

**Natural Preservatives:**

**Oregano Products**

**Oregano Antioxidants**

**Our Story...2011**



*Origanum vulgare* L. (Oregano) grown in Israel

# Bakto Natural Preservatives

- Bakto NP initiated in 2006
- Privately held; founders and investors
- Actively managed by founders
- Research performed at Rutgers University, ARO, PPO
- Owns Int'l patent *Recovery of Residual Plant Components After Distillation of Oils, WO/2007/075580*
- Developed NPs based on elite Oregano clone
- Technology can applied to other plants in the future
- Utilize consultants, outsourced production
- Direct sales and marketing, as well as distributors

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
5 July 2007 (05.07.2007)

PCT

(10) International Publication Number  
**WO 2007/075580 A2**

(51) International Patent Classification:  
A61K 36/53 (2006.01)

(21) International Application Number:  
PCT/US2006/048260

(22) International Filing Date:  
18 December 2006 (18.12.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/750,588 16 December 2005 (16.12.2005) US

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SI, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— without international search report and to be republished upon receipt of that report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.



075580 A2

# Why Natural Preservatives?

- Huge global preservatives market
- Essential to protect our food supply and personal care products from spoilage
- Consumers worldwide want alternatives to synthetic chemicals
- Industry faces multiple challenges:
  - Ready-to-eat foods
  - Zero trans fatty acids
  - Organic
  - No synthetic preservatives
- Real need for natural preservative (NP), both antimicrobial and antioxidant, cost-effective, minimal impact on color, aroma, and taste, and soluble in a multitude of applications
- Diversified opportunity:
  - food, flavors, beverages, feed, nutraceuticals, cosmetics, pharmaceuticals

# Oregano Natural Preservative

- Oregano clone selected for active components
- Currently sourced in Holland and Israel
- Conventional and Organically grown, Kosher
- Proprietary extraction process
- Water-soluble and oil soluble
- Minimal off-flavor and color impact in finished products
- Excellent antioxidant
- Many different products from one source

# ONP Product List

	ONP Product	Proposed Application	Description	Available
1	Liquid ONP available in various carriers	Antioxidant / Antimicrobial Natural Preservative in food, feed, cosmetics	ONP as Natural Preservative	Yes
		Antioxidant in Nutraceutical, Functional Foods	Potent antioxidant; Boost ORAC value in functional foods	Yes
2	Spray-Dried (SD) ONP, different concentrations of active ingredients	Antioxidant / Antimicrobial Natural Preservative in food, feed, cosmetics	ONP as Natural Preservative; available in various concentrations	Yes
		Nutraceutical, Functional Foods	Potent antioxidant; Boost ORAC value in functional foods	Yes
3	ONP for Cosmetics and Dermatology	Medicinal, Cosmetic, Cosmeceutical	For medicinal and cosmetic applications, antimicrobial, anti-inflammatory; Special formulation for skin care	Yes
4	Deodorized ONP	Antioxidant / Antimicrobial Natural Preservative in food, feed, cosmetics	For applications that require additives to be tasteless and/or aromaless	2011
5	Colorless ONP	Antioxidant / Antimicrobial Natural Preservative in food, feed, cosmetics	For applications that require additives to be colorless	2011
6	New Formulations ONP	Antioxidant / Antimicrobial Natural Preservative in food, feed, cosmetics	Purified, highly concentrated ONP formulations as antimicrobial, antioxidant or chelating agents	2012

# Antioxidant Activity

- Antioxidants are chemicals that reduce or prevent the rate of oxidation reactions.
- Prevent damage to cell's components from oxidation.
- Function as Natural Preservatives.
- Measured by effect on food preservation, antioxidant activity against model compounds and by direct analytical methods. Such as oxygen bomb, lipid oxidation by products (TBARS).

# Antimicrobial & Antifungal Activity

- Compounds that kill or inhibit the growth of microorganisms involving many modes of action.

# Nutraceutical Properties

**Nutraceutical** refers to food components claimed to have a medicinal (or beneficial) effect on human health. Such foods are also called functional food.

Many nutraceuticals are phyto-chemicals found in plants.

# ONP Properties - Antioxidant

- ORAC
  - Liquid: 300,000  $\mu$ mole TE/100g ONP
  - Spray-dried: 600,000  $\mu$ mole TE/100g ONP
- Total Phenols, DPPH, FRAP, Peroxide Value, CD, TEAC, HPLC analysis.
- Metal chelating properties

# ONP Properties - Antioxidant

## Test Definition:

- Total Phenols Assay
- HPLC/GC/MS analysis
- ORAC: Oxygen Radical Absorption Capacity
- DPPH: Reduction of purple color
- FRAP: Ferric Reducing Ability of Plasma
- Peroxide Value: Peroxide content
- CD: Conjugated Diene
- TEAC: Trolox equivalent antioxidant capacity
- Chelating properties: Metal Binding Capacity

