Mango Kernel extracts as potential antioxidant food additives

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Food Additives

1. To prevent spoilage of food
2. To prevent loss in quality
3. To improve taste / flavour
4. To modify / stabilize texture / state

Food additives

1. Acidulants
2. 2. Antioxidants
3. Colorings
4. Emulsifiers
5. Enzymes
6. Flavour enhancers
7. Flour additives
8. Nutritive additives
9. Polysaccarides
10. Preservatives
11. Sequestrants
12. Sweeteners

Antioxidants - Introduction

Oxidation in Foods

- Lipid Oxidation: Off flavor & aroma
- Pigments Oxidation: Color degradation
- Vitamin Oxidation: Loss of nutrients
- Protein Oxidation: Changes in texture & functionality

Loss of Quality, Nutritional & Sensory Value!

Some common synthetic antioxidant food additives

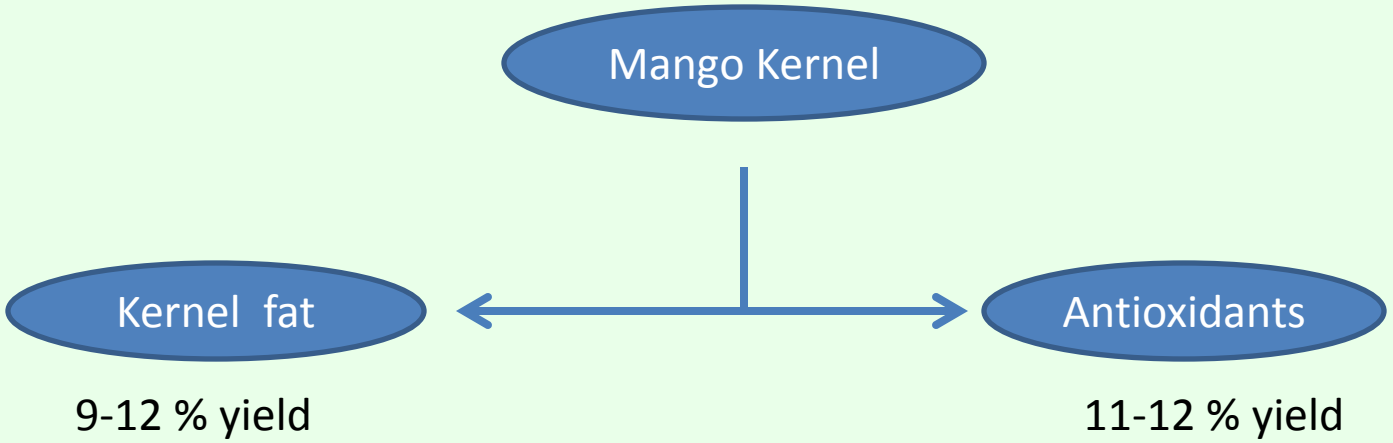
	Antioxidant	Max permitted level
1	BHT	100-200 mg/kg
2	BHA	100-200 mg/kg
3	TBHQ	100-200 mg/kg
4	Propyl gallate	90-200 mg/kg

All are synthetic in nature. Many people have apprehensions about their safety

Tilt towards natural

The demand for natural ingredients is growing in the shelf-life extension food additives market, as consumers increasingly opt for healthier alternatives to conventional antioxidants, which are perceived to be unhealthy if consumed over a long term. Negative media reports about the side effects of synthetic ingredients have popularized natural antioxidants, such as green tea extracts, oregano and grape extracts.

MANGO KERNEL PRODUCTS



Used in cosmoceutical products Eg. Sunscreen lotions, anti-aging creams etc.

Kernel antioxidants superior activity comparable to ascorbates. Can be used in place of BHT, BHA, PG etc.

A process was developed for the isolation of natural antioxidants and fat from the kernel .

Antioxidants from kernel powder

S. No.	Sample	Yield %	Total phenols mg/ g of extract	DPPH Antioxidant activity Ascorbic acid eqvsmg/ g	FRAP Antioxidant activity Ascorbic acid eqvsmg/ g
1	Totapuri kernel – Process A	18.4	414	997	787
2	Totapuri kernel - Process B	11.62	636	1442	1094
3	Alphonso kernel – Process A	20.26	444	1084	861
4	Alphonso kernel - Process B	12.98	644	1441	1078

Kernel antioxidants were found to possess superior activity comparable to those of ascorbates.

