.** In the hemp grain and processing part of the industry, sampling is required at all levels of production and processing. Important decisions are made based on the various tests conducted on sampling. Examples:
 - Testing moisture levels of seed in farm bins, before seed is cleaned, determines when and how the product can be transported and handled by the cleaner. After sampling and testing, and being off by as little as 2 percentage points for moisture could result in an entire seed lot being contaminated with mold. Exactly, which can then get spread throughout the milled load
 - Microbial test samples - the sampler fails to wear sterile gloves and inadvertently introduces– *E. coli* into a sample, which could lead to an apparent contamination of the entire lot. Such a costly mistake need not occur.

Standard Operating Procedures and Good Agricultural Collection Practices (GACP)

Herb and Spice and Specialty Agriculture (HSSA) presently delivers the Good Agricultural Collection Practices (GACP) training for CHTA. The training has been funded through proposal submissions to GF2 provincially. Cost is approx. \$1500 per workshop. To date 50 farmers have attended the training, at no cost to the farmer. Why has the farmer not been charged to do this

workshop? If this is their business, there is something called “continuing education” that is any profession is mandatory. The training has been delivered in 2 formats – one day or two-day session. The one day session allows for producers to begin work on their own farm SOPs and to receive critical review by their peers. It is very helpful if a processor is in attendance. Once training is complete farmers receive a certificate. They are encouraged to maintain this credential by annually submitting back to HSSA’s five SOPs that identify risk, how they addressed the risk, and how they have proved it – i.e., via an annual audit process. Users do this independently. CFIA recognizes the GACP training as ‘technically sound’ and believes this training should be considered as mandatory, or could become part of hemp industry ‘Best Practices’. GACP is part of the AgriRisk Project and a guidebook will be available later in 2017.

FOOD SAFETY - “MUST HAVE”

General

As industrial hemp and the various nutritional products derived from the grain (Hulled Seed, Protein Powder and Hempseed Oil) is largely distributed and consumed as a raw ingredient, there is a risk that contamination from harmful micro-organisms may cause disease in consumers. Therefore, once correct sampling is conducted and the sample is sent off to an accredited laboratory, the CHTA suggests that the below listed set of tests are to be conducted to determine if the representative sample, and by extension, the entire grain or product lot meets minimum safety standards. This short list of required tests is very effective in identifying dangerous parameters, thereby protecting consumers and the industry from significant food safety hazards that could result in illness, recalls, and damage to the reputation of the hemp industry. **This is where experience comes into play; we have found the perfect temperate climate for the warehouse and for shipping containers year-round. That needs to be part of the standards and is extremely important for shelf life.**

The list of tests and data points – used to identify specific microbial and environmental conditions that are considered detrimental to human health and for the hemp industry - when considered together, form the basis of a Certificate of Analysis (C of A) report, which is a document that should accompany every grain or product shipment.

Currently, buyers use a variety of parameters for purchasing and selling hemp food products. Many of these are quality related, favoring subjective vs objective means to qualify a product as acceptable or not. The CHTA requires that the subjectivity factor be minimized in favour of a set of ‘minimum standards’ based on objective, scientific method, and that these “minimum standards” be honored and accepted ~~protected~~ by Canadian hemp industry members. The list of tests to achieve the “minimum standards” when looking to detect Food Safety Hazards includes the following:

- i. *Escherichia coli (E. coli)* bacteria that live naturally in the intestines of cattle, poultry and other animals (including birds, humans and rodents). Raw fruits and vegetables can also become contaminated with *E. coli* while in the field, through improperly composted manure, contaminated water, wildlife and contaminated harvesters. Most *E. coli* are harmless to humans, but some varieties carry genes that allow them to cause disease.¹
- ii. Total coliforms include bacteria such as *E. coli* and are a general indicator of cleanliness and microbiological purity.
- iii. Salmonella bacteria, like *E. coli*, are found naturally in the intestines of animals so when manures are used as fertilizer or when feces are introduced incidentally, raw food crops can be contaminated, leading to disease and illness in humans.¹
- iv. Standard plate count (SPC), Aerobic Plate Count (APC) or Total Plate Count (TPC), all of which can be used interchangeably, are indicators of general cleanliness and have the potential to create sensory and shelf life issues in hemp food products. In general terms, they are any microbe/bacteria, helpful or dangerous, that is growing with oxygen present.

