Enhancing the Value of Cosmeceuticals Through Internally Stabilised Spice Formulations

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Abstract

Food plays a pivotal role in the wellbeing of humans. Food is a strong medicine if consumed in proper quantities. We always advocate for the cosmetic industry the famous slogan 'It´s what you eat, it´s what you should apply'.

This paper reveals our research into the 'magic' properties of spices for providing powerful cosmetic formulations

Introduction

Food is the most basic prerequisite of living organisms. It contributes towards building the body, providing energy for living and working and regulating the mechanisms essential for health and the survival of life. Food thus constitutes the foundation for the health of both humans and animals.

Food and nutrition have long been discussed in the context of how certain dietary components may modulate oxidative stress and inflammation. Medicines and foods have a common origin. Modern science, however, is a common starting point for providing real evidence of this very concept.

Harmony of mind, body and spirit are hinged on a balance of free radicals and oxidants (created by the products of oxygen molecules) and antioxidants, which protect our cell membranes throughout the body. Illness occurs when we are in a state of deficiency. Thus nutritional lifestyle and environmental choices must be balanced to maintain our antioxidant status account.

The history of the use of aromatic oils on the body goes back at least 2,000 years before Christ. There are records in the Bible about the use of plants and their oils, both in the treatment of illness and for religious purposes. The Egyptians used them widely, both as cosmetics and for embalming their dead, in order to delay decomposition. These oils were known in China perhaps even before that time and then their use gradually spread to the Greeks and Romans, who of course brought the idea to Europe.

We have successfully demonstrated the application of rosemary in stabilising the oils and butters in cosmetic formulations. The main antioxidative effects of rosemary extracts come from three phenolic components namely carnosic acid, carnosol and rosmarinic acid, of which over 90% of the antioxidant activity is from carnosic acid and carnosol. Flavonoids, particularly flavones, have been identified in rosemary extracts.

Apart from the antioxidant activity, there are mentions of antimicrobial, antiviral, antimutagenic activities of rosemary extracts. Until we developed the method of internal stabilisation, the most common way of avoiding oxidation was the external addition by simple mixing of antioxidants to the oils and butters. Such additions often required heating, homogenisations, extra labour and handling of powders. All of these can be now successfully avoided through internally stabilised oils. Our research has proven that internal stabilisation of exotic butters and natural oils enhances oxidative stability many-fold.

This paper describes the application of various spice oils in expanding research of internal stabilisation in testing various products.

Method of Analysis

Oil stability index (GSI) was determined as a tool for judging oxidation stability. The instrument chosen for determining OSI was a Rancimat 743. The principle of Rancimat analysis depends on the measurement of the increase of electrical conductivity by the volatile carboxylic acids generated in the oxidising oil sample. The temperature was varied between 90°C and 110°C respectively. The air in-flow was continuously maintained at 18 litres/hour and the sample size was 3 + 0.05 gram.

The test oil was flaxseed, as this is a highly unsaturated oil and all the spice oils were procured locally.

Results and Discussions

The data obtained from the Rancimat tests were plotted as a function of time to obtain bar diagrams which show the relative increase of oxidative stability for each of the test samples.

In our experimental design, we used flaxseed oil internally stabilised with rosemary as described in our previously published studies[1-3]. The standard addition of all spice oils was limited to 1,000 ppm and then the added oil was deodorised and the Rancimat runs were performed at various temperatures.

Figure 1 depicts the result of measurements employing cinnamon, fennel, clove and ginger at 90°C. These results clearly show excellent reproducibility and extreme synergy in enhancing the life cycle of the oil. These results were performed at 110°C and the data presented in Figure 2 conforms to the earlier experiment.

Figure 3 shows the result of the addition of 1,000 ppm of fennel, cinnamon, clove, lavender and ginger at 130°C. This further confirms the boosting effect of the addition of spice oils. In further experiments we tried to externally add 1,000 ppm and 10,000 ppm of clove oil and compare it with the deodorised process. The result shown in Figure 4 clearly explains the remarkable shelf life extension during deodorisation.

