Design, Fabrication and Testing of an Automated Mechanical Chile Destemmer

A Presentation at
The 24th International Pepper Conference 2018, Fort Myers, Florida

Nag Kodali, Ph.D.
DeStem Cell, LLC
November 2018
Mechanical Destemmer

Questions:
  What?
  Why?
  How?
  What is the current status?
  Where is it going?
What is a Mechanical Destemmer

A mechanical device that separates the stem from the pod of a fresh pepper
Why a Mechanical Destemmer

Current Harvesting Practice:

Hand picked
Stem left behind on the plant
Transported to a cannery the same day
Processed and canned within 24 hours
Why a Mechanical Destemmer

Issues Facing the Industry:

Example: New Mexico Chile Industry 1995 – current

Acreage: 40,000 to 10,000
Shortage of farm workers
Increasing competition from foreign markets
Drastic reduction in Jalapeno acreage

Similar issues in AZ and CA
Why a Mechanical Destemmer

Answer to the Problem:

Transition from manual harvest to mechanical harvest

Two Components to Achieve Transition:

a) Mechanical Harvester
b) Mechanical Destemmer
How to Destem Mechanically?

Cut or Snap the Stem?

Two methodologies:
  a) Imaging followed by a cut (blade or water)
     - expensive, data intensive
  b) Completely mechanical
     - less expensive, easier maintenance
Key Factors in Mechanical Approach

1. Feeder
2. Singulation
3. Pepper Orientation
4. Stem Alignment
5. Stem Detachment

Step 5 is the most important factor
Stem Detachment
Stem Detachment
Stem Detachment
Pepper Orientation
Orientation Capture & Pepper Transfer
Twisted Conveyor
Destemmer Assembly
Pepper Self-alignment
Complete Destemming Process
Destem with Pin Conveyor
Idea - Double Twisting Conveyor
Double Twisting Conveyor
Pepper Coaster in Action
Pepper Coaster in Action
Jalapeno Destem
Stem Cut 2
Performance

Throughput
  • About 3000 lb per hour @ full speed (estimate)

Efficiency
  > 90% for Jalapenos for stem pull
  > 95% for Stem cut
Stem: Cut vs Pull

Stem pull: Whole pods

Stem Cut: Higher efficiency

Mechanical harvesting is likely to cause some damage to the structural integrity of the pods and stems
Cut may be a better option for mechanically harvested chile and jalapenos
New Chile Varieties
Conclusions

Mechanical pepper destemmer designed and fabricated

Pepper orientation issue resolved

Self-alignment of stems

Precise positioning of calyx and stem detachment

Feeder under fabrication
Acknowledgements

New Mexico Chile Association
New Mexico State University
New Mexico Chile Commission
Mr. Ed Curry
Mr. Marvin Clary
Dr. Stephanie Walker
Destemming Approach

Pros:
- Mechanical Stem Detachment
- Integrity of the Pod Preserved
- No Data Processing Equipment
- Simplicity

Cons:
- Slow Orientation
- Less Throughput
Destemmer-Pin Conveyor
Destemmer in Action 1
Destemmer in Action 2
Advancements due to the Pin Conveyor

• Vast improvement in the stem detachment quality
  No stem Breakage at the calyx

• Flexibility to tailor inter-pin gap

• Elimination of the need to orient chile

• Elimination of the Stem-jam
Curry Farms