Tea Q. 43 (3), 88-90. (1972). Printed in Ceylon.

PRODUCTS FROM TEA SEEDS

I—EXTRACTION AND PROPERTIES OF OIL

*G. R. Roberts and U. L. L. de Silva

An edible oil can be extracted from tea seeds. The details of the extraction procedure and some important properties of the oil are discussed.

Tea seeds contain extractable quantities of an unsaturated edible oil. The oil has been extracted from different varieties of the tea plant in Ceylon, China, India and Japan. The only report of the commercial production of tea seed oil is from China where unconfirmed reports have claimed that 180,000 tons were produced in 1958 (Reddy 1958). Tea seed oil has been used as an adultrant in olive oil (Chakrabarty & Chakrabarty 1954) and a special test has been devised for its detection (Fitelson 1936). Some detailed analysis of oil from seeds of *Camellia sasanqua* has been reported (Chakrabarty & Chakrabarty 1954).

The extraction of this oil by the commonly-used expressor technique not only results in low yields but also leads to the production of an oil unsuitable for consumption due to the high content of saponins (Child 1936). This investigation was carried out to ascertain the possibility of extracting an edible oil from seeds of *C. sinensis* using a selective solvent-extraction technique. The details of the process are discussed with respect to its adaption for the production of tea seed oil on a large scale. The residual cake after oil extraction can be further utilized for the production of saponins.

MATERIALS AND METHODS

Tea Seeds

Mature seeds were collected from low-country tea estates. The seeds were dried in the sun for 6 to 8 hr and in an oven at 70° for about 3 hr to obtain a final moisture content of approximately 10%. Higher moisture contents resulted in the formation of an uneven sticky mass on crushing which was unsuitable for solvent extraction. The dried seeds were crushed lightly and the testa separated. The kernels were powdered and used for oil extraction. Extraction without separation of the testa resulted in a darker coloured oil. It was found that the dry seed kernels could be stored in a dry atmosphere without loss in the final yield of oil (up to 3 months in one experiment).

Solvents

The extraction was carried out with special boiling point 62/82 Solvent obtained from Lankem (Ceylon) Ltd., Colombo, and the Ceylon Petroleum Corporation. This solvent obtained from the distillation of crude petroleum contains mainly hexane (Pareksh 1964) and will probably be produced in Ceylon in 1973 (Personal Communication).

* Biochemist and Experimental Officer respectively, Tea Research Institute of Ceylon, Ratnapura, Sri Lanka.

Extraction Procedure

The seed powder (1 Kg) was packed into columns made from pieces of S-lon pipe (120 x 5 cm). The columns were saturated with the extraction solvent and allowed to stand for 12 to 16 hr. The solvent was then drained out and the elution continued until the eluate was colourless. The combined eluates were dried for 6 to 8 hr with a hydrous sodium sulphate. The extraction solvent was completely removed under reduced pressure in a rotary vacuum evaporator at 75—85° C. This resulted in a free flowing yellow oil which could be further clarified by centrifugation at 27,000 x g for 10 min. Generally, yields of 18 to 22% of dry weight were obtained. Some batches of oil were bleached by passing the oil/solvent mixture through a column of charcoal (BDH, activated; 15 cm x 3 cm). It was observed that the decolourized oil obtained by evaporation of the solvent solidified at 4°, at which temperature the yellow oil remained a liquid.

PROPERTIES OF TEA SEED OIL

The oil was yellow-coloured, free flowing, had a pleasant odour. The oil was stored at room temperature for nearly three months without loss in quality. The iodine value, saponification value and free fatty acid content of the oil were determinated by standard procedures (Methods of Analysis of the Association of Official Agricultural Chemists 1960). The values obtained for tea seed oil together with those of some other commercially available oils are shown in Table 1. The free fatty acid content of tea seed oil did not change appreciably during storage at room temperature (two months storage in present experiment).

TABLE 1 — *Chemical properties of oils*

Type of oil	*Iodine Value*	*Saponification value*	*Free fatty acid content*
Tea Seed (Yellow)	88.9	187.4	5.34
Tea Seed (decolourized)	88.3	188.56	4.06
Sesame (Gingerlly)	110.00	186.0	10.0*
Olive	79.88*	185.0*	3.12
Coconut	16.1	253.0*	6.26

*From Biochemists Handbook Ed. C. Long, E. & FN SPON. London (1961)

LARGE - SCALE PRODUCTION OF OIL

The cultivation of the tea plant for the production of seeds on the large scale would depend on the availability of a ready market for tea seed oil and other commercially useful products which can be manufactured from the seed. Two such potentially useful products are saponins, which can be extracted from the cake left over after removal of the oil (de Silva & Roberts 1971) and the final residual cake, which can be purified and used in the preparation of animal foods.

The acceptability of tea seed oil as an edible oil is being investigated. Its properties, particularly its degree of unsaturation, which are similar to olive oil, corn oil and gingerlly oil (sesame) could result in tea seed oil being a useful and perhaps cheaper substitute for these oils.

The organization and operation of an extraction plant should not present any particular problem because many solvent extraction plants for oil seeds are already in operation in many countries and these well-established principles can be employed (Pareksh 1964) to work out a programme for the drying and extraction of tea seeds.

REFERENCES

CHAKRABARTY, S. R. & CHAKRABARTY, M. M. (1954). Science & Culture (*India*) **20**, 186.

CHILD, R. (1935). Tropical Agriculturist **84**. 71.

FITELSON, J. J. (1936). *Methods of Analysis of the Association of Official Agricultural Chemists*, 1960 (Ninth Edition)

PAREKSH, H. V. (1964). *Indian Oil Chemists Association* 1964. (Monograph)

REDDY, H. A. (1958). ECAFE report on oil seed extraction in Ceylon. (from Ceylon Oils & Fats Corporation).

DE SILVA, U. L. L. & ROBERTS, G. R. (1971). *Tea Quarterly*, **43**

Accepted for Publication—10*th December* 1971.