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CHEMICAL AND TECHNOLOGICAL STUDIES OF CORIANDER SEEDS AND TURMERIC RHIZOMES POWDER IN EGYPT

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ABSTRACT

Coriander seeds and Turmeric rhizomes powder were analyzed for their proximate chemical composition, minerals elements, fatty acids, phenolic compounds and flavonoids contents to evaluate their importance in human nutrition. The results showed that coriander seeds and turmeric contains appreciable amount powder of essential nutrients. The moisture content, ether extract, , crude protein, ash, crude fiber and carbohydrates recorded in coriander seeds 8.8%, 15.1%, 13.4%, 6.3% and 31.6%, respectively, and 11.3%, 9.3%, 8.2%, 8.9%, and 69.8 for turmeric (on dry weight basis).Also high concentration of macro minerals elements Ca, K and Na , high concentration of micro minerals' Fe and Zn . The dietary coriander seeds, oil consisted mainly of fatty acids such as oleic acid, linoleic acid and plamitic acid,.On the other hand fatty acids composition of turmeric consisted mainly of linoleic and oleic acids. High concentration of phenolic compound and flavonoids From this study it can be concluded that consumption of coriander seeds and turmeric rhizomes in different combinations could provide a reasonable daily recommended amount of essential nutrients for maintenance of healthy life and normal body functioning.Through this study ,the possibility of adding coriander seeds powder and turmeric rhizomes to some of the products so as to raise their nutritional value.

INTRODUCTION

Coriander (*Coriandrum sativum L.; Umbelliferae*) is widely distributed and mainly cultivated for the seeds. The seeds contain an essential oil (up to 1%) and the monoterpenoid, linalool, is the main component . Coriander seeds is a popular spice and finely ground seeds is a major ingredient of curry powder. The seeds are mainly responsible for the medical use of coriander and have been used as a drug for indigestion,against worms, rheumatism and pain in the joints . Recent studies have also demonstrated hypoglycaemic action and effects on carbohydrate metabolism (Chithra and Leelamma, 2000). Volatile components in essential oil, from both seeds and leaves, have been reported to inhibit growth of a range of micro-organisms (Delaquis**,** *et al*., 2002), and inhibition of lipid peroxidation (Tanabe,*et al*., 2002**).**

It is well known that herbs and spices possess antioxidant activity (Tanabe*, et al*., 2002**)**, and caffeic acid derivates, flavonoids and terpenoids are suggested to be responsible for this effect During recent years consumers have been more concerned about the addition of synthetic additives to food and the two most commonly used antioxidants, butylated hydroxyl anisole (BHA) and butylated hydroxy toluene (BHT), have shown

Deoxyribo Nucleic Acid (DNA) damage induction (Sasaki *et al*., 2002). Therefore, there is an increasing interest in natural food additives, such as spices or spice extracts, which can function as natural antioxidants besides seasoning the food. Selection of a suitable extraction procedure can increase the antioxidant concentration relative to the plant material, and differences in antioxidant activity between the extracts indicate the polarity of the compounds mediating antioxidant effect. Several analytical methods have been developed to determine the antioxidant capacity of natural substances in vitro (Caldentey –Oksman , 2003).

Turmeric rhizomes (*Curcuma Longa*.) In many Asian countries including Indonesia the using of turmeric as a food spice, colorant and medicine has a long tradition (HMPC, 2009). It is traditionally accepted that turmeric is a potent antioxidant and anti-inflammatory agent (Pal *et al*., 2001). It is also strongly alleged that turmeric can improve digestion and nutrient metabolism. The latter beneficial effects of turmeric are related to atsiri oil and curcumin contents in turmeric (Al- Sultan and Gameel, 2004). Curcumin, in the form of curcuminoids (HMPC, 2009), can enhance bile production and hence fat digestion (Al-Sultan and Gameel, 2004). Being intended further specifically on fat metabolism, administration of turmeric in broiler is subjected to enhance the production of succinyl-CoA (formed in the Krebs metabolic cycle) which in turn is expected to increase the production of hemoglobin. This aim is motivated by the fact that the first step in heme (constituent of hemoglobin) (Chowdhury *et.al*;2008) **.**

