

# Retting: A Key to Unlocking Value

Presented to:

## Effective Straw Management Workshop

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by

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# Retting - ASTM definition

- “in flax, the process of partial biological or chemical decomposition of pectins and other components which bind the fiber, fiber bundles, and the non-fiber structures, thereby facilitating removal of bast fibers from stems”

# Under-retting - ASTM definition

- “in flax, indicates that decomposition is insufficient to allow fiber bundles to be easily removed from the non-fibrous parts of the stem”

# Over-retting - ASTM definition

- “in flax, indicates that decomposition has caused excessive deterioration of bast fibers”

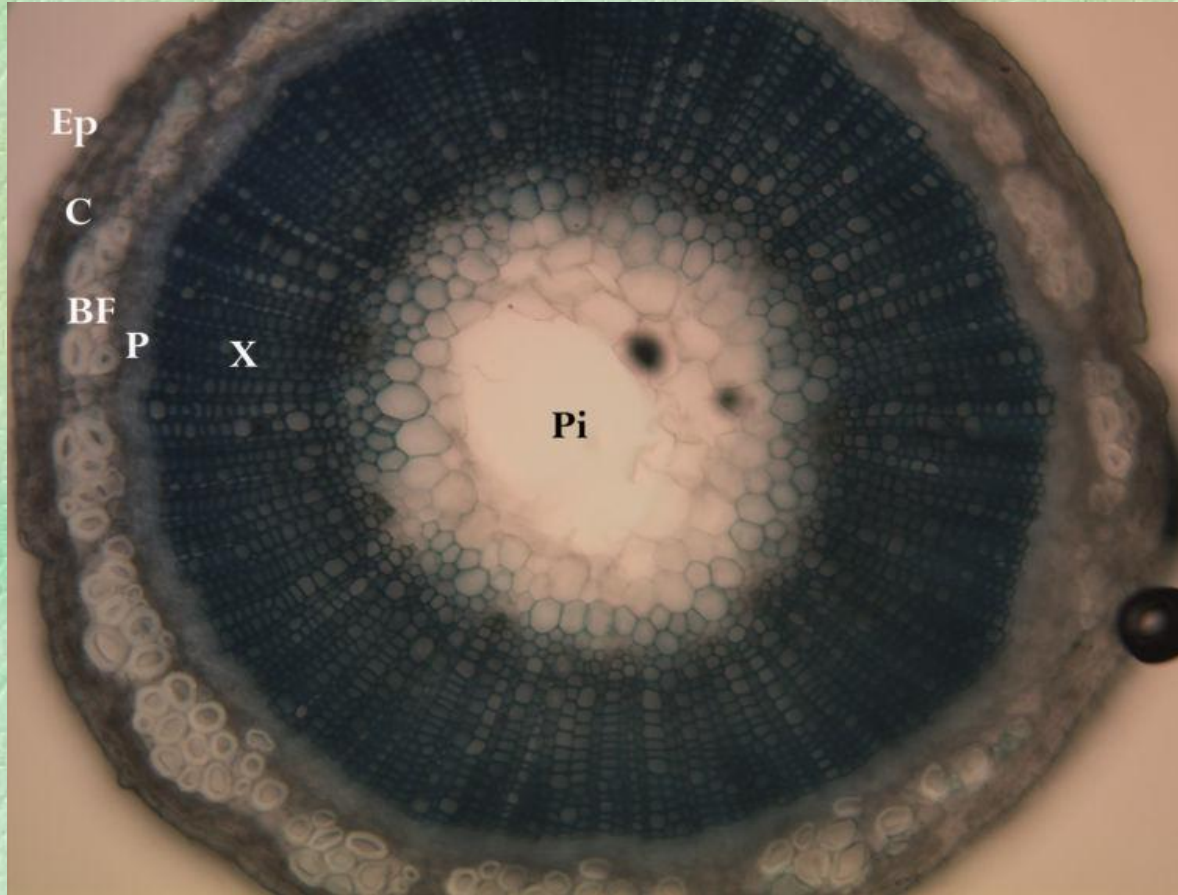
# Retting - layman's definition

- “in flax, the rotting of flax to the point where fibers can be easily extracted from the stem but not to the point where the fibers are very weak”

