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ADDITION OF HIBISCUS EXTRACT TO RETARED BEEF MEAT SAUSAGE RANCIDITY

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ABSTRACT

The present study was carried out to investegate the effect of antioxidants extracted from hibiscus calyx as natural antioxidant. Natural and synthetic (butylated hudroxy anisol, BHA) antioxidants exhibited strong and close antioxidative activities of 88.57% and 92.62%, respectively.

The hibisucs exteact was added to beef meat sausage at levels of 250, 500 and 1000 ppm, whereas , BHA added at levels 250 and 500 ppm to keep its quality during storage at –20˚C for six month . Some physico – chemical characteristics were determined.

The oxidative stability of beef meat sausage with and without addition of antioxidant was determined by thiobarbitutic acid values. It was clear that the addition of hibiscus extract as a natural antioxident to beef meat sausage delayed the peroxidation during six month from 0.08 to 0.26 mg malonaldehyde / kg sample.

Color is a prime factoe in judging meat and meat products quality . The color of beef meat sausage was determind by suing Hunter Color apparatus for six month . The Hunter color values of sausage beef meat was increased after addition of natural antioxidants during storage .

It will be notice that hibiscus is a good source of antioxidant and delayed the peroxidation of beef meat sausage during storage for six month .

INTRODUCTION

Roselle (Hibiscus Sabdariffa L.) is cultivated extensively at present in India , Thailand, Senegal and Egypt for its pleasant red coloured calyxes which are used to make jellies jams and beverages . The brilliant red colour and unique flavor make it avaluable food product . The anthocyanin pigemants that create colour are resposible for the wide range of colouring in many food (*Tsai and Ou, 1996 and Balami, 1998*).

In its native home in Africa , the roselle is used for both food and non-food applications(*FAO, 1988 and Mnzava,1997*) for food application, the tender stem, leaves and calyxes are used as vegetable in the preperation of soups and sausage , the calyxes are specially prepared into a textural from suitable for used as a meat substitute. For non-food applications , the flower and fleshy fruit are used in pharmacutical infusions to relieve symptoms of bronchitis and coughs.

Tsai et al., (2002) determined that the relation between antioxidant activity and anthocyanin in roselle (Hibiscus sabdriffa L.) petals . The results showed that the antioxidant capacity of roselle extract increased when extraction time or weight of petals increased. Also , the anthothyanin is the major sources of antioxidant in roselle extract .

Anthocyanins , the biggest group of water-soluble natural pigments of plants , are responsible for the attracive colors of flowers , fruits and vegetables, contributing largely to the aesthetic quality of plant-derived products (*Gradinaru et al, 2003*). Available evidence also suggests that this group of anthocyanins could exhibit multiple biological effects, e.g. antioxidative, antivadical activity, antiinflamatory action, inhibition of blood platelet aggregation and antimicrobial activity, treatment of diabetic retinopathy and prevention of cholesterol-induced atherosclerosis (*Clifford, 2000 and Espin et al., 2000*)

The focus of this study is to evaluated the effectiveness of natural antioxidants extracted from hibiscus calyxes and compared with butylated hydroxyanisol at different levels using beef sausage.

MATERIALS AND METHODS

Materials :

Dried calyces of roselle (Hibiscus sabdatiffa L.) were purchased from a local market in Cairo , Egypt . Hibiscus was finely ground in Wiley Mill to a fine powder .

Butylated hydroxyanisol (BHA) was obtained from Narrden International Company , Holand .

Imported Brazil beef (frozen) was purchased from local market in Caito , Egypt .

Method :

Extraction of antioxidant from hibiscus :

The dried calyces of hibiscus (500g) was finely ground and extracted with petrolum ether (B.P.40-60˚C) in Soxhelt apparatus to remove lipids and resinous materials . The residue was exhustively extracted with 2 liters of water by heating on a water bath for 6 hours at 60˚ C . Extraction was repeated until a colour-less extract was obtained. The extracts were pooled and concentrated using a rotary evaporator at 50˚ C and then converted to powder by freeze drying . The yield of extraction was stored in a dark container according to the method as reported by (*Tseng et al., 1996*).

Determination of antioxidant activity :

The antioxidant activity of the previous extract of hibiscus was compared with BHA and it was derermined as reported by *Tsuda et al., (1993)* . A dried antioxidant sample (2.0 mg) was added to a solution mixture of linoleic acid (0.13 ml) , ethanol (10 ml) and 0.2 M phosphate buffer (pH 7.0, 10 ml) and the total volume was adjuted to 25 ml with distilled water . The solution was mixed in a conical flask and incubated at 37˚ C . At intervals during incubation, the degree of oxidation was measured in duplicate by thiocyanate methods and reading the absorbance at 500 n.m after coloring with $FeCl_2$ and thiocyante.

