Abstracts

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Distinguishing Knapweeds and Star Thistles (*Centaurea* spp.) of Interest to Canadian Weed Seed Regulation

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Yellow (*Centaurea solstitialis* L.) and Iberian star thistle (*Centaurea iberica* Trevir. ex Spreng.), from south-eastern Europe, are proposed as prohibited noxious weeds for the revised *Weed Seeds Order* currently under review. Both species of star thistle are only found in the United States but have the potential to enter Canada through contaminated seed lots and imported hay. Diffuse (*Centaurea diffusa* Lam.) and spotted knapweed (*Centaurea stoebe* L.) are European species already present across Canada, causing much damage to rangelands. Yellow star thistle, diffuse knapweed and spotted knapweed are currently regulated as prohibited noxious weeds in Canada. It is important to correctly identify these species for the continued protection of Canada's croplands and pastures. Knapweeds and star thistle fruits are difficult to identify to species; they are usually distinguished in the field by their distinct involucral bracts and corolla color. Canadian National Seed Herbarium staff have examined these four species and identified characters that may aid in determining the species using the fruit (cypselae). These characters are size, pappus length, side notch length and surface pattern. Identification may be more challenging if the fruit is immature, the pappus removed during processing, the reference collection is poor or a single fruit is found in a sample. Iberian star thistle has a large, wide fruit that is usually covered in reddish-brown streaks, but can occasionally be solid white, with an average-sized pappus and small side notch. It should be compared to the similar purple star thistle (*C. calcitrapa* L.) which has a duller surface and no pappus. Yellow star thistle is of average length and has a notably long pappus and small side notch. It is dimorphic; the fruit from the central florets is glossy with brown and white streaks, the rarely found fruit of the outer florets is dull, dark brown with no pappus. The general shape is parallel-sided with a rounded base. Yellow star thistle fruits lacking brown streaking should be compared to the pale grey Maltese star thistle (*C. melitensis* L.); the coloration is very similar. Maltese star thistle has a strongly tapered outline, greenish ring beneath the collar, wider pappus bristles, deeper side notch often shaped like a hook (some fruits have a shallow notch) and prominent side stripes. The fruits of diffuse and spotted knapweed are often confused. Diffuse knapweed fruits have a very short pappus; those with a long pappus might be suspected of being a hybrid between diffuse and spotted knapweed, *C.* × *psammogena* G.Gáyer, reported in British Columbia, Ontario and Quebec. Diffuse knapweed fruits are colored a pale greenish-brown with a pale golden collar and lengthwise stripes that fade in the middle. Spotted knapweed fruits are the same size, but have a long pappus and are greenish-black, broken up by pale stripes and a pale base. Both species have large and deep side notches.

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Pilot Project: Canada's Least Wanted Plant Species

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Invasive plants, often referred to as noxious weeds, can negatively impact Canada's domestic crop production, foreign market access, human health, land use and value, biodiversity, and recreational opportunities. They also affect other species by direct parasitism and hybridization, competing for resources, and acting as hosts or vectors of plant pests. It is estimated that invasive plants cost the Canadian agricultural community approximately $2.2 billion each year. Species with a potential to become invasive may be intentionally introduced into Canada as landscape plants, ornamentals, agricultural crops, and plants for bioenergy, medicinal and research purposes. Invasive species may be introduced unintentionally through plant products (contaminants in seed, grain, forage, produce, and wood products), livestock and other animals, soil, freight, packing materials, vehicles, machinery, and recreational equipment. The most efficient and cost effective means of addressing the risks associated with invasive plants is prevention. Once an invasive species enters and establishes in a new area, the impacts, including costs of eradication and control, increase exponentially. The Canadian Food Inspection Agency (CFIA) is mandated to protect the plant production base and responsible for regulating the importation, sale and use of plants and plant products under the authority of the *Plant Protection Act, Seeds Act* and *Weed Seeds Order, Feeds Act* and associated regulations. As a pilot project, the CFIA consulted publicly with stakeholders on 25 invasive plant species from June 26th to October 1st, 2010. The CFIA uses pest risk analysis as the scientific basis for decision-making under the *Plant Protection Act*. Pests that pose a significant risk to Canada's plant resources are recommended for designation as quarantine pests and placement on the *List of Pests Regulated by Canada*. Expected regulation or policy changes and preventative measures are proceeding. More information is posted on the CFIA website at http://www.inspection.gc.ca/english/plaveg/invenv/plante.shtml. To facilitate the anticipated policy changes and their enforcement, seed identification fact sheets for proposed species were developed by the Seed Science and Technology Section of the CFIA Science Branch. The fact sheets contain diagnostic images, taxonomic information and similar species. They can be further developed as an identification tool in the future.

