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Acoustic impedance of some fruits and vegetables from the region of Zacatecas, Mexico: An approach to the quality of agricultural products

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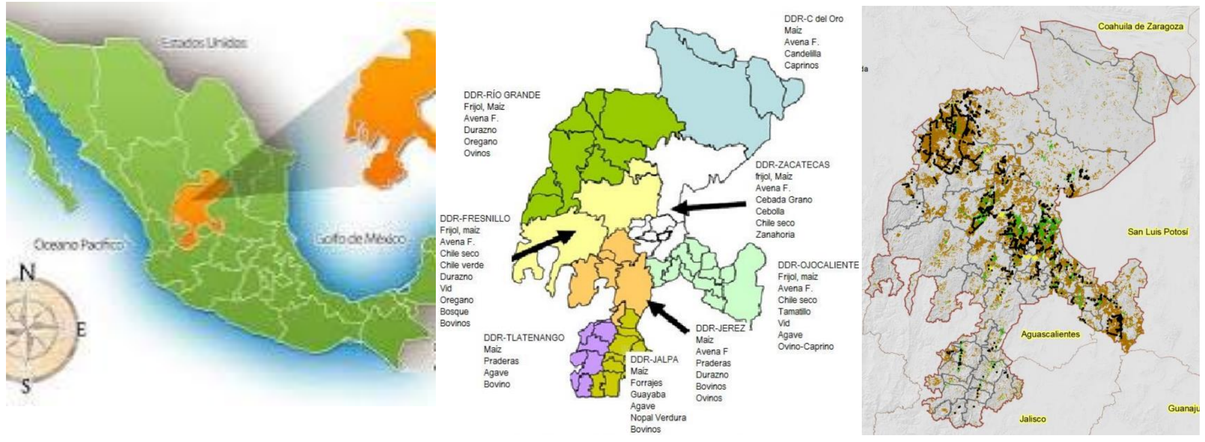
INTRODUCTION & AIM

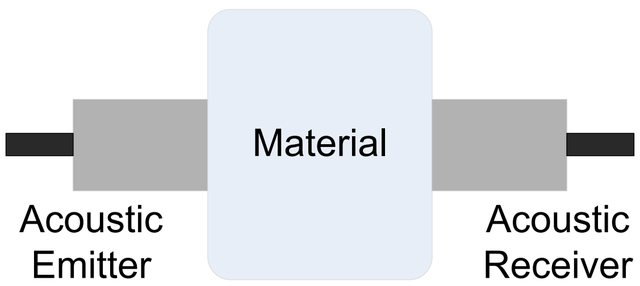


This cartel presents a study to determine the acoustic impedance of various agricultural products from the Zacatecas region of Mexico. The products were purchased from a local store. The fruit and vegetables analysed were peach (*Prunus persica*), grape (*Vitis vinifiera*), guava (*Psidium guajava*), apple (*Malus domestica*) and quince (*Cydonia oblonda*); onion (*Allium cepa*), prickly pear (*Opuntia ficus-indica*), tomato (*Solanum lycopersicum*), carrot (*Daucus carota*), beans (*Phaseolus vulgaris*), and maize (*Zea mayz*).

METHOD

Name	Range, (Hz)
Infrasound	IS < 16
Audible Sound	16 ≤ AS ≤ 17.8
Ultrasound	17.8 < US < 1 G
Hypersound	HS ≥ 1 G

