



# Extraction, identification, and quantification of pumpkin species carotenoids from the Algerian local market

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## Introduction

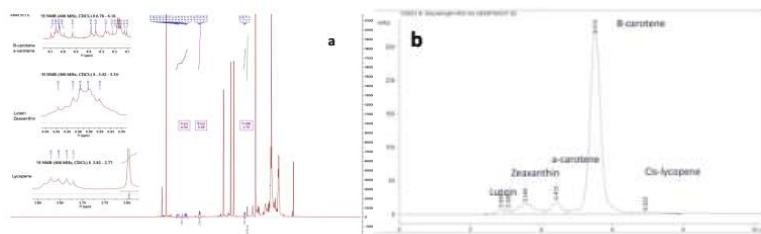
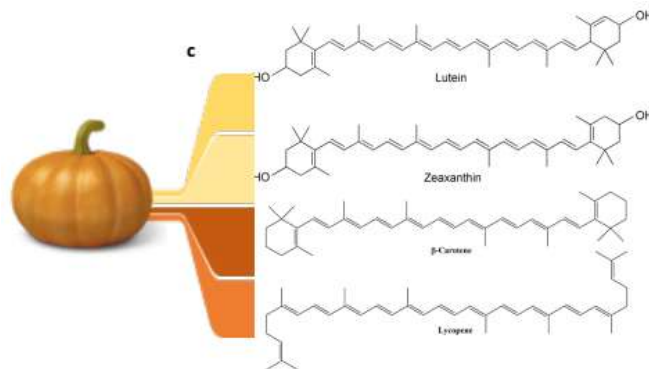
Pumpkin fruits are widely appreciated and consumed worldwide. In addition to their balanced nutritional profile, pumpkin species also present valuable bioactive compounds that confer biological and pharmacological properties to them. However, the seeds, peels and fibrous strands resulting from pumpkin processing are still poorly explored by the food industry. The current study used those fruit components from the genotypes of pumpkin that are economically significant in Algeria to produce bioactive extracts.

The Carotenoids extraction of dry samples using a mixture of solvents was performed on three raw cultivars that are popular in Algeria: V1 *Cucurbita maxima* (Gold nugget Pumpkin), V2 *Cucurbita moschata* (Butternut Squash), and V3 *Cucurbita moschata* (Musquée de Provençal Squash), by using various fruit parts (peel, pulp and fibers).

## Material et Methods

Carotenoids extraction was performed on 100 mg of dry samples in a mixture CHCl<sub>3</sub>/acetone/hexane (2ml) + 10 mg of CaCO<sub>3</sub>. Centrifuged and the supernatant was dried by nitrogen steam and then resuspended with 1 ml of the extraction solvent mixture.

The extracted carotenoids were first identified by NMR 400 and then determined according to the elution order at 450 nm and quantified by HPLC-U-Vis system equipped with a C18 column by external standard method using B-carotene as external standard. Mobile phase A: Methanol/water (3:1, V/V) + 10mM CH<sub>3</sub>COONH<sub>4</sub> and mobile phase B: ethyl acet/methyl butanol (3:1, V/V) operated in gradient mode.

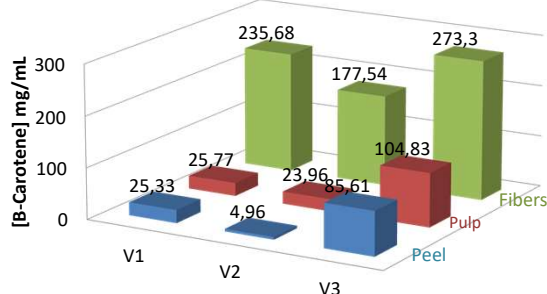


**Figure 1:** Carotenoids identification; **a:** NMR spectra of carotenoids with characteristic pics of the identified each carotenoid, **b:** HPLC-UV-Vis chromatogram of carotenoids recorded at 450 nm, **c:** chemical structure of the carotenoids identified.

## Results and Discussion

**Table 1:** Carotenoids concentration (mg/100g dw) of the studied cultivars of pumpkin.

mg/100g	V1 : <i>Cucurbita maxima</i> (Gold nugget pumpkin)			V2 : <i>Cucurbita moschata</i> (butternut squash)			V3 : <i>Cucurbita moschata</i> (musquée de provençe squash)		
Fruit part	Peel	Pulp	Fibers	Peel	Pulp	Fibers	Peel	Pulp	Fibers
Lutein	66.22 ± 2.01	4.60 ± 0.16	3.57 ± 0.13	2.66 ± 0.1	0.004 ± 0.001	4.06 ± 0.14	12.94 ± 0.41	1.30 ± 0.06	3.72 ± 0.13
Chlorophyll B	-	0.07 ± 0.01	1.43 ± 0.06	0.02 ± 0.001	-	0.96 ± 0.05	0.76 ± 0.04	0.09 ± 0.01	0.63 ± 0.04
Chlorophyll A	0.70 ± 0.04	-	-	0.42 ± 0.03	-	-	7.99 ± 0.26	-	-
Zeaxanthin	22.78 ± 0.7	3.86 ± 0.14	21.39 ± 0.66	0.39 ± 0.03	1.82 ± 0.07	7.71 ± 0.25	10.60 ± 0.34	8.92 ± 0.29	20.29 ± 0.63
β-cryptoxanthin	95.59 ± 2.87	4.41 ± 0.15	-	-	-	-	-	-	-
α-carotene	22.96 ± 0.71	3.29 ± 0.12	15.06 ± 0.47	2.77 ± 0.1	3.29 ± 0.12	3.89 ± 0.14	5.38 ± 0.18	5.54 ± 0.19	13.44 ± 0.42
β-carotene	25.33 ± 0.77	25.77 ± 0.79	235.68 ± 7.05	4.96 ± 0.17	23.69 ± 0.73	177.54 ± 5.32	85.61 ± 2.23	104.83 ± 3.15	273.30 ± 6.88
Cis-Lycopene	-	-	-	2.70 ± 0.1	2.02 ± 0.08	2.12 ± 0.05	-	3.68 ± 0.08	-
Trans-Lycopene	-	-	-	-	3.73 ± 0.13	3.33 ± 0.12	4.77 ± 0.16	3.09 ± 0.11	-
<b>Total carotenoids</b>	233.57 ± 7.09	42.01 ± 1.37	277.13 ± 8.37	13.93 ± 0.56	34.55 ± 1.17	199.60 ± 6.10	128.05 ± 3.96	127.45 ± 3.94	311.36 ± 5.21



**Figure 2:** B-carotene concentration in the different pumpkin cultivars.

## Conclusion

The results showed considerable differences amongst the cultivars and the fruit parts.

Five carotenoids were abundant in all the samples including lutein, zeaxanthin, α-carotene, β-carotene, and lycopene.

The highest content of carotenoids was found in the '*C. moschata* (musquée de provençe squash), B-carotene was obviously dominant, accounting for 51.26 % of the total carotenoid content in *C. maxima*, 83.11% in *C. moschata* (butternut squash), and 81.80 % in *C. moschata* (musquée de provençe squash).

## References