

2017 PROCEDURES FOR REGISTRATION OF CONDIMENT MUSTARD CULTIVARS IN WESTERN CANADA

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FINAL
PROCEDURES FOR REGISTRATION OF CONDIMENT MUSTARD CULTIVARS IN
WESTERN CANADA

Updated October 2017

1. Introduction and Background

Three types of condiment mustard are grown in western Canada, representing two species:

1. Yellow mustard, *Sinapis alba* L. (yellow seeded)
2. Oriental mustard, *Brassica juncea* (L.) Czern. (yellow seeded)
3. Brown mustard, *Brassica juncea* (L.) Czern. (brown seeded)

Western Canada is the world's leading exporter of condiment mustard, with up to 500,000 acres seeded annually, usually on a contract basis. The majority of production in western Canada is of the yellow mustard type, and the remaining production is split between the oriental and brown mustard types. Export market supply and demand for a given year dictates the percentage split in production among the three types, with yellow mustard typically commanding 40 to 60 percent of the total acreage.

At the past Prairie Recommending Committee for Oilseeds (PRCO) meetings in Winnipeg, MB (2014); in Banff, AB (2015) the Mustard Stakeholders Working Group (MSWG) recommended that mustard cultivar registration be “a mustard value chain stakeholder driven process”.

This document outlines the Canadian mustard variety evaluation and testing system developed and operated by the Prairie Recommending Committee for Oilseeds – Condiment Mustard (PRCO-CM). The MSWG has selected Crop Variety Registration Option 1 in the “Canada - Issues and Options” document because it allows the flexibility inherent in the current Crop Variety Registration system to emerge.

The PRCO-CM objective is to register mustard varieties in Canada to ensure that new mustard varieties provide continuous, improved, reliable and competitive agronomic performance for producers as well as improved quality and functionality performance for end users. The PRCO-CM assesses merit based on performance from field trial data compared to the reference check varieties and recommends the variety for registration to the Canadian Food Inspection Agency's Variety Registration Office (CFIA's VRO). The CFIA's VRO accepts the PRCO-CM recommendations and, after reviewing and evaluating the information package that accompanies the application for registration, registers the new variety when appropriate.

The MSWG represents the mustard value chain at PRCO-CM meetings. The MSWG is made up of stakeholders (individuals and/or organizations) interested in the wellbeing of the Canadian mustard value chain. Membership in MSWG is open to all stakeholders of the condiment mustard value chain (researchers, producers, market developers, processors, end users, traders, etc.) upon expression of interest. Although all members of the MSWG are interested in the success of mustard as a Canadian crop, it is the PRCO-CM that is responsible for voting on and recommending mustard varieties for registration in western Canada.

The MSWG has developed these **Procedures for Registration of Condiment Mustard Cultivars in Western Canada** document to ensure a fair, transparent, and consistent determination of merit for condiment mustard variety registration under Schedule III, Part I of the *Seeds Regulations*.

The MSWG has incorporated the principles and objectives of the recently released Canadian Food Inspection Agency (CFIA) *Model Operating Procedures* (MOP) document

(Guidance for Variety Registration Recommending Committees – V2.0 June 30, 2015) in developing the 2015 Procedures for Registration of Condiment Mustard Cultivars in Western Canada. These Procedures are meant to ensure that the PRCO-CM operates in accordance with the spirit and the letter of subsections 65.1 (1) to (3) of the *Seed Regulations* (See Appendix A and B).

2. Prairie Recommending Committee for Oilseeds - Condiment Mustard (PRCO-CM)

The PRCO-CM operates under the umbrella of the Prairie Grain Development Committee (PGDC) (www.pgdc.ca). The Mustard Stakeholder Workers Group (MSWG) elects and recommends to the PRCO individuals to represent the mustard stakeholders on the PRCO-CM. The PRCO-CM, representing the Canadian mustard stakeholders, is a voting subcommittee of the PRCO.

The PRCO-CM makes recommendations to the PRCO and eventually to the Variety Registration Office (VRO) of the Field Crops Division, Canadian Food Inspection Agency (CFIA) regarding the suitability of candidate condiment mustard cultivars for registration in western Canada.

2.1 PRCO-CM Membership

All PRCO-CM members have expertise in some facet(s) of the Canadian condiment mustard industry and thereby membership reflects the interests of the full Canadian condiment mustard value chain.

- i) Members of the PRCO-CM are elected annually by the MSWG and recommended to the PRCO each year at the annual meeting.
- ii) Membership on the PRCO-CM represents the full mustard value chain sector, including researchers, producers, developers, processors, and end users.
PRCO-CM membership is confirmed annually and vacant positions are filled through a general election process by MSWG among qualified candidates at the PRCO-CM annual meeting. Positions on the PRCO-CM are for 3 years to allow overlap and continuity.

2.1.1 Responsibilities of the PRCO-CM

- i) Defining condiment mustard merit(s) for variety registration in terms of the key attributes that provide commercial value in the marketplace. PRCO-CM members apply their expertise to determine what attributes should be sought and how best to determine if a candidate cultivar has merit that will benefit the mustard sector as a whole.
- ii) Coordinating and conducting trials and characterizing the phenotype potential of condiment mustard cultivars as per the procedures developed by the PRCO-CM and approved by the VRO.
- iii) Designing the best test protocols to assess merit(s) for variety registration of mustard cultivars. The goal is to make the process efficient, i.e. as rapid as possible while meeting the requirements to assess merit with an acceptable level of risk. The PRCO-CM will consider the commercial impact of the test protocols and balance the need for the generation of adequate data against the burden of delayed time to commercialization of these cultivars.
- iv) Making a recommendation to register candidate mustard cultivar(s) deemed to have merit and add value to the mustard value chain to the Registrar, Variety Registration Office, Canadian Food Inspection Agency. The PRCO-CM Committee's recommendations carry significant weight and are a requirement for eligibility for registration under the *Seeds Regulations* (Schedule III, Parts I and II crop kinds); however, the final decision to register new varieties rests solely with the Registrar, Variety Registration Office.

- v) Establishing and communicating a clear, consistent, transparent process including conflict of interest guidelines for PRCO-CM members with respect to voting to recommend a candidate cultivar for registration.

2.2 PRCO-CM Governance

The goal of the PRCO-CM governance is to be clear and efficient. Consistency, transparency and predictability are expected in the evaluation and determination of merit for a mustard cultivar. A clear set of merit criteria is established based on the discrete values of check varieties or the means of check varieties. Cultivars that demonstrate relatively equal or better values than the checks or check means are eligible to be recommended for registration.

There are clear options for cultivars failing to meet one or more of the merit criteria. In cases where there are deficiencies in one or more merit criteria, but where the registrants wish to make their case based on the overall attributes of the cultivar, they may elect to request a review by the committee: a set aside of the rules to be decided by majority (defined as 66%) vote. All of the merit criteria test results for varieties recommended to the PRCO for registration shall be published.

A summary list of the required merit criteria and values measured for all of the check varieties shall be published annually to ensure developers may determine progress (or lack thereof) toward their breeding targets within these criteria.

A formal appeal process is included in the PRCO-CM procedures to allow cultivar developers to challenge a negative decision from the PRCO-CM on the basis of procedural errors. A challenge or complaint shall be heard by the Appeals Board. (section 2.6).

Should a PRCO-CM member be in a position of real or perceived conflict of interest, that member shall declare their conflict and recuse themselves from any directly related vote(s).

A member unable to attend the meeting shall notify the Chair and Secretary of this expected absence and may delegate their proxy to the Chair, to allow the committee to *attain quorum*.

2.3 PRCO-CM Facilitating Innovation in the Industry

Decisions of the PRCO-CM must be based on efficiency, support for innovation, and minimizing regulatory burden while also minimizing risk and providing value to the mustard crop sector. The balance between having adequate scientific data to fully assess merit versus the impact of delayed time to market and other innovation-related considerations must be clearly described and taken into account for the full crop sector when developing test requirements.

