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Research Progress towards Mechanical Harvest of New Mexico Pod-type Green Chile

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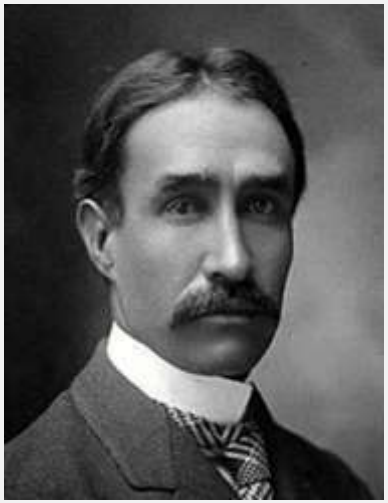
Introduction – New Mexico Chile

- NM pod type chile peppers (*C. annuum)*
  -Introduction with ‘New Mexico No. 9’ release by Fabian Garcia in 1913
- Also referred to as ‘Hatch’ and ‘Anaheim’ chile



Fabian Garcia

Introduction – New Mexico Chile

- **Red** (physiologically mature) and **green** (full sized, physiologically immature) chile
- Quality attributes differ; different cultivars developed for red vs. green chile production
- NM red chile mostly mechanized

NM Green chile is currently 100% hand-harvested

Photo courtesy of P. Funk

NM Chile Mechanization

- Commercial production of NM green chile threatened because of labor challenges
- Mechanization is critical to sustaining domestic NM green chile production

Challenges to Mechanical Harvest of NM Green Chile

- Lack of mechanical de-stemmer
- Excessive fruit damage
- Excessive field loss / fruit left in field
- Excessive harvested trash (sticks & stems)

- Currently available NM green chile cultivars not optimum for mechanical harvest

Previous Research

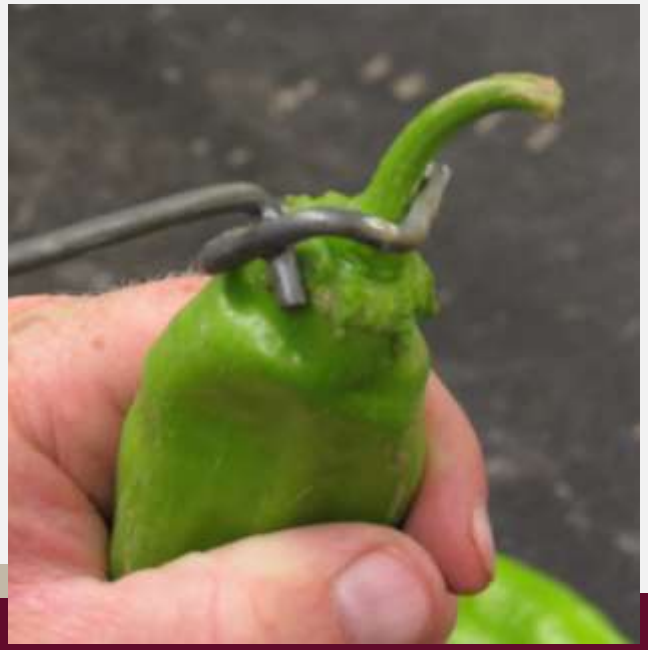
- **Evaluation of commercial and experimental chile harvester heads**
  - Etgar (unmodified) provided the highest recovery of undamaged, marketable NM green chile fruit of those tested
- **Determination of best production protocols**
  - Irrigation method, seed vs. transplant, plant spacing

Previous Research

- **Evaluation of commercially available NM green chile cultivars**
  - Some had higher MH efficiency; ‘NuMex Joe E. Parker’ highest MH yield of those tested
- **Determination of breeding objectives (key plant architecture traits for increased mechanical harvest efficiency**
  - Taller plants, fewer basal branches, higher height to bifurcation, thicker stems

Current Research

- **Development of NM green chile cultivars with improved mechanical harvest efficiency**
  - Less fruit breakage
  - Less harvested trash (sticks & stems)
  - Less fruit left in field after harvest
  - Fruit with easier pedicel removal
  - Maintain excellent flavor and fruit characteristics for NM green chile



Objective (2017 Season)

Evaluate advanced, open-pollinated New Mexico green chile breeding lines developed for mechanization efficiency

Materials and Methods

- **Six advanced New Mexico green chile breeding lines:** 54W17, 55W17, 57W17, 58W17, 60W17, 61W17
- **Two commercially available New Mexico green chile cultivars:** NuMex Joe Parker, AZ-1904
- Lines all open-pollinated