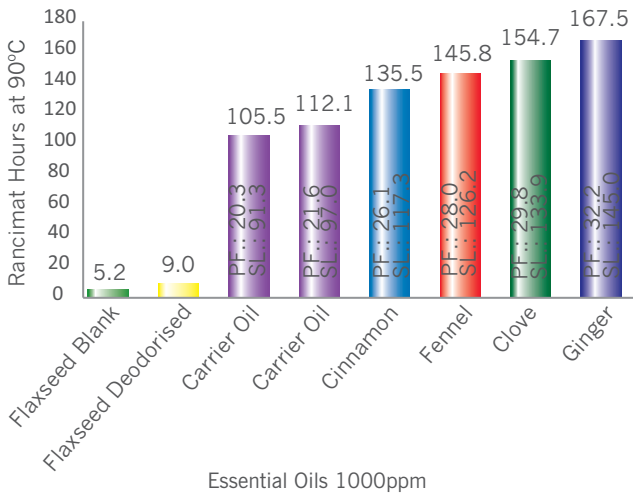

Figure 1. Rancimat Hours at 90°C for the Flaxseed Oil Before and After Deodorisation and the Reproducibility for the Carrier Oil. It also Shows the Effect of Adding 1,000 ppm of Cinnamon Oil, Fennel Oil, Clove Oil and Ginger Oil

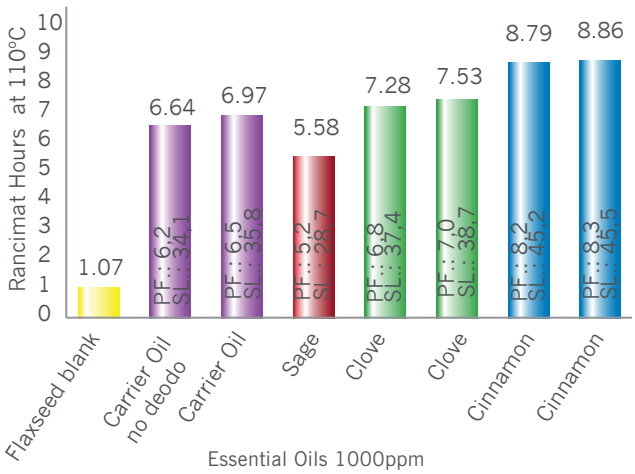

Figure 2. Rancimat Hours at 110°C for the Carrier Oil Before and After Adding 1,000 ppm of Sage Oil, Clove Oil and Cinnamon Oil

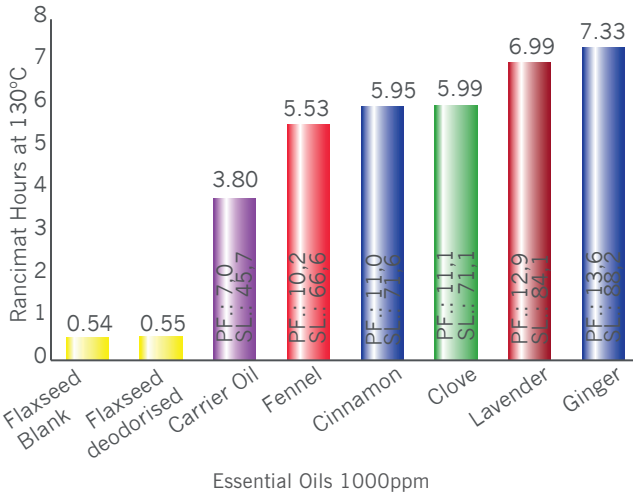

Figure 3. Rancimat Hours at 130°C for the Carrier Oil Before and After Adding 1,000 ppm of Fennel Oil, Cinnamon Oil, Clove Oil, Lavender Oil and Ginger Oil

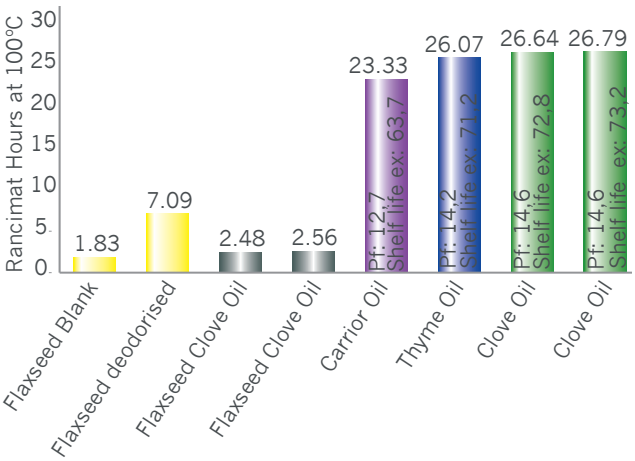

Figure 4. The Difference in Rancimat Hours at 100°C for the Adding of 1,000 ppm and 10,000 ppm and Internally Stabilising with 1,000 ppm Clove Oil and Thyme Oil

