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# Phenolics and Antioxidant Activity of American and Hybrid Hazelnuts

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# Thomas Jefferson

- "...the greatest service which can be rendered any country is to add an useful plant to its culture; especially, a bread grain; next in value to bread is oil."









Zel 07  
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GEFFONI



285



281



243A



284



250



244



283



248



240



251



243B

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# Why we asked the question?

- Flavor profile work found some with mild bitterness and astringency
- Much of what causes both factors may be positively related to human health





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# Antioxidants and human health

- Some research suggests good for heart health
- May counteract other negative factors in food
- Preserve food quality



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# Current Examples

- Resveratrol from grapes, mulberries and sprouted peanuts
- Rosemary/sage extract (carnosic acid)-toothpaste etc.



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# Antioxidants in Food

- Foods contain them naturally
- Processed foods often use BHA, BHT, TBHQ



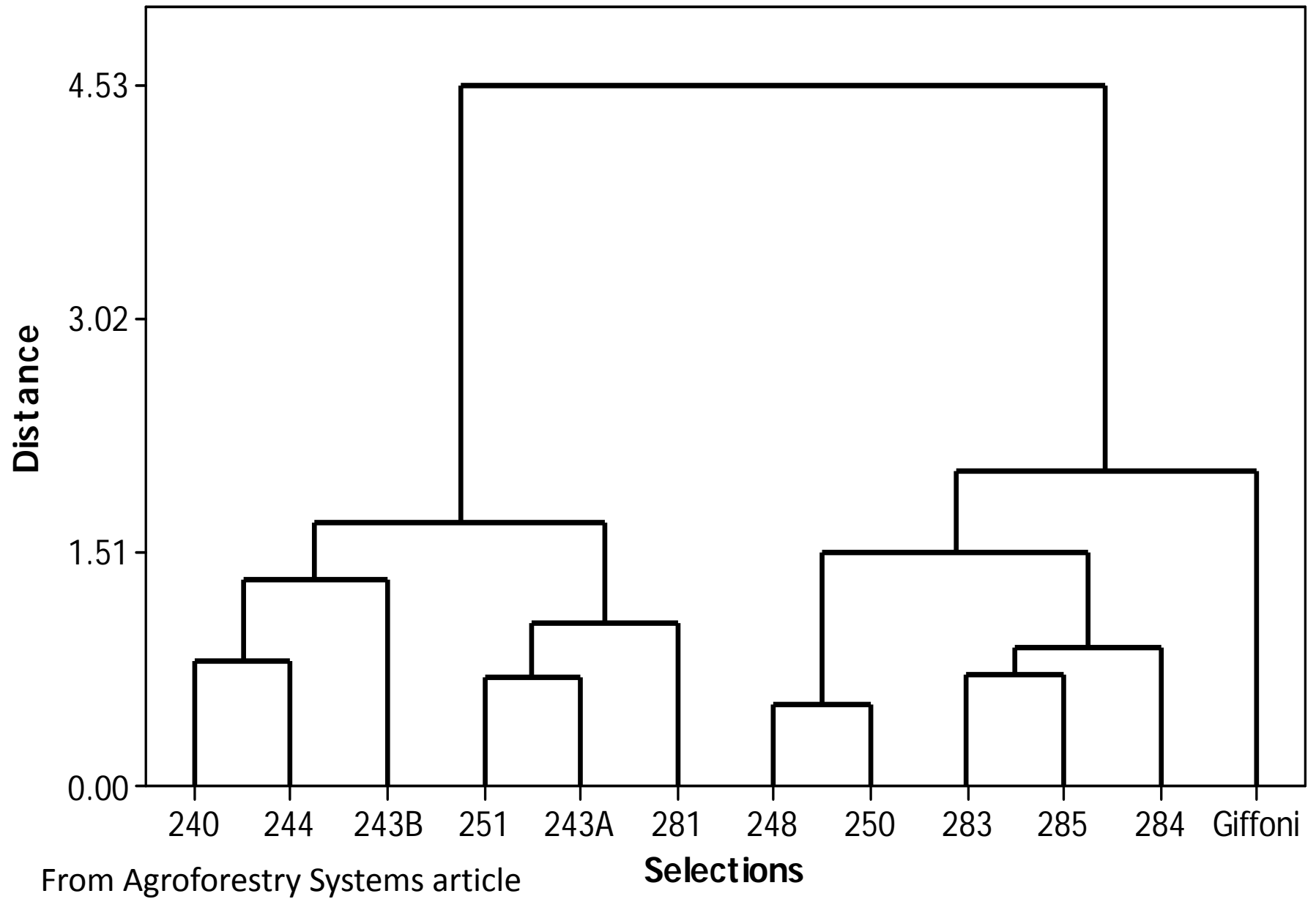
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# Why this is of interest?