TRANSMISSION METHOD

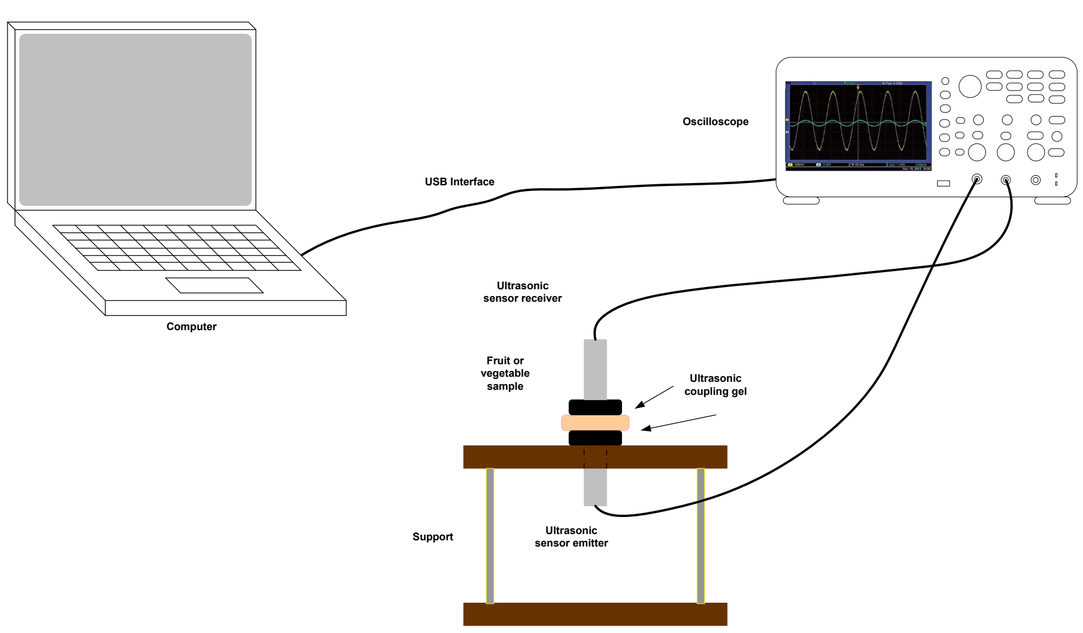


Experimental conditions:

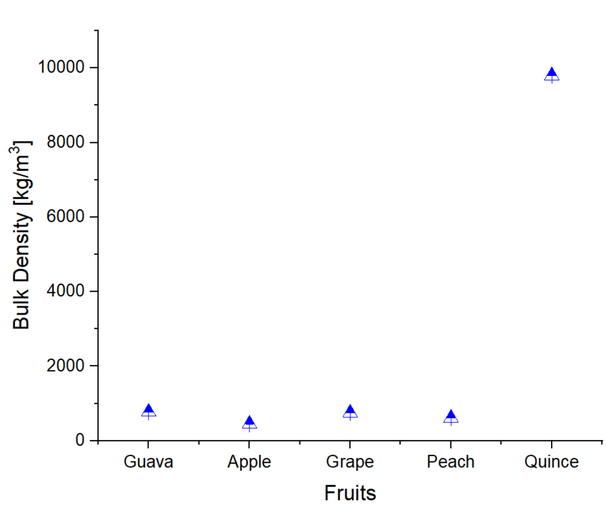
- ✓ 7 – 9 AM.
- ✓ Samples type: Fruis and vegetables.
- ✓ Sampling rate: 100MHz.
- ✓ Excitation pulse: normal incidence.

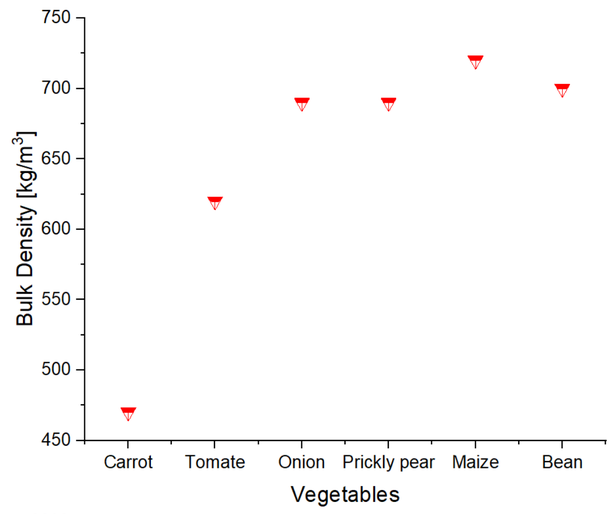
Thermodynamic conditions:

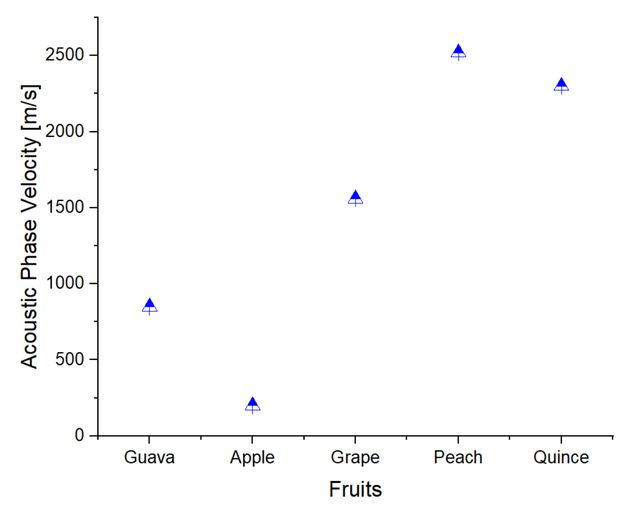
- ✓ Open system.
- ✓ Atmospheric pressure: 1020.1hPa
- ✓ Humidity: 27%
- ✓ Laboratory temperature: 15±1°C