# ONP Properties – Nutraceutical

- Antioxidant
- Antimicrobial
- Anti-inflammatory
- Beneficial for:
  - Digestive system disorders
  - Colds, flu, upper respiratory illness
  - Protection and preservation of nutraceutical products

# Oregano Natural Preservatives Analysis

**1X ONP % Dry weight** ( Identified >50 compounds)

**Phenols:** total Phenols Assay: 80-100 mg/mL (chlorogenic acid equivalent)  
comprised of:

Rosmarinic acid: 3-5%

Caffeic acid:>1%

Chlorogenic acid:>0.5%

Caffeic acid derivatives: 2-4%

Coumaric acid:>0.1%

Cinnamic acid:>0.1%

Benzoic acid derivatives, Protocatechuic Acid, Benzoic Acid, Pro Aldehyde

Syringic Acid:~0.05%.

Triterpenes: Ursolic Acid and Oleanolic Acid >0.05%

Flavonoids : Epicatechin, Apigenin, Luteolin-7-*O*-Glucoside, Quercetin, Methylated

Quercetin, Eriodictyol 6,8-di-C-glucoside, Apigenin 6,8-di-C-glucoside: ~1%

**Carbohydrates** trace

**Amino acids** trace

**Terpenes** trace

# Competitive Advantages

	Bakto ONP Advantages		
	Bakto ONP	Oregano on the Market	Rosemary on the Market
<b>Antioxidant</b>	Excellent antioxidant in water solutions	Fair antioxidant	Excellent antioxidant in oil
<b>Antibacterial</b>	Self preserve antibacterial	Antibacterial	Average antibacterial
<b>Antifungal</b>	Antifungal	N/A	Fair antifungal
<b>Price</b>	Competitive	competitive	Wide Range
<b>Natural</b>	Natural; Extracted with alcohol and water	Not a natural extraction process	Extracted with solvents / concentrated
<b>Organic</b>	Can be certified organic	N/A	Can to be organic
<b>Spray-Dried</b>	Available	Available???	Available ???
<b>Storage</b>	Self-preserved in water	N/A	Mostly sold in PG, or in oil
<b>Aroma</b>	Mild tea aroma	Mild tea aroma	Mild to harsh unpleasant rosemary aroma
<b>Color</b>	Light yellow in application	Light yellow in application	Green to brown
<b>Health Benefits</b>	Excellent nutraceutical	Nutraceutical	Rosemary is not readily acceptable for consumption
<b>Heat Stable</b>	Heat stable is many applications	N/A	Not stable as ONP



## BAKTO NATURAL PRESERVATIVES, LLC

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Product Specification

January 14, 2008

### Oregano Antioxidant- Powder (Spray Dried)

Product #ONP-SD-07

**Product Origin:** *Origanum vulgare*, Extracted & Spray dried in the US

**CSA No:** 84012-24-8

**EINECS No:** 281-670-3

#### Physical and Chemical Information:

Appearance:	Yellowish powder
Physical State:	Powder
Specific Gravity:	N/A
Flash Point:	N/A
Refraction Index:	N/A
pH:	4.5-5.0(in water)
Total Phenols:	20%
ORAC value:	600,000 $\mu$ mol TE/100g

#### Storage

Room temperature up to 25°C (77 °F) in a dark sealed container.

Shelf life: 48 months

#### Regulatory Information

Food grade, GRAS, Natural

Can be certified upon request: Organic, Kosher, Halal

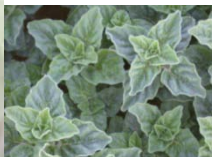
No heavy metals, pesticide residue, bacteria/mold contamination

**List of Ingredients:** Maltodextrins, Oregano leaf extractives, Xanthan Gum

#### Solubility Table

Water	Highly soluble
Ethyl Alcohol	Highly soluble
Propylene Glycol	Highly soluble
Oil	Slightly soluble

**Comments:** Usage: (0.01-1.0%), depending on application.



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Product Specification

January 14, 2008

### Oregano Antioxidant- Liquid -Water

Product #ONP-L-07

**Product Origin:** *Origanum vulgare* from The Netherlands

**CSA No:** 84012-24-8

**EINECS No:** 281-670-3

#### Physical and Chemical Information:

Appearance:	Dark brown with mild tea aroma
Physical State:	Liquid
Specific Gravity:	1.02
Flash Point:	>93°C (200°F)
Refraction Index:	1.02 (25.0 % Soluble Solids)
pH:	4.5-5.0
Total Phenols:	10%
ORAC value:	300,000 µmol TE/100 mL

#### Storage

Room temperature up to 25°C (77 °F) in a dark sealed container.  
Shelf life: 48 months

#### Regulatory Information

Food grade, GRAS, Natural  
Can be certified upon request: Organic, Kosher, Halal  
No heavy metals, pesticide residue, bacteria/mold contamination

**List of Ingredients:** Water, Oregano leaf extractives

#### Solubility Table

Water	Highly soluble
Ethyl Alcohol	Highly soluble
Propylene Glycol	Highly soluble
Oil	Slightly soluble

