SYNERGISTIC BLENDS OF NATURAL POLYPHENOLS
IMPORTANCE OF CLEAN LABEL

Consumers are increasingly aware of what is contained in their food. And they are looking at ingredients lists carefully, with the understanding that “we are what we eat”. Clean labels, where the presence of synthetic or modified ingredients is reduced to the minimum, have become a frequent request by consumers and are heavily influencing their buying decisions. Consequently, there is a need for the food industry to meet consumers’ demands.

On top of this, regulators are working to progressively reduce or abolish substances whose presence, although technically useful, represent a concern for consumers’ health or for environmental sustainability.

The botanical kingdom, if wisely used, can offer effective solutions capable of satisfying both consumers’ safety concerns and the industry’s technical requests.

The use of botanical flavourings to replace synthetic flavourings, or to provide a more natural and genuine taste, is now well established in the food industry. In addition, some botanical extracts, due to their peculiar polyphenol composition, can offer the added benefit of an antioxidant effect on the matrix: this is achieved, for example, by inhibiting peroxidation and by chelating metal ions (such as iron, copper and nickel), by which process they are removed from the food matrix. Chelated ions are no longer available as catalysts of oxidative reactions, thus significantly reducing the oxidation rate of the whole food matrix.

An extended shelf life, a wider geographical accessibility, a safer nutritional profile, and a richer taste can all be obtained with wisely developed botanical extracts.

OPLODEX™ is a patent pending platform of optimized botanical combinations, specifically tailored to assist the food industry in its quest for effective, safe and natural solutions.
IMPORTANCE OF POLYPHENOLS

Polyphenols are well known for their healthy antioxidant effect and for breaking the free radical chain reaction. What is true for our body is also true for food.

A straightforward and effective way of measuring a substance’s antioxidant power is through the comparison with benchmarks such as gallic acid or ascorbic acid. Also, the radical scavenging activity can be measured by checking the substances’ efficacy against stable DPPH species.

Oxidation is also strongly facilitated by the presence of metal ions. A special category of additives that reduce catalyzed peroxidation is known as sequestrants: these are compounds which have a chelating action and thus can “capture” metallic ions such as copper, iron or nickel, reducing their contact with foods and blocking metal ions’ catalytic oxidative action.

Very promising preliminary results on antioxidant/radical scavenging power of selected botanical extracts rich in polyphenols such as green tea (T), grape seed (E) and oak wood (Q) suggested to investigate the potential synergy of different blends.

OPLODEX™ is thus a system of flavouring preparations, obtained through the balanced and synergistic combination of polyphenolic botanical extracts, stable in a broad range of pH and temperatures.

Additionally, OPLODEX™ platform has been tested in several trials, outperforming both market benchmarks and synthetic ingredients (e.g. EDTA), with the aim of offering an effective solution for fresh and processed food shelf life.

The tests carried out on OPLODEX™ system have assessed antioxidant power, radical scavenging activity and chelation effect.
OPLODEX™ is a patent pending flavouring that contains oak, grape seed and green tea extracts and may provide the matrix with the relevant organoleptic characteristics. It is presented as a dry, water soluble powder, to offer a clean label solution.

Additionally, in vitro and in matrix experimental data have been carried out to demonstrate its chelation and antioxidant properties, useful for matrix protection and for shelf life prolongation.

OPLODEX™ has performed very well, achieving the best results with a very low dosage in a broad range of pH and temperatures.

EXPERIMENTAL DATA

MINCED MEAT - HAMBURGERS
200 ppm OPLODEX™ were added to fresh sausages and hamburgers matrix and monitored for microbiological parameters. Shelf life was checked by testing peroxide number and MDA formation (meq peroxide/kg fat) in comparison with standard product normally used in the food.


PROTECTION INDEX

MINCED MEAT - HAMBURGERS
Malondialdehyde (MDA) is a main marker of oxidative stress.
Results were normalized according to the real dosage used in the trial and are calculated as the difference between the control without additive and treated meat matrix.

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PROTECTION INDEX - MDA INHIBITION

(Difference vs control/dosage) x 1000

200 ppm OPLODEX™ were shown to inhibit the peroxidation thus preserving lipids’ integrity up to 8 days.
OPLODEX™ QT can be used as an ingredient in meat products seeking USDA approval for labels featuring the “All Natural” or “Uncured” claims.

OPLODEX™ QT can be presented as seasoning (maltodextrin, green tea extract, English oak extract), thus contributing to a clean ingredients statement on product labels.

CHELATING ACTIVITY

EXPERIMENTAL DATA
The chelating and ant-radical power of the extracts were measured. The lower the IC₅₀ value, the greater the chelating capacity of the sample. OPLODEX™ maintains an antioxidant and chelating activity (even at high temperature) over time. Tested dosages have shown a similar chelating activity as the positive control and may be considered a natural solution for any processed food sensitive to peroxidation.

PEROXIDE INHIBITION IN BAKERY

EXPERIMENTAL DATA
FLATBREAD PIZZA
200 ppm OPLODEX™ were added to the water premix and poured into the dough. Flatbread pizza was baked for 50 min at 150°-170°C. Peroxide number was tested after baking and after 6 months in comparison with the control matrix product on the stored packed samples.

200 ppm OPLODEX™ were shown to sensitively control the lipid peroxidation after 6 months in the salty bakery products thus protecting the overall matrix taste.
ANTIOXIDATIVE POWER AND ACTIVITY VS BHA AND BHT

AP = n° free radicals /mg·min measured by ESR technique.

The resulting AP is expressed in antioxidative units (AU), where 1 AU corresponds to the activity of a 1 ppm solution of pure vitamin C (ascorbic acid) as a benchmark.

PEROXIDE INHIBITION IN FRESH PASTA

200 ppm OPLODEX™ QT in fresh pasta and 200 ppm OPLODEX™ QE in the filling

OPLODEX™ was added to the water premix and poured into the dough containing ground shelled hemp seeds and eggs. Pasta was then kept in a simple cardboard box at 8°C.

Peroxide content was tested on pasta in the following 10 days in comparison with the control matrix product without OPLODEX™.

<table>
<thead>
<tr>
<th>PRODUCTS</th>
<th>BOTANICAL SINERGY</th>
<th>DOSAGE (PPM)</th>
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<tbody>
<tr>
<td>OPLODEX™ QE</td>
<td>Oak wood &amp; Grape seed extracts</td>
<td></td>
</tr>
<tr>
<td>OPLODEX™ QT</td>
<td>Oak &amp; Green Tea extracts</td>
<td>200 to 400</td>
</tr>
<tr>
<td>OPLODEX™ TE</td>
<td>Green Tea &amp; Grape seed extracts</td>
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At Indena we believe that an in-depth knowledge of active ingredients derived from botanicals, and the search for excellence at all times, are both crucial parts of the commitment to serving our customers in pharmaceuticals, health foods, foods and personal care.

Research and production technologies are the main focus of our mission and the way in which we create a “value difference” for our partners.

We’ve got more than 90 years of experience to prove it and we are now bringing our expertise into the food market.
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