



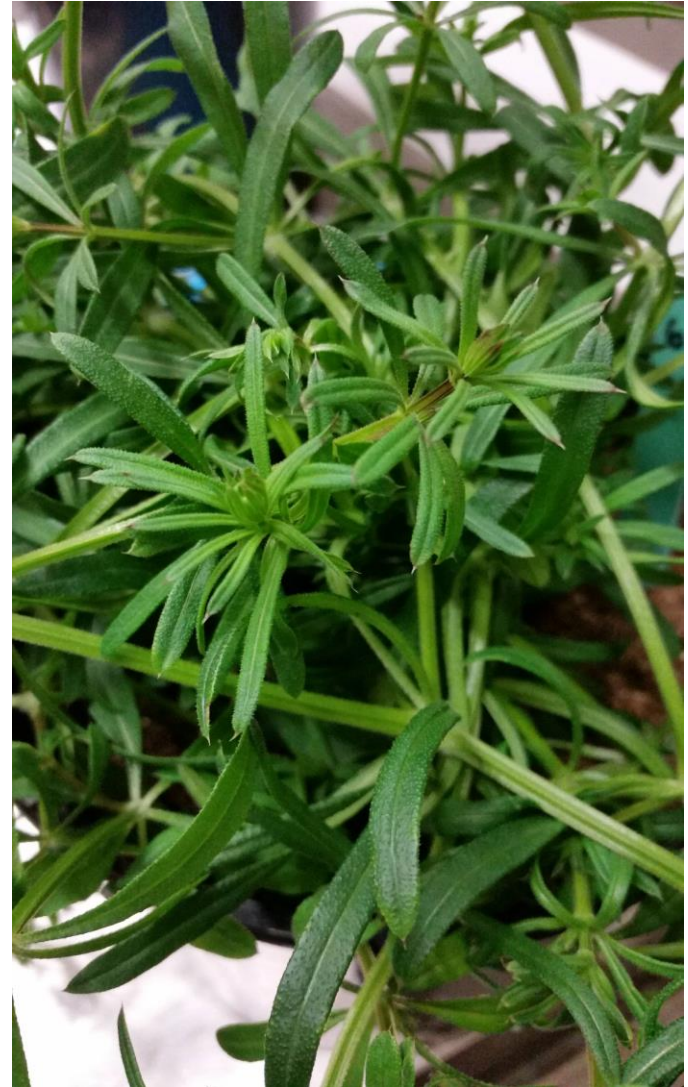
Molecular discrimination of Catchweed Bedstraw (*Galium aparine* L.) and False Cleavers (*Galium spurium* L.) in Western Canada

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Galium spp.

- Three in Western Canada
 - *Galium boreale* L.
 - *Galium aparine* L.
 - *Galium spurium* L.
- Differences in habitat preferences
- Known differences in chromosome count in *Galium aparine* and *Galium spurium*

Galium aparine vs. *Galium spurium*



Importance to Weed Science

- Need for improved techniques
- Predict the movement of herbicide resistance
- Competitive characteristics
- Environmental restraints

