Fostering the Transition to Sustainable Food Systems: Embracing Novelty and Overcoming Challenges

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ABSTRACT BOOK

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Slow and Sustainable: Texture and Colour Assessment of Solar-Cooked Chickpeas

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Aim:
To evaluate the texture and colour of chickpeas cooked using three different methods - gas stove, kitchen robot (Bimby®), and the Suntaste solar oven - to assess the potential of slow, energy-efficient techniques as sustainable alternatives to conventional cooking, while maintaining desirable quality in legume-based food preparation.

Method:
Chickpeas were soaked at a 1:4 (w/v) ratio for 12 hours at room temperature. Cooking methods included solar cooking (5 h; average water temperature: 77 °C), gas stove cooking (3 h; 100 °C), and Bimby® (35 min; 100 °C). The solar cooking process followed a typical slow-cooking thermal profile, with a gradual temperature rise and stabilization below boiling. Texture was evaluated using Texture Profile Analysis (TPA) on a TA.XT2i analyzer, measuring hardness, springiness, cohesiveness, and adhesiveness. Colour was analysed with a Minolta CR-400 colorimeter using the CIELAB system, and total colour difference (ΔE) was calculated between samples.

Results:
Solar- and Bimby® - cooked chickpeas exhibited significantly higher hardness (~1200 N) than stove-cooked samples (~800 N) ($p < 0.05$), while no significant differences were observed in springiness, cohesiveness, or adhesiveness, indicating comparable internal structure. Although instrumental hardness was higher, the solar-cooked chickpeas were perceived as adequately cooked, highlighting that mechanical resistance alone may not fully predict eating quality. Colour analysis showed that solar-cooked samples were visually closer to stove-cooked ones ($\Delta E = 3.57$) than to Bimby® ($\Delta E = 4.08$), indicating better preservation of visual attributes.

Conclusion:
The Suntaste solar oven, operating under slow cooking conditions, successfully produced chickpeas with structural and visual quality comparable to conventional methods. These findings underscore the potential of solar cooking as a sustainable, fuel-free approach for preparing legumes, offering significant energy savings while maintaining product quality. As global food systems seek to reduce their environmental impact, solar cooking is a promising strategy to promote low-energy domestic food processing, particularly in sun-rich regions and off-grid settings.