Preparation of sausage :

Sausage was prepared in the laboratory and recipes as shown in Table (1)

Table (1) : Composition of beef sausage

Ingredients	Weight/g
Beef meat	68.6
Sheep beef	15.0
Powder milk	3.0
Salt	2.0
Ground garlic	1.1
Spices	0.9
Water (ice flakes)	10.0

Sausage was prepared by mincing meat which mixed with all ingredients (except fat) and half of the ice flakes . The mixture was blended for 2 min.in a chopper and minced fat plus remaining ice flakes were added . The antioxidant extracted from hibiscus was added separetely to the mixture at level 250, 500 and 1000 ppm and compared with BHA at level 250 and 500 ppm was added finelly the mixture was mixed for 15 min . The mixture was stuffed into mutton casing and stored frozen at – 20° C up to six month according to the method deseribed by *Ibrahim ,(2004) and Hussin ,(2007)*.

Physico-chemical characteristics of sausage :

Thiobarbutric acid (TBA) values was determind in the sausage during storge as described by *Pearson ,(1970)* and the results were represented as mg of malonaldehyde/kg sample.

Color of beef sausage samples were measured with Hunter Lab colorimeter Model D25 according to *Hunter .(1958)*

RESULTS AND DISCUSSION

Antioxidant activity of crude extract :

The natural antioxidant activity of calyxes hibiscus extracted by water was compared with synthetic antioxdant , butylated hydroxyanisol (BHA) and measured by thiocyanate method . The results are shown in Table (2) : The natural and synthetic antioxidant showed strong antioxidant activity had values of 88.57% and 92.62%, respectively .

Hirunpanich et al., (2006) found the strongest verious antioxidant constituents in the calyx hibiscus , such as anthocyain, anthocyanidin and polyphenolic compounds. Noveover, hibiscus calyxes are a good sources of antioxidants and this activity stable over a storage period, although provided by different compounds (*Mazza and Brouillard, 1990*).

Table (2) Antioxdant activity of hibiscus extract and Butyl hydroxyanisol

Antioxidants	Abosrbance at 500 nm	Lipid peroxidation%	Ativity
No additive	0.7	100	0.0
Hibiscus extract	0.08	11.43	88.57
BHA	0.048	7.38	92.62

Physico-chemical characteristics of sausaga :

Data presented in Table (3) show the thiobarabturic acid values of sausage made from natural and synthetic antioxidant during storage at – 20°

C . From these results , it could be observed that natural antioxdant at level 1000 ppm effectively inhibited increasing in thiobarbituric acid value for a peried of 6 month from 0.08 to 0.26 mg . malonaldehyde / kg sample . Very close effects were observed for the addition of BHA and natural antioxidant at 500 ppm .This means that the hibiscus extract contained antioxidants (polyphenols) to retar lipid peroxidation during storage. In this respect , *Vekiari et al,(1993*) reported that flavonol was an effective antioxidant . Dihydrofavonals had the same antioxdant activity as the correspoding flavonols . Conversion of dihydroflavonols to flavonols took place, while the compounds were in contact with the oxidizing lipids and that the conversion might account for the antioxidant activity . Antioxidant activity of the flavonoids increased with increment number of phenalic hydroxy groups (*Pekkarinen, 1996*) . Also , flovonoid aglycones are more effictive in inhibiting malandiadehyde production than their correspnding glycosides (*Ratty and Das, 1988*). Whereas flavonoid glucoside reduces the antiperoxidation efficiency of adjacent hydroxyl groups due to steric hindrance *(Mora et al., 1990)* .

Table (3) Thiobarbituric acid values of sausages as affected by different levels of natural and synthetic antioxidant during frozen storage (mg.malonaldehy / kg sample)

Storage time (mounthly)	Control sausage	Natural antioxidant (ppm)			Synthetic antioxidant (ppm)	
		250	500	1000	250	500
Zero time	0.08	0.080	0.080	0.080	0.080	0.080
1	0.140	0.110	0.093	0.087	0.098	0.090
2	0.200	0.130	0.115	0.110	0.122	0.112
3	0.250	0.190	0.170	0.150	0.175	0.159
4	0.320	0.230	0.210	0.180	0.212	0.198
5	0.503	0.315	0.275	0.220	0.297	0.235
6	0.716	0.440	0.325	0.260	0.430	0.305

Control sausage made from free antioxidant

Color of processe d sausage .

Color is a prime factor in judging meat and meat products quality. *Sonia and Dorothy., (1981)* reported that physical appearance of meat products and the most important factor used in meat used in meat selection . The consumers select meat for appearance and freshness, with the judgmeat based on the brightness of the color.

The results in Table (4) showed the Hunter color values of sausage beef meat after addition of natural and synthetic antioxidant at different levels during storage at- 20°C for six month . From these results , it could be noticed that the lightness ("L" Values), redness (" a " values) and yellowness (" b " values) were increased after addition and during storage as natural antioxidant al level 1000 ppm . Very more effects were noticed after addition and during storage of BHA synthetic and natural antioxidants at different levels.

