



Maestría en Gestión e Innovación Tecnológica

Title

**The wild sunflower "polocote": the plague that can
revolutionate the packaging industry**

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1. Introduction

Polystyrene is a hydrocarbon based material massively used in the manufacture of packaging materials [G.A. Holt *et al*, 2012]. Since polystyrene is non-biodegradable and a vast range of environmental and health issues are attributed, **a biodegradable substitute that is eco-friendly is being sought for packaging and insulation board consumers.**

The **wild sunflower (*Tithonia tubiformis*), or so called “polocote”** by locals in the Puebla Valley and Central Mexico, is the most abundant plague for farmers [Espinosa *et al*, 1997]. The Xilema is the plant’s stem, a white porous material that resembles the main characteristics of polystyrene. **This plague could become a biodegradable and eco-friendly alternative to the spread use of polystyrene in the packaging industry**, and potentially detonate a new value chain with environmental, economic, and sustainable benefits..

2. Aim

The main objective of this project is to test and compare the mechanical characteristics of a packaging prototype made with “*Tithonia tubiformis*”, against the ones from Polystyrene. This will let us know if the proposed material is suitable for packaging appliances



Polocote on geowing season



Polocote on dry season



Polocote Stem with cortex

3. Method

The prototype will be subjected to the following testing methods:

- Compressive Strength
- Flexural Strength
- Modulus of elasticity
- Density
- Dimensional stability
- Accelerated aging
- Water absorption
- Cone calorimetry
- Thermal conductivity.

4. Partial Results

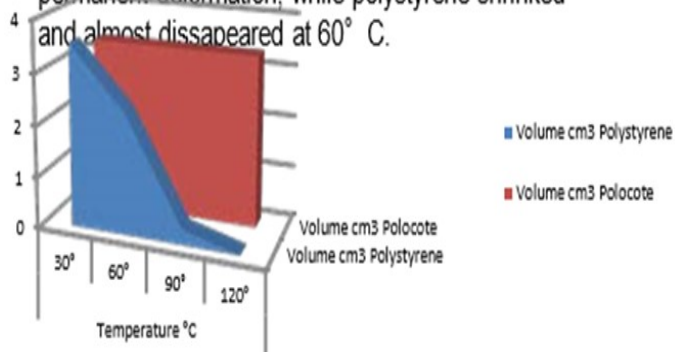
Density. The procedure consisted on cutting a polystyrene bar of dimensions 3 cm x 1.5 cm x 1 cm, with volume 4.5 cm³ which weighted 0.045 g. The same was applied to a polocote rod of 3.322 cm³ wich weighted 60g. The result was that on raw state, the plant *Tithonia tubiformis*, was 80% more dense than their polystyrene counterpart, according to the following table:

	Density
Polystyrene	0.01 g/cm ³
Polocote	0.018 g/cm ³

Water absoption. On raw state, *Tithonia tubiformis*, absorbed 50% of its weight in water, while polvstvrene is a hvdrophobic material and almost

	Weigth before immersion	Weight After Immersion
Polystyrene	0.045 g.	0.04555 g.
Polocote	0.060 g.	0.090 g.

Dimensional Stability. On raw state, the plant *Tithonia tubiformis*, performed better than polystyrene, achieving 120° C without suffering permanent deformation, while polystyrene shrank and almost dissapeared at 60° C.



Polocote peeled Stem

5. Conclusion

According to preliminary results, the Plant *Tithonia Tubiformis* could be a good substitute to polystyrene due to its low density, and dimensional stability at high temperatures. In the present context, it could well become an eco-friendly material alternative for the packaging industry, getting advantage of the main plague for mexican farmers, also helping to reduce the carbon footprint of one of the most polluting industries in the world.

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