- Potential alternative preservative
- Maybe for livestock feed or human foods



# Ward Linkage, Euclidean Distance



Factor	Cluster1	Cluster2
Aroma intensity	4.20	3.16
Roast/nutty	4.32	4.10
Woody	3.48	3.21
Almond-like	1.20	1.25
Popcorn / roasty	1.25	1.03
Oily	1.07	1.04
Fruity	1.64	1.62
Cleaner / soapy	0.10	0.66
Basic sweet	2.57	2.67
Basic sour	0.93	0.88
Basic bitter	2.12	1.73
Nutty AT	3.64	3.40
Astringent AT	3.60	3.38
Bitter AT	2.13	1.75

From  
Agroforestry  
Systems article

## ...continued

- Reducing bitterness dominates much of the history of plant breeding
- European hazelnut skins have a lot of phenolics
- They are often powerful antioxidants
- Possible natural food preservative as well as health promoting



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# Objective

- To determine the levels of phenolics (American hazelnut and hybrids)
- Test these extracts for antioxidant potential





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# Methods

- Follow established methods to be able to compare to European hazelnuts
- Note: this procedure is simplified a bit for clarity...main steps are listed, minor stuff is ignored



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# Sample Collection

- 5 American hazelnut selections
- 8 hybrid selection
- Nuts, shells, involucre, leaves



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# Process

- Grind
- Remove fat (hexane)
- Air-dry results



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# Extract

- Use alcohol and water mixture
- Vacuum and freeze-dry results
- This is the phenolics and other stuff



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# Testing Phenolics

- Add a reagent Folin-Ciocalteu phenol reagent
- This turns blue proportional to the phenols in solution
- Test with a spectrophotometer
- Compare to catechin



# Antioxidant Activity

- Take more extract and dissolve (phosphate buffered saline)
- Filter
- Standardize to 200 ppm
- Add hydrogen peroxide
- Test how much of the peroxide is consumed



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# Results

- Quite high phenolic level in the waste products (co-products)
- Less in the nuts
- Surprisingly, similar to European hazelnuts



# Results

		Nutmeat	Shell	Leaf	Involucre
		mg CE/g			
<b>Total Phenolics</b>	Hybrid	18.7(3.0)	162.0(20.1)	234.9(22.1)	160.8(15.7)
	Wild	23.5(3.9)	140.8(11.1)	207.7(26.2)	155.7(18.6)
		Proportion hydrogen peroxide consumed			
<b>Antioxidant</b>	Hybrid	0.63(0.02)	0.81(0.01)	0.95(0.01)	0.97(0.01)
	Wild	0.67(0.03)	0.79(0.01)	0.98(0.01)	0.97(0.01)





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# Overall

- Leaves are highest, involucre and shell similar, nuts are low
- These levels are 50-100 times those found in ag wastes (potato skins, sugarbeet pulp, sesame cake)
- Phenolics in leaves and involucre are strongest antioxidants, shells are next, nuts are least



# Conclusions

- There are probable co-products in the waste products of hazelnut production
- Would require more research
  - What are the specific phenolics
  - To determine how they would perform and safety in food/feed




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# Acknowledgements

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A photograph of a large, dense bush with many green leaves and some yellowing or brownish leaves. A person's hands are visible on the right side, reaching into the bush. The background is a grassy field.

Questions?