WATER FOOTPRINT IN THE PRODUCTION OF NATURAL CELLULOSE BIOFILM FOR THE CONSERVATION OF VEGE-TABLES

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The goal of the project consisted of the production of paper and two plastic biofilms from cellulose obtained from corn bagasse, which constitutes the waste of the plant. This with a double aim, on the one hand, reduce the impact to the environment derived from the use of synthetic plastics, and on the other, increase the life time of vegetables; all under the concept of water footprint.

Methodology

- Under different procedures paper and two plastic biofilms were elaborated from corn maize leaves waste. One from the extraction of pectin and the other from lignin from the black liquor by-product generated in the production of paper.
- During the obtaining of paper and the bioplastics, the water footprint was calculated and compared with that reported in the literature for all cases using the equation established by Hoekstra and Mekonnen 2012:

$$WF_{prod}[p] = WF_{proc}[p] + \sum\left(\frac{WF_{prod}[i]}{f_m[p,i]}\right) \times f_v[i$$

- The biodegradability of the material produced was environmentally exposed over soil during 21 days.
- The preservative and antioxidant effect for the bioplastics was evaluated on banana and melon.

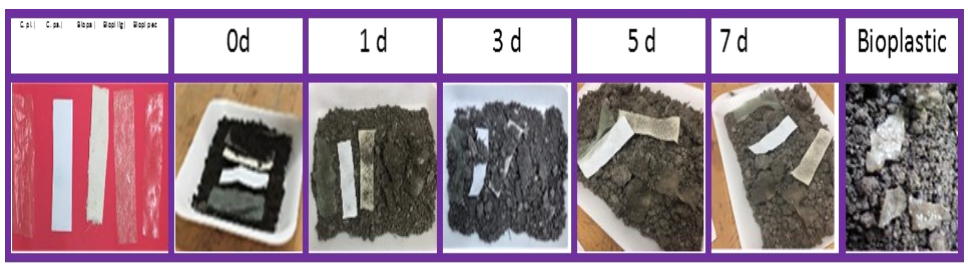
Results and Discussion

Table 1. WF and Saved Water by paper and bioplastic production

		Production of Biopaper and Bioplatic		
Water Foodprint m^3/kg	Constituens of WF	Paper	Lingnin	Pectin
	Blue	2.33	81.02	82.28
	Green	118.24	947	947
	Grew	4.43	197.56	203.5
	Calculated	125	1,226	1,233
	Theoretical**	1,347	4,226	4,226
	Saved Water	1.102	3.432	3.43

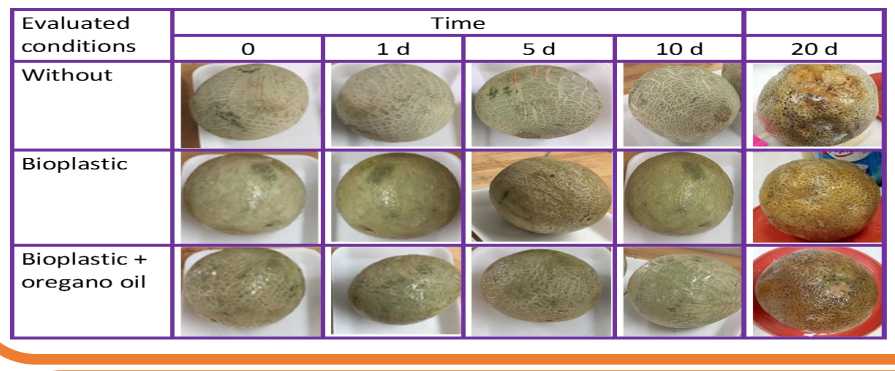
**Endah Putri, 2018

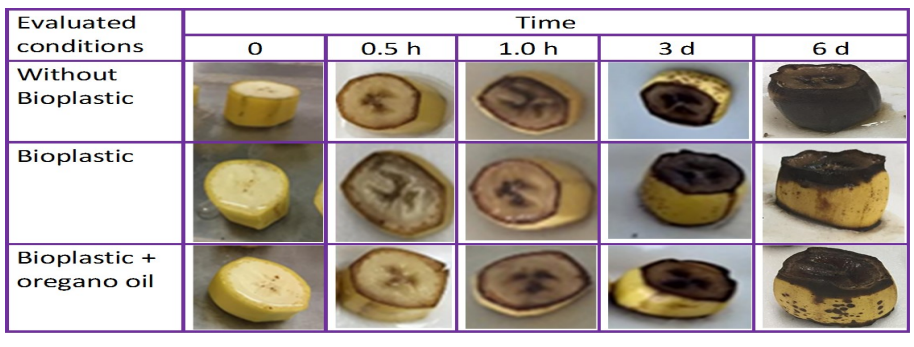
Figure 1. Biodegradability of the material environmentally exposed on soil



The bioplastics biodegradability is shown as loss discoloration of surface brightness, tensile strength and elongation, cracking, sticky surfaces, surface erosion and even their total disintegration.

Figure 2. Preservative and antioxidant effects of bioplastics on melon and banana





Conclusions

- The elaboration of bioplastics and paper achieves a reduction of 3.43 and 1.10 times of WF compared with theoretical production estimations for bioplastic and commercial paper.
- The biodegradability of bioplastics and biopapers occurs in a period of 5 days, compared to 1000 years of commercial plastic products.
- The bioplastic retards the oxidation process of fruits and vegetables up to 21 days. This has potential application in the food industry sector of highly perishable products, sustainable management of resources, particularly water, as well as the environmental impact related to the different components of the water footprint.
- The use of bioplastics reduces the impact on the environment, mainly in aquatic bodies such as oceans, lakes and rivers, as well as within the trophic chain. Their nature give them the ability to be included in compost systems to increase their rate of degradation.
- The use of bioplastics is an economic and innovative alternative compared to conventional methods to have materials with a shorter lifetime.