



## Brief report

## Investigation on the Effects of Various Solvents on the Extraction of Carotenoids with Antioxidant Activity from Pumpkin

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**Introduction:** Pumpkin is one of the agricultural products that despite its very low price, is known as a rich source of carotenoids with high antioxidant activity. Iran is one of the good producers of pumpkin at the world with fifth rank which is cultivated at provinces like Mazandaran, Guilan, Khorasan, and Hamedan and so on extensively. Pumpkin is almost available for entire the year but many of them is spoiled and perished because of low storage equipments; on the other hand, unfortunately this valuable vegetable which is full of many types of carotenoids with high nutritive values, is not consumed by most of Iranian peoples, because of its low sensory properties such as no pleasant taste or odor; whereas it is used at many cuisines at other countries, especially North America. The pumpkin carotenoids contain natural pigment, beta- carotene and lycopene which can be used as natural colorant at food processed products or dietary supplements. Nowadays, the positive health effect of carotenoids such as improvement of eyesight, fetus growth, prevention from cardiovascular disease and cancer, maintenance of skin health and whole of body, anti blood hypertension and cholesterol is known, well, hence it must more be emphasized at household food basket. There are many researches about extraction of carotenoids from tomato, carrot, yeast and so on, but studying the pumpkin carotenoids was done less. Generally, due to the hydrophobic characteristic of carotenoids and their little solubility at water, organic solvents such as hexane are applied for their extraction, which some researches had been done about its solubility at different organic solvents, yet.

**Materials and methods:** In this research the ripped pumpkins (*Curcubita moschata*) were cultivated at private farm at Khorasan were rinsed and chopped to same cubes. Then, pumpkin cubes were peeled off and the seeds were removed. For extraction of carotenoids, the pumpkin specimens prepared at four states of raw (mashed pumpkin), cooked (mashed pumpkin), dried (40 °C) (powder) and dry powder of cooked pieces (40 °C). Carotenoids were extracted from pumpkin samples by various organic solvents such as hexane, acetone, ethanol, at different volume ratio of them like 1:1(v) and 1:1:1(v). When the pumpkins became colorless, the extract had been evaporated at a vacuumed rotating evaporator to gain a thick extract without any solvent. The extract had been gathered and stored at black bottles and refrigerator to minimize the side effects of light and heat on nutritive characteristics of carotenoids. The total carotenoids content of the pumpkin extracts was measured by spectrophotometric method at 480 nm according to beta- carotene. The antioxidant activity of the extracts was calculated on the basis of DPPH scavenging activity of the samples at 517 nm. The project was done on a complete random design and one-way ANOVA and Duncan test were used for statistical data analysis and clearance the significant difference among treatments at 95% confidence level.

**Results & Discussions:** Statistical analysis of the results showed that various organic solvents, their volume ratio and also various state of pumpkin specimens had a significant effect on the carotenoid extraction from pumpkin samples ( $p < 0.05$ ) which the most efficiency of carotenoid extraction equal to 16.74  $\mu\text{g/g}$ , gained by hexane and dry powder of cooked pumpkins and secondly, the 1:1(v) hexane: acetone mix solvent showed the more extraction efficiency for all of the pumpkin samples. Ethanol showed the least ability for extraction of carotenoids from pumpkin samples. According to the antioxidant activity, the effect of type of organic solvent,

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their ratio and also various state of pumpkin specimens were significant for all carotenoid extracts ( $p < 0.05$ ) and the raw mashed pumpkin extract that obtained by 1:1(v) hexane:acetone mix had noticeable DPPH scavenging activity (63.14%). The cooked, dried and dry powder of cooked pieces of pumpkin showed a little antioxidant activity despite of high carotenoid extraction efficiency, probably because of extraction of various carotenoids with different structures as well as different scavenging activities of DPPH which can impact on the calculation of the antioxidant activity. Thus, studying the effect of temperature on extraction efficiency and nature of pumpkin carotenoids and their stability at environmental conditions is needed to introducing the carotenoids extracted from pumpkin as a natural colorant to addition of many of food products as a rich source of antioxidants and finally promotion of society health.

**Keywords:** Pumpkin; Extraction; Carotenoid; Organic Solvent; DPPH Scavenging Activity.