**Comments:** Usage: (0.01-1.0%), depending on application.



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Product Specification

January 14, 2008

### Oregano Antioxidant- Liquid Propylene Glycol

Product #ONP-L-PG-07

**Product Origin:** *Origanum vulgare* from The Netherlands

**CSA No:** 84012-24-8

**EINECS No:** 281-670-3

#### Physical and Chemical Information:

Appearance:	Dark brown with mild tea aroma
Physical State:	Liquid
Specific Gravity:	1.040
Flash Point:	>93°C (200°F)
Refraction Index:	1.02 (25.0 % Soluble Solids)
pH:	N/A
Total Phenols:	10%
ORAC value:	300,000 µmol TE/100 mL

#### Storage

Room temperature up to 25°C (77 °F) in a dark sealed container.

Shelf life: 48 months

#### Regulatory Information

Food grade, GRAS, Natural

Can be certified upon request: Kosher, Halal

No heavy metals, pesticide residue, bacteria/mold contamination

**List of Ingredients:** Propylene Glycol, Oregano leaf extractives

#### Solubility Table

Water	Highly soluble
Ethyl Alcohol	Highly soluble
Propylene Glycol	Highly soluble
Oil	Moderately soluble

**Comments:** Usage: (0.01-1.0%), depending on application.



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Product Specification

January 14, 2008

### Oregano Antioxidant- Liquid- Glycerin

Product #ONP-L-PG-07

**Product Origin:** *Origanum vulgare* from The Netherlands

**CSA No:** 84012-24-8

**EINECS No:** 281-670-3

#### Physical and Chemical Information:

Appearance:	Dark brown with mild tea aroma
Physical State:	Liquid
Specific Gravity:	1.040
Flash Point:	>93°C (200°F)
Refraction Index:	1.02 (25.0 % Soluble Solids)
pH:	N?A
Total Phenols:	10%
ORAC value:	300,000 µmol TE/100 mL

#### Storage

Room temperature up to 25°C (77 °F) in a dark sealed container.  
Shelf life: 48 months

#### Regulatory Information

Food grade, GRAS, Natural  
Can be certified upon request: Kosher, Halal  
No heavy metals, pesticide residue, bacteria/mold contamination

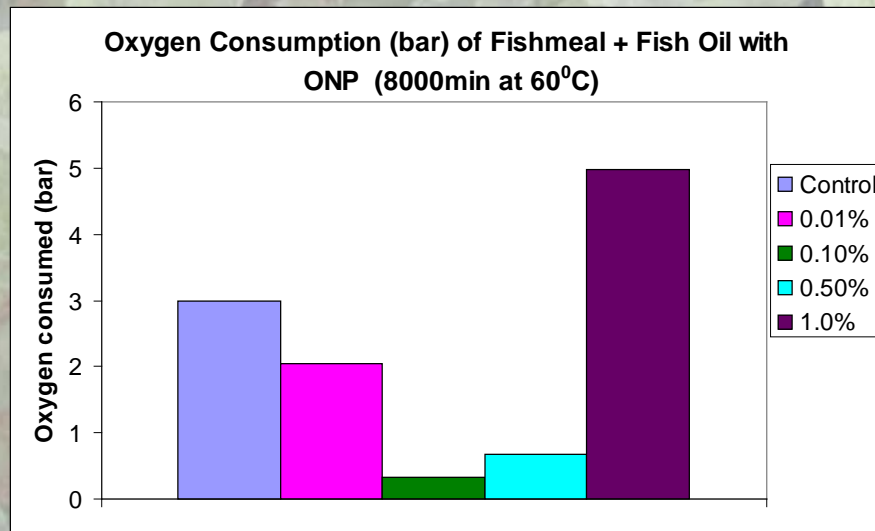
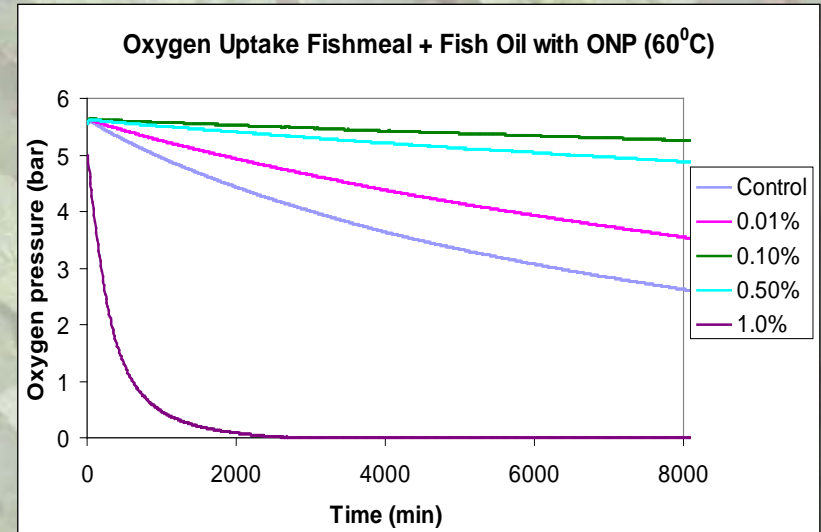
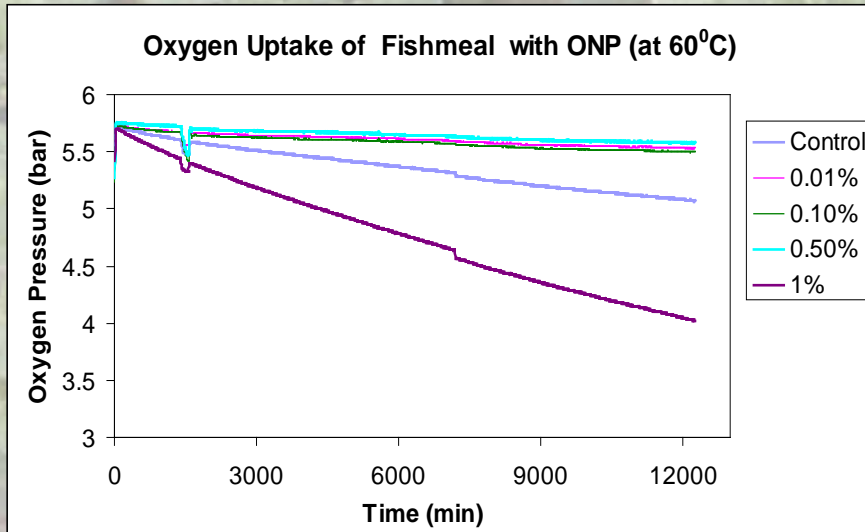
**List of Ingredients:** Glycerin, water, oregano leaf extractives