Oxidative stress is one of the hallmarks of TBI that has the potential to initiate the events resulting in protracted neuronal function and plasticity. We have previously shown that increased free radical formation associated with the consumption of a diet high in saturated fat worsened the outcome of Toxics Release Inventory TBI on cognition and neuroplasticity **(**Wu *et al*., 2004**)** The phenolic yellow curry pigment curcumin has potent anti-inflammatory and antioxidant activities that can function to reduce oxidative damage and cognitive deficits associated with aging. In particular, curcumin has been shown to reduce oxidative damage and amyloid pathology in Alzheimer’s disease **(** Thiyagarajan and Sharma, 2004).

Curcumin has antioxidant and cytoprotective actions with ability to lower cholesterol, and to stimulate the production of bile, which is needed to digest fat and to protect the liver from the damaging effects of toxic chemicals and pharmaceutical drugs.
(Randhawa, 2008) .

MATERIALS AND METHODS

Materials.

Coriander seeds *(Coriandrum sativum)*:

It was obtained from the local performer market of Kafr El-Sheikh, Egypt. Seed were cleaned ,separated from forgein matters , ground up to pass through 100 mesh screen sieve,then kept in polyethylene bags and stored in freezer at- 18 ± 2°C until analysis and other uses powder .

Turmeric rhizomes (*Curcuma longa L*.):

Turmeric rhizomes powder, It was obtained from the local performer market of Kafr El-Sheikh, Egypt it kept in polyethylene bags and stored in freezer at - 18 ± 2°C until analysis and other uses.

Chemical analysis:-

Moisture,protein,ether extract,ash and crude fiber were determined according to A.O.A.C.(2000).Total carbohydrates content was calculated by differrntce.Minerals were determined using atomic absorpation spectrophotometer perken Elmer Model 2180 as described by A.O.A.C.(2000).Total phosphorus content was determined coloraimetrically using the method of (Tausky and Shorr.1953)

Coriander seeds and turmeric rhizomes oils extraction:

Coriander seeds and turmeric rhizomes oil were extracted with hexane (40-60c) using soxhelt extractor for 6-8 hours. The solvent was removed by rotary vacuum evaporation and the oil was collected. The percentage yield was calculated on a dry weight basis (Papageorgiou *et al.,* 1996).

Fatty acids composition of corander seeds and turmeric rhizomes oils :

Fatty acids composition of corander seeds and turmeric oils were determined in Faculty of Agriculture, Alexanderia,(Saba-Bacha) using gas chromatography(GC Modle,Shimadzu-8A,equipped with a FID Chromo Q, Detector temperature 270ċ,H2 flow rate 75ml/min, Sensitivity 16x10, Column temperature 150-180ċ at rate 2 c/min,N2 flow rate 20ml/min,Air flow rate 0.5ml/min and Start speed 2.5 mm/min according to the method described by**(** Radwan ,S.S.1978).

Determination of polyphenols:

Phenolic compounds from coriander seeds and turmeric rhizomes powder were extracted according to the methods of(Rodriguez de Sotlillo , *et al*., 1994) with methanol 95% under cooling (4 ºC) as follows : five grams of corander seeds and turmeric rhizomes powder were homogenized for 4 min. (in adulrang Osterizer belender) with 29 ml of cold methanol . The resulting slurry was centrifuged (Hettich, mikro rapid /K type 1306) at 3000 × 9 for 10 min. at 5 ºC. The supernatant liquid was filtered through whatman no. 4, filter paper the filtrate was collected for quantitative analysis.

Phenolic compounds of methanolic extracts from coriander seeds and turmeric rhizomes powder were determined using HPLC Hewllet Packared (series 1050) equipped with auto sampling injector, solvent degasser, ultra violet (UV) detector set at 210 nm and quarter horse power HP pump (series1050). The column temperature was mainted at 35ºc .An isocratic separation was carried out with(0.01N) H_2SO_4 as a mobile phase at flow rate of 1 ml/min. The phenolic compounds standard from Fluka Co. Were dissolved in a mobile phase and inject into HPLC. Retention time and peak area were used to calculation of phenolic compound concentration by the data analysis of Hewllet Packared software according to the method described by (Anderson and Pederson, 1983)**.**

RESULTS AND DISCUSSION

Chemical composition of coriander seeds and turmeric rhizomes (on dry weight basis).