Figure 5 presents the data of extremely high reproducibility of carrier oil thyme and clove oil at 100°C. We tried a range of different oils and the data presented in Figure 6 shows the extreme superiority of oregano as compared to the other oils.

In order to test the linearity of the addition of oregano oil at 1,000, 2,000 and 5,000 ppm, we tested these oils at 110°C and these results (Figure 7) show a good effect in higher concentrations but 1,000 ppm will be the best addition in order to achieve the desired result. The results presented in Figure 8 show similar conclusions. Figure 9 shows the Rancimat Hours at 110°C for a range of other essential oils.

The protection factors of the various oils studied at 110°C are presented in Figures 10 and 11 respectively (see next page). These results, once again, confirm that oregano oil is the most powerful antioxidant in connection with rosemary, followed by sage and other oils.

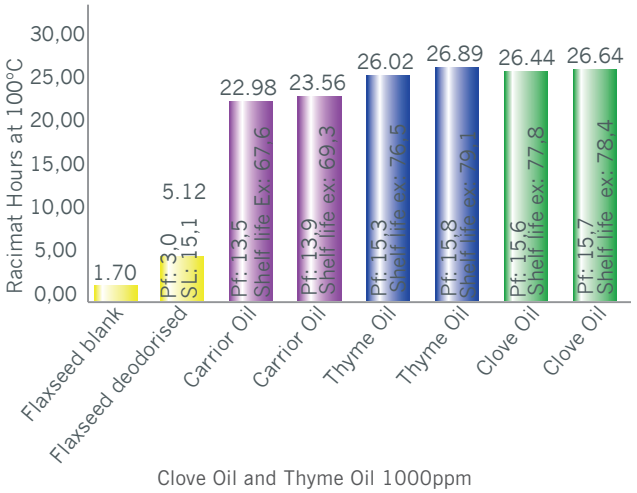

Figure 5. Reproducibility of the Rancimat Hours at 100°C

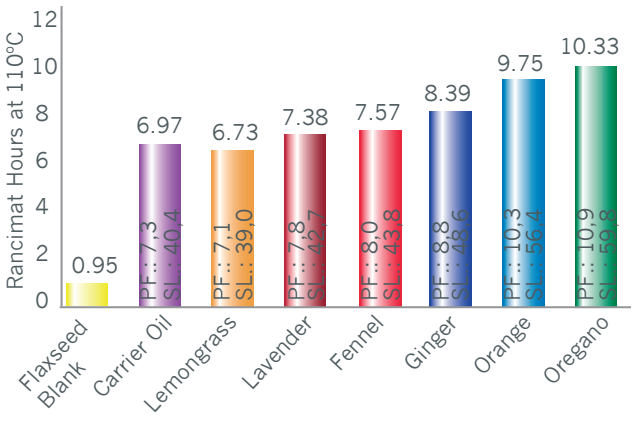

Figure 6. The Effect on Rancimat Hours at 110°C of the Addition of 1,000 ppm of Various Essential Oils

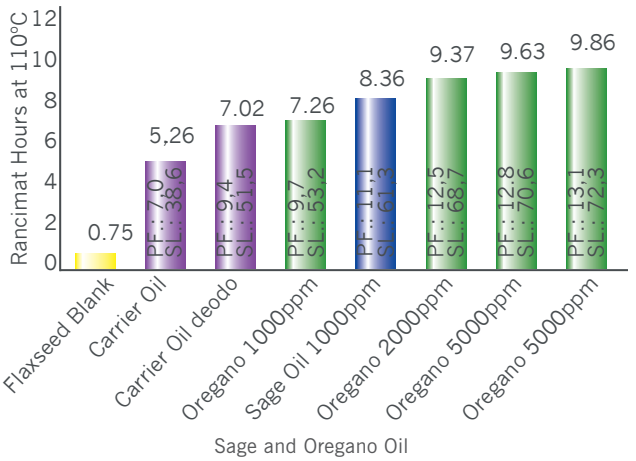

Figure 7. The Effect on Rancimat Hours at 110°C of the Addition of Increasing Amounts of Oregano Oil