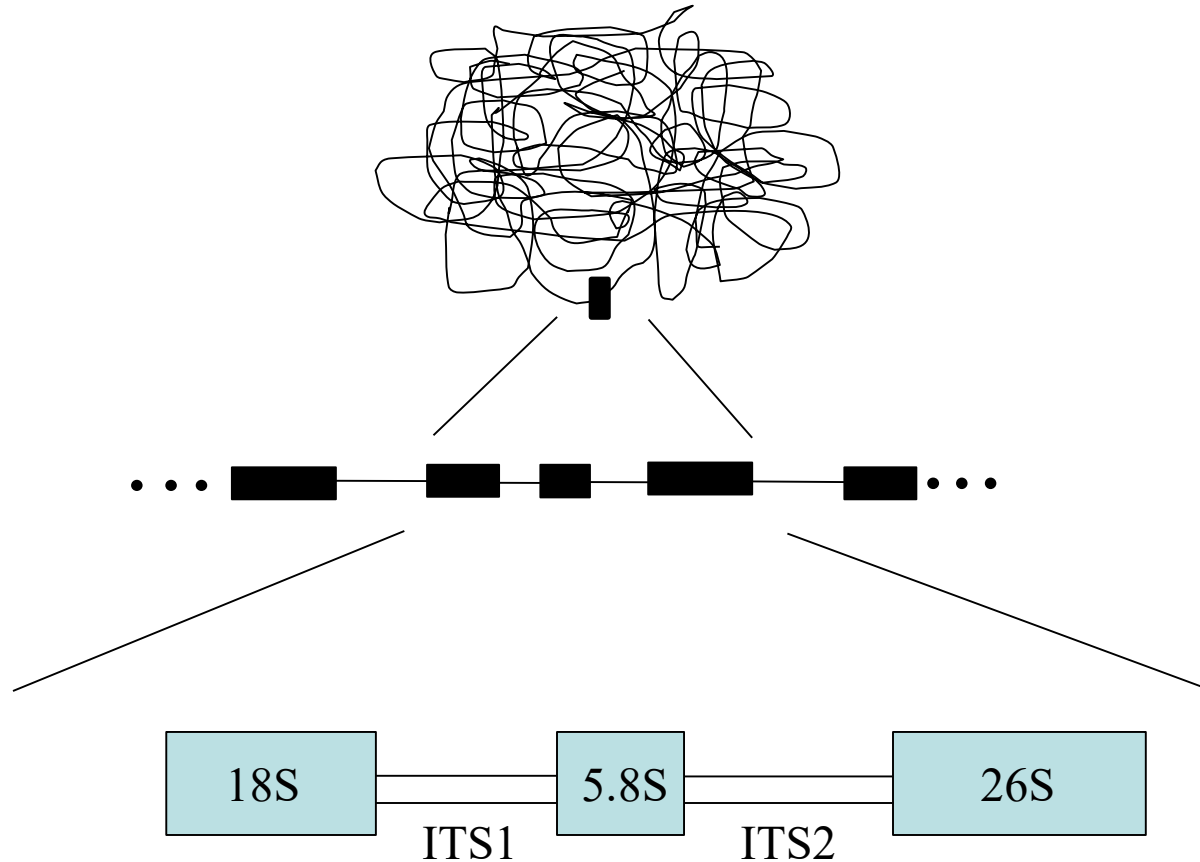
The Problem for Producers

- Presence of cleavers on the Prairies is increasing
- Difficult to determine species visually and cytogenetically
- Solution: Look into DNA to tell them apart

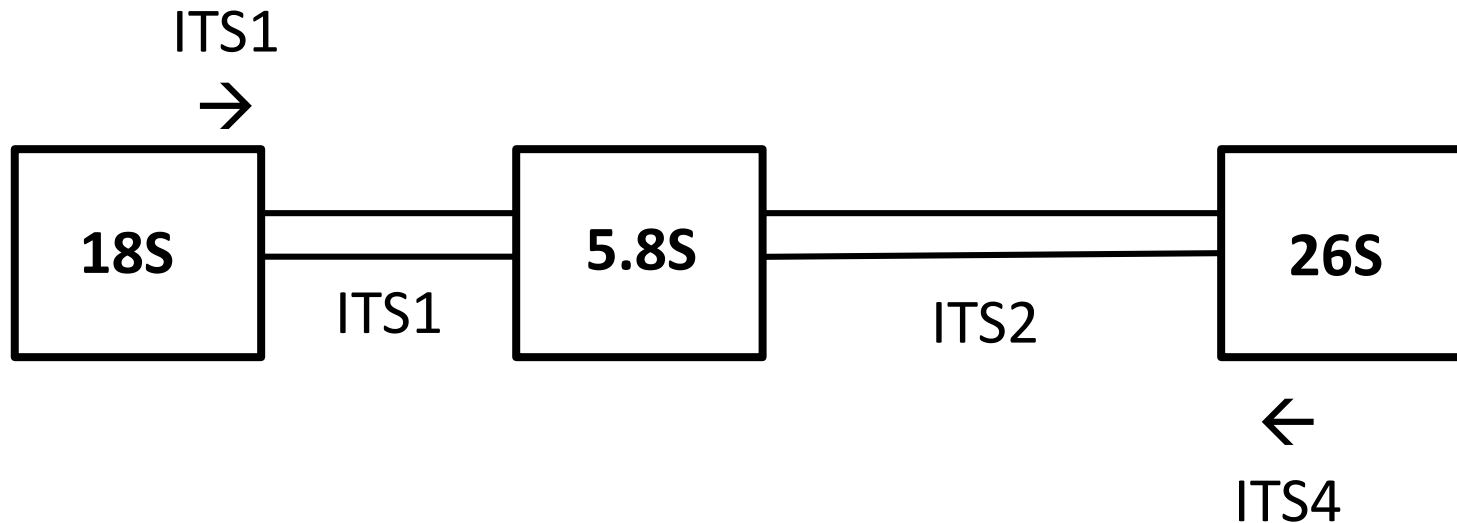
Project Objectives

- Identify variation within the ITS1-5.8S-ITS2 region in the cleavers genome that could be used to differentiate species
- Determine the speciation of various cleavers populations across western Canada

What is the ITS Region?