#### Solubility Table

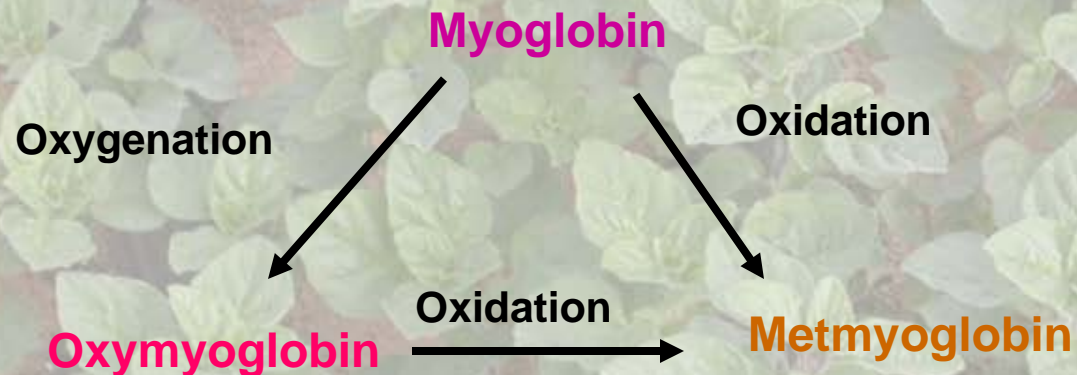
Water	Highly soluble
Ethyl Alcohol	Highly soluble
Propylene Glycol	Highly soluble
Oil	Moderately soluble