# Flax Fiber

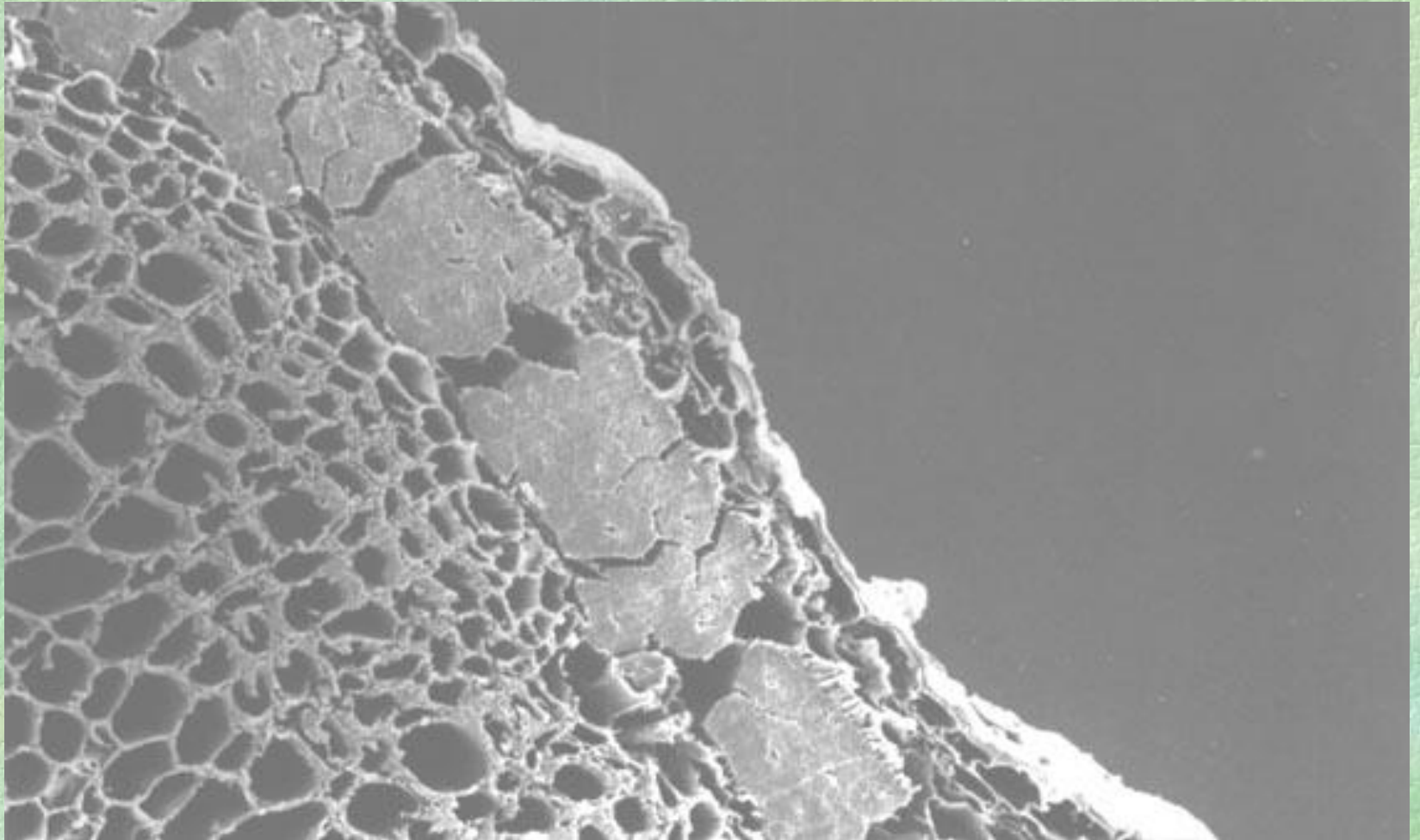
- Where is it in the plant?
- Why can't we just pull it out?