Note: Other common microbiological tests on hemp include Total Yeast and Total Mold counts. Producers and/or processors may choose, on a case by case basis, to perform additional testing.

THC – less than 10 ppm (parts per million) for hempseed oil. Testing conducted as per the Hemp Technical Manual.

We do testing for: **microbials, pv, ffa, gluten, protein content (protein powder), THC (for shipping overseas), metals, pesticides and depending on the country, other bacterial tests.**

Hempseed Sample Testing

Representative samples are subsampled by accredited laboratories, using good laboratory practices, and tested according to recognized methods.

Intertek – does not test for gluten, or THC. Their results are way too

sensitive and if you use them, you would never sell product anywhere in the world.

SGS – very forgiving based on their method.....which is the same as Intertek.

Labsmart – they are a year behind in their used method upgrade.

The issue is this: chose a lab that is accredited but will give you the best results. I say this with trepidation as we have used all 3 and none of them are consistent with the other, rendering this testing fairly useless. So how do you chose a method or lab, when they all deliver different results? Then you have the added issue of your large customer who does testing in house and finds things your worldwide labs did not. It is fallible.

The lettered and numerical codes as identified by Health Canada and listed in the third column signify: specific tests, with exacting methodologies, to insure that tests are conducted the same way, each and every time.

It is proposed that results from the following analytical tests be considered the minimum acceptable food safety standards for listing on a Certificate of Analysis (C of A) for: whole raw hempseed; hulled hempseed; hemp protein powder; and hempseed oil.

| Test | Specification | Testing Method ² |
|----------------------------|-------------------------|-----------------------------|
| <i>E. coli</i> | Negative (MPN/g) | MFHPB-34 |
| Total coliforms | < 1,000 (MPN/g) | MFHPB-34 |
| <i>Salmonella</i> | Negative (spp per 25 g) | MFHPB-20 |
| Standard plate count (SPC) | < 300,000 (cfu/g) | MFHPB-33 |

I think this plate count is too low and will not work for whole seed. There can be lots of bacteria on the hull and once the hull is removed, it is negligible. However, when pressing, you can see higher quantities.

¹ Health Canada (<http://www.hc-sc.gc.ca/fn-an/securit/ill-intox/index-eng.php>)

² Health Canada Compendium of Analytical Methods (<http://www.hc-sc.gc.ca/fn-an/res-rech/analy-meth/microbio/volume2-eng.php>).

The values and metrics presented in the “Specification” column above signify the quantity of organisms found in a volume of liquefied sample.

The designation of MPN/g is “most probable number”

The designation of spp per 25 g is number of the species found in a 25 g sample

The designation of cfu/g denotes “colony forming unit” as seen as microbial growth clusters on the surface of nutritional media in a petri dish. The number of 300,000, while appearing “large” recognizes the reality for the existence of good and bad microbes, and is the maximum accepted for ‘ready to eat foods’ health guidelines established by Manitoba, BC and Alberta.

However, as it is both good and bad bugs, don’t be shy to increase it. I have herbs I use in my blends that can be a million. Why would it be different for any ingestible food? Careful not to box us all in with a standard like this. What you need to do is bring in an analyst from a lab to do this for you. Like we did.

PRODUCT QUALITY “MUST HAVES” – WHOLE, RAW AND HULLED SEED

In addition to the microbial testing food safety “must haves,” CHTA requires that whole and hulled hempseed conform to a Product Quality “must have”: with no more than 2% discoloration (yellow or tan brown) of the kernel. This discoloration, an established and accepted indicator of rancidity of the fatty acids in hempseed kernels, has in the past been used as a deciding factor to reject entire loads of hempseed (or hulled product). Therefore, this less than 2% discoloration metric is now considered a hemp industry Standard. **But different seed types will offer up different color as well. More oily the seed, more discolored it can be.**

However, for the short term, there are no quick, reliable and certified testing criteria available to producers and laboratories to test for rancidity related discoloration, commonly described as organoleptic features. While canola farmers, grain terminals and laboratories have long been equipped with the “Strip Counter Method”, such technology is not yet been well adapted for hempseed perfected for use with hempseed. CHTA must therefore approach the developers of the canola testing strip method to determine the feasibility of having it modified to meet the needs of the hemp industry. It would then

be important to seek and international certification so that testing laboratories can use this visual-based and likely verifiable and replicatable methodology to test for rancidity in whole hempseed.