**Comments:** Usage: (0.01-1.0%), depending on application.

# The Effect of Oregano Natural Preservatives (ONP) on the Lipid Oxidation of Fishmeal and Fish Oil at 60°C



# Interconversion of Meat Pigments

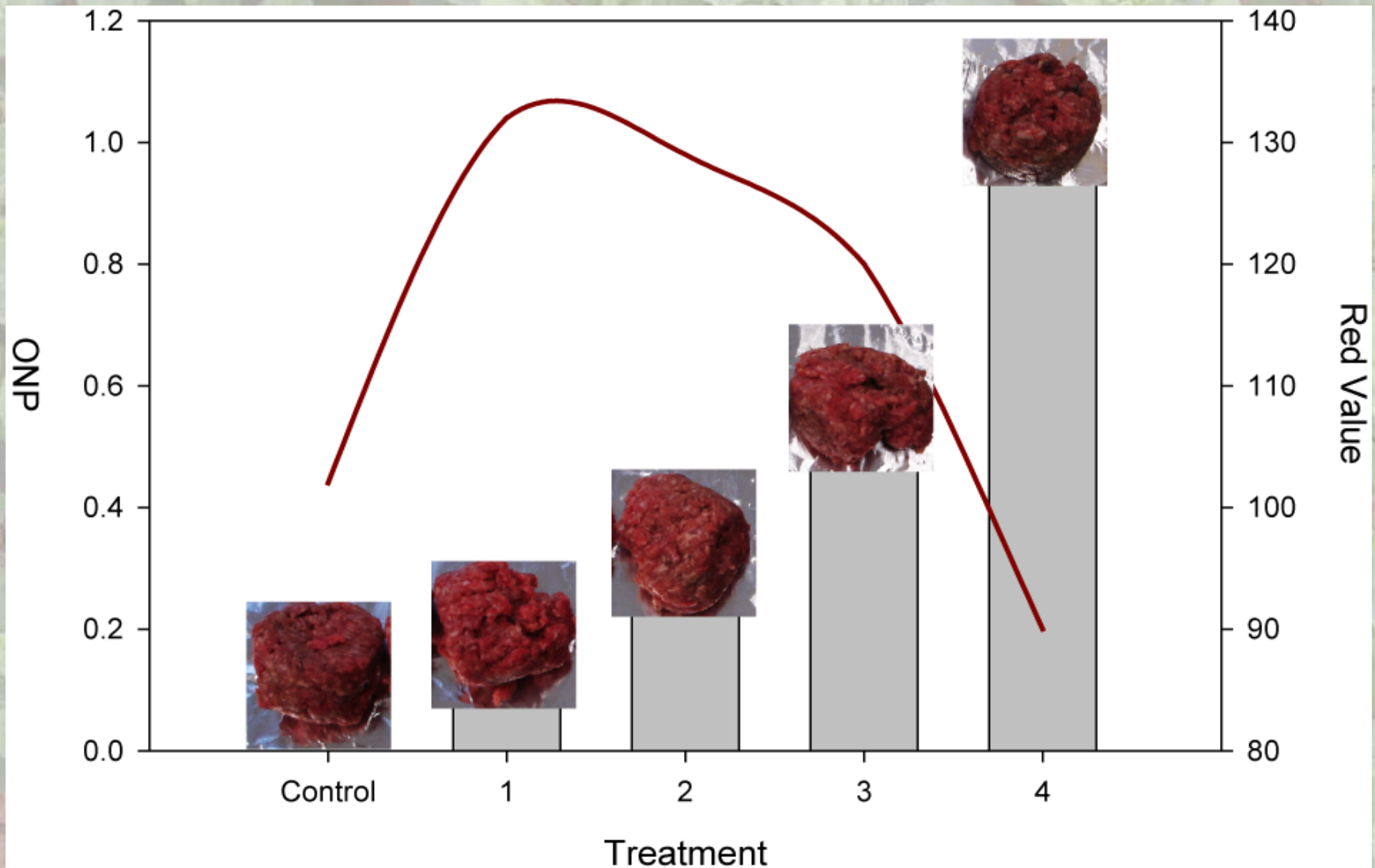


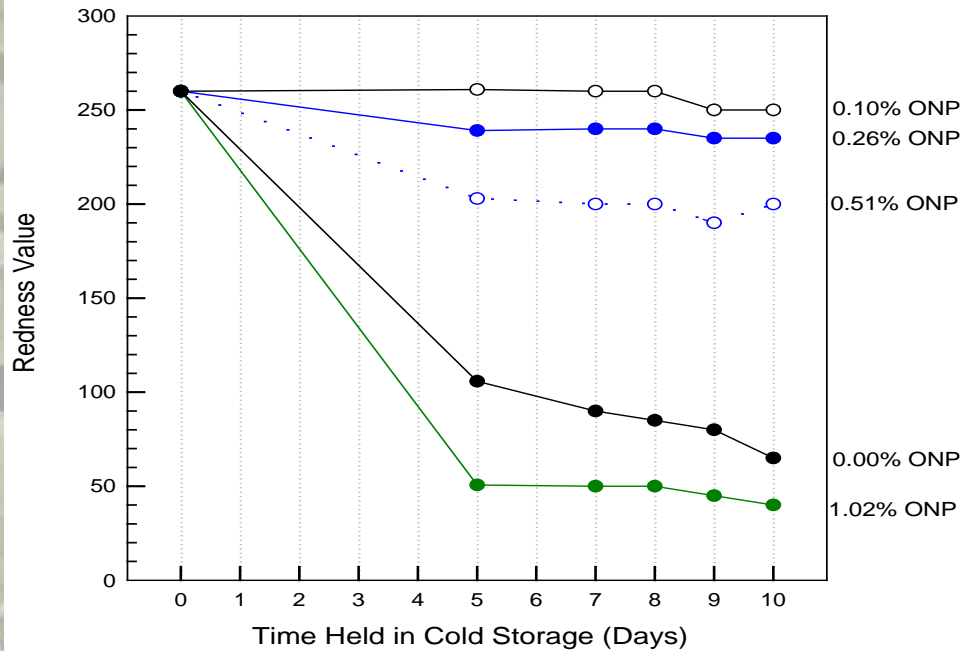
Myoglobin is bright red, when oxygenated, and is termed oxymyoglobin.

Both myoglobin and oxymyoglobin can lose an electron (oxidize) to form metmyoglobin.