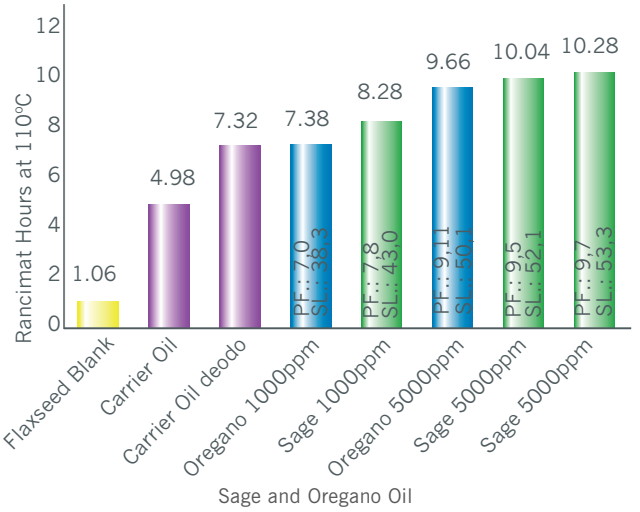

Figure 8. The Reproduction of the Tests Described in Figure 7

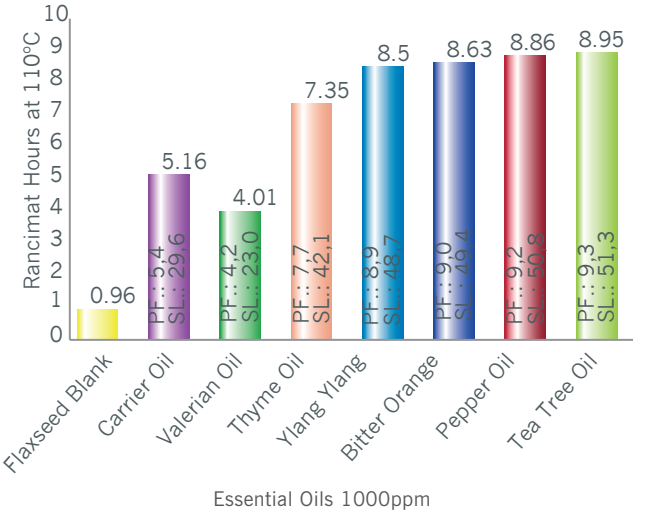

Figure 9. The Effect on Rancimat Hours at 110°C of the Addition of 1,000 ppm of Various Essential Oils