The chemical compositions of coriander seeds powder and turmeric rhizomes were determined results in Table (1) reveal that coriander seeds and turmeric rhizomes powder can be considered as good source of Ether extract ,crude protein; Crude fiber and ash.

Table (1): Chemical composition of coriander seeds and turmeric rhizomes (on dry weight basis).

Component %	**Coriander seeds powder**	**Turmeric rhizomes powder**
Moisture	8.8	1 1.3
Ether extract	15.1	8.3
Crude protein	13.4	11.5
Ash	6.3	8.9
Crude fiber	31.6	11.6
Total carbohydrate ***	65.2	71.3

*****Total carbohydrate was calculated by differences**

In addition it can be noticed that moisture content was(8.8 %)and (11.3%) for coriander seeds and turmeric rhizomes powder**.**The results also showed that the total carbohydrates was higher in turmeric (71.3 %),compared with coriander seeds (65.2 %), On the other hand crude fiber is higher in coriander seeds (31.6 %) compared with turmeric rhizomes (11.6%). Ether extrac**t** was (15.1%) in coriander seeds and (8.3 %) in turmeric rhizomes , ash were recorded(6.3%) in coriander seeds and (8.9 %) in turmeric rhizomes.The present results were in agreement with those of(Zein,Ragaa I;2006) reported that, coriander seeds contained, 9.6% moisture,13.43% crude protein,14.13% ether extract,6.28% ash,28.45% crude fiber and 66.16% total carbohydrate**.** Also(Al-Nazawi and El-Bahr, 2012) reported that, turmeric rhizomes powder containted, 13.5% moisture, 11.74% crude protein, 6.4% ether extract, 4.56% ash 10.6 %crude fiber and 70.07% total carbohydrate.

Mineral contents of coriander seeds and turmeric rhizomes (on dry weight basis)

Data in Table (2). shows that, coriander seeds were rich in certain minerals, (K ,Ca, Mg, Ph, Na and Fe) ,respectively **.** turmeric rhizomes powder were high in this minerals(K , Ph, Mg, Ca , Fe and Na**)**, respectively**.** These minerals were essential for regulater of osmotic pressure and acid base balance as revealed by (Gabr,1998) .These results are in agreement with the finding of (Zein,Ragaa I;2006)

Table (2): Mineral contents of coriander seeds and turmeric rhizome powder(on dry weight basis).

Mineral	Coriander seeds powder mg/100g	Turmeric rhizomes powder mg/100g
Fe	16.5	40.6
Zn	5.40	3.90
Mn	1.45	0.00
Mg	327	189
Ca	612	191
Na	34.3	39.6
K	1069	2523
Ph	182	266

Isolation and identification of phenolic compounds from coriander seeds and turmeric rhizomes (powder).

The data Table**(3)** cleared that,catechin acids was the main phenolic compound in corainder seeds powder extract, representing about (0.0207g/100g). Followed by caffeic acids (0.029 g/100g) cholorgenic (0.021g/100g), gallicacid (0.0165g/100g) ,hesperiden (0.0017g**/**100), catechulic 0.0015g / 100g), caffeine (0.0097g/100g), andSalicylic (0.0096g/100g) .

Also cleared that turmeric rhizomes powder extract contain higher amounts of vanillic(0.054 g/100g), chrisin(0.0032 g/100g), catechin acid (0.0015 g/100g), Caffeic acid (0.0012 g/100g) , Salicylic(0.0081 g/100g), enzoic(0.0033 g/100g), Ferrulic acid (0.0036 g/100g) **,** Chlorogenic acid (0.0026 g/100g) , Gallic acid (0.0017 g/100g) and Catechulic(0.0012 g/100g).