# ONP in the protection of ground beef

5 days @ 4C



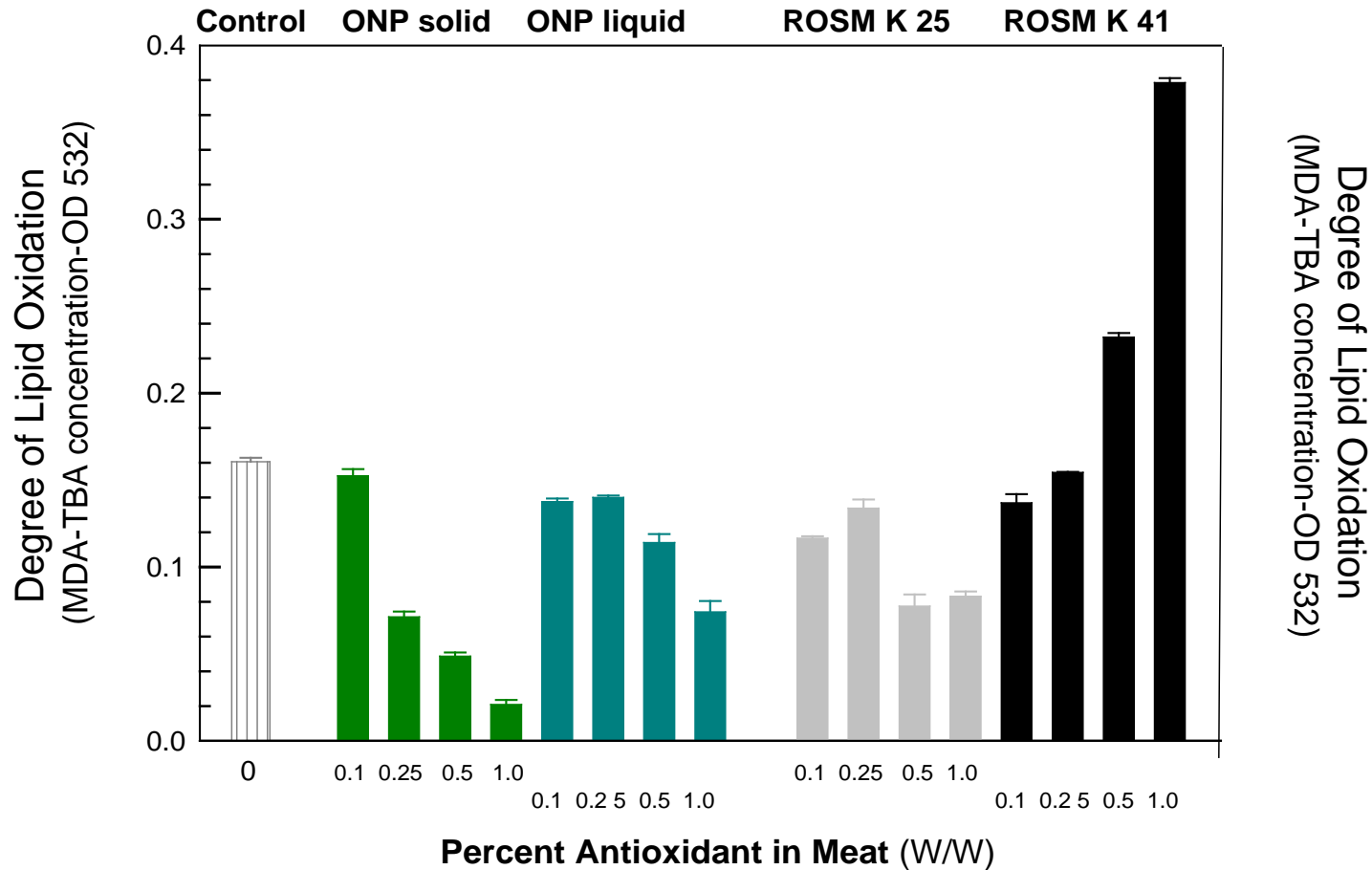


A graph showing change in Redness value of hamburger meat containing different concentrations of ONP powder and held for 0, 5, 7, 8, 9 and 10 days in cold storage

Fresh hamburger meat (20% fat content) was purchased from a local supermarket. The ground meat was divided into 5 portions and each mixed with different concentrations of dry ONP powder.

Next, the meat-ONP mixture was placed in dark containers and held at 4°C (40°F) for 5, 7, 8, 9 and 10 days. The meat, containing different ONP level was then evaluated for degree of redness.