Extraction process standardization

Process is standardized with respect to

1. Solvent ratio
2. Temperature
3. Time
4. pH

Heat stability of extracts

	Treatment	FRAP Antioxidant activity mg/ g
1	Direct heating of extract at 200°C for 30 min	959.25
2	Direct heating of extract at 110°C for 30 min	949.28
3	Heated 0.5 ml aq. solution at 110°C/30 min	984.12
4	Boiled 10 ml aq. Solution of extract (in test tube) in boiling water bath for 15 min	965.70
5	Control	936.75

Extracts were found to be stable in solid state as well as in solution when exposed to temperatures up to 200 ° C

pH stability and substrate stability of antioxidants

	Treatment	FRAP Antioxidant activity mg/ g AEAC
1	Antioxidant activity without pH adjustment (control)	927.96
2	Antioxidant activity at pH 4.0	897.71
3	Antioxidant activity at pH 9.0	877.03
4	Antioxidant activity of Miada & ghee (control)	0.08
5	Antioxidant activity Miada & ghee + antioxidant extract (treated)	0.93

The activity of kernel antioxidants were found to be unaltered under acidic as well as basic conditions

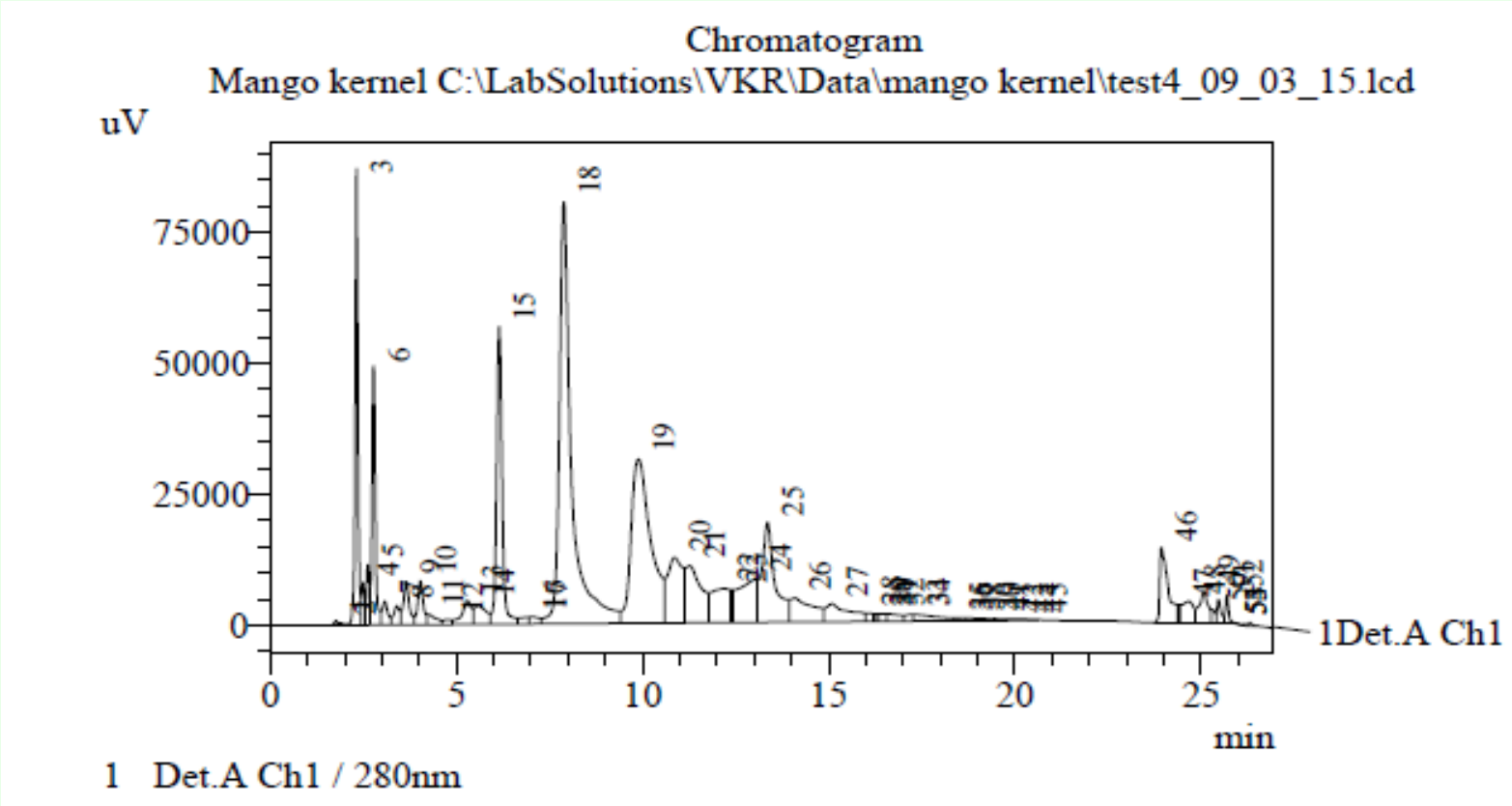
Fortification of kernel antioxidants in cookies

