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A study of Preservative Effects of Turmeric (*Curcuma longa)* on Mashed Potatoes

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Abstract

The biopreservative efficiencies of different amounts of yellow pigment of Turmeric (*Curcuma longa)* on mashed potatoes were compared. Different levels of yellow pigment were added individually or in combinations to mashed potatoes , which was acidified to pH 4.5, before storage at 5, 10 and 15°C. Addition of 0.05% and 0.1 % Turmeric (*Curcuma longa)* increased the shelf life of mashed potatoes to 30 days, while it was 5 days for the control mashed potatoes without preservatives incubated at room temperature and observed for over ten and half weeks. The results showed that *Curcuma longa*was more efficient in preserving stored potatoes paste. The *Curcuma longa is considered as*a good preservative prevents microbial growths. The result of this study showed that *Curcuma longa* was clearly superior within the trial duration. Organisms found associated with the spoilage of the stored potatoes paste included fungi such as Aspergillumsflavus, A. fumigates, A. Niger and Fusariumspp and bacteria such as Bacillus coagulans, B. stearothermophilus and Proteus spp. It is recommended that regular consumption of turmeric in the diet provides a constant supply of potential antioxidants. It was found that addition of small amount of turmeric in solution basedenvironment delayed the contamination pattern observed in control set. It requires extensive validation to use it at commercial level.

Keywords: Biopreservatives, mashed potatoes , antimicrobial, *Curcuma longa*, spoilage organism Shelf life

INTRODUCTION

Turmeric has been used in Asia for thousands of years and is a major part of many Asian dishes. And Indian traditional medicine, called Siddha,.[1]It was first used as adye, and then later for its medicinal properties[2]The most important chemical components of turmeric are a group of compounds called curcuminoids, which include curcumin (diferuloylmethane), demethoxycurcumin, and bisdemethoxy-curcumin. The best-studied compound is curcumin, which constitutes 3.14% (on average) of powdered turmeric.[3-6] However, there are big variations incurcumincontent in the different lines of the species Curcuma longa (1–3189 mg/100g). In addition, other importantvolatile oilsinclude turmerone, atlantone, andzingiberene. Some general constituents aresugars, proteins, andresins.[7-9]

Moreover, nutrients found in turmeric do more than just prevent deficiency diseases. It has a high nutritional status that can be exploited. The curcumin contain vitamins or vitamin precursor which produces vitamin C, beta - carotene as well as polyphenol coupled with fatty acid and essential oil. Turmeric is a good source of spice compared with other spices. Though consumed in Africa and some sub - Saharan countries, it has been regarded as an under exploited spice. It has probably been one of the most underutilized tropical crops. The leaves are known as great source of vitamin and minerals[10] Introduction of the plant as part of diet has been successful despite the fact that new foods are very often difficult to introduce [11]. Tumeric has been used traditionally as household remedy in curing various diseases such as anorexia, cough, rheumatism and intestine disorder. There is a need to investigate tumeric scientifically so that it would not be used only traditionally but industrially in food and drug production. This study will give an insight of the nutritional, phytochemical and microbial properties of tumeric plant which could be a gate way to different ways in which tumeric could be used. The objectives of this work are to determine the antimicrobial activities of turmeric plant.The nutritional benefits [12-13] derived from Curcuma longa are based on the variety being utilized, so using it as preservatives is the target ofour study. The present study was undertaken to determine the potential of preservatives effects of *Curcuma longa*

MATERIALS AND METHODS

The experiment was conducted in the laboratories of basic science; at applied science university during Jan–March 2017 .Fresh Jordanian potatoes were boiled and mashed. Curcuma longa were obtained from local Jordan supermarket .Different levels of *Curcuma longa* were used as preservatives as per following

Treatments:-

T1= 0.10 g mashed potatoes with 0 ppm *Curcuma longa*

T2= 0.10 g mashed potatoes with 100 ppm *Curcuma longa*

T3= 0.10 g mashed potatoes with 200 ppm *Curcuma longa*

T4= 0.10 g mashed potatoes with 400ppm *Curcuma longa*

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Estimation of moisture and carbohydrate

The percent of moisture in the sample was estimated by the standard procedure as recommended by (Tarioul, 2007) [11] .Physicochemical analyses (pH, quality characteristics) of samples were examined by using ISImethods [12] .Sensory evaluation of samples. Samples were examined by the method described by Govindarajan et al., [13] for their quality

Parameters like color, aroma, taste, texture and overall acceptability.For statistical analysis of sensory data, a 1-9 point hedonic scale was used to assess the degree of acceptabilityof samples. The highest score is 9 'like extremely 'and 'dislike extremely' is the lowest score of 1. The datawere analyzed for ANOVA in completely randomized design (CRD) under computerized statistical methodsof M-stat and least significant difference (LSD) was used to compare the means. The results were evaluated by Analysis of variance and Duncan's New Multiple Range Test procedures of the Statistical Analysis System [14].