# TBARS in Cooked Ground Beef After 48hours @4.0°C



Degree of lipid oxidation in cooked hamburger meat as function of antioxidant concentration form different commercial preparations

# Applications in Food

- Ready-to-eat foods
- Salad dressings-**emulsion**
- Soft drinks-**pasteurized**
- Baked goods-**baking**
- Cereals-**extruded**
- Meat, poultry, sausages, fish-**fresh and cooked**
- Animal Feed- **pelletized**
- Flavors, especially citrus
- Fats and Oils as emulsions

# Applications in Cosmetics

## Add to creams as:

- Antioxidants
- Anti-inflammation
- Anti-itching
- Reduce skin redness

– Clinical Study in progress 2011

# Flow diagram container distillation

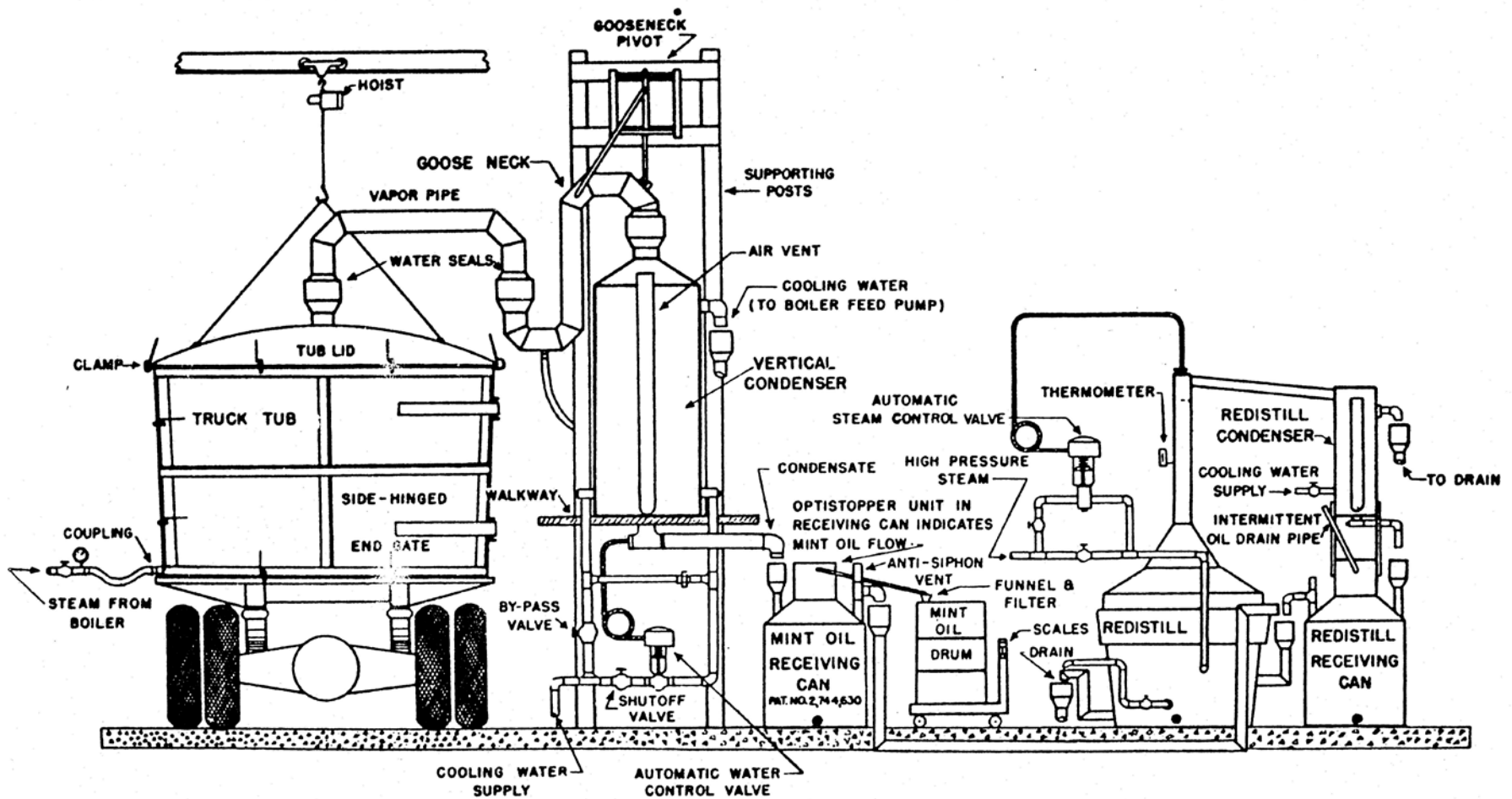


Figure 1. Flow diagram of mint oil distillation equipment.