Although recommending committees meet annually, at a minimum, they may choose to meet more frequently (by electronic meetings and/or face-to-face meetings) at any time throughout the year, in accordance with their operating procedures.

There shall be flexibility in the decision-making/recommendation process so that innovative products falling short of the registration criteria are given due consideration for a possible path to market using Interim and/or Contract Registration when deemed appropriate by the PRCO-CM.

The PRCO-CM will have a process for allowing up to 100% of privately generated data to be submitted in support of a variety registration recommendation. This data must meet test protocol requirements as published in this procedures document. Acceptable data sets for merit consideration and registration recommendation may be generated by all private resources, all public resources, or any combination of the two. In setting out its yearly testing plans, the PRCO-CM shall give equal consideration to all requests for experimental cultivar testing and ensure that its resources are allocated equally to all candidate cultivar entries received.

Data generated in regions of the USA that are representative of Canadian crop production areas (suitability to be determined by the PRCO-CM), in whole or in part, subject to

meeting the test protocols, may be considered in part or in their entirety as meeting the data set requirements for merit assessment and mustard variety registration recommendation.

2.4 PRCO-CM Operation

The operational procedural framework outlined in this document exists to generate relevant, unbiased and representative data for candidate cultivars. A recommendation to “support” or “not support” or “object to” an application for registration of a condiment mustard cultivar will be based on data generated by the Advanced Yield Trials, Mustard Adaptation Tests (MAT) and yield trials done across Canada or in similar eco-zones in USA. The candidate cultivar must demonstrate acceptability and merit for agronomic, seed quality and disease resistance traits, and meet the minimum standards outlined in *Appendix G*.

2.4.1 PRCO-CM Membership

PRCO-CM membership reflects the interests of the full Canadian condiment mustard value chain and represents stakeholders as follows:

Voting Members (12):

- a. Research group (3)
- b. Producer group (2)
- c. Market/Product Development / New Uses group (2)
- d. Processor group (2)
- e. Trader group (2)
- f. Canadian Grain Commission (1)

Non-Voting members (2)

- a. Regulatory/Provincial Oilseeds group (2)

PRCO-CM membership will be 3 year terms. The PRCO-CM members are confirmed every year at the PRCO-CM annual meeting and their respective term will be printed in an Appendix.

2.4.1.1 New Members: Members are elected by the PRCO-CM at the annual meeting. All applications for new members must be received by the PRCO-CM Secretary at least seven (7) days prior to the annual meeting. MSWG members in good standing can nominate new members by forwarding the name(s), affiliation(s), and coordinates of the nominee(s), and written justification describing the expertise of the nominee(s), to the PRCO-CM Secretary who will communicate the information to the PRCO-CM Executive Committee for review. The PRCO-CM Executive Committee will make a recommendation to the members of the PRCO-CM

Mustard Stakeholders Working Group (MSWG) experts or stakeholders who are not PRCO-CM members (those who vote on variety recommendations) will be eligible to attend general meetings. To be recognized by the PRCO-CM, they must be either MSWG members in good standing or provide advance written notification of their planned attendance to the Chair of the PRCO-CM at least seven (7) days prior to the annual meeting. A code of conduct and terms of reference will be provided. Mustard Stakeholders Working Group experts/stakeholders will have an opportunity to be recognized by the Chair to provide constructive expert input to the PRCO-CM as needed.

2.4.1.2 MSWG Membership Termination: MSWG members not attending at least two (2) consecutive annual meetings of the PRCO-CM will forfeit their membership status. Exceptions to this rule are accepted only when there is prior notification of extenuating circumstances preventing the member from attending the annual meeting.

2.4.2 PRCO-CM Chair, Secretary and Executive Structure

The PRCO-CM will elect a Chair and Secretary annually from PRCO-CM members to call and conduct the meetings to discuss condiment mustard priorities and plans, and report to the PRCO as part of the process.

In circumstances where the PRCO-CM Chair is unavailable to act in the official capacity of the position, the Secretary will assume the role of Chair and appoint a temporary Secretary from among the membership of the PRCO-CM. In circumstances where the Secretary is unavailable, the Chair will appoint a temporary Secretary from among the membership of the PRCO-CM.

The Chair (or Acting Chair) is **not** entitled to a vote. The Chair may actively participate in the discussions only if the Chair steps down from that position for the duration of the discussion.

2.4.2.1 PRCO-CM – Executive

The PRCO-CM Executive Committee is made up of the PRCO-CM Chair, Secretary, Mustard Adaptation Tests (MAT) Coordinator and one member from among the PRCO-CM members. All Executive positions commence following the annual meeting when the position holders were elected. The Executive Committee is responsible for i) PRCO-CM and MSWG Membership; ii) Contract Registration; and iii) Appeals Process.

- i) PRCO-CM Membership: The Executive Committee reviews the membership list, receives requests for new members and sponsored members, and presents recommendations for new members at the annual meeting. The Mustard Stakeholders Working Group members in attendance at the annual meeting vote on the recommended nomination(s). Once elected, new PRCO-CM member(s) may participate in the discussions; however, voting status will become effective only when approved by CFIA. In the case of members representing the seed trade, producer organizations, and provincial governments (sponsored members), the identity of the sponsored member shall be requested in writing by the PRCO-CM Secretary at least one (1) month prior to the annual meeting of the PRCO-CM. The identity of the sponsored member shall be provided in writing to the PRCO-CM Secretary at least ten (10) days prior to the annual meeting of the PRCO-CM. Once the sponsored member has been identified, the PRCO-CM Secretary will forward the appropriate documents to the member as well as the password to access the password-protected section of the PRCO-CM on the PGDC website (www.pgdc.ca).
- ii) Appeals Process: See section 2.6.

2.4.2.2 PRCO-CM – Subcommittees

At the discretion of the PRCO-CM, ad hoc working Subcommittees or Task Forces may be struck. These Subcommittees or Task Forces may be made up of PRCO-CM and/or MSWG members. Subcommittees or Task Forces may be established for specific purposes (i.e. selection of new check varieties) and will be required to submit a report to the PRCO-CM with recommendations in the form of a motion to be voted on at the PRCO-CM meeting.

2.4.3 Quorum and Decisions

Quorum is defined as a minimum of six members including the Chair as long as each group (researchers, producers, developers, processors, traders) is represented by at least one member.

Decisions of the PRCO-CM represent a simple majority of members present, 50% plus 1, with respect to current and future variety development and continued development of a

sustainable mustard industry through innovation. The one exception to this is the case of setting aside of the rules as described in section 2.2, which requires 66% support.

2.4.4 PRCO-CM Other

2.4.4.1: The Chair and Secretary of the PRCO-CM are the mustard representatives on the Executive of the PGDC.

2.4.4.2: At the start of the annual meeting of the PRCO-CM, a Member is nominated by the PRCO-CM membership to provide guidance on the rules of order and conduct of the annual meeting.

2.4.4.3: The PRCO-CM membership participates on the Appeals Board (Section 2.6) and the Contract Registration Committee as described in section 2.4.2.1 and 2.7.5.

2.5 PRCO-CM Meetings

The PRCO-CM meets annually during the PRCO annual meeting, usually in the second or third week of February. The normal sequence for the meetings of the PRCO-CM membership is as follows although logistics may result in changes:

- Executive Committee PRCO-CM
- MSWG meeting
- Entire PRCO-CM membership annual meeting
- Executive Committee with PRCO

All meetings shall be conducted according to Robert's Rules of Order.

PRCO-CM Meetings are open to all interested Mustard Stakeholders. All guests must make a request to the PRCO-CM Chair to attend the meetings and are to be identified at the start of the meetings.

PRCO-CM Members attending the annual meeting of the PRCO-CM may, by a simple majority vote, create in camera portions of the meetings, as necessary.