Table (3): Phenolic compounds from coriander seeds and turmeric rhizomes using (HPLC). (on dry weight basis)

Identification phenolic compounds	Coriander seeds powder g/100g	Turmeric rhizomes powder g/100g
Catechin	0.0 207	0.0015
Caffeine	0.00 96	Trace
Chlorogenic	0.0 21	0.0026
Catechol	0.00116	0.0039
Vanillic	Trace	0.054
Caffeic	0.0 29	0.0012
Hesperidin	0. 0017	Trace
Salicylic	0.0096	0.0081
Hesperetin	0.0019	Trace
Chrisin	Trace	0.032
Gallic	0.0165	0.0017
Catechulic	0.0 015	0.0012
Benzoic	Trace	0.0033
Ferulic	Trace	0.0036

These results are in agreement with those reported by(Wojdylo *et al*. 2007) (Caldentey –Oksman , 2003) Reported that The distribution of phenolic compounds in coriander seeds and leaves contained highest amounts, of gallic acid equivalents ((1.9g/100 g) and(5.5g/100g) , respectively. As shown in all extracts, the contents of phenolic were higher in the leaves than in the seeds

Fatty acid composition of coriander seeds and turmeric rhizomes powder (g/100g on dry weight basis).

The Coriander seeds oil consisted mainly of oleic acid 18:1n-9 (71,5%) linoleic acid 18:2 n-6(13.85%) and plamitic acid 16:0 (4.74%) . On the other hand fatty acid composition of turmeric rhizomes consisted mainly of myristic 14:0(56.36%) oleic 18:1 n-9 (18.59%) and linoleic18:2 n-6 (8.15%),

Table (4): Fatty acids composition from coriander seeds and turmeric rhizomes using (G.L.C) (g/100g on dry weight basis).

Fatty acids	Symbol	Coriander seeds powder %	Turmeric rhizomes powder%
Capric	**C10:0**	2.91	4.86
Lauric	**C12:0**	2.37	0.33
Myristic	**C14:0**	3.01	56.36
Myristoleic	**C14:1**	0.64	0.89
Palmtic	**C16:0**	4.74	6.42
Palmitoleic	**C16:1**	0.30	0.05
Heptadecanoic	**C17:0**	0.00	0.01
Heptadec enoic	**C17:1**	0.00	0.06
Stearic	**C18:0**	1.14	3.50
Oleic	**C18:1**	71.05	18.59
Linoleic	**C18:2**	13.85	8.15
Arachidic	**C20:0**	0.00	0.00
Eicosenoic	**C20:1**	0.00	0.67
Total Saturated	**%**	14.17	71.59
Total UnSaturated	**%**	85.84	28 .41

These results are in agreement with those reported high contentes by .(Ramadan and Mo¨rsel 2003) who reported that coriander seeds contains of oleic and linoleic .

And turmeric rhizomes powder contains high amounts of oleic, linoleic , palmtic and Stearic(Chowdhury *et.al*;2008)

Organoleptic properties of bread sticks supplemented with coriander seeds powder.

Data in Table(5) shows the organoleptic properties of bread sticks supplemented with 5%, 10% and 15% coriander seeds powder. The obtained data indicated that , no differences were found between bread sticks produced by using 100% wheat flour and even those 5% coriander seeds powder except for color ,but differences were found in case of others levels of supplementation (10% and15%).However, the results revealed that, the produced bread sticks by using 5% coriander replacement (instead of wheat flour) had properties better than those of 10% and 15% .On the other hand ,it should be noted that , increasing the percent of substituted powder,caused a reduction in the organoleptic properties of bread sticks .So,it can be concluded that , the best level of supplemented with coriander seeds powder was 5% followed by 10% for making bread sticks with a good acceptability.

Table(5):Organoleplic properties of bread sticks produced from wheat flour supplemented with different levels of coriander seeds powder.

Blends	Organoleptic properties				
	Color 10	Taste 10	Flavor 10	Texture 10	Overall Acceptability10
1	9.33	8.83	9.11	8.89	8.94
2	7. 49	8.22	8. 96	8.39	8. 83
3	6.44	7.67	7.55	7.67	7.44
4	7.11	6.89	7.22	7.33	7.17

Bread sticks making using the method of (Aper and Bezaro,1990)
Where:
Blend 1: 100% wheat flour (72 extractions).
Blend 2: 95% wheat flour + 5% Coriander seeds flour.
Blend 3: 9 0% wheat flour + 10% Coriander seeds flour.
Blend 4: 85% wheat flour +15% Coriander seeds flour.