'NuMex Joe E. Parker'

Materials and Methods

- Field was direct seeded 4 April 2017 at the Los Lunas Agricultural Science Center (Los Lunas, NM)
- Plots were 40’ long; randomized in a complete block design with seven replications
- Field was furrow-irrigated (30” furrows), thinned (8” plant spacing), and maintained according to local production protocols

Materials and Methods

- Plots (inner 30') were harvested 29 August 2017
- Single row, Etgar double open-helix picking head powered by tractor used for harvest

Materials and Methods – Pre-harvest

- Plant Measurements (Avg. of 6 plants/plot):
  -Height
  -Width
  -Distance to bifurcation (primary branch angle)
  -Internode length
  -Stem diameter
  -Number of basal branches

Materials and Methods – Post-harvest

- **Mechanically Harvested Yield Components:**
  -Marketable green fruit
  -Damaged fruit
  -Trash (sticks and leaves)
  -Red fruit, diseased fruit
- **Field Loss:**
  -Fruit dropped on ground
  -Fruit left on plants

Materials and Methods – Fruit Quality

- **Marketable Green Fruit (Avg. of 10 fruit/plot):**

  -Fruit width
  -Fruit length
  -Number of locules
  -Pericarp (fruit wall) thickness
  -Flavor & heat

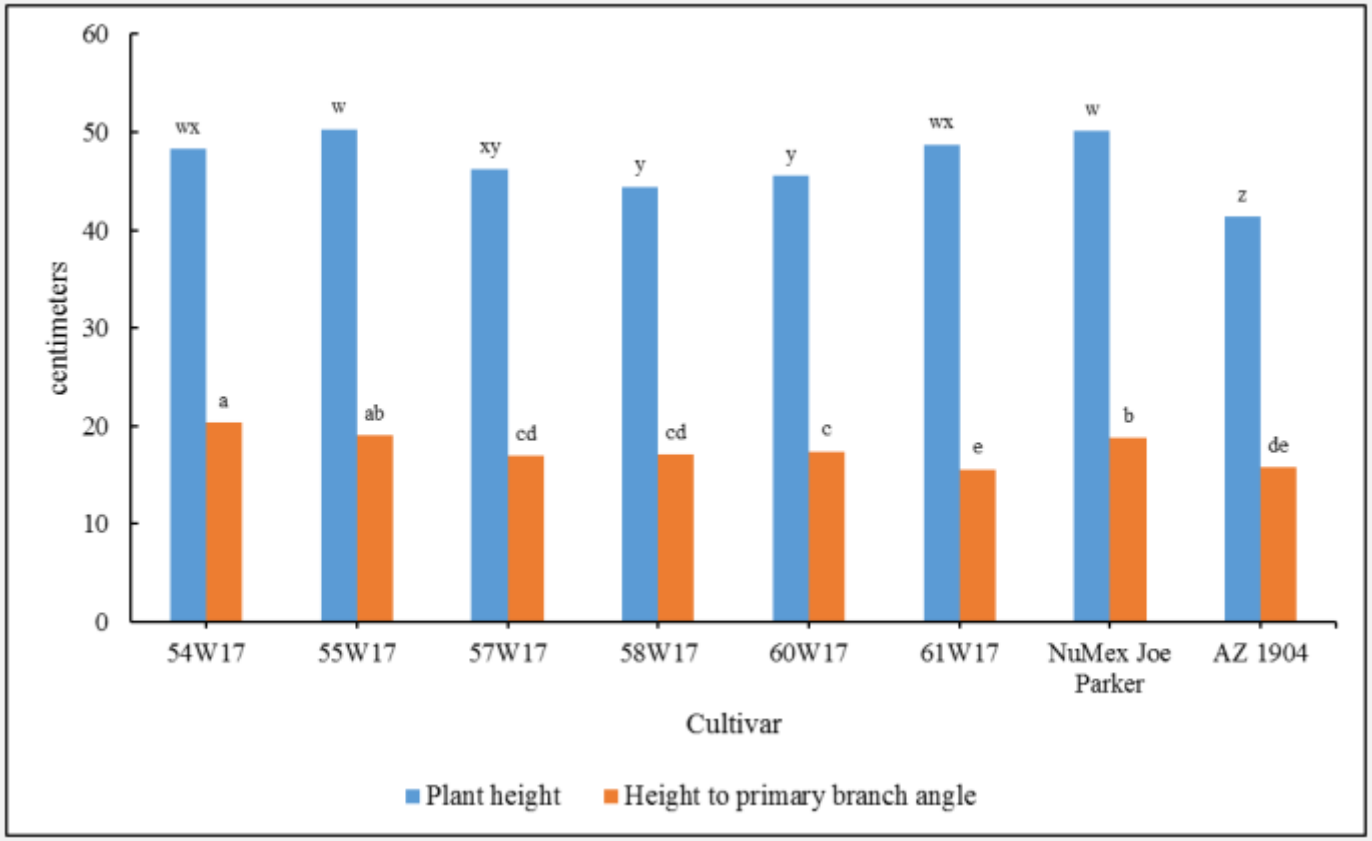
Materials and Methods – Statistical Analysis