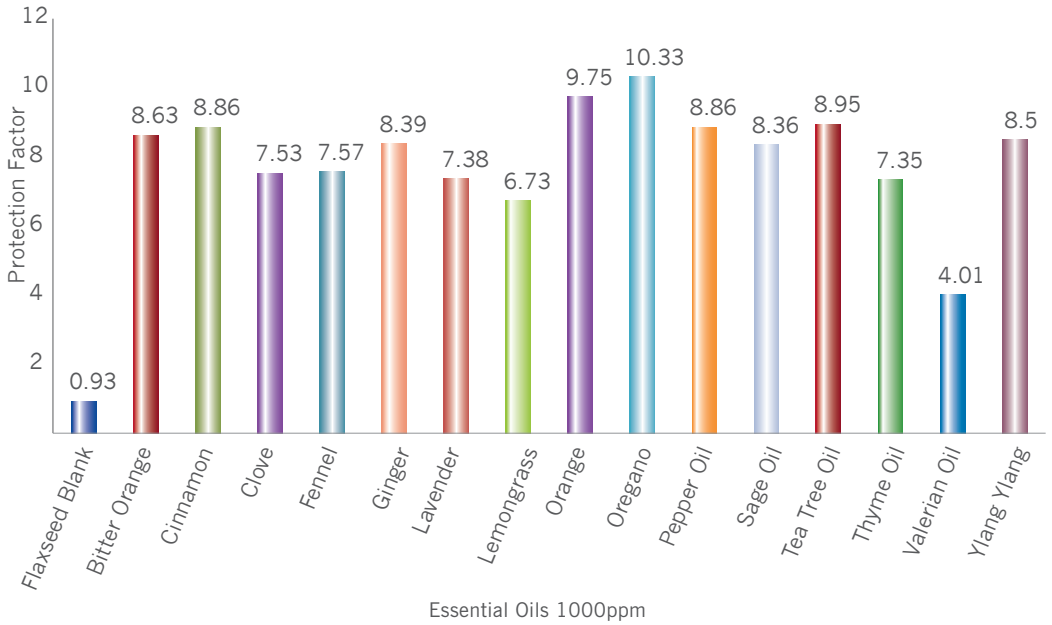

Figure 10. A Comparison of the Effect on Rancimat Hours at 110°C of Adding 1,000 ppm of Various Essential Oils

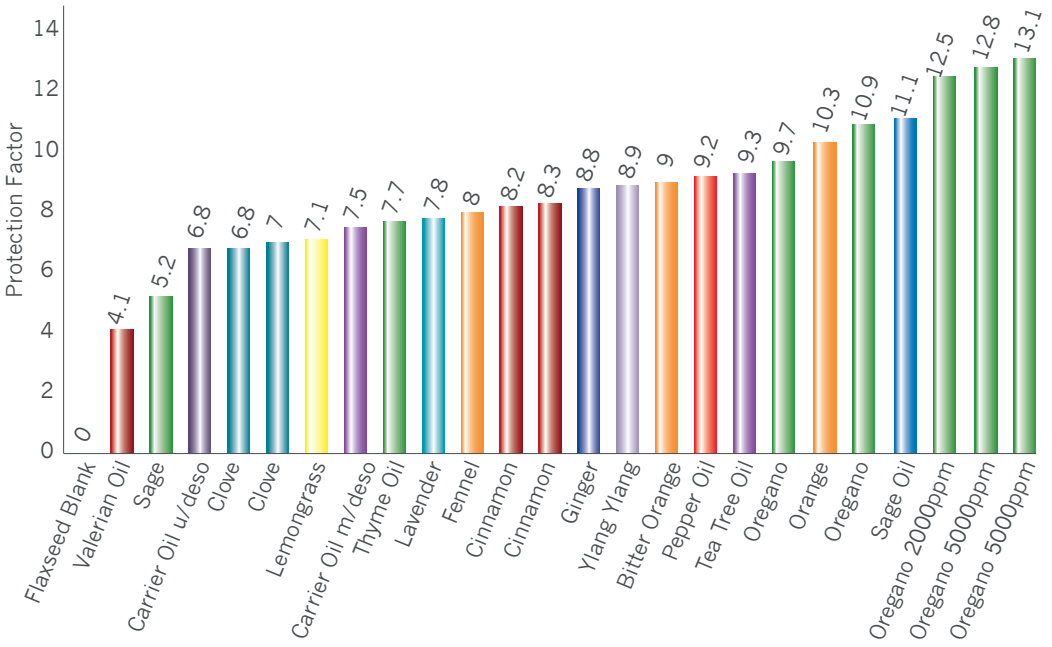

Figure 11. A Comparison of the Protection Factors of Various Essential Oils

Conclusion

This paper clearly defines the strong antioxidant properties of various spice oils. This opens a new avenue of cosmetic formulations employing natural components, thus providing the following benefits:

- Prolonged shelf life of the cosmetic formulations
- Stronger antioxidant properties compared to natural tocopherols
- No need to add antioxidants in the formulation of the cosmetic product
- Adds a more 'natural' clean label to the product.

References

1. Vijai K. S. Shukla and Kaustuv Bhattacharya, Happi, Dec 2003 p. 91-93
2. Vijai K. S. Shukla and Kaustuv Bhattacharya, Cosmetics and Toiletries, May 2004 p. 99-104

3. Vijai K. S. Shukla and Søren Nielsen, Cosmetic Science Technology 2012, p. 43-48

Authors' Biographies

Professor, Dr. Vijai K. S. Shukla is President of International Food Science Centre ApS and also Adjunct Professor in the Department of Food Science and Nutrition, at the College of Food, Agricultural and Natural Resource Science, University of Minnesota, St. Paul, Minneapolis.