Additionally, hempseed processors have the luxury of running samples of whole seed through dehulling machines and, upon placing the hulled product on a flat surface, they can conduct a count. The issue here is to provide the replicability and assurance of a procedure that would support a load rejection order. A method developed by CHTA, and still requiring certification, is provided below.

Hempseed Oil

In addition to the above listed general analytical tests for hempseed nutritional products, hempseed oil, which is rich in unsaturated fatty acids, is highly susceptible to rancidity and therefore requires two additional and mandatory analytical tests conducted:

| Test | Specification | Testing Method ² |
|--------------------------|---------------|-----------------------------|
| Peroxide | ≤ 10 meq/kg | AOCS Cd 8B-90 |
| Free Fatty Acid Analysis | <2% | AOCS Ca 5a-40 |

FOOD SAFETY “NICE TO HAVE”

The list of tests which CHTA considers the minimum “must haves” to form a credible C of A are often accompanied by other tests and data points, based on producer and or processor preference and/or contract requirements. Also, some laboratories offer testing packages that include the “must haves” plus a few others. Additionally, and depending on the product type (whole hempseed, dehulled grain, protein powder or oil), moisture, gluten, peroxide and fatty acid are popular “nice to haves.”

Moisture – is a “nice to have” data point that provides producers and processors an indication of shell/husk condition and how the seed might perform when dehulled. Laboratories regularly conduct moisture testing and it is a good idea to include the test in the COA, which serves as the record of note for any party assessing a grain lot or fiber batch for quality. Moisture content is a very important detail for the safe storage of hempseed - the

wetter the grain the higher the microbial count. High moisture can lead to a risk of heating, sprouting and spoilage. If moisture persists above 9%, quality issues can be observed; i.e., yeast and mold contamination. Moisture levels of less than 4% can result in issues of husks cracking and splintering when dehulling.

Total Yeast/Total mold – more “nice to haves”, both of which are classified as food quality indicators vs food safety concerns. Therefore, testing for the presence of yeast or mold is a subjective indication of a product being ‘off’ and shelf life may become an issue. Being subjective infers that they cannot serve as the basis for a standard but rather, as a perception.

| Test | Specification | Testing Method ² |
|-------------------|---------------|-----------------------------|
| Total Yeast Count | ≤ 5500 cfu/g | MFHPB-22 |
| Total Mold Count | ≤ 5500 cfu/g | MFHPB-22 |

Gluten - while pure hemp seed does not contain gluten, contaminants from the field, farm, or bins may contain gluten. It is required that anyone making gluten-free statements and/or claims perform gluten testing to support those claims.

| Test | Specification | Method |
|--------|---------------|--------|
| Gluten | < 10 ppm | ELISA |

Dockage - The above-mentioned rancidity field test can also be considered as an industry acceptable methodology to test for dockage. Adjustments to the technology to be considered: when spreading out a sample to one layer and counting particles present, group various contaminants and count the items in each group, providing identification where possible and providing photographic evidence for later review. A percentage comparison can be made of hemp seed vs various contaminant groups.

Farmers. we must start there... volunteer crop issues. Ensuring farmers comply with standards, we may not have any issues with contamination of gluten moving forward.

Suggested Field Rancidity Testing Method

Using the sampling methodology suggested in the Grains Canada Sampling Manual

1. Collect a 0.5 kg sample, as the grain is being unloaded from trailer (or use a properly collected sample sent previously)
2. Apply the sample directly into the dehuller chamber using normal/generic seed type settings
3. Collect 0.5 kg of hulled and whole grain at first available outlet, after dehuller chamber
4. Spread collected material out on a clean, dark, flat surface
5. Separate grain from kernels
6. Spread kernels out to one particle thick layer and select a 10 x 10 cm wide section. Count all the particles found within, separating out any yellow or brown biodegraded seed, re-counting them separately
7. Conduct a percentage comparison between the two fractions
8. Repeat layering and particle count process two more times
9. Photograph the compared fractions.