Extraordinary Meetings of the PRCO-CM may be called on fifteen (15) days notice. A simple majority of the total current PRCO-CM membership is required to call such meetings. The PRCO-CM Chair or Secretary will communicate the notice of any extraordinary meeting(s) by facsimile, electronic mail, or telephone. The PRCO-CM Chair or Secretary will record the receipt of the notice and will tabulate the vote to support the calling of the extraordinary meeting.

An **Appeals Board** meeting (section 2.6) may be held after the adjournment of the annual meeting of the PRCO-CM if an appeal has been initiated and the members of the Appeals Board are available for the meeting. Other meetings of the Appeals Board may be called with the consensus of the membership of the Appeals Board. *The Appellant will pay for all expenses incurred for such a meeting.*

Meetings of the **Contract Registration** committee (section 2.7.5) will be held prior to the annual meeting of the PRCO-CM if there is a reason to do so.

2.5.1 Voting

Voting is normally done at the annual meeting of the PRCO-CM. **Proxy votes are not permitted.**

Major motions such as recommendations, changes to procedures, membership and tabling of motions, require a simple majority of the PRCO-CM voting membership in attendance at the meeting. Setting aside the rules is a 2/3 majority. Minor motions, such as calling and adjourning of meetings and approval of reports, require a simple majority of the PRCO-CM voting membership in attendance at the meeting.

In special circumstances, and at the discretion of the pertinent Chair, voting may be conducted using regular mail, facsimile or electronic mail. This would be considered an

extraordinary meeting. Quorum for voting at such a meeting is a simple majority of the membership who:

- a) Received the motion as distributed to the membership and notification of receipt of the motion was received back to the Chair or Secretary; and
- b) Submit their vote back to the PRCO-CM Chair or Secretary in the time allocated for completion of the vote.

Voting at the annual meeting of the PRCO-CM will be by a show of voting cards that have been prepared as per the current membership list and distributed to members at the beginning of the annual meeting. Counting of votes will be by two (2) members of the PRCO-CM appointed by the Chair at the start of the meeting. The members will independently count and record the votes. If the vote count agrees between the recording members, the result will be announced. If the vote count does not agree, a recount will be done. It is expected that all members will vote impartially.

Abstentions are expected **only** in the case of a previously and openly declared conflict of interest (section 2.5.2). Where the number of abstentions is equal to or greater than $\frac{1}{3}$ of the votes cast, the Chair will ask for a re-vote. If the re-vote results in the number of abstentions being equal to or greater than $\frac{1}{3}$ of the votes cast, the Chair will file a report stating that no recommendation could be made.

The Chair (or Acting Chair) is **not** entitled to a vote. The Chair may actively participate in the discussions only if the Chair steps down from that position for the duration of the discussion.

Under extenuating circumstances, it may be necessary for the PRCO-CM to temporarily disregard its approved procedures. Any proposed suspension of procedures must be put to a vote, with a 2/3 majority of the membership in attendance required for the procedures to be suspended. The rationale for such an action and the recording of the empowering vote will form part of the final decision.

In order to allow sufficient time for consideration of the request to support a candidate cultivar, the Secretary must receive the Request for Support of Registration document for a candidate cultivar at least fourteen (14) working days prior to the annual meeting of the PRCO-CM and the members must receive said document at least ten (10) working days prior to the annual meeting of the PRCO-CM.

2.5.2 Voting at the annual meeting of the PRCO-CM

Based on the submitted information package provided by the registrant, the PRCO-CM members will consider the overall attributes and merit of mustard candidate cultivars. The registrant (breeder/sponsor) may present a case requesting support for the registration of the candidate cultivar. Deliberations and recommendations are then discussed by the PRCO-CM. Following discussion, a motion to support the recommendation for registration of the candidate cultivar may be put forward by the registrant. At the PRCO-CM level of consideration of a candidate cultivar, deficiency in one characteristic of merit may be compensated for by strength in another characteristic of merit. Traits not considered for merit must not be used to influence the basis for decision of the vote for a candidate cultivar. There is an allowance to continue subjective assessment of varieties that may have unique value through 'set aside' provisions. The PRCO-CM Chair will call for a vote of the membership to be cast in one of the following categories:

- Support:** The candidate cultivar shows merit by having a summary of characteristics which are equal to or superior to the relevant check cultivar(s) for the traits determining merit as specified in the operating procedures.
- Object:** The candidate cultivar's attributes are inferior to those of the relevant check cultivar(s) for the traits determining merit as specified in the operating procedures.

Abstain: Abstentions are only expected in cases of openly declared conflicts of interest.

Recommendations to support the registration of a candidate cultivar are in effect for two (2) years from the adjournment of the annual meeting at which the recommendation was accepted. The PRCO-CM Secretary will record the results of the PRCO-CM membership votes and/or recommendation(s) and submit the documentation to the VRO within two (2) weeks from the adjournment of the annual meeting.

Exceptions to this include, but are not limited to, the meetings of the Contract Registration Committee and request(s) for support for Interim Registration. If erroneous data or omission of pertinent data is used as a basis of decision for voting on a candidate cultivar, the registrant breeder/ sponsor must inform the PRCO-CM Chair with an explanation and provide a new supporting document to the PRCO-CM Executive. The PRCO-CM Executive will determine if there was an omission or error and if this information may have affected the original decision. If it is determined that the original decision would have been affected, then the Chair will inform the PRCO-CM membership of the need for a re-vote.

2.6 Appeal of PRCO-CM Recommendation for Request of Support for Registration of a Candidate Cultivar

All expenses incurred by the Appeals Board meeting will be paid by the Appellant.

The PRCO-CM recommendation for request of support for registration of a candidate cultivar may be appealed by the breeder/sponsor of the candidate cultivar. The bases of appeal of a PRCO-CM recommendation of a candidate cultivar are:

- a) Failure of the PRCO-CM to follow its approved Procedures for Registration and/or
- b) The recommendation was based on erroneous data.

A written request to appeal the recommendation must be received by the PRCO-CM Chair within fifteen (15) days of the close of the annual meeting of the PRCO-CM. The appeal must indicate the basis for the appeal and include a copy of the data package for the candidate cultivar. Consideration of the appeal will be by the Appeals Board.

The Appeals Board will consist of four (4) individuals, representing the PRCO-CM Executive and one PRCO-CM member. Where there is a conflict of interest, members of the Appeals Board will appoint alternates. These alternates will be selected based on the next ascending seed number on the PRCO-CM membership list. The PRCO-CM Chair will preside over the meeting of the Appeals Board and the PRCO-CM Secretary will record the minutes. The Appeals Board consists of four members:

The PRCO-CM Chair, Secretary, the Coordinator of the Mustard Adaptation Tests (MAT) (Test Coordinator) and

One PRCO-CM Member selected based on his/her randomly generated seed number and who is not part of the PRCO-CM Executive.

The processing of the appeal may take one of the following forms as decided by the Appellant:

- a) If the members of the Appeals Board are available immediately or shortly after the adjournment of the annual meeting of the PRCO-CM, then a meeting may be held where the Appellant will be given the opportunity to present the appeal to the Appeals Board. Documentation on the appeal will be distributed to the Appeals Board by the Appellant. Following presentation of the arguments, the Appellant will withdraw from the meeting room, the vote will be held and the Appellant will be notified upon conclusion of the meeting.

- b) If the appeal is requested after the annual meeting of the PRCO-CM has been adjourned and the members have left and cannot be recalled, the Appellant will circulate the appeal documentation to the Appeals Board by mail, facsimile, or electronic communication. A conference call defending the appeal may be arranged by the Appellant and the vote to hear the appeal will be held during the conference call.

Following deliberations of the Appeals Board, the PRCO-CM Chair will call for the vote and the decision will be based on simple majority of the Appeals Board members present. No additional appeals will be available at the Recommending Committee level. The committee chair does not have a vote unless it is required to split a tied vote?