# A Cross Section of a Flax Stem



- Ep - epidermis
- C - cortex
- BF - bast fibers
- P - phloem
- X - xylem
- Pi - pith  
(lumen)

# A section of the Outer Edge of a Flax Stem



# Retting

- is one of the key ways to add value to flax straw because it increases the yield and decrease the cost of producing clean fiber
- dissolves or decomposes the substances that bind and surround the cellulosic fibers found in the inner bark of the stem

# Flax Fiber

## Why can't we just pull it out? ...

- In oilseed flax a typical “bundle” of flax fiber is:
  - 50 microns thick X 40 cm long
  - or 50 microns X 40,000 microns
  - or 8,000 times longer than it is wide
- if a pencil (7 mm thick) were a flax fiber bundle, it would be 56 meters long! (182 ft!)

## ... Flax Fiber

# Why can't we just pull it out?

- Pectins and Retting

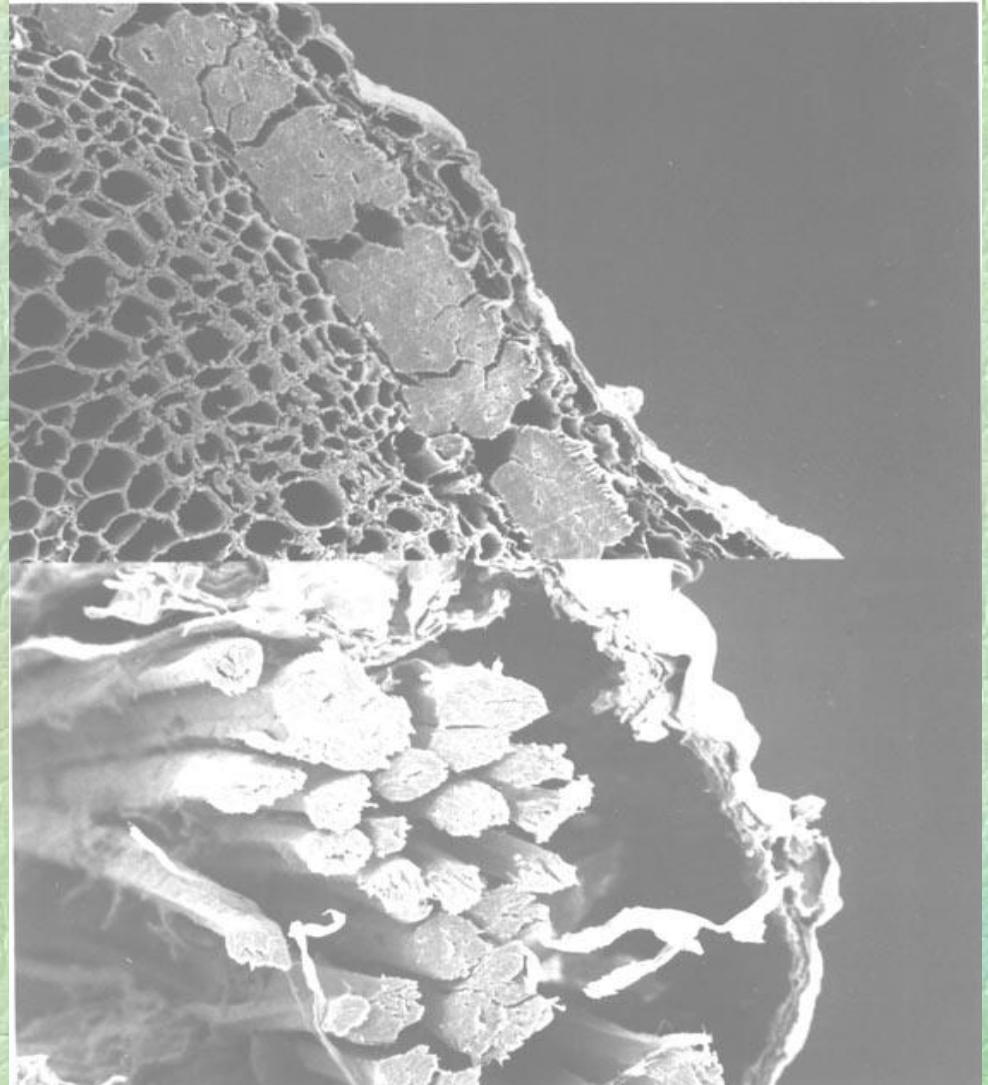
- Pectins plus tremendous surface area to volume keep fibers firmly attached
- Retting dissolves the pectin (glue) that holds the fiber in place