Note: Counts where more than a 2 % kernel discoloration (yellow or brown) suggests that the sample and therefore the load is going rancid. This finding, in isolation of all other features, should be considered grounds for downgrading or load rejection. This quick field test, if conducted in a consistent manner, can be included in the purchase contract and accepted by the industry as an acceptance standard.

Note: Hulled product that exceeds the 2% discoloration level can also be rejected or devalued, as there are few, if any, separation technologies available to work effectively on this oily product.

GRAIN AND BY-PRODUCT GRADING

The CHTA recognizes that hemp food industry participants: e.g., varietal hemp seed growers, farmers, seed cleaners, processors, buyers and sellers have all worked to establish a set of parameters by which certified organic and conventionally grown hempseed and its various by-products can be considered safe for sale. From these parameters, a set of industry Standards that look to discourage food borne illness and ensures the 'health and longevity' of the industry have been created. Out of those Standards comes a set of nationally recognized and enforced grades for hempseed (grain), hulled hempseed, protein powder and whole hempseed.

Grain Grading

It is recommended that industrial hemp grain (from the farmer to processor) be graded using a three-tier system:

Canada Grade A – grain that meets or surpasses the:

- 1.) Minimum posted microbial levels required in standard C of A

| Test | Specification | Testing Method ² |
|-------------------------------|-------------------------|-----------------------------|
| <i>E. coli</i> | Negative (MPN/g) | MFHPB-34 |
| Canada Total coliforms | < 1,000 (MPN/g) | MFHPB-34 |
| <i>Salmonella</i> | Negative (spp per 25 g) | MFHPB-20 |
| Standard plate count (SPC) | < 300,000 (cfu/g) | MFHPB-33 |

- 2.) Less than 2 % brown/yellow grain kernels (as established by the proscribed dehuller/field test). Any lot with a value above 2% is to be considered rancid.

If samples fail for one or more of the above mentioned factors, grain will be downgraded. However, if the grain failed because of category 1 and the entire lot can be “cleaned up” by means of an approved and proven “kill step,” where subsequent laboratory testing shows microbial levels are reduced to meet minimum standards, a **Canada** Grade A status could be reinstated.

Note: If, following the de-hulling process brown and yellow kernels can be selectively removed by color separation, or another effective separation technology, there should be an opportunity for the grain producer to apply for refunded for revenues lost by the initial down grade.

Canada Grade B – grain not meeting either of the minimum 2% discoloration (brown/yellow kernel colouring – i.e. $\geq 2\%$) or microbial standards (that cannot be remediated) will not be considered fit for dehulling (for quality issues vs food safety) or to be sold for oil pressing.

Processed Hemp Food - Product Grading

Hulled Hempseed

Canada Grade A - the hulled product meets or surpasses the:

- 1.) Minimum posted microbial levels required in the standard C of A

| Test | Specification | Testing Method ² |
|----------------------------|-------------------------|-----------------------------|
| <i>E. coli</i> | Negative (MPN/g) | MFHPB-34 |
| Total coliforms | < 1,000 (MPN/g) | MFHPB-34 |
| <i>Salmonella</i> | Negative (spp per 25 g) | MFHPB-20 |
| Standard plate count (SPC) | < 300,000 (cfu/g) | MFHPB-33 |

Plus

- 1.) Less than 2 % brown/yellow grain kernels (as established either by the proscribed dehuller/field test or the modified canola test strip methods).

Note: If it can be shown through approved laboratory testing that microbial levels, that do not initially meet minimum standards, can be treated with an approved “kill step”. When and if such a technology becomes available, hulled product can be re-graded back to a **Canada Grade A** designation with the attestation on all lot # specific product labelling that a kill step was utilized.

Note: If it can be shown that the brown/yellow kernels resulting from degradation can be selectively removed via color sorting or some other approved cleaning/separation technology, the hulled product could be re graded to receive a **Canada Grade A** designation.

Canada Grade B – hulled seed not meeting either of the minimum 2% discoloration (brown/yellow kernel colouring i.e., ≥ 2%) or microbial standards (that cannot be remediated) would be considered not fit for raw consumption (for quality issues vs food safety).