The Appellant and members of the Appeals Board will be sent written notification of the Appeals Board decision and its rationale by the PRCO-CM Chair within fifteen (15) days after the hearing of the appeal.

2.7 Mustard: Types of Registrations

In Canada, the *Seeds Act and Regulations* is the federal legislation governing the testing, inspection, quality and sale of seeds in Canada. Mustard will remain in Part I of Schedule III. As such, the registration of mustard will continue to be based on recommendations from the voting members of the PRCO-CM.

The PRCO-CM and its membership are officially recognized by the Minister of Agriculture and Agri-Food Canada for this purpose through the Prairie Recommending Committee for Oilseeds – Condiment Mustard (PRCO-CM). The PRCO-CM can recommend variety to CFIA for the following type of registration:

2.7.1 National (Full) Registration

The PRCO-CM registration recommendation is valid for all provinces and territories of Canada, until such time as the registration is cancelled or suspended, and without any restrictions on the production of the seed or commodity. If it is supported by a recommending committee and granted a registration, it may be imported or sold in all of Canada, except where regional restrictions apply.

2.7.2 Restricted Registrations

The PRCO-CM registration recommendations are Prairie regional. However, there are forms of restricted registration such as “Interim Registration”, “Regional Registration”, and “Contract Registration”. The PRCO-CM will consider Interim, Regional, or Contract Registration.

2.7.3 Interim Registration

The PRCO-CM Interim registration recommendation is used for the purpose of production of grain or other commodity for market acceptability tests, for accelerated market entry of breakthrough technology or for emergency/crisis reasons (e.g., disease). A minimum of one (1) year of evaluation in variety registration trials is required for Interim Registration. Interim Registration may be granted initially for a period of up to three (3) years, if requested by the Recommending Committee, provided the appropriate fees are submitted and that an acceptable application package is received. Otherwise, a variety will be granted a one (1) year registration. Interim Registration may be renewed for additional periods, to a maximum total life of five (5) years.

2.7.4 Regional Registration

The PRCO-CM may recommend a regional registration for crop varieties in those instances where the variety poses a potential threat or harm to agriculture in specific regions for reasons such as seed/grain distinguishability, quality, disease or where the variety or its progeny may be detrimental to human or animal health and safety, or the environment. For Regional Variety Registration purposes, “harm” is defined as harm to the industry.

2.7.5 Contract Registration

The PRCO-CM can recommend a Contract registration for candidate cultivars where biochemical or biophysical characteristics distinguish them from the majority of registered cultivars of the same kind or species. It must be shown that these characteristics could compromise the end-use suitability of cultivars registered for traditional commodity markets. The sponsor of the candidate cultivar must demonstrate the possibility of industry harm if granted an unrestricted registration.

Contract registration is used for varieties where delivery of the resulting commodity into traditional commodity channels would cause harm to those channels. Thus, a variety must demonstrate the possibility of harm if granted an unrestricted registration or full registration in order to qualify for this type of registration. The applicant must make available to the VRO a quality control system that describes fully how any and all potentially adverse effects of the variety will be managed. In addition, the quality control system must address any regulatory concerns under the *Canada Grain Act*.

Contract registration is not to be used as a substitute for traditional forms of registration (full or interim) when the PRCO-CM has objected to the registration of a candidate cultivar based on deficiency in merit. However, the PRCO-CM may suggest that the candidate cultivar be considered for contract registration when there is rationale to do so. The Contract Registration Committee (CRC) may be required to consider the case and determine if the required conditions for contract registration have been met.

3. Mustard Cultivar – Mustard Adaptation Testing (MAT) Process

3.1 Requirements for Entry

Candidate cultivars may be entered into the Mustard Adaptation Tests by Canadian public institutions or through a private sector Canadian sponsor or breeder’s agent. There are no restrictions on candidate cultivars entering into first year (private data) trials as part of the Mustard Adaptation Test. For advancement into second year (public data) MAT trials, the sponsor must obtain approval from the Coordinator of the Mustard Adaptation Test (Test Coordinator). Requests for entry of a candidate cultivar into public trials must be received by the Test Coordinator by March 1st of each year and a two (2) year supply of seed for planting the trials must be provided to the Test Coordinator by March 31st.

A minimum of two (2) site-years of data collected from valid replicated field trials in the mustard growing areas of western Canada is required for entry into second year (public data) MAT trials. The data must indicate that the candidate cultivar has merit for agronomic performance and seed quality in comparison to the designated check cultivars indicated in *Appendices F and G*.

A minimum of one (1) site-year of valid data for blackleg is required for entry into second year (public data) MAT trials. The data must indicate that the candidate cultivar has merit for disease resistance in comparison to the designated check cultivars indicated in *Appendix E*. In the event that first year private data for disease reaction is not available, but where due diligence has been demonstrated, the candidate cultivar will be allowed to advance to second year public trials and the required disease reaction data must be provided from either private or public trials in the second year of MAT trials.

The maximum number of entries in the Cooperative Mustard Test public trials is 30 entries of *S. alba* including checks, and 30 entries of *B. juncea* including checks. If the maximum number of entries exceeds this limit, supporting data submitted for each candidate cultivar will be reviewed by the Test Coordinator. Merit will be considered as well as the date of submission of the supporting data.

3.2 Testing Period

Evaluation of candidate cultivars in the (Cooperative) Mustard Adaptation Test normally takes two (2) calendar years. First year trials may be private data trials and second year trials are public or MAT (Co-op) yield data trials. An additional year of testing in public trials may be required if the minimum data requirements are not met after two (2) calendar years of testing. Candidate cultivars, having achieved merit as defined by meeting or surpassing the minimum standards listed in *Appendix G* after two (2) or more calendar years of testing, are eligible to be considered for recommendation for registration by the PRCO-CM. Candidate cultivars eligible to be considered for recommendation for registration may remain in public trials at the discretion of the Test Coordinator.

3.3 Test Coordinator and Cooperators

The MAT Coordinator is responsible for coordinating the multiplication of check varieties for evaluating candidate cultivars, movement of seed for test entries, generation of experimental protocols, randomizations, variables to be assessed, field books, trial site inspection, data analysis, and production of a report for the PRCO-CM. The Test Coordinator also organizes the mustard seed quality analysis. The MAT Coordinator retains the prerogative to delegate these responsibilities to designated alternates.

The current Test Coordinator and the designated alternates are listed in *Appendix H*. Experimental protocols and the size of trials are communicated to sponsors and/or the breeder of candidate cultivars. Co-operators or contractors are then contacted and trial sites are arranged throughout the mustard growing areas of Saskatchewan, Alberta and Manitoba (*Appendix C*).

Trial site management is the responsibility of each of the Co-operators / contractors. All trials are managed and harvested according to sound agronomic and scientific practices appropriate for each trial site. This includes using appropriate fertilizers and pesticides applied according to label recommendations.

All Co-operators / Contractors are expected to conduct the trials in an ethical manner, allowing the MA Coordinator approved visitations to trial sites and making efforts to ensure the security and confidentiality of trials.

Trial sites are planted according to planting plans provided by the MAT Coordinator. No additional lines may be added to the Mustard Adaptation Test and no additional testing may be done at the trial site(s), e.g. disease evaluation, without the approval of the MAT Coordinator.

After seeding, the Co-operators / contractors will label the trial site and the first plot. Trial site information is supplied to the MAT Coordinator or designated alternate(s) indicating trial site location, seeding date and any other relevant information specific to the trial site.

Currently, no “special management” practices will be performed for any candidate cultivar. If the breeder or sponsor can demonstrate the need for special management of a candidate cultivar, a new testing procedure may be considered.