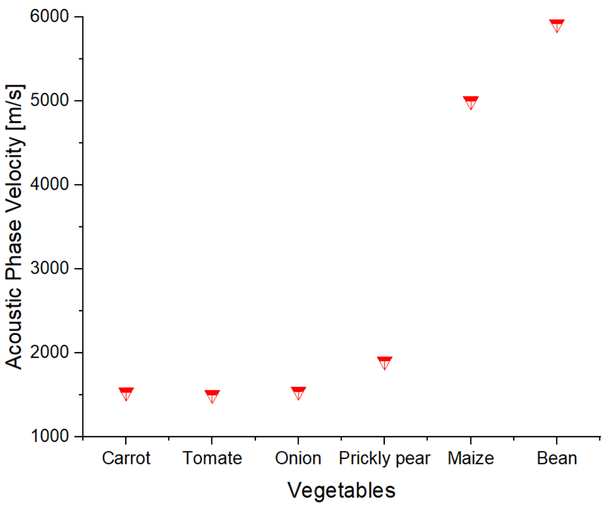


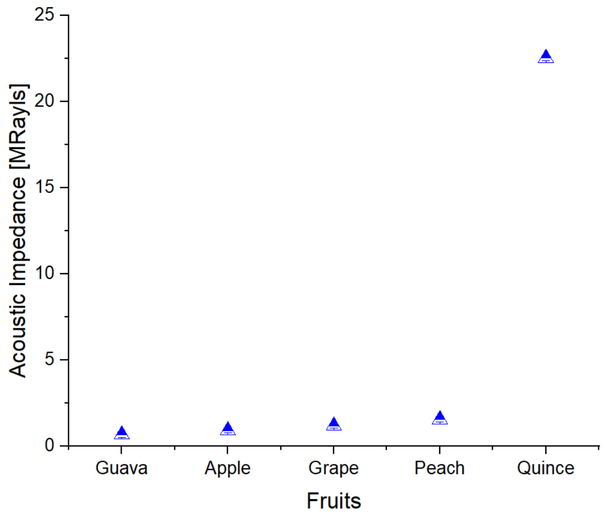
RESULTS & DISCUSSION

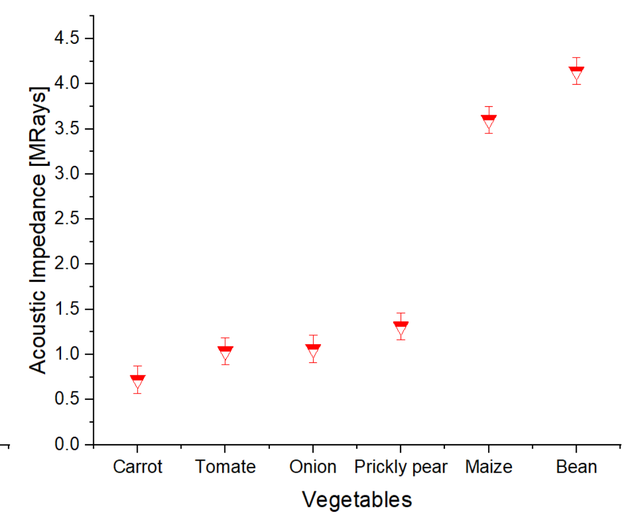












CONCLUSION

- ✓ The acoustic properties of fruits and vegetables produced in the state of Zacatecas, Mexico, were characterized.
- ✓ The bulk density and acoustic phase velocity of fruits such as peaches, grapes, guavas, apples, and quinces were determined; and vegetables such as onions, cactus, tomatoes, and carrots were determined; as well as a few seeds such as beans and maize.
- ✓ The acoustic impedance of these agricultural products was determined.

FUTURE WORK / REFERENCES

It is proposed to continue exploring the acoustic properties of agricultural products to correlate them with optical, rheological, and textural properties. Furthermore, it is advisable to explore new acoustic models and parameters using ultrasonic resonance spectroscopy for semi-solid and solid products.

- L. E. Kinsler, A. R. Frey, A. B. Coopens, J. V. Sanders, *Fundamentals of Acoustics*, 4th Ed., Wiley & Sons, USA, 2000.
- L. O. Figura, A. A. Teixeira, *Food Physics, Physical Properties – Measurement and Applications*, Springer, Germany, 2007.