- Analysis of variance to detect significance at $P \leq 0.05$
- If significant, means were separated by Least Significant Difference Test ($P \leq 0.05$)

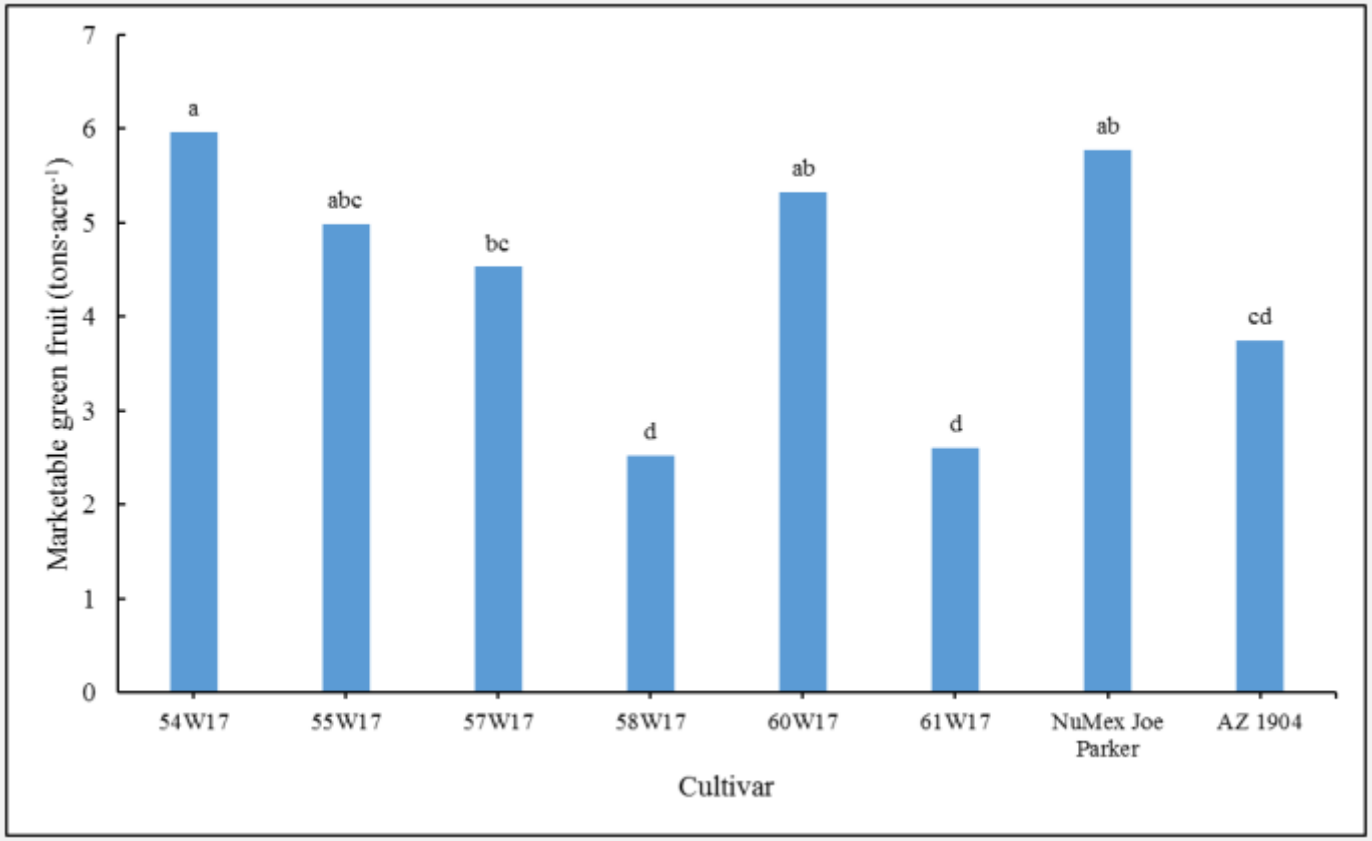
Courtesy P. Funk

Results

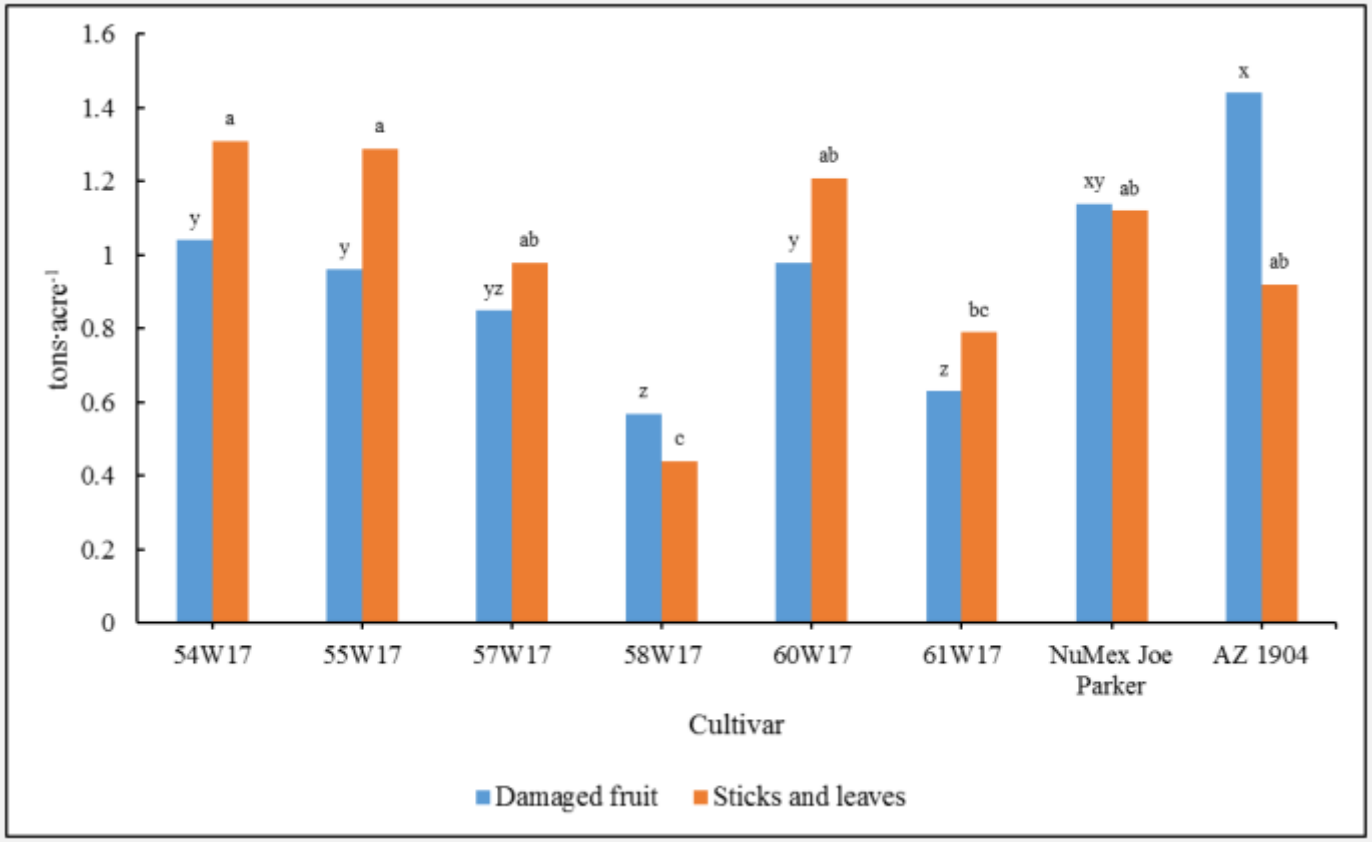
Results: Plant Architecture



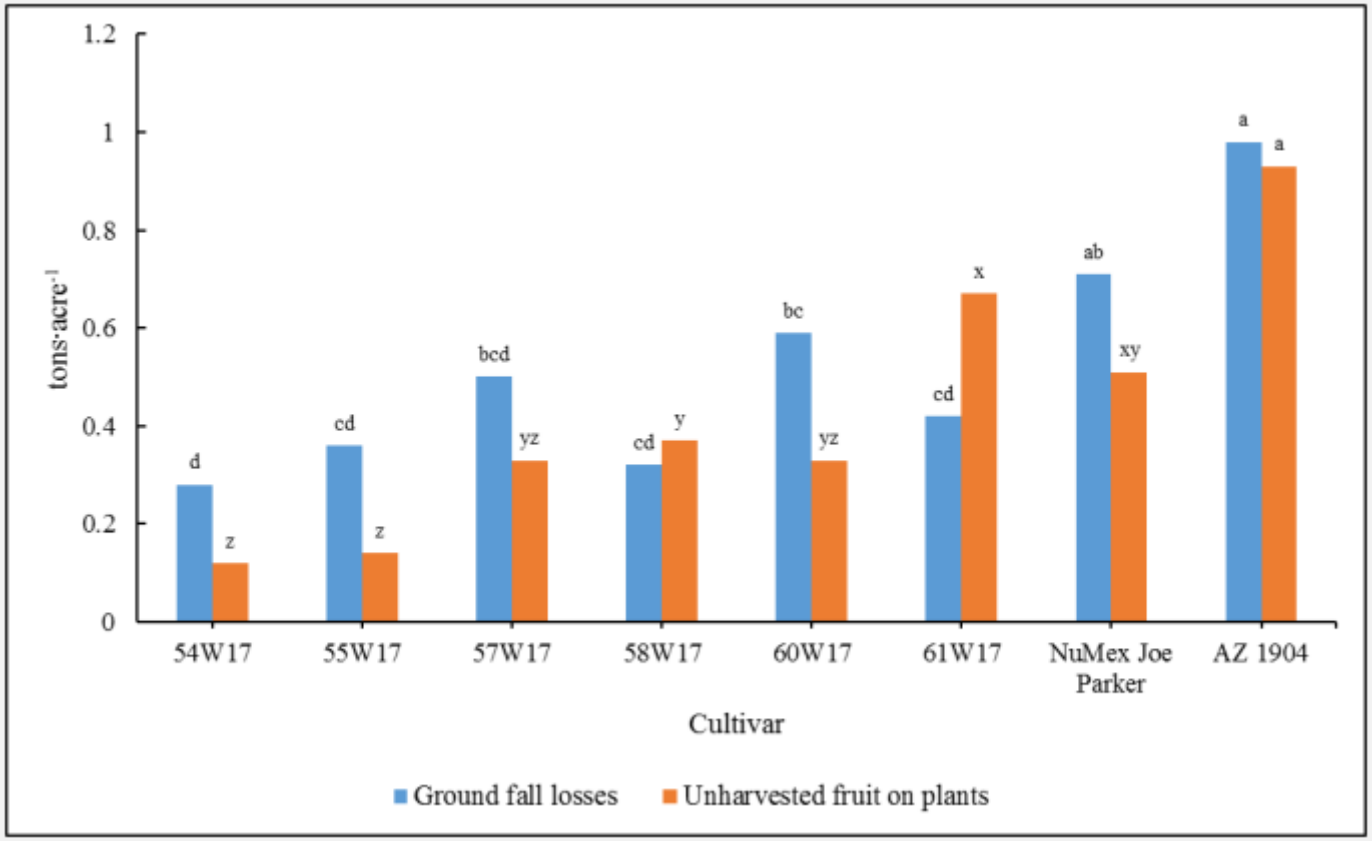
Results: Harvested Marketable Fruit



Results: Harvested Damaged Fruit & Trash



Results: Field Loss



Conclusions

- Fruit damage and harvested trash (sticks and leaves) tended to increase with higher marketable fruit yield

- Breeding line 54W17 provided best mechanical harvest
  - Significantly greater distance to bifurcation and thickest stem diameter (data not shown)
  - Highest marketable fruit yield, but not significantly different than Joe E. Parker
  -Significantly less field loss (unharvested fruit remaining on the plants and ground fall losses) compared to AZ-1904 and Joe E. Parker

Acknowledgements

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Thank you…
…Questions?