3.4 Data Collected

Information is collected on days to flower, plant height, resistance to lodging and days to maturity. Detailed instructions are available in *Appendix C*. Problems associated with specific plots (e.g., poor emergence, flooding) must be noted in the field books and relayed to the Mustard Adaptation Test Coordinator.

Seed yields are obtained at all trial sites and are recorded to represent yields on a dry weight basis. Adjustments for moisture content must be indicated with the data collected. Subsamples of 50 to 60 grams from each plot are sent to the Test Coordinator for determination of seed quality traits. Measurements of seed quality traits are determined using the methodologies outlined in *Appendix D*. Disease reactions are determined by plant pathologists following the procedures outlined in *Appendix E*.

3.5 Check Cultivars

Check cultivars are included in the Mustard Adaptation Test as comparisons for agronomic and seed quality traits and disease reaction purposes. Check cultivars are determined by the Coordinator of the Cooperative Mustard Test based on recommendations by stakeholders. Changes in check cultivars must be approved by the PRCO-CM. The current check cultivars are listed in *Appendix F*.

Widely grown cultivars may remain in the Mustard Adaptation Test to provide additional information for provincial variety recommendation committees. Additional or alternate checks may be suggested when deemed appropriate. These changes would appear as amendments to the Appendices after acceptance by the Test Coordinator and the PRCO-CM.

3.6 Experimental Design

An experiment with four (4) replicates in a randomized complete block design is used to evaluate agronomic and seed quality traits. However, a lattice design may be utilized if an appropriate number of entries are tested. Experimental design details for disease resistance testing are given in *Appendix E*.

Plot size may vary but the plot size must be a minimum of four (4) to six (6) rows in width and five (5) to seven (7) metres in length. The entire plot or only the center rows may be harvested. Other modifications may be made as necessary at each location.

The seeding rate for *B. juncea* is 6 lbs/acre (1.1 g/plot or 200 seeds/6 m or 20 ft row); for *S. alba*, the appropriate seeding rate is 12 lbs/acre (2.1 g/plot or 200 seeds/6 m or 20 ft row). Adjustments for germination percentage and seed weight may be made if necessary.

3.7 Seed Requirement and Seed Treatment

On the first year of entry into public Mustard Adaptation Test trials, the cultivar registrant must provide a two (2) kg quantity of untreated seed to the Test Coordinator for each of the candidate cultivars being tested in the Mustard Adaptation Test. This allows the same seed source to be used for two (2) calendar years of testing in public trials in the event that an additional year of testing is required.

The trial Coordinator will apply a fungicide and insecticide seed treatment for all trial entries.

3.8 Trial Inspection and Validation

It is the intent of the Test Coordinator of the Mustard Adaptation Test to inspect trials on an annual basis.

In order for a trial to be valid, the inspector must approve a minimum of three (3) replicates. For yield trials, plots must be a minimum of four (4) rows in width, and five (5) metres in length. A trial is considered invalid if visual inspection by the Test Coordinator or a Co-operator / Contractor reveals unacceptable planting, emergence, soil gradient, pest or environmental problems. If a check cultivar has only two (2) acceptable plots in a trial, the entire trial shall be considered invalid and the data will not be included in the MAT report.

If a candidate cultivar has only two (2) acceptable plots in a trial, the data for that line or cultivar will not be used from that trial; however, data from the remaining entries that have a minimum of three (3) good replicates may be considered acceptable.

Data collected from a trial site will be considered valid if the overall coefficient of variation (CV) for plot and/or kg/ha yield is less than 16%. If the CV for yield is equal to or exceeds 16%, then data collected from the trial site will not be used in the Mustard Adaptation Test report. No quality analyses will be conducted on seed from such trials. If there were unusual circumstances (e.g., windblown swaths, hail damage) that contributed to the CV for yield exceeding 16% and if the Cooperator is confident that agronomic observations are valid, then these agronomic observations may be included in the Mustard Adaptation Test report.

Blackleg disease evaluation trials will be considered valid when the mean severity rating for Westar is greater than or equal to 2.60 (scale: 0–5 where 0 = healthy, 5 = dead); a minimum of three (3) replicates must be approved. Westar is a *B. napus* canola cultivar highly susceptible to blackleg, and is included in the trials as a check to monitor disease pressure. In years where there is poor disease development in western Canada the use of data from trials with a rating for Westar exceeding 2.0 may be used. A white rust trial will be considered valid when the susceptible check has a disease incidence >90% for the appropriate race(s) of white rust.

3.9 Fees

The PRCO-CM may establish a fee associated with the testing of entries in order to cover the MAT trial costs, quality analysis and disease evaluation in the Mustard Adaptation Test. The fee per cultivar will be established annually for the following growing season based on the number of locations and the number of entries for seed quality testing.

3.10 Security of Entries

The Test Coordinator and Cooperators / contractors will take reasonable precautions to ensure the security of entries and will not distribute seed for purposes other than registration testing without the consent of the owner(s).

4. Submission of Data for Support of Registration

4.1 Years and Checks

The data submitted for consideration in support of registration must include all the valid data from all the years in which the entry was included in private and public trials as part of the Mustard Adaptation Test. Candidate cultivars must be compared to the designated check cultivar of similar type.

During all years of private and public testing in the Mustard Adaptation Test, a candidate cultivar shall be compared to the same check cultivar(s) that were in place in the year of initial entry into the Mustard Adaptation Test.

4.2 Relevant Data

All relevant data, including screening, laboratory, and non-Co-op data, judged to be acceptable and useful by the PRCO-CM, may be used in support of registration in addition to official test data generated from the Mustard Adaptation Test, Advanced Yield Trials or similar eco zones from the U.S.A.. Subsets of data from the Mustard Adaptation Test must be accurately represented and meet with the approval of the Test Coordinator, pathologists and chemist. Agronomic and seed quality data from trials grown outside North American mustard growing areas is not acceptable.

4.3 Analyses of Data

Analyses of data to generate means over all locations and years of testing must utilize recognized statistical models that use the appropriate error term to generate standard error or least significant differences (LSD). Generally a two-tailed test is used. Data submitted for cultivar registration should be from a trial with a CV of less than 16%. See Appendix “C”.

4.4 Performance and Definition of Merit

To receive support for registration, a candidate mustard cultivar must show merit for agronomy, seed quality and disease reaction. The minimum standards are described in *Appendix G*.

A candidate cultivar that shows merit is “equal to”, “better than”, or “superior to” current check cultivars. The category “equal to” is defined as the arithmetic equality to the check or mean of the checks. The category “better than” is defined as the arithmetic superiority to the check or mean of the checks with or without statistical significance. The category “superior to” is defined as statistically superior by a two-tailed test at a 5% level of significance.

If a candidate cultivar fails to meet the minimum standards for the traits normally considered for recommendation for registration of a condiment mustard variety, but shows a collection of other strengths in relation to the check(s) that are deemed to be of value to the Industry (e.g., to develop new technologies, to respond to new pathogen threats, to create new market opportunities for specific oil and meal qualities, etc.), then this collection of traits must be considered by the PRCO-CM when the sponsor of the candidate cultivar presents the support for registration data.

4.5 Deadline

The breeder or sponsor of a candidate cultivar must provide a “Request for Support for Registration”, an electronic or a written summary of the data, to all voting members of the PRCO-CM and Executive Committee of PRCO no later than fourteen (14) working days prior to the annual meeting of the PRCO-CM. This time will allow PRCO-CM members to consider the merit and suitability of the candidate cultivar proposed for registration prior to the PRCO-CM meeting. The PRCO-CM may refuse to consider a request on the grounds of late circulation, illegibility or inaccuracy of data.

In addition, a copy of the “Request for Support for Registration”, an electronic or a written summary of the data, should be sent to the Variety Registration Office (VRO) of the CFIA. The address is listed in *Appendix H*. This is not a requirement, but rather a request from the VRO to allow efficient processing of documentation if a candidate cultivar has been supported for registration.

