

2004 TAIWAN INTERNATIONAL SCIENCE FAIR

CATEGORY : Chemistry

**PROJECT : Tamarind(Tamaridus Indical.)Seed
Coat Extracts As Coconut Oil
Antioxidant**

AWARDS : Chemistry Third Award

SCHOOL : Datdaruni

**FINALISTS : Teerathon Sorncharoen
Pacharaporn Srijantanakul**

COUNTRY : Thailand

ABSTRACT OF EXHIBIT

Title : **TAMARIND (*Tamaridus indica* L.) SEED COAT EXTRACTS
AS COCONUT OIL ANTIOXIDANT**

Catogory : Chemistry

Students : Teerathon Sorncharoen and Pacharaporn Srijantanakul
Datdaruni school, Namuang district, Muang, Chachoengsao 24000 Thailand

After short period of storage the coconut oil at room temperature we found that it becomes rancid. The oxidizing flavor is disgusting and causes economic loss. Some chemicals are used to prevent the oxidation of coconut oil but they are expensive and may be harmful to consumer's health if used daily. Moreover, they are not suitable for homemade coconut oil and residual waste from the process may be environmental toxic. The present work thus aims at extracting substances from local plants and used as antioxidant for coconut oil.

Seven kinds of local Caesalpiniaceae plants in Eastern Thailand namely Tamarind (*Tamaridus indica* L.), Peacock flower *Caesalpinia pulcherrima* L.), Flame tree (*Delonix regia* L.), Golden shower (*Cassia fistula* L.), Siamese cassia (*C. siamea* Lamk.), Candelabra bush (*C. occidentalis* L.), and Copper pod (*Peltophorum pterocarpum* DC.) were used. Ten grams of seed coats were mixed with 50 ml of the distilled water and 95% Ethyl alcohol (1:1) mixture in a closed container. The mixture was heated in a water-bath at 60 °C for about 2 hrs. and then kept in 10 °C icebox about 2 hrs. The mixture was then filtered and the filtrate was heated in an hot-air oven at 80 °C for about ½ hrs. Ten ml of coconut oil was added with 0.5g of the extracts and kept at room temperature for 5 days. The pH and peroxide value (using the Iodometric titration method) of the oil were measured. It was found that the coconut oil with the Tamarind seed extract had the lowest peroxide value and was selected. Next the suitable amount of the Tamarind extract was studied by adding the extract to 10 ml coconut oil at 0-7% (w/v) and the contents were kept at room temperature for 5 days. The result showed that the 3% (and more over) Tamarind extract had the lowest peroxide value. Then the coconut oil with 3% Tamarind extract was kept at room temperature for 30 days. The pH and peroxide value were measured every 5 days. It was found that the oil could be stored for 25 days without significant change in pH and its peroxide value was less than 10 milliequivalent oxygen per kilogram oil according to FAO/WHO (Codex) standard.

Therefore, Tamarind seed coat at 3% could be used to retard the coconut oil oxidation for 25 days. This work presents the applicable use of plentiful local plants such as Tamarind seed, which is normally discarded, as an antioxidant for coconut oil.

Keywords : Tamarind seed coat, coconut oil antioxidant, Caesalpiniaceae plants

PROBLEMS

In my home town, coconut oil is one of the major agricultural products for consumption, Thai medicine and export. It is composed of unsaturated fatty acids so it becomes rancid from the oxidation within 1 - 2 days at room temperature preservation. The oxidizing flavor is disgusting and causes problem to the quality of the oil. Some chemicals are used for preventing the oxidation but they are expensive and may be harmful to health. Moreover they are not suitable for homemade coconut oil.

Some plants contain tannin in many parts such as trunk coat, seed coat, gum, leaves etc. Tannin is showed to have an antioxidant effect for oil and fat. Caesalpiniaceae plants, in generally, have thick-hard seed coat which contains many tannin such as Tamarind (*Tamarindus indica* L.). Its seed is normally discarded. The use of plentiful natural resources to make worthwhile products for society or community is to be recognized. The present work thus aim at investigating the possibility of using the extract from Tamarind seed coat and other Caesalpiniaceae plants as homemade coconut oil antioxidant.