Microbial test MIC of Samples

Aspergillums flavus, A. fumigates, A. Niger and Fusariumspp and bacteria such as Bacillus coagulant, were cultured in 0.08-1.0% (weight/volume) diluted in broth. Four types of polymicrobial cultures were prepared byculturing the isolates with each other in broth (control) and broth containing various concentrations of *Curcuma longa* Microbial growth was as observed on solid plate media after 24 h incubation.

RESULTS AND DISCUSSION

Table1 revealed that the moisture content of sample packed in polyethylene bags slightly decreased in T1, T2,T3, and T4 for the first two months of storage and it was 8.80%, 9.20%, 9.13 and 19.05%respectively. After the next two months, it was slightly increased in all treatments. This may be due tovariation in atmospheric relative humidity that ranged from 42 to 65% during first two months and 55-85%during next month of storage period. The initial carbohydrate content in T1, T2, T3, and T4 wasobserved 67.38, 67.40,67 33.and 67.45 % respectively, after the next two months, it was observed67.30, 67.35 and 67.47 % respectively. There was very little changed in carbohydrate and protein contentsduring three months of storage at room temperature. The pH of the sample was gradually increased in all treatments during storageperiods. From the Table 2, it was observed that all the treatments were free from insect and microbialinfestation up to two months of storage. After three months of storage T1 (aspergillums) and T4 (bacteria) wereinfested by micro organism. The other treatments were free from insect and microbial infestation up to three months of storage

Table 1. Physical and Chemical Parameter of *Curcuma longa* -Potatoes Samples during Storage.

Treatments	Moisture (%)			Carbohydrate (%)			Protein (%)		
	0m	2m	3m	0m	2m	3m	0m	2m	3m
T_1	8.92	8.80	8.92	67.38	67.28	67.20	9.40	9.35	9.30
T_2	8.92	9.20	9.40	67.40	67.30	67.32	9.38	9.39	9.40
T_3	8.92	9.13	9.95	67.33	67.35	67.37	9.37	9.40	9.40
T_4	8.92	9.05	9.97	67.45	67.47	67.45	9.42	9.44	9.45

Note: m=Month

Table 2. Microbial Infestation of Stored Potatoes.

Treatments	Storage period (month)		
	0m	2m	3m
T1	+a+b	+a	+a+b
T2	-	+a+b	-
T3	-	-	-
T4	-	-	-

Note: a = aspergillums, b = bacteria

(+ Present, and –absence)

Quality characteristics and sensory evaluation of potatoes samples

Curcuma longa samples were evaluated for quality parameters such as visual colour, texture and odor by panel Presented in Table 3. Sample without *Curcuma longa* was performed yellowish color with crispy and dissolving texture and good appetizing and rest of them developed off flavor. The effect of *Curcuma longa*on sensory test parameter for stored potatoes revealed that it had a positive effect (Table 3). From thevisual observation of potatoes, it was found that addition of*Curcuma long* improving the colour of the samples Data present in Table 4 revealed that the T3 (8.25) had the higher score for overall acceptability considering colour, flavor, texture and taste followed by T4 (7.32) and T2 (7.23).

Table 3. Quality characteristics of potatoes samples

Treatments	**Colour**	**Texture**	**Odor**
T1	**Light brown**	**Hard and brittle**	**off flavor**
T2	**Straw yellow**	**Hard and brittle**	**Appetizing**
T3	**Yellowish**	**Crisp and dissolving**	**Appetizing**
T4	**Deep brown**	**Hard and brittle Slight**	**off flavour**