5. Review of Procedures

The *2015 Procedures for Registration of Condiment Mustard Cultivars in Western Canada* shall be reviewed and amended by the PRCO-CM at least once every three (3) years or when necessary, by a Team assigned by the PRCO-CM, based on recommendations made by the MSWG.

Check cultivar(s) and minimum standards for agronomic, seed quality traits, and disease reaction may be reviewed and confirmed each year at the annual meeting of the PRCO-CM and any of the other relevant appendices may be modified accordingly.

6. Variety Registration Office, CFIA

The PRCO-CM Secretary shall inform the Registrar of the VRO, in writing, of the decision of the PRCO-CM. Copies of the decision will be sent to the breeder or sponsor and the PRCO-CM Chair. Copies of the statements from the Evaluation Teams shall be provided by the Secretary and sent to the breeder or sponsor and to the VRO.

Applications for registration of the recommended candidate shall be submitted on the Variety Registration Application Form available from the VRO, or from the CFIA web site (www.inspection.gc.ca). The application, along with other required supporting documentation,

reference samples and prescribed fees, must be sent to the address indicated below. For further information, refer to the most recent publication of the “Procedures for the Registration of Crop Varieties in Canada”.

Variety Registration Office
Field Crops Division
Canadian Food Inspection Agency
59 Camelot Drive
Ottawa, Ontario
K1A 0Y9
Telephone: (613) 773-7146
Fax: (613) 773-7144

APPENDIX A: Authority Provided under Section 65.1 in the Seeds Regulations

RECOMMENDING COMMITTEES

65.1 (1) The Minister shall approve, for Canada or a region of Canada, a committee to establish and administer protocols for testing the varieties of a species, kind or type of crop listed in Part I of Schedule III, to determine the merit of the varieties and to make recommendation respecting their registration if

- (a) The members of the committee have the knowledge and expertise required to establish and administer testing protocols for varieties of that species, kind or type of crop;
- (b) The members of the committee have the knowledge and expertise required to determine the merit of the varieties of that species, kind or type of crop;
- (c) The testing protocols established by the committee are appropriate for that species, kind or type of crop, are practical and are based on scientific principles;
- (d) The procedures established by the committee for determining the merit of varieties of that species, kind or type of crop are appropriate for that purpose and are based on scientific principles;
- (e) The operating procedures established by the committee will ensure that its functioning is transparent and that varieties are dealt with in a fair and consistent manner; and
- (f) No other committee is approved as a recommending committee for that species, kind or type of crop for Canada or the region.

(2) The Minister shall approve, for Canada or a region of Canada, a committee to establish and administer protocols for testing the varieties of a species, kind or type of crop listed in Part II of Schedule III and to make recommendations respecting their registration if

- (a) The members of the committee have the knowledge and expertise required to establish and administer testing protocols for varieties of that species, kind or type of crop;
- (b) The testing protocols established by the committee are appropriate for that species, kind or type of crop, are practical and are based on scientific principles;
- (c) The operating procedures established by the committee will ensure that its functioning is transparent and that varieties are dealt with in a fair and consistent manner; and
- (d) No other committee is approved as a recommending committee for that species, kind or type of crop for Canada or the region.

(3) In carrying out its functions, a recommending committee must apply the testing protocols it has established, act in accordance with its operating procedures and, in the case of a committee approved under subsection (1), apply the procedures it has established to determine the merit of varieties.

(4) For the purposes of subsections 67(1) and 67.1(1), the recommendation of a recommending committee must be based on the following;

- (a) In the case of a species, kind or type of crop that is listed in Part I of Schedule III, the results of testing the variety in accordance with the relevant testing protocols and a determination of whether the variety has merit; and
- (b) In the case of a species, kind or type of crop that is listed in Part II of Schedule III, the results of testing the variety in accordance with the relevant testing protocols.

APPENDIX B: Eligibility requirement for Variety Registration

67.1(1) A variety of a species, kind or type of crop that is listed in Part I of Schedule III is eligible for registration if

- (a) The variety has merit;
- (b) The variety has been tested in accordance with testing protocols of a recommending committee;
- (c) The recommending committee has made a recommendation respecting registration of the variety;
- (d) The variety or its progeny is not detrimental to human or animal health and safety or the environment when grown and used as intended;
- (e) The representative reference sample of the variety does not contain off-types or impurities in excess of the Association's standards for varietal purity;
- (f) The variety meets the standards for varietal purity established by the Association or these Regulations for a variety of that species, kind or type;
- (g) The variety is distinguishable from all other varieties that were or currently are registered in Canada;
- (h) The variety name is not a registered trademark in respect of the variety;
- (i) The variety name is not likely to mislead a purchaser with respect to the composition, genetic origin or utility of the variety;
- (j) The variety name is not likely to be confused with the name of a variety that was or currently is registered;
- (k) The variety name is not likely to offend the public;
- (l) No false statement or falsified document and no misleading or incorrect information have been submitted in support of the application for registration; and
- (m) The information provided to the Registrar is sufficient to enable the variety to be evaluated.

(2) A variety of a species, kind or type of crop that is listed in Part II of Schedule III is eligible for registration if the requirements for eligibility set out in paragraphs (1) (b) to (m) are met.

(3) A variety of a species, kind or type of crop that is listed in Part III of Schedule III is eligible for registration if the requirements for eligibility set out in paragraphs (1) (d) to (m) are met.

APPENDIX C: Agronomy Evaluation Mustard Adaptation Tests

C1 Trials

At each trial site there are separate trials, one for each species, *Sinapis alba* and *Brassica juncea*. Each of the trials is replicated and randomized, and the two trials must be treated separately. Species borders on the sides of each trial must be the same as the species in the trial.

C2 Trial Sites

In western Canada, mustard production is best suited to the Brown and Dark Brown Soil Zones; however, there is limited acreage in the Black and Grey Zones. Saskatchewan is the primary production area, followed by Alberta and Manitoba. Trial sites are established to reflect the areas of production. Specific locations are selected on an annual basis, depending on the Cooperator and collaborator/contractor site availability.

C3 Measurement and Rating Scales

C3.1 Height

A minimum of two measurements of plant height is taken in each plot; the average is determined and expressed in centimetres (cm).

C3.2 Lodging

A visual rating scale is used to measure resistance to lodging:
1 to 5 (1 = completely erect, 5 = completely lodged, flat on ground)

C3.3 Maturity

Maturity is the number of days from date of seeding to swathing maturity. Swathing maturity is reached when the seeds are firm when pressed between the fingers, representing a moisture content of about 25%. The lower pods will have changed colour, but the upper pods may be green. At this time, 60% of the seeds in the pod have started to change colour to reddish brown in brown mustard and 75% of the seeds will have turned yellow in oriental mustard. Yellow mustard is fully mature when the plot is free of green seed.

N.B. The use of a desiccant is an undesirable method for the Mustard Adaptation Test but, if it is necessary, the desiccant must be applied to the yellow mustard when at least 60–70% of the seeds within the pod have reached their mature colour.

C3.4 Yield (yield equal to or superior to the check cultivars is required to demonstrate a candidate's merit).

Plot yield at each site is measured, adjusted to dry weight and harvest area if different from seeded area, and expressed as kg/ha and yield relative to the designated check(s).

C3.5 Seed Weight

Seed weight is determined on a randomly selected sample of 500 counted seeds dried to <5% moisture content, measured as grams per 500 seeds, and then adjusted to 1,000 kernel weight and expressed as grams per 1,000 seeds.

Height, Lodging (when differences occur among entries), Maturity and Yield are determined on all four replicates from valid trials.

Seed weight is determined on a minimum of two (2) replicates from trials with acceptable C.V. for yield. If the number of trials throughout western Canada exceeds the required number for a given year, then seed weight will be determined on trials with the lowest C.V. for yield.

C4 Trial Sites for Evaluation of Agronomic Traits

Agronomic traits are measured only on valid trials.