PURPOSES

1. To select the best suitable extracts from seven Caesalpiniaceae plants seed coat to retard/prevent the oxidation of homemade coconut oil.
2. To study the shelf-life of coconut oil after adding the suitable extract.

HYPOTHESIS

Extracts from Caesalpiniaceae plants affect the oxidation of coconut oil.

PROCEDURES

Experiment I Study on suitable kind of seed coat extracts for coconut oil antioxidation.

1. Collected seeds and prepared them according to the method described by Rivas & Zaya (1998).
2. oven-dried at 80 °C about 1 h.
3. Cut and grinded seed coat.
4. 10 g of seed coat was mixed with 50 ml of the mixture of distilled water and 95% Ethyl alcohol (1:1 ratio).
5. Heated the mixture in 60°C water-bath for about 2 hrs.
6. Cooled in 10 °C icebox about 2 hrs and then filtered.
7. Oven-dried the filtrate at 80 °C for about ½ hrs.
8. 10 ml. coconut oil was added with the extract at 0.5 g.
9. Kept at room temperature for 5 days.
10. pH and peroxide value (using the Iodometric titration method) were measured.
11. Selected the extract the gave the lowest peroxide value.

Experiment II Study on suitable quantities of extracts for coconut oil antioxidation

1. Extracted the selected seed coat.
2. Add 0.1, 0.3, 0.5 and 0.7 g extract into 10 ml coconut oil. (1, 3, 5 and 7%, w/v)
3. Kept at room temperature for 5 days.
4. Measured pH and peroxide value of the oil.
5. Selected the amount of extract that gave the lowest peroxide value.

Experiment III Study on shelf-life of coconut oil after adding suitable extracts

1. Added the suitable quantity of extract from the above experiment into 10 ml coconut oil.
2. Stored at room temperature for 30 days.
3. Measured pH and peroxide value every 5 days.

CONCLUSION

1. Tamarind seed coat extracts is suitable for use as antioxidant in coconut oil because it gave the lowest pH change and peroxide value.
2. The least quantity of Tamarind seed coat extract is 3% (w/v) which can prevent the oxidation.
3. The 3% of Tamarind seed coat extract (w/v) in coconut oil can prevent oxidation for 25 days. The oil had peroxide value less than 10 milliequivalent oxygen per kilogram oil according to FAO/WHO (Codex) standard of safety oil.

SUGGESTION

1. This work is one example of making usage of natural resources such as local plants to make worthwhile products. Other plentiful resources in our nature should be searched for good characters or properties to make more benefit for the community.
2. The extract in this work should be purified and tested with other oils.
3. The work focuses on "Back To Nature" should be supported. Health conscious, safe and environmental friendly are keywords of prime importance in the present day of high technology era.