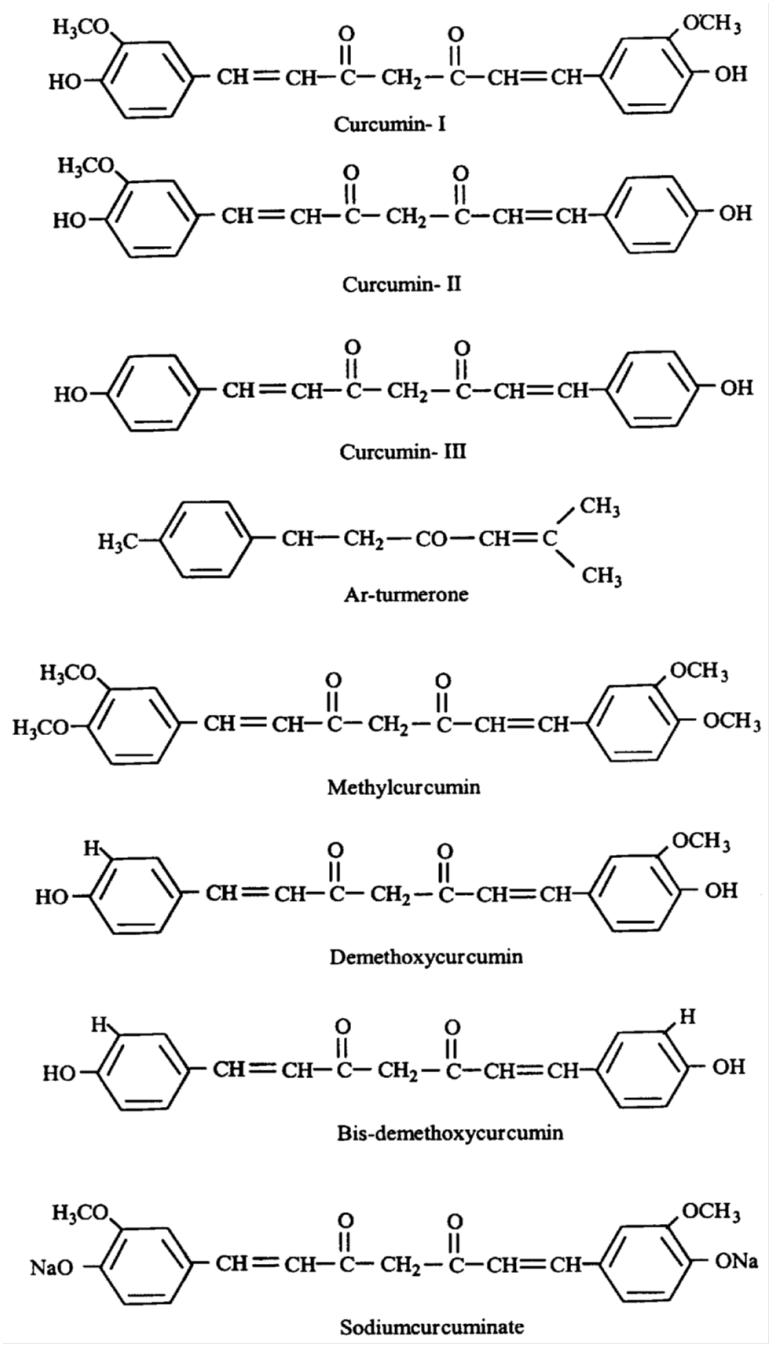
Table 4. Sensory evaluation of potatoes samples after four months of storage

Treatments	Colour	Flavors	Texture	Taste	Overall acceptability
T1	**5.63c**	**6.77c**	**7.22a**	**7.22b**	**6.81c**
T2	**6.68b**	**7.25b**	**7.20a**	**7.12c**	**7.02b**
T3	**7.69a**	**8.35a**	**7.58a**	**8.59a**	**8.25a**
T4	**7.29a**	**7.35b**	**7.33a**	**7.26b**	**7.32b**

a= Profile Attribute Analysis [15]
b=Texture Profile Method [16]
c =Revised Math Attitude Scale[17]

Table 5. Antimicrobial activity of the *Curcuma longa MIC* (µg/ml)

Microorganisms	MIC (µg/ml)
Bacillus coagulant	**32.5**
Streptococcus	**62.5**
Staphylococcus	**125**
Lactobacillus	**32.5**



Structure of natural curcuminoids.

CONCLUSION

Civilization has brought a lot of changes with respect to how food items can be stored or preserved, since *Curcuma longa* is a natural antibacterial agent So it's probably more accurate to say that *Curcuma longa* has thepotential to be antibacterial but I couldn't find any other information confirming the efficiency of the *Curcuma longa*itself.In conclusion, *Curcuma longa*prevents the growth of the microorganisms in single and mixed microbial .No micro organism

was grown in stored *Curcuma longa*-potatoes samples. It was fully safety to consumer. As multifunctional bioactivity ingredients, *Curcuma longa* can be used as antiioxidative, antibacterial coloring agent and coating.

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