Organoleptic properties of bread sticks supplemented with turmeric rhizomes powder .

Data in Table(6) shows the organoleptic properties of bread sticks supplemented with 5, 10 and 15% turmeric . The powder obtained data indicated that , no differences were found between bread sticks produced by using 100% wheat flour and even those 5% and 10% turmeric except for color and taste of 10% suplement ,but differences were found in case of others levels of supplementation (15%).However, the resultes revealed that, the produced bread sticks by using 5% turmeric rhizomes powder replacement (instead of wheat flour) had properties better than those of 10% and 15% .On the other hand ,it should be noted that , increasing the percent of substituted powder,caused a reduction in the organoleptic properties of bread sticks .So,it can be concluded that , the best level of supplemented with turmeric rhizomes powder was 5% followed by 10% for making bread sticks with a good acceptability.

Table(6):Organoleptic properties of bread sticks produced from wheat flour supplemented with different levels of turmeric rhizomes powder .

Blends	Organoleptic properties				
	Color 10	Taste 10	Flavor 10	Texture 10	Overall Acceptability 10
1	9.30	9.22	8.89	8.67	9.11
2	8. 76	8.64	8.22	8.67	8.96
3	8. 11	8.33	8.56	8.67	8.78
4	7.33	7.56	7.67	8.33	7.44

Bread sticks making using the method of (Aper and Bezaro,1990)
Where:
Blend 1: 100% wheat flour (72 extraction). Blend 2: 95% wheat flour + 5% Turmeric
Blend 3: 9 0% wheat flour + 10% Turmeric . Blend 4: 85% wheat flour +15% Turmeric

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دراسات كيماوية وتكنولوجية علي بذور الكزبرة والكركم في مصر

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**معهد بحوث تكنولوجيا الأغذية – مركز البحوث الزراعية-الجيزة- مصر

تم اجراء هذا البحث بهدف دراسة التركيب الكيماوي لكل من بذور الكزبرة والكركم وكذلك محتواهما من المعادن والأحماض الدهنية والمركبات الفينولية والفلافونويدات من خلال تقديرهما وذلك لأهميتها في تغذية الإنسان. واوضحت النتائج ان بذور الكزبرة والكركم يحتويان علي كميات مناسبة من المغذيات الضرورية وكانت نسبة الرطوبة والكربوهيدرات والبروتين الخام والمستخلص الإثيري والألياف الخام وكذلك الرماد في بذور الكزبرة (٨.٨٪ ،٦٥.٢٪ ،١٣.٤٪ ،١٥.١٪ ،٣١.٦٪ ،٦.٣٪)علي التوالي وفي الكركم كانت (١١.٣٪ ،٧١.٣٪ ،١١.٥٪ ،٨.٣٪ ،١١.٦٪ ،٨.٩٪) علي التوالي، وكميات مرتفعة من المعادن الكبري مثل الكالسيوم والبوتاسيوم والصوديوم، وكميات مرتفعة من المعادن الصغري مثل الحديد والزنك. ووجد ان اهم الأحماض الدهنية السائدة في الكزبرة كانت الأوليك واللينوليك والباليميتك، وكانت الأحماض الدهنية السائدة في الكركم هي المرستيك والاوليك واللينوليك. ووجد أن بذور الكزبرة والكركم يحتويان علي المركبات الفينولية والفلافونويدات بتركيزات مرتفعة،ثم تم اضافة الكزبرة والكركم الى الدقيق بتركيزات مختلفة(٥ ،١٠،١٥) وتم عمل بقسماط و ودراسة الخواص الحسية لهذا المنتج. اتضح من خلال هذه الدراسة امكانية اضافة بذور الكزبرة والكركم الى بعض المخبوزات وذلك لرفع القيمة التغذوية لها.

قام بتحكيم البحث

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