# Retting

- Traditional retting relies on putting straw in conditions that favor certain types of microbial growth
  - 1. Pond retting
  - 2. Stream retting
  - 3. Bog retting
  - 4. Tank retting
  - 5. Field retting

# Retting

- 1st stage - fiber bundles separate from the stem
- 2nd stage - ultimate fibers separate from the fiber bundles



# Field Retting

- In the past, all traditional retting systems were labor intensive, except for field retting
- Field retting can be easily mechanized BUT quality cannot be controlled as well

# Principles of Field Retting

## “think like a microbe”

- Good exposure to light
- good exposure to moisture
- close contact with ground
- all pieces of straw treated the same
- longer pieces of straw better than shorter pieces

# Field Retting Methods that have worked in Saskatchewan ...

- 1st Stage:
  - use straight cut header to cut straw just below bolls, or
  - use stripper header (can be done earlier in season than straight cutting)









# ... Field Retting Methods ...

## ■ 2nd Stage:

- get long pieces of straw flat on the ground
- 1. Rolling in two directions with land roller or
- 2. Cut close to ground with disc bine mower or
- 3. Cut close to ground with rotary mower or
- 4. Cut with sickle mower followed by packers on tine harrow (set almost flat)



# ... Field Retting Methods ...

- 3rd Stage:
  - allow straw to ret until fiber easy to separate from straw (straw usually mousy grey)
  - may be retted late fall or early spring
  - will ret faster if warmer and wetter



Good

# ... Field Retting Methods ...

- 4th Stage:
  - rake straw in windrows for baling
  - 1. Use V-rake, or
  - 2. Use tetter-rake, or
  - 3. Use side delivery rake
- Note: may be problem if some straw not moved by rake



# ... Field Retting Methods

- 5th Stage:
  - bale up straw for transport and storage
  - 1. Use large round baler, or
  - 2. Use small square baler, or
  - 3. Use large square baler (but cover quickly)



# Some Data from Swift Current 06 Retting Trials

- Field trials organized by Mark Stumborg and staff of AAFC Research Station in Swift Current
- Samples processed and tested at Crop Fibers Canada pilot plant in Saskatoon

# Some Data from Swift Current 06

## Retting Trials

	Retting Speed a/	Clean Fiber Yield (%)
Sickle Mower – Coil Packer	1.87	18.9
Sickle Mower – Tine Harrow	1.65	17.2
Sickle Mower – Crowfoot Packer	1.92	16.3
Haybine – Coil Packer	2.00	14.9
Haybine – Tine Harrow	1.96	21.4
Haybine – Crowfoot Packer	2.02	14.2
Swather – Coil Packer	2.07	12.2
Swather – Tine Harrow	1.94	12.7
Swather – Crowfoot Packer	2.29	14.2
Standing Stubble	2.43	14.8

a/ lower number = faster retting

# Other Criteria that Should be Considered

- 1. How fast does it take to get fiber of a certain cleanliness?
- 2. How clean and free from fiber are the shive?
- 3. What is the average length of the fibers?
- 4. What is the average diameter of the clean fiber produced?
- 5. What is the total cost of producing fiber using a particular combination of field and processing methods?

# In Summary

- We have learned many things that will speed up the rate and consistency of field retting in Saskatchewan
- Work still needs to be done to reduce the risk and optimize the parameters
- We should continue to search out alternatives to field retting because of ever present weather risks

# Any Questions?

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