These results revealed that frozen storage samples was not failured effact on Hunter Color values . These results are closed with that repoeted by *Claus et al., (1994)* they found that the effects storage color values for

cooked turkey . The results illusterated that the L and b values were slightly derreased during starage.

The anthocyanin pigments that create the colour are responsible for the wide range of colouring in the preperation of soups and sausage (*Tsai and Ou, 1996 and Balami, 1998*). Also , the hibicus of calyxes are speciellly prepared into the texture from sutible for used as a meat substitute (*Mnzava , 1997*).Moreover, anthecyanins were also found to have many times more activity than comman antioxidants such as ascorbate (*Wang et al., 1997*).

Generally speaking, hibiscus calyxes are a good sources of antioxidant and this activity is relatively stable over a storage period , although provided by different compounds. The nutrituional benfit of hibicus as an antioxidant will ultimately depend on the bioavailability of the anthocyanins.

Table (4) Effect of additive natural and synthetic antioxidants on the Hunter lab (L,a and b values) of beef sausage samples during frozen storage .

Parameter and storage period	Control sausage	Natural antioxidant (ppm)			Synthetic antioxidant (ppm)	
		250	500	1000	250	500
"L" value						
Zero time	57.3	57.4	57.7	57.8	57.4	57.6
One month	46.0	55.4	56.5	56.4	45.2	46.2
Two	40.1	53.0	54.6	53.7	42.3	43.0
Three	39.3	52.3	53.3	52.6	41.2	42.0
Four	38.6	50.2	52.7	52.1	40.0	41.8
Five	37.5	49.0	51.5	51.0	40.0	40.2
Six	36.7	48.6	49.6	50.6	39.2	40.0
"a" value						
Zero time	18.2	16.8	22.5	24.2	15.8	15.7
One month	14.0	14.2	20.2	22.0	13.6	12.4
Two	10.3	11.3	18.0	19.3	11.0	11.3
Three	4.0	10.1	14.5	15.8	9.2	9.2
Four	2.7	8.5	10.2	12.0	7.1	7.6
Five	-1.0	6.1	8.3	9.4	4.2	45
Six	-2.0	3.0	6.2	7.1	2.1	2.9
"b" value						
Zero time	4.4	5.3	6.2	8.4	5.6	7.4
One month	4.2	5.0	6.0	7.9	5.2	7.1
Two	3.8	4.8	5.2	6.8	4.9	5.8
Three	3.1	4.6	5.0	6.1	4.7	4.5
Four	3.0	4.4	4.1	5.8	4.5	5.3
Five	2.8	4.1	5.2	5.6	4.3	5.0
Six	2.3	4.0	5.0	5.5	4.2	5.3

Hunter color values (L= Lightness, a = redness, b= yellowness)

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إضافة مستخلص الكركديه لحماية سجق اللحم البقرى من التزنخ

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أوضحت الدراسة فى هذا البحث تأثير مستخلص الكركديه كمضادات أكسدة طبيعيـــة . تعتبر مضادات الأكسدة الطبيعية والمخلقة صناعياً مثبطات قوية للأكسدة ، ونـــشاطها ٨٨,٥٧% و ٩٢,٦٢ % على التوالى .

مستخلص الكركدية تم إضافته إثناء تصنيع السجق بتركيـــزات ٢٥٠ و ٥٠٠ و ١٠٠٠ جزء فى المليون بينما المضادات الصناعية تم إضافتها بتركيزات ٢٥٠ و ٥٠٠ جزء فى المليـــون بغرض الحفاظ على جودة السجق أثناء فترة التخزين على – ٢٠° م لمدة ٦ شهور. وقد تم تقـــدير بعض الخواص الفيزوكيماوية.

ثم تقدر ثبات الأكسدة على السجق المضاف إليه مضادات الأكسدة الطبيعية والـــصناعية بواسطة تسجيل قيم حامض الثيوبار بيتوريك أوضحت النتائج أن إضـــافة مـــستخلص الكركديـــه كمضاد أكسده طبيعى إلى السجق المصنع من الضأن تؤخر عملية الأكسدة أثناء التخزين لمـــدة ٦ شهور من ٠,٠٨ إلى ٠,٠٢٦ مليجرام مالونالدهيد / كيلو جرام عينة . اللون يكون العامـــل الأول فى الحكم على جودة اللحم منتجاته لذلك تم تقدير اللون فى عينات السجق باستخدام جهاز هنتـــر . أظهرت العينات المعاملة بمضادات الأكسدة الطبيعية زيادة فى القيم أثناء فترة التخزين .

لذلك نلاحظ أن مستخلص الكركديه من المصادر الجيدة لمضادات الأكسدة الطبيعية كما أنه يؤخر عملية الأكسده فى السجق المصنع من الضأن أثناء فترة التخزين لمدة ٦ شهور.