Research interests

Professor, Dr. Vijai K. S. Shukla is the author of nearly 110 original scientific publications, 12 invited review papers, 15 book chapters in the areas of biochemistry, human nutrition, cosmeceuticals, neutraceuticals, enzymology, modern analytical techniques for the separation of lipids and proteins. He is also the editor of six books.

Specialisation

Professor, Dr. Shukla's research interests have ranged from physical phenomena to mechanism of autoxidation, isolation of lipids, spectral phenomena related to lipids, modern analytical methodology and involvement of essential fatty acids in health and diseases such as multiple sclerosis and Batten's syndrome and he has also shown essential fatty acid deficiency in multiple sclerosis and Batten's disease. These were related with glutathione peroxidase activity and antioxidant requirements in these diseases. He has also analysed arctic diet in Greenland Eskimos and compared them with Danes, elucidating some of the mechanism of coronary heart diseases in these population groups. In his research work Professor, Dr. Shukla employs modern analytical methodology in order to resolve various scientific problems.

Accomplishments in Industrial Applications

Professor, Dr Vijai K. S. Shukla has been working in the area of confectionery product development for the last three decades. He has a special expertise in cocoa butter, milk fat, cocoa butter equivalents and cocoa butter substitutes based on modern concepts of recipe engineering. He has always applied scientific principles to upgrade or modify existing production to achieve super quality products. Some of his major achievements are as follows: during 1996 Professor, Dr. Shukla established a brand new refinery in The Netherlands and has successfully demonstrated that total oxidation in bulk oils can be completely arrested and that speciality fats delivered to the customers will be of extremely fresh quality. These deliveries were in the scale of 500-1000 MT per shipment. A proper research approach clearly shows that it is possible to provide uplift to large scale production through extreme care, taking the help of nitrogen as inert gas and stainless steel in the production system. A number of international press articles presented these developments.

For the last two decades Professor, Dr. Shukla's research has focused on the quality of encapsulated fish and vegetable oils. He has successfully demonstrated that it is possible to produce ultra refined fish oil with extreme low peroxide value and anisidine value. This oil is already in commercial production. Having produced the above mentioned oils it is of the utmost importance to keep these oxidation values extremely low, therefore he has designed several natural antioxidant systems for general nutrition as well as cosmetic oils. This natural antioxidant system is 50 to 60 times more powerful than existing available antioxidants. He has recently developed a novel designer oil called Nutridan containing very high amounts of essential polyunsaturated fatty acids. The oils used are of vegetable origin and extracted by physical means and are thus totally solvent free. Nutridan provides not only balanced essential fatty acids but also a high dosage of natural antioxidants which are extremely beneficial for better health.

Extraordinary Achievements

Professor, Dr Vijai K. S. Shukla has appeared in: Who's Who in the World, 12th edition 1995-96; 2000 Outstanding Scientists of the World; 2000 Outstanding Intellectuals of the 20th Century; The Barons 500 Leaders for the new Century; The Cambridge Blue Book 2005. In 1996 he was awarded the American Oil Chemists' Society (AOCS) prestigious Herbert Dutton Award for pioneering contribution in Lipid research presented in Indianapolis. The title of the award lecture was 'Chocolate - The Chemistry of Pleasure. In 2002 he received the American Oil Chemists' Society prestigious Stephen S. Chang Award presented in Montréal, Canada. The title of the award lecture was 'Chocolate – Friend or Foe?' This award is given to a scientist who has achieved decisive accomplishments in basic research and the knowledge that the person has produced must have been utilised by industries for the improvement or development of food products related to lipids. And in 2005 he was made an AOCS Fellow in recognition of his achievements in science and appreciation for significant service to the AOCS. E-Mail: shukla@ifsc.dk

Mr Søren Nielsen studied at Odense University Hospital, Odense, Denmark. He is a Research and Development Technician at ICSC. He specialises in product innovation, technology of fats, analytical evaluation and recipe engineering programmes. He also specialises in refining technologies of oils and fats and he has more than 30 years of experience in lipid research.