CHEMICAL EVALUATION OF *QUERCUS GLAUCA* SEEDS AND ITS OIL

by

***Abdul Ghaffar Marwat, Pazir Gul and Fazli Wahid Khan**

Summary. *Oil extracted from the seeds of* Quercus glauca *with soxhlet apparatus, using petroleum ether as a solvent, was analysed for its physico-chemical constants and composition of fatty acids. The oil was found to be a non-drying comparing favourably well with the oils from* Quercus ilex, *and* Quercus incana (5, 6, 7). *It was concluded that this oil can be used for edible purposes. The seeds, which were analysed for its nutrients, indicate its utilization as poultry and live stock feed* (8).

Introduction. Quercus seed oil is usually obtained from the seeds of *Quercus dilatata, Quercus ilex, Quercus incana* and other *Quercus* species. *Quercus* species grow gregariously in Pakistan at Chitral, Dir, Swat, Galies, Haripur, Kaghan and Murree Forest Divisions at an elevation ranging from 3500-9000 ft. In India it occurs in the inner arid tracts of Himalayas from Sutlaj valley west-wards to Afghanistan (10). The leaves and acorns of *Quercus glauca* are used as winter fodder by live-stock and wildlife. As the oil can be utilized for edible purposes as such, the present study was taken up with a view to find the yield and chemical composition of the oil from the seeds of indigenous plant and to compare it with the oils from exotic species, in order to explore the possibility of its commercial utilization.

Review of Literature. The oil expressed from *Quercus incana, Quercus ilex*, and *Quercus dilatata* is yellow in colour and the usual range of characteristics of oils from these three species are: specific gravity at 25°C, 0.9079-0.9089; refractive index, 1.4576-1.4588; saponification value; 188.0-192.2; iodine value, 81.5-90.31 and unsaponifiable matter, 0.8-2.3% (3). The oils have no toxic principle, are non-drying in nature having iodine value below 100 and are fit for edible purposes. The oils adsorb and retain odour, and can therefore be used in cosmetics and perfumery (7). The acorns of *Quercus ilex* and *Quercus subur* are used as human food in Spain and Morocoo (6,7). The acorns can also be used as a poultry feed provided its slight difficiency in protein content is made up by mixing it with some suitable protein rich material (8).

Material and Method. *Quercus* glauca seeds, collected from Haripur Forest Division were dried and cleaned. The shells were separated from the kernels and the oil was obtained with the helps of a Soxhlet apparatus from the deshelled kernels through solvent extraction using pertoleum ether (40-60°C) as a solvent. The oil thus obtained was purified by the method of Jamieson (1943). The physico-chemical constants such as specific gravity,

*The authors are the Assistant Professor at Islamia College Peshawar and Technical Assistant and Technical Assistant and Forest Chemist at Pakistan Forest Institute, Peshawar.

refractive index, iodine value, acid value, saponification value and hehner value were determined by the usual standard methods outlined by A.O.A.C. (1975) and Jacob (1962). The isolation of individual fatty acid was carried out by fractional crystallisation and precipitation techniques prescribed by Rosenthaler (1930). The seeds were analysed for carbohydrats, protein, cellulose, and moisture contents by the standard methods given by A.O.A.C. (1975) and Griffin (1955).

Results and Discussion. The acorns comprised of 20.0% by weight of shell and 80.0% by weight of kernel. The kernel contained 6.5% and acorn 5.0% by weight of oil. The yield of oil is much less than the yield (14.55%) reported in case of *Quercus ilex* and (16.0%) reported in case of *Quercus incana* (6,7).

The observed physico-chemical constants of the oil from *Quercus glauca* are compared below with those of the other Quercus species reported in literature (5, 6, 7).

Physico-Chemical constants	Quercus glauca lab. work	Quercus ilex Khan, F.W., et al.	Quercus incana Puntambekar, S.V. et al.	Reference of methods adopted for work in the laboratory
Specific gravity at 25°C	0.9062	0.9086	0.9081	A.O.A.C, and Jacobs, M.B.
Refractive Index at 25°C	1.4660	1.4701	1.4576	A.O.A.C., Griffin, R.C. nd Jacobs, M.B.
Peroxide No.	76.m.e/ 1000 gm	78 m.e/ 1000 gm		A.O.A.C, Griffin, R.C. and Jacobs, M.B.
Saponification value	185.13	189.05	192.20	A.O.A.C., Griffin, R.C. and Jacobs, M.B.
Acid value	4.20	3.70	13.0	A.O.A.C. Griffin, R.C. and Jacobs, M.B.
Iodine value	99.55	98.80	81.50	A.O.A.C. Griffin, R.C. and Jacobs, M.B.
Hehner value	85.95	72.50	96.10	Jacobs, M. B. and Griffin, R.C.

It was observed that these values compare favourably well with those of *Quercus ilex* and *Quercus incana.* The iodine value of this oil is in the range of 97.2-100.0% and so this falls in the non-drying class.

The chemical composition of the oil from *Qurecus glauca* is like-wise compared below with those of the oils from *Quercus ilex* and *Quercus incana.*

Name of constituents	Quercus glauca lab. work %	Quercus ilex Khan, F.W. et. al.	Quercus incana Puntambekar, S.V. et. al	Reference of methods adopted for work in the laboratory
Saturated fatty acids	16.50