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Genetic Testing in Ryegrass: Beyond Visual Inspection

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Seedling root fluorescence (SRF) of ryegrass has been used in seed testing almost since it was discovered in 1929. The SRF test is used to predict contamination of annual ryegrass in perennial ryegrass seed lots. The test is easy to conduct, but quite often provides wrong results because false positives are observed. While warnings that SRF should only be used as a general indicator of ryegrass crop quality have been suggested in Oregon since 1938, the test has become entrenched in seed testing as an absolute estimator of contamination. Seed growers' payments have been docked and end use customers provided an inadequately tested product as a result of this poorly applied test. The maturity grow-out test (GOT) was developed to provide a better estimate of plant type and reduce the dockage problem for growers. To promote uniformity, testing conditions for the GOT must be the same in each laboratory that conducts the test and these conditions are hard to standardize. The GOT takes at least 42 days to complete, but the subjective end point determination makes it difficult to identify seedlings that actually have an annual or perennial growth type. The GOT is a measure of vernalization (flowering response after cold treatment) requirement and the actual test length for this trait, as in barley and wheat, should be 100 days. Nucleic acid tests (PCR) on genomic DNA have been developed that determine the presence or absence of the actual alleles (alternate forms of genes) involved in flowering control of grasses. Conducting these chemical tests is beyond visual inspection, but prediction of the potential growth type can be done more quickly, more accurately, and provide more uniform results on a per plant basis than is possible with a GOT.

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2010 Kentucky Seed Count Survey

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In the United States, there is an increasing trend toward selling seed based on the number of seeds per container or bag, rather than on weight. In 2010, just over 1500 regulatory samples were collected at firms located in Kentucky for regulatory purposes and of these samples, 216 had a seed count stated on the label. Mechanical seed counts were conducted on 183 samples of corn (35), soybeans (72) and wheat (76) in accordance with the AOSA *Rules for Testing Seeds*. Tolerances of 2%, 4% and 3% were applied to corn, soybeans and wheat, respectively. Among the corn, soybean and wheat samples analyzed, 43%, 35% and 50%, respectively, were out of tolerance with the guarantees. Of the 78 violations, nearly all exceeded the label guarantee, meaning the purchaser received at least the number of seeds that were stated on the bag. Within the corn, soybeans and

wheat violations, 6 samples (13%, 4% and 8%, respectively) were well below the guarantee. For these seed lots, customers would not have received the minimum number of seed per pound stated on the bag. A similar seed count survey was conducted in 2003. Of 89 soybean samples labeled as to seed count, 40% were out of tolerance with the guarantee, 19% of which did not meet the guarantee. In 26 wheat samples tested, 50% were out of tolerance, with 62% of the violations not meeting the guarantee. Because producers are making decisions based on seed counts, the accuracy of this information is crucial.

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Developing a Standard Germination Protocol for Partridge Pea

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Partridge Pea [*Chamaecrista fasciculata* (Michx.) Greene] is a widely-distributed annual forb, native to the eastern half of the United States. It is frequently used as a component in native seed mixtures, for soil stabilization and as a wildlife food source. This seed kind has no established laboratory testing procedure and was identified as a species of interest for developing a standard germination protocol based on input from laboratories in the Southern region of the US. A survey was distributed to AOSA laboratories and SCST members via email to determine laboratory methods currently in use. Twenty responses were returned detailing sample information and test conditions used in each laboratory for this species. Of the respondents, 35% had never received this seed kind for testing; in laboratories that had previously tested this seed kind, the number of samples per year ranged from less than 1 to 40. Although testing of few samples suggests a relatively limited number of seed lots in commerce, developing a simple and effective germination protocol is of interest to seed testing laboratories. Eight different test methods were reported and, based on survey responses, preliminary experiments were conducted to determine optimal test conditions. Three commercially available seed lots were subjected to dormancy breaking treatments including KNO_3, clipping in advance of germination, prechill (water and KNO_3) and testa piercing during the germination test. Prechilling and clipping hastened germination, but clipping resulted in numerous abnormal seedlings. In the future, referee samples and potential test methods will be provided to interested laboratories to determine optimal conditions for testing and to evaluate consistency across laboratories to establish a standard test method for this seed kind.

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