

Evaluation of the pretreatment of tomato waste as support for the recovery of carotenoids through Solid-State Fermentation Assisted Extraction (SSFAE)

J.Y. Méndez-Carmona¹, K.N. Ramírez-Guzmán², J.A. Ascacio-Valdés², L. Sepulveda¹, J. Sandoval-Cortés¹, C.N. Aguilar^{1*}

¹School of Chemistry, Universidad Autónoma de Coahuila, Saltillo, Coahuila, 25280, México

²Center for Interdisciplinary Studies and Research, Universidad Autónoma de Coahuila, Saltillo, Coahuila, 25280, México

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Presenting author email: jmendez@uadec.edu.mx

The tomato has an important accumulation of carotenoids that are important due to the multiple applications, in addition to the proven benefits to the human health (Çetin, 2022).

Solid-State Fermentation Assisted Extraction (SSFAE) is a bioprocess which have been studied due its remarkable results in the extraction and recovery of biocompounds from plant residues.

The present work studied the pre-treatments of the tomato waste to be used as a support for the recovery of carotenoids through SSFAE with *Aspergillus niger* GH1.

Different tomato waste samples were dehydrated by conventional oven at different temperatures (40 °C, 50 °C, and 60 °C), in addition to other samples dehydrated by freeze-dry. Using previously studied solid-state fermentation condition with a 65% of humidity, 1x10⁶ spores/gram inoculum size, pH 4, and evaluating different incubation temperatures (25 °C, 28 °C, 30 °C, and 33°C) the results were quantified by HPLC.

Table 1. Equivalents of total carotenoids recovery at different incubation temperature of the solid-state fermentation (SSF) with previous conditions established (1x10⁶ spores/gr of inoculum size, pH 4, 65 humidity percentage) employing different pretreatment of drying of the tomato waste as a support for the bioprocess.

Incubation temperature of SSF (°C)	Pretreatment (dried) of tomato waste	Equivalents of total carotenoids recovery (mg/g dw)
25	T1 Conventional oven (40 °C)	0.003 ± 0.000 ^b
	T2 Conventional oven (50 °C)	0.253 ± 0.121 ^{ab}
25	T3 Conventional oven (60 °C)	0.666 ± 0.059 ^a
25	T4 Freeze-dry	0.055 ± 0.022 ^b
28	T1 Conventional oven (40 °C)	0.049 ± 0.006 ^b

28	T2 Conventional oven (50 °C)	0.346 ± 0.027 ^{ab}
	T3 Conventional oven (60 °C)	0.526 ± 0.003 ^a
28	T4 Freeze-dry	0.114 ± 0.018 ^b
30	T1 Conventional oven (40 °C)	0.057 ± 0.006 ^b
	T2 Conventional oven (50 °C)	0.277 ± 0.003 ^{ab}
30	T3 Conventional oven (60 °C)	0.338 ± 0.079 ^a
30	T4 Freeze-dry	0.038 ± 0.004 ^b
33	T1 Conventional oven (40 °C)	0.093 ± 0.004 ^b
	T2 Conventional oven (50 °C)	0.249 ± 0.007 ^{ab}
33	T3 Conventional oven (60 °C)	0.352 ± 0.082 ^a
33	T4 Freeze-dry	0.034 ± 0.002 ^b

Results and Discussion

The tomato waste dehydration process influences the recovery of carotenoids by solid-state fermentation. Dehydration by conventional oven at 60 °C for 5 days allowed a higher recovery of carotenoids compared to tomato samples that were freeze-dried. Likewise, under the fermentation conditions: 65 % humidity, 1x10⁶ spores/gram as inoculum size, at 25 °C incubation for 36 hours, 0.666 ± 0.059 mg/g dw equivalents of total carotenoid were recovered. SSFAE with *Aspergillus niger* GH1 allows the recovery of carotenoids from tomato waste, it is essential to study various factors in both the support and the bioprocess that could increase the amount of biocompounds recovered.

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