Hemp Seed Oil Grading

Grade A the hulled product meets or surpasses the:

1. Minimum posted microbial levels required in standard C of A

| Test | Specification | Testing Method ² |
|----------------------------|-------------------------|-----------------------------|
| <i>E. coli</i> | Negative (MPN/g) | MFHPB-34 |
| Total coliforms | < 1,000 (MPN/g) | MFHPB-34 |
| <i>Salmonella</i> | Negative (spp per 25 g) | MFHPB-20 |
| Standard plate count (SPC) | < 300,000 (cfu/g) | MFHPB-33 |

2. Minimum standards for rancidity in liquid

| Test | Specification | Testing Method ² |
|--------------------------|---------------|-----------------------------|
| Peroxide | ≤ 10 meq/kg | AOCS Cd 8b-90 |
| Free Fatty Acid Analysis | <2% | AOCS Ca 5a-40 |

Canada Grade B – Hempseed Oil minimum microbial and or rancidity in liquid designations and not fit for human consumption.

TOOLS AND PROCESSES – FARM AND PRODUCTION

Sampling Methods

Various sampling methods will be profiled. These methods are recommended for use in all agricultural operations. In each case, the basics are provided, however it is recommended that complete guidelines of ISTA Standards or CSI (Canadian Seeds Institute) be reviewed.

General Principles of Sampling

THE OBJECTIVE OF SAMPLING A LOT OF SEED OR GRAIN IS TO OBTAIN A REPRESENTATIVE SAMPLE OF A SIZE SUITABLE FOR THE REQUIRED TESTING AND/OR GRADING. It is expected that the test results and grading will reflect

the average quality of the seed or grain lot from which the sample was taken. The principles of sampling and the methods and procedures described below are science-based and reflect current international methods for sampling seed or grain.

The sampler plays a critical role in sampling lots for testing and/or grading as the accuracy of the sampling and the information submitted with the sample are vital to the validity of any subsequent test results. The principle of random sampling is that each particle in the population being sampled has an equal chance of being chosen. Ordinarily, the size of the sample tested is minute compared with the size of the lot that it represents. It is essential that the sample be taken with care, and in a manner that provides confidence the sample is truly representative of the lot. Likewise, in reducing the composite sample, every effort must be made to obtain a representative submitted sample. No matter how accurately the analytical work is done, the results can only reflect the quality of the sample submitted for analysis.

For example:

- If the ambient temperature and air moisture are low at the time of sampling, a seed or grain sample may contain more immature seeds, as static electricity will inadvertently attract poor quality material, and thus bias the sampling procedure. In this case, samplers must be trained to avoid or discharge static electricity that has gathered at the end of the seed/grain sampling probe, before the sample is taken.

The accuracy with which the results of analyses represent the lot depends upon the:

- a) Homogeneity of the lot from which the sample is drawn;
- b) Sampling is done in a manner that ensures that the sample is randomly selected;
- c) Use of sampling equipment appropriate to the crop type and the program for which the sampling is taken;
- d) Care used in drawing the samples;
- e) Care with which the primary samples are mixed to obtain the composite sample;
- f) Care used in mixing and dividing the composite sample to obtain the required sub-samples for testing; and
- g) Integrity of the primary, composite and submitted sample(s) and the information provided with the submitted samples.

There is much more to be learned about proper sampling techniques and the reader is encouraged to access <http://www.grainscanada.gc.ca/pva-vpa/container-contenant/proc-301/proc3-0-1-en.pdf> and recognize that sampling methodologies will be covered in the a CHTA partnership with the HSSA instruction on important SOPs specific to the hemp industry.

Moisture

Moisture content readings taken at the farm gate, or at the processor, is a very important parameter from which to guide proper storage and transport decisions for a seed lot in top condition.

Farm- and production-side moisture readings are usually conducted with the generally accepted and federally mandated *Labtronics Model 919 Grain Moisture Tester*. It is an accepted truth that when working with hemp, moisture content values of 4% or less are correlated with hull cracking issues. Also, when the hull is too dry, dehulling will accentuate cracking and even splintering of the hull, thus turning kernels into dust that contaminates the desired product.