S. No		Maida	Ghee	Added antioxidants
1	Control	100 g	32 ml	nil
2	T1	100 g	32 ml	26.4 mg Kernel antioxidants
3	T2	100 g	32 ml	26.4 mg BHA

Baked at 180° C for 20 minutes . Stored for 3 months

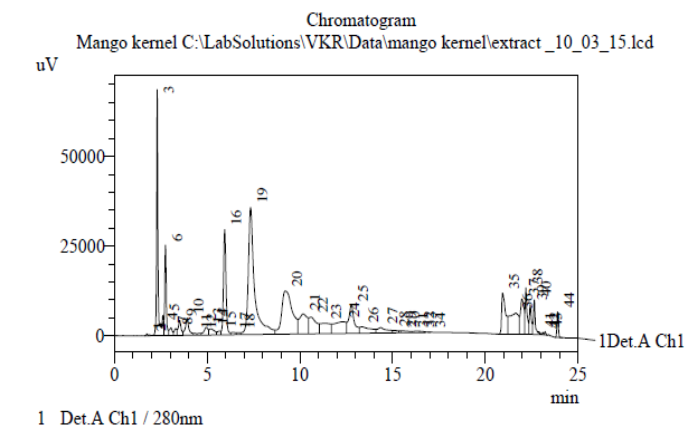
The efficiency of kernel antioxidants was tested by incorporation in cookies. The activity was tested by calculating TBARS. Kernel antioxidants imparted 51 % protection whereas BHA gave 80 % protection against lipid peroxidation.