# Swathing full grown crop



# Picking-up and chopping of field dried plant-material



# Oregano plant material after distillation



# Put down harvesting container at distillery



# Outside view distillery with steam-generator



# Condensation/Separation units



# Separating essential oil from water



# Transfer the essential oil into barrel



# Oregano Oil Analysis

Sample name		Oregano Kislev	05.07.05
Sample No. (Urim)		104	
Sample No. (lab)		284	
$\alpha$ -Thujene	0.91	Linalool	0.07
$\alpha$ -Pinene	0.37	(Z)-Sabinene hydrate	0.11
Camphene	0.05	Borneol	0.17
Sabinene	0.11	Terpinen-4-ol	0.44
$\beta$ -Pinene	0.10	$\alpha$ -Terpineol	0.07
1-Octen-3-ol	0.75	(Z)-Dihydro carvone	0.06
3-Octanone	0.17	(E)-Dihydro carvone	0.06
Myrcene	1.43	Carvacrol methyl ether	0.03
3-Octanol	0.03	Carvone	0.05
$\alpha$ -Phellandrene	0.18	Geranial	0.00
$\delta$ -2-Carene	0.06	Thymol	0.47
$\alpha$ -Terpinene	1.61	Carvacrol	74.72
para-Cymene	3.72	Carvacrol aceate	0.05
Limonene	0.16	(E)-Caryophyllene	1.75
$\beta$ -Phellandrene	0.17	$\alpha$ -Humulene	0.24
1,8-Cineole	0.05	$\beta$ -Copaene	0.08
(E)- $\beta$ -Ocimene	0.10	$\beta$ -Bisabolene	0.48
$\gamma$ -Terpinene	10.29	$\beta$ -Sesquihellandrene	0.02
(E)-Sabinene hydrate	0.44	Thymohydroquinon	0.00
Terpinolene	0.06	Caryophyllene oxide	0.37
para-Cymenene	0.01	Total %	100

## Oregano Special Properties (page 1)

- ❑ Oregano is indigenous to the Mediterranean area, where it has been used in medicine since biblical times. The contemporary literature is rich with information on the benefits of Oregano. We chose to extract oregano and to develop lines of products based on its special antioxidant, and antiinflammation properties.
- ❑ Our products are produced from an elite clone of *Origanum vulgare* grown in Holland and Israel. Our ONP is a leaf extract, whereas recent products are extracted mainly from fruit, for example, pomegranate, grape seeds extracts, cranberry, blueberry, noni, or mangosteen.
- ❑ ONP contains > 50 constituents. A major group of active ingredients are the polyphenols, containing phenolic acids such as caffeic acid, rosmarinic acid, protocatechuic acid, ferulic acid or gallic acid and flavonoids such as quercetin, eriocitrin, luteolin, apigenin, luteolin glucosides or apigenin glucosides.
- ❑ ONP, being a leaf extract, has a completely different make up of active components and in addition is free of interferences found in fruit extracts, such as pectin, sugars, waxes and other compounds. Oregano contains polyphenols, some of which are low molecular weight compounds (caffeic acid, rosmarinic acid, protocatechuic acid or ferulic acid), can protect and stabilize bigger anthocyanin molecules, the principle active ingredient in fruit extract of cranberry, or raspberry for instance. Accordingly, the addition of leaf extracts from oregano or other [\*Lamiaceae\*](#) family species can be used to stabilize active ingredients in fruit extracts and juices.
- ❑ ONP offers a triple effect:
  - It is protect food from damage by oxidation.
  - It protects other antioxidants in the food.
  - It can/may offers health benefits as an antioxidant, when absorbed by the intestines.
- ❑ ONP is water soluble extract fits perfectly with beverages, flavors, baked goods and cosmetics...
- ❑ ONP has a mild tea aroma.

## **Advantages of ONP (page 2)**

Potent antioxidant and antimicrobial agent, with one of the highest ORAC values recorded.

High activity for: Total Phenol, DPPH, TEAC, FRAP and CD.

Excellent chelating agent.

Shown to be effective against a vast array of microorganisms.

Self-preserved and shows stability for at least 3 years

Stable at 80° C (176° F) for several weeks. Stable in cooking meat and beaked good etc (350-500 ° F)

Very good stability at different pH regimes

Cost effective (herb vs. fruit)

## **Literature Record of Oregano Extract Benefits**

Consumption of phenolic antioxidants, found in foods, can act as the crucial factor responsible for reducing coronary diseases.

Polyphenols and flavonoid compounds from oregano protect low-density lipoproteins from copper-induced oxidation.

Oregano extract scores at the top among other plant extracts, ORAC, DPPH, ATBS, being a strong chelating agent.

Inhibition of *Listeria monocytogenes* in fish and meat by oregano extract

Inhibition of *Staphylococcus aureus* by oregano and other members of the Lamiaceae family.

Oregano extract shows antimicrobial activity against *Helicobacter pylori* .

Plant based formulations for improving liver health by protecting the liver from alcohol and chemical insults and/or by inducing phase II enzymes.

Wine formulations containing plant essential oils and other compounds from oregano extract effective against food borne pathogenic bacteria *Escherichia coli* O157:H7 and *Salmonella*.

There are large numbers of papers dealing only with the antioxidant capability of oregano.

# Oregano Natural Preservatives – Post Distillation Product

- The oregano plant biomes that had been stripped of the essential oil is ONP row material.
- This step is followed by drying, separation and extraction.
- Next, the water extract is spray dried and obtained as powder.
- Available for various applications are:
  - ONP extracts in water
  - ONP extracts in glycerin and
  - ONP extracts in propylene glycol
  - ONP powder on maltodextrins