A moisture contents of 9% is ideal, while higher moisture values often lead to mold growth, which increases the risk of exposing the kernel to air, thus leading to oxidization and rancidity of the grain's oil, which is evident by a color change of kernels from cream/white to yellow or brown, in addition to off tastes. A finding of more than 2% of this discoloration is a strong indicator that the entire grain lot has gone rancid.

Moisture Testing Steps

Step 1 Prepare for moisture testing

- Check your thermometer to make sure it is calibrated and working properly.
- Ensure the temperature of the sample is between 11°C and 30°C.
- Check your scale's accuracy with a set of weights or a sample of known weight.
- Ensure that you use the correct conversion table for the Model 919/3.5" moisture meter.

Step 2 Calibrate *Model 919/3.5"* and *Model 393/3.5"* moisture meters

How often you test samples will influence how often you need to check the calibration of your moisture meter.

- If you are continuously testing samples, calibrate the moisture meter at least every 10 minutes.
- If you are intermittently testing samples, calibrate the moisture meter before testing each sample.

To calibrate a *Model 919/3.5"* or *Model 393/3.5"* moisture meter:

- Move the ON-OFF switch to ON.
- Turn the function knob to CAL.
- Turn the large knob on the moisture meter's right side until the dial reading 53 is directly beneath the hairline. Dial reading 53 has a red arrow marked CAL.
- **Note : for hemp seed a dial reading of 73 is used for calibration.**
- Rotate the small knob on the moisture meter's left side until the meter needle reaches the lowest possible position on the meter movement.

Step 3 Measure temperatures of grain samples

- Use a sample of grain that has been weighed and cleaned. You will find the required sample weight in the moisture conversion table.
- Place the sample in the warmed-up container or dump cylinder.
- Insert a thermometer in the grain sample. **Important:** Make sure the thermometer's bulb does not touch the container walls.
- Wait 1 to 3 minutes to stabilize the thermometer.
- Record the temperature of the sample:
 - If the temperature is from 11°C or 30°C, determine the moisture content.
 - If the temperature is under 11°C or over 30°C, keep the sample in an airtight container until its temperature is between 11°C and 30°C.

Step 4 Take a dial reading

- Set the function knob on the moisture meter to OP.
- Record the grain sample temperature.
- Place the loaded dump cylinder on the measuring cell.
- Push the release button to dump the sample into the test cell.
 - **Important:** If grain contacts the surface of the centre post's inverted cone portion, the sample is probably lightweight. This

means the moisture meter's reading will be inaccurate. You must estimate the moisture content for lightweight samples.

- Remove the empty dump cylinder from the measuring cell.
- Turn the dump cylinder over to prepare it for the next sample.
- Turn the large knob on the meter's right side until the needle reaches the lowest position on the meter movement.
- Record the dial reading directly beneath the hairline to the nearest 0.5 of a division.
- Return the weighed grains sample to the dump cylinder. Make sure that you do not lose any grain.
- Repeat twice to take a total of 3 dial readings for each sample.

For more information on the *Labtronics 919* unit check out

<http://www.grainscanada.gc.ca/guides-guides/moisture-teneur/tableau/hemp1.pdf>

To add this very important testing application into your day to day operations check out the discussion on establishing Standard Operating Procedures as defined by the Canadian Grain Commission and a learning tool to be added to a CHTA partnership with the Canadian Herb, Spice and Natural Health Products Coalition (CHSNC) who will design and implement a training program on developing farm and processor SOPs specific to the hemp industry.

APPENDIX

CSI Technical Manual for Conditions and Bulk Storage Facilities
<https://csi-ics.com/seed/news/csi-technical-manual-approved-conditioners-and-bulk-storage-facilities>

Industrial Hemp Technical Manual

<https://www.canada.ca/en/health-canada/services/health-concerns/reports-publications/controlled-substances-precursor-chemicals/industrial-hemp-technical-manual-standard-operating-procedures-sampling-testing-processing-methodology.html>

Moisture

Maintain accuracy of Model 919/3.5" and Model 393/3.5" moisture meters

<http://www.grainscanada.gc.ca/guides-guides/moisture-teneur/guide/mdg-ddte-eng.htm#f>