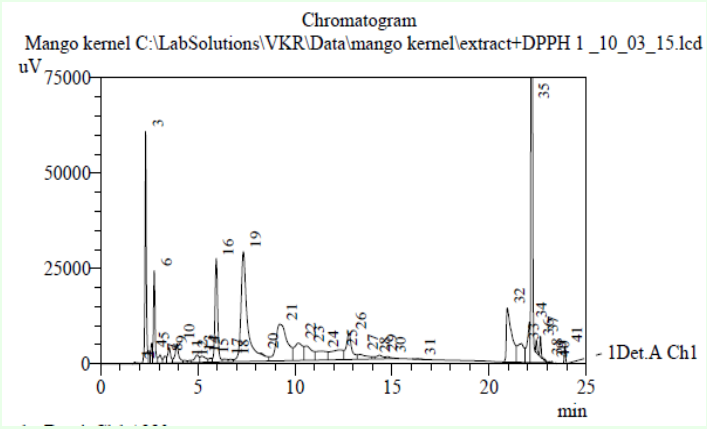
HPLC chromatogram of the kernel extract

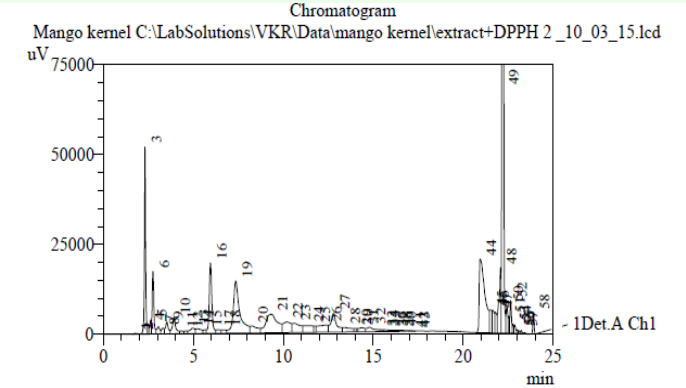


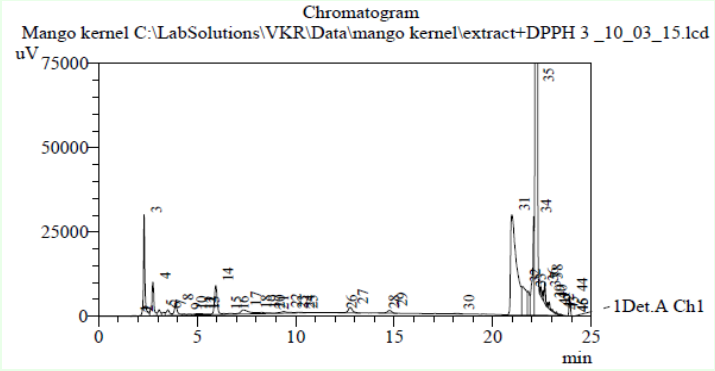
HPLC chromatogram indicates the presence of 5 to 6 prominent compounds. Most of the compounds are substituted gallates

HPLC profiles in the presence of DPPH









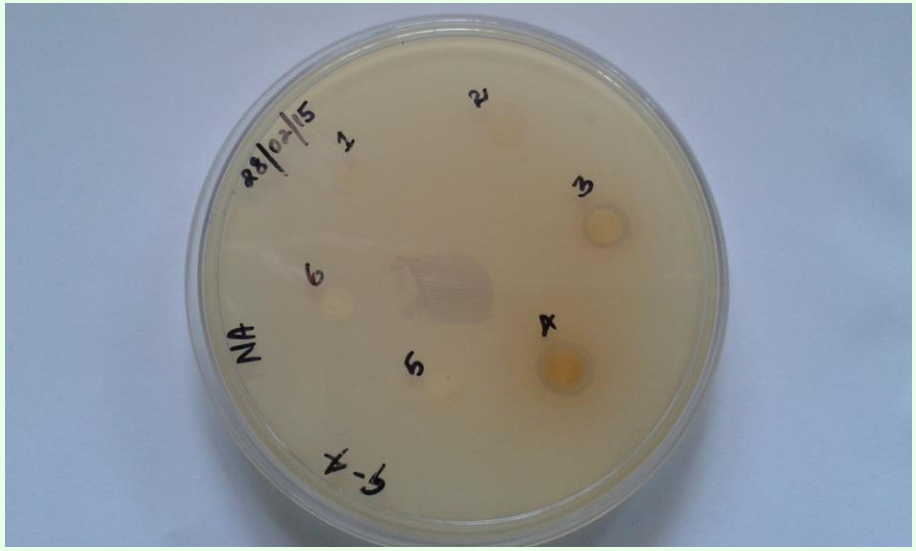
The activity of antioxidants was also confirmed by reacting with DPPH. Reduction in peak areas was observed with increasing concentration and time.

Antibacterial activity of the kernel antioxidants

1. **Organism used in the test – Bacillus cereus**
2. **Media used – a. Nurient Agar b. Muller Hinton Agar**
3. **Strains Used – G-4 and R-7**
4. **Method – Zone inhibition**

S. No.	Sample	Inhibition (mm)
1	Kernel extract (0.02 %)	Not significant
2	Kernel extract (0.1 %)	6 mm
3	Kernel extract (0.5 %)	8 mm
4	Kernel extract (1 %)	10 mm
5	Potassium metabisulphite (50 ppm)	Not significant
6	Sodium benzoate (50 ppm)	Not significant

Antibacterial activity
Organism: *Bacillus cerius*



Antibacterial activity of the kernel extract

1. **Organism used in the test – Enterobacter strain**
2. **Media used – a. Nurient Agar b. Muller Hinton Agar**
3. **Method – Zone inhibition**

S. No.	Sample	Inhibition (mm) NA medium	Inhibition (mm) MHA medium
1	Kernel extract (0.02 %)	Not significant	Not significant
2	Kernel extract (0.1 %)	Not significant	Not significant
3	Kernel extract (0.5 %)	9 mm	8 mm
4	Kernel extract (1 %)	11 mm	10 mm
5	Potassium metabisulphite (50 ppm)	Not significant	Not significant
6	Sodium benzoate (50 ppm)	Not significant	Not significant

Antibacterial activity
Organism: Enterobacter strain

Thank you