BIBLIOGRAPHY

- Adnan, S.I. 2001. "Chronische Prostatitis". *Johannisbrot-Inhaltsstoffe*.
- American Oil Chemists' Society (AOCS). 1971. *Official and Tentative Methods*, Cd 8-53 : 1-2 & Cd 12-57 : 1-5.
- Chaicharnthipayut, C. & et al. (editors). 1979. Use of medicinal plants I. The project of Medicinal plant production, Faculty of Pharmaceutical Science, Chulalongkorn university, Thailand.
- Chaiprasop, O. 1999. Food preservation. Department of Food Technology, Faculty of Science, Ramkhamhaeng university, Thailand.
- Chanthawong, P. & et al. 1984. "Study on temperature and time preservation affected to vegetable oil static. Journal of Agriculture 2 (3) : 23-27.
- Charuchotkamon, A. 2003. "The fundamental principle of Pharmacology." Pharmacology department, Faculty of Pharmaceutical and Health science, Mahasarakham university, Thailand. <http://www.pharmacy.msu.ac.th/> (retrieved on September 16, 2003).
- Chayamarit, K.. 1998. The manual of Plant Taxonomy. Bureau of Forestry botany, Department of the Royal forestry, Ministry of Agriculture and Cooperatives, Thailand.
- Copping, L.G. 1996. Crop protection agents from nature : Nature products and analogues. The Royal Society of Chemistry Cambridge, U.K.
- Damrongsiri, N. 1999. Botanical taxonomy. Biology department, Faculty of Science, Ramkhamhaeng university, Thailand.
- Department of Agricultural Extension. 1998. Coconut cultivation. Ministry of Agriculture and Cooperatives, Thailand.
- Department of Education. 1997. Chemistry 4 (Sci 033) for High school curriculum. 5th ed. The Institute for Promotion Teaching Science and Technology, Ministry of Education. Bangkok : Teacher council of Thailand Publisher Ladproaw.
- Faculty of Agriculture industry, Chiangmai university, Thailand. 2002. "Use of spices as natural antioxidant." Knowledge extension project on Dailynews newspaper, March 22, 2002 : 8.
- Faculty of Agriculture industry, Prince of Songkla university, Thailand. 2001. "Use of vitamin C and phenolic acid to be antioxidant. " Knowledge extension project on Dailynews newspaper, October 30, 2001 : 8.
- Helrich, K. (ed.). 1990. "Official methods of analysis of the Association of Official Analytical Chemists." 15th ed., chapter 4. Virginia: AOAC Inc.
- Kaewsutthi, S. and Surinrat, P. 200. "An antioxidant properties of fruits." Biochemistry department, Faculty of Pharmaceutical science, Chulalongkorn university. In proceeding of The 28th Thailand Science and Technology Conference, October 24-26, 2002, at Her Majesty Queen Sirikit National Conference Center, Bangkok.
- Kasetsart university, Thailand. 1995. "Pre-entrance chemistry lecture." Summer project of promotion for Student's special talent.
- Kongkachaui, S., Towatthana, N. and Mahabutsarakam, W. 2001. "Study on antioxidation properties of LDL in *Garcinia dulcis* (Roxb.) Kurz. extracts." Chemistry department, Faculty of Science, Prince of Songkla, in proceeding of The 27th Thailand Science and Technology Conference, October 16-18, 2001. at Lee Garden Plaza hotel, Hadyai, Songkla.
- Kongsakphisan, A., Chaisupakitsin, M. and Sratun, S. 1984. Agricultural chemistry. 3rd ed. Faculty of Industrial Education, King Mongkut's Institute of Technology Ladkrabang.

- Meesook, P. and Assawatiratanakun, K. 1986. Manual of Biochemistry Laboratory. Biochemistry department, Faculty of Science, Srinakharinwirote Songkla University, Thailand.
- Medicinal plant information center, Mahidol university, Thailand, <http://www.medplant.mahidol.ac.th/> (retrieved on August 27, 2003).
- Passwater, R.A. 1997. The Antioxidants, <http://www.celltech.com/resources/vt/antioxidants3.asp> (retrieved on January 22, 2003).
- Phamornsumit, S. 2001. "Food additives". Department of Food technology and Nutrition Faculty of Technology, Mahasarakham university, Thailand.
- Phinyawat, S. 1999. Biochemistry I. Chemistry department, Faculty of Science, Ramkhamhaeng university, Thailand.
- Rivas, G.M. and Zaya, P. 1998. "Tannin produced from pine bark in Chile". International Development Research Centre, Ottawa, Canada. http://www.idrc.ca/nayudamma/tannin_47e.html (retrieved on August 27,2003).
- Sinthawalai, S. 1982. Food theory II : The principle of food preservation and quality control. Department of agricultural product development, Faculty of Agriculture industry, Kasetsart university, Thailand.
- Sriphiro, P. 1980. Biomolecular substances. Chemistry department, Faculty of Science, Srinakharinwirot Mahasarakham university, Thailand.
- Suntharosot, P. & et al. (editors). 1991. Plant resources in the Southeastern Asia III : Dyes and tannin plants. National Institute of Science and Technology Research, Thailand.
- Tanthaphanitchakun, R. 1999. Food chemistry. Chemistry department, Faculty of Science, Ramkhamhaeng university, Thailand.
-