A minimum of twelve (12) site-years of valid agronomic data collected over two (2) or more calendar years, including one (1) year private trial and a minimum of one (1) year Mustard Adaptation Test, is required.

All reasonable attempts will be made to collect agronomic data from a minimum of six (6) valid trials per year. If the number of valid trials in any given year is fewer than six (6), then the deficient trials may be made up in another year of the Cooperative Mustard Test.

APPENDIX D: Seed Quality Evaluation Mustard Adaptation Test

D. Seed Quality Traits to be Measured

D1 Oil Content

Oil content is determined by near infrared spectroscopy (NIRS) using measurements calibrated against the nuclear magnetic resonance method adapted for use in mustard from the American Oil Chemist Society (A.O.C.S.) recommended practice (Ak 3-94) - Oil Content of Rapeseed by Nuclear Magnetic Resonance. Results are reported as percent whole seed, calculated on a dry weight basis.

D2 Protein Content

Protein content is determined by near infrared spectroscopy (NIRS) using measurements calibrated against the Dumas Combustion method adapted for mustard from the A.O.C.S. Official Method Ba 4e-93. Total nitrogen content of the seed is measured and the value is multiplied by a correction factor of 6.25 ($N \times 6.25$) to give a value for protein. Results for protein are reported as percent whole seed on a dry weight basis.

D3 Glucosinolates

The glucosinolate content is determined by capillary gas chromatography of the trimethylsilyl derivatives of extracted and purified desulfoglucosinolates (Sosulski and Dabrowski 1984). Intact glucosinolates are extracted from the seed using 67% methanol and purified via the ion-exchange chromatography and “on-column” enzymatic method of Thies (1980). Preparation of trimethylsilyl derivatives utilizes the acetone and 1-methylimidazole based method of Landerouin et al. (1987). Benzyl glucosinolate is used as the internal standard. Potential allyl isothiocyanate evolution (synonyms: AITC, volatile oil) is reported for oriental and brown mustard as mg/g on a seed (8.5% moisture) basis. It is based on a direct conversion of the measured allyl glucosinolate content to an equivalent value for allyl isothiocyanate.

References:

- Landerouin, A., Quinsac, A. and Ribailier, D. (1987) Optimization of silylation reactions of desulfoglucosinolates before gas chromatography. *World Crops: Production, Utilization, Description* 13:26–37.
- Sosulski, F. and Dabrowski, K.J. (1984) Determination of glucosinolates in canola meal and protein products by desulfation and capillary gas-liquid chromatography. *J. Agric. Food Chem.* 32:1172–1175.
- Thies, W. (1980) Analysis of Glucosinolates via “on-column” desulfation. *Proc. Symposium “Analytical Chemistry of Rapeseed and its Products”*, Winnipeg, Canada. pp. 66–71.

D4 Seed Colour

Seed colour is determined by near infrared spectroscopy (NIRS) using measurements calibrated against the Hunter Lab colour system. The calibrated index of reflectance that best describes the darkness and purity of the brown colour of the seed coat and/or meal and the brightness or intensity of the yellow colour is used.

D5 Mucilage Content

Mucilage content is determined by measurement of the viscosity of the mucilage released from the seed. Mucilage content is reported in Centistokes (Cs) \times ml/g seed.

D6 Green Seed

The number of green seeds is determined by a subjective measurement of the number of distinctly green seeds after a random sample of 1,000 seeds has been crushed with a roller. Results are reported on a percentage basis.

D7 Chlorophyll

Chlorophyll content is determined by a spectrophotometric method adapted for mustard seed from the A.O.C.S. official method Ak 2-92 - Determination of chlorophyll content in rapeseed (Colza) by spectrophotometry. The results are reported as mg/kg on a seed (tel que) basis.

The above methods of measuring the required seed quality traits may be modified, or new methods utilized, as they are developed and accepted as providing equivalent or better data to the above described methods.

Other seed quality traits that may be viewed as important characteristics for condiment mustard will be added to the list of required seed quality analyses when appropriate testing methods have been developed and accepted. These modified and additional measurements of seed quality will then be presented as an amendment to *Appendix D*.

Seed quality data will be collected from a minimum of two (2) separate replicates for each of the traits, using the same two replicates whenever possible.

D8 Trial Sites for Evaluation of Seed Quality Traits

Measurement of seed quality traits is done only for valid trials with an acceptable C.V. for yield. A minimum of twelve (12) site-years of seed quality data collected over two (2) or more calendar years, including one (1) year private trial and a minimum of one (1) year public Mustard Adaptation Test, is required. Refer to *Appendix C*, Section C4 (Trial Sites for Evaluation of Agronomic Traits) for more detail.

APPENDIX E: Disease Evaluation Mustard Tests

E. Disease Evaluation Mustard Tests

E1. Procedures for Blackleg (*Leptosphaeria maculans*; anamorph: *Phoma lingam*) All cultivars to date have been resistant to Blackleg). These procedures are provided as a means to demonstrate that a new line considered for registration will not harm the industry.

Candidate cultivars of *Brassica juncea* (brown and oriental mustard) and *Sinapis alba* (yellow mustard) are evaluated for resistance to blackleg of crucifers in comparison to designated check cultivars in field nurseries naturally infested with *L. maculans*. Separate trials are conducted for the *B. juncea* and *S. alba* entries. Westar, a *B. napus* canola cultivar highly susceptible to blackleg, is also included in each trial as a check to monitor disease pressure.

For each trial, single (1) or two (2) row plots of each entry are sown in a randomized complete block with four (4) replicates; rows are at least three (3) metres long and contain 100 seeds/3 m. Planting is normally done during mid to late May. Additional rows of Westar may also be sown in each trial as indicators of disease pressure and uniformity of inoculum, and to provide a source of secondary (pycnidiospore) inoculum. Additional pycnidiospore inoculum from agar cultures of *P. lingam* may be sprayed on the plants at the 2–3 leaf stage. Plots may be irrigated with overhead sprinklers as required to maintain moisture conditions conducive to blackleg.

The severity of blackleg infection is evaluated on a minimum of 25 plants per entry in each replicate after the plants are fully podded and just beginning to ripen. In trials having only three (3) good replicates, 35 plants per replicate must be evaluated for each entry. Plants are uprooted, cut through the hypocotyl and/or tap root, and blackleg severity is scored for each plant using the following scale based on the area of diseased tissue in the cross-section:

- 0 = No diseased tissue visible in the cross-section.
- 1 = Diseased tissue occupies less than or equal to 25% of cross-section.
- 2 = Diseased tissue occupies 26% to 50% of cross-section.
- 3 = Diseased tissue occupies 51% to 75% of cross-section.
- 4 = Diseased tissue occupies more than 75% of cross-section with little or no constriction of affected tissues.
- 5 = Diseased tissue occupies 100% of cross-section with significant constriction of affected tissues; tissue dry and brittle; plant dead.

Mean blackleg severity is calculated for each combination of replicate and entry as follows:

$$\text{Blackleg severity} = \frac{\sum [(\text{Numerical value of disease category}) \times (\text{Number of plants in disease category})]}{\text{[Total number of plants in all disease categories]}}$$

Mean blackleg severity values over all replicates are reported for each entry.

The minimum requirement for blackleg reaction to support a recommendation for registration of a *B. juncea* (brown and oriental mustard) or a *S. alba* (yellow mustard) candidate cultivar is disease severity less than or equal to the designated check for each type of mustard (*Appendix F* and *Appendix G*). All designated checks are highly resistant to blackleg.

E2. Procedures for White Rust (*Albugo candida*) Evaluation.

Candidate cultivars of *B. juncea* (brown and oriental mustard) are evaluated for resistance to race 2a of *A. candida* in comparison to designated check cultivars; additional testing with race 2v may also be conducted. Only resistance to Race 2a is currently required to demonstrate a candidate's suitability for registration.