Large Subunit RNA



- 5.8S gene is highly conserved
- ITS1 and ITS2 can readily evolve



Methodology

- Cleaver DNA extracted from leaf material
 - Standard CTAB method
- ITS1-5.8S-ITS2 region isolated using polymerase chain reaction (PCR)
- Clone to isolate single copies
- Sequencing
 - Standard Sanger sequencing

Developing Consensus Sequences

- 10 plant samples per population
 - Isolated and sequenced 3 copies of the target region
 - Total of 30 sequences for a consensus sequence
- Why?
 - a) PCR copying introduces mistakes
 - b) Sequencing introduces mistakes
- Robust sequences

Variation at the ITS2

Spurium GTTCGAATAAAGCC-AGGGGAAGAGAGAGAAA
 Aparine GTTTGAATAGAGCCAAGGGGGGAAGAGAAAAG
 Boreale G-----AGC---GCGGGCGCG-----

Clancy GTTCGAATAAAGCC-AGGGGAAGAGAGAGAAA
 Heavin GTTCGAATAAAGCC-AGGGGAAGAGAGAGAAA
 Lacombe GTTCGAATAAAGCC-AGGGGAAGAGAGAGAAA
 Manitoba GTTCGAATAAAGCC-AGGGGAAGAGAGAGAAA
 Moosomin GTTCGAATAAAGCC-AGGGGAAGAGAGAGAAA
 SPG GTTCGAATAAAGCC-AGGGGAAGAGAGAGAAA
 Trawin GTTCGAATAAAGCC-AGGGGAAGAGAGAGAAA
 Vegreville GTTCGAATAAAGCC-AGGGGAAGAGAGAGAAA
 Yorkton GTTCGAATAAAGCC-AGGGGAAGAGAGAGAAA

Variation in the 5.8S Gene

Spurium GTAACCAATACGACTGTCGGCAACGGATATCTAGGCTCTCGCATCGATGAAGAACGTAGC
Aparine GTAACCAGTACGACTGTCGGCAACGGATATCTAGGCTCTCGCATCGATGAAGAACGTAGC
Boreale GTAACCAATACGACTCTCGGCAACGGATATCTAGGCTCTCGCATCGATGAAGAACGTAGC

Spurium AAAATGCGATACTTGGTGTGAATTGCAGAATCCCGTGAATCATCGAGTTTTTGAACGCAA
Aparine AAAATGCGATACTTGGTGTGAATTGCAGAATCCCGTGAATCATCGAGTTTTTGAACGCAA
Boreale AAAATGCGATACTTGGTGTGAATTGCAGAATCCCGTGAATCATCGAGTTTTTGAACGCAA

Spurium GTTGCGCCCAAGCCACT
Aparine GTTGCGCCCGAAGCCACT
Boreale GTTGCGCCCGAAGCCATT

Clancy GTAACCAATACGACTGTCGGCAACGGATATCTAGGCTCTCGCATCGATGAAGAACGTAGC
 Heavin GTAACCAATACGACTGTCGGCAACGGATATCTAGGCTCTCGCATCGATGAAGAACGTAGC
 Lacombe GTAACCAATACGACTGTCGGCAACGGATATCTAGGCTCTCGCATCGATGAAGAACGTAGC
 Manitoba GTAACCAATACGACTGTCGGCAACGGATATCTAGGCTCTCGCATCGATGAAGAACGTAGC
 Moosomin GTAACCAATACGACTGTCGGCAACGGATATCTAGGCTCTCGCATCGATGAAGAACGTAGC
 SPG GTAACCAATACGACTGTCGGCAACGGATATCTAGGCTCTCGCATCGATGAAGAACGTAGC
 Trawin GTAACCAATACGACTGTCGGCAACGGATATCTAGGCTCTCGCATCGATGAAGAACGTAGC
 Vegreville GTAACCAATACGACTGTCGGCAACGGATATCTAGGCTCTCGCATCGATGAAGAACGTAGC
 Yorkton GTAACCAATACGACTGTCGGCAACGGATATCTAGGCTCTCGCATCGATGAAGAACGTAGC

Clancy AAAATGCGATACTTGGTGTGAATTGCAGAATCCCGTGAATCATCGAGTTTTTGAACGCAA
 Heavin AAAATGCGATACTTGGTGTGAATTGCAGAATCCCGTGAATCATCGAGTTTTTGAACGCAA
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 Manitoba AAAATGCGATACTTGGTGTGAATTGCAGAATCCCGTGAATCATCGAGTTTTTGAACGCAA
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 Vegreville GTTGCGCCCAAAGCCACT
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Spurium – A

Aparine – G

Conclusions

- ITS region can successfully differentiate *Galium spp.*
- Cleavers populations are *Galium spurium*
- Herbicide resistance could develop
 - Already resistant to group 2 and 4

- Formation of markers to check speciation in more samples, quickly and economically

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Questions?