Candidate cultivars of *S. alba* (yellow mustard) are evaluated for resistance to races 2 and 7 of *A. candida* in comparison to designated check cultivars. Evaluations are conducted with races 2v and 7v since these are currently the most prevalent races in western Canada; additional testing with races 2a and 7a may also be conducted.

All trials are conducted in controlled environment chambers. Separate trials are conducted for each race of white rust, and each trial includes appropriate checks to monitor race purity.

The severity of white rust infection is evaluated on a minimum of 100 plants per entry for each race of *A. candida*. A suspension of zoospores (10^4 zoospores/mL) from germinated sporangia is applied to the plants using one of the following methods:

- a) A 10 μ l droplet of the zoospore suspension is applied to each cotyledon 6–7 days after planting.
- b) The zoospore suspension is sprayed onto the seedlings 12–14 days after planting, when the first true leaf is expanding.

Immediately following inoculation, plants are incubated in a misting chamber (100% RH) in the dark for 24–48 hours. White rust severity is scored for each plant 7–8 days (cotyledon) or 10 days (leaf) after inoculation using the following scale:

- 0 = No visible symptoms on either leaf surface.
- 1 = Small, pinpoint to larger brown necrotic flecks under the point of inoculation on upper surface, occasionally necrosis extending to lower epidermis. No sporulation.
- 3 = Very sparse, one to few, minute scattered pustules on upper surface. None to very few pustules on lower surface. Lesions usually have chlorosis and/or necrosis.
- 5 = Few to many scattered pustules on upper surface. None to few scattered pustules on lower surface. Pustules sometimes have a chlorotic halo.
- 7 = Many to few pustules on upper surface. Many scattered small to larger pustules on lower surface.
- 9 = Very few to no pustules on upper surface. Many large coalescing pustules on lower surface.

Mean white rust severity is calculated for each entry as follows:

$$\text{White rust severity} = \frac{\sum [(\text{Numerical value of disease category}) \times (\text{Number of plants in disease category})]}{[\text{Total number of plants in all disease categories}]}$$

Mean white rust severity values are reported for each entry. The mean percentage of infected plants (disease incidence; includes plants with disease scores of 3 or more) may also be provided.

The minimum requirement for white rust reaction to support a recommendation for registration of candidate open-pollinated (OP) varieties from 2012 onwards and hybrid varieties from 2020 onwards is disease severity less than or equal to the designated check for race 2a in brown and oriental mustard (*B. juncea*) (*Appendix F* and *Appendix G*). Resistance requirements for race 2v will be established when cultivars resistant to this race are commercialized.

The minimum requirement for white rust reaction to support a recommendation for registration of a *S. alba* (yellow mustard) candidate cultivar is disease severity less than or equal to the designated check for races 2 and 7 (*Appendix F* and *Appendix G*). The designated check is moderately resistant to races 2a, 2v, 7a, and 7v.

E3 Other Diseases

Alternaria black spot:

This disease is prevalent on *B. juncea* mustard. All currently registered cultivars of brown and oriental mustard are susceptible to this disease. No minimum standards can be established until reliable sources of resistance/tolerance are identified and become available to breeding programs. All currently registered cultivars of yellow mustard are moderately resistant to this disease.

Sclerotinia stem rot:

This disease attacks all members of the Brassicaceae. All currently registered cultivars of brown, oriental, and yellow mustard are susceptible to this disease. No minimum standards can be established until reliable sources of resistance/tolerance are identified and become available to breeding programs.

Other diseases such as seedling blight, root and foot rot, aster yellows, and downy mildew are of minor importance. There are currently no guidelines or standard requirements for these diseases in the evaluation of candidate cultivars.

E4 Trial Sites for Evaluation of Disease Resistance

A minimum of one (1) site-year of valid blackleg and white rust resistance data, collected from private or public trials, is required for recommendation for registration of a condiment mustard variety.

APPENDIX F: Designated Check Cultivars for the Mustard Adaptation Test

Cultivars that have significant commercial production in the condiment mustard growing areas of western Canada are generally chosen as checks. Checks will include established cultivars, special purpose cultivars or recent cultivars of superior merit. Changes in check cultivars must be approved by the PRCO-CM. A candidate cultivar will be compared to the appropriate check cultivar(s) in place at the time the candidate cultivar is first entered into the Cooperative Mustard Test; assigned check(s) will remain with the candidate cultivar for the duration of testing.

Yellow Mustard (*Sinapis alba*)

The current check cultivar for yellow mustard is Andante.

Oriental Mustard (*Brassica juncea*)

The current check cultivar for oriental mustard is Cutlass.

Brown Mustard (*Brassica juncea*)

The current check cultivar for agronomy and seed quality for brown mustard is Centennial Brown. The current check cultivar for blackleg and white rust resistance for brown mustard is Amigo.

APPENDIX G: Minimum Standards for Condiment Mustard Cultivar Registration

To receive support for registration, a candidate must show merit. A candidate that shows merit is “equal to”, “better than” or “superior to” current check cultivars.

If a candidate cultivar fails to meet the minimum standards for the traits normally considered for recommendation of a condiment mustard variety, but shows a collection of other strengths in relation to the check(s) that are deemed to be of value to the Industry (e.g., to develop new technologies, to respond to new pathogen threats, to create new market opportunities for specific oil and meal qualities, etc.), then this collection of traits must be considered by the PRCO-CM when the sponsor of the candidate cultivar presents the support for registration data.

Agronomic (yield) and seed quality data collected over a minimum of two (2) calendar years and twelve (12) site-years from valid trials, blackleg resistance data collected from a minimum of one (1) valid trial, and white rust resistance data collected from a minimum of one (1) valid trial, are required for consideration for recommendation for registration of a candidate cultivar.

Valid trial sites for evaluation of agronomic and seed quality traits shall be representative of the mustard growing areas of western Canada and have a C.V. for yield less than 16%.

Agronomic and seed quality data from a minimum of six (6) valid trials per year shall be collected, whenever possible, to ensure that candidate cultivars have enough data to meet this minimum standard. If the number of valid trials in any year is lower than six (6), then the deficient trials may be made up in another year of public Co-op testing.

Agronomic traits considered for merit evaluation include: Yield.

Seed quality traits considered for merit evaluation include: Oil content (fixed oil for *B. juncea* only), protein content, glucosinolate content (for *B. juncea* only) chlorophyll and/or green seed content (*B. juncea* only). Seed weight and seed uniformity are traits that may be measured and reported in the Cooperative Mustard Test, but minimum standards are not established for these traits.

Resistance to blackleg and white rust diseases is considered in the evaluation for merit. The minimum requirement for white rust reaction to support a recommendation for registration of candidate OP varieties from 2012 onwards and hybrid varieties from 2020 onwards is disease severity less than or equal to the designated check for race 2a in brown and oriental mustard (*B. juncea*) (*Appendix E* and *Appendix F*). Refer to *Appendix E* for the different pathogen races for the different mustard species.

a) Brown mustard (*Brassica juncea*)

Blackleg - highly resistant; equivalent to but not more susceptible than the designated check (*Appendix F*)

White rust races –resistant to race 2a; equivalent to but not more susceptible than the designated check (*Appendix F*)

b) Oriental mustard (*Brassica juncea*)

Blackleg - highly resistant; equivalent to but not more susceptible than the designated check (*Appendix F*)

White rust races –resistant to race 2a; equivalent to but not more susceptible than the designated check (*Appendix F*)

c) Yellow mustard (*Sinapis alba*)

Blackleg - highly resistant; equivalent to but not more susceptible than the designated check (*Appendix F*)

White rust - moderately resistant to races 2 and 7; equivalent to but not more susceptible than the designated check (*Appendix F*)

APPENDIX H: Current Cooperative Mustard Test Coordinator, Chemist and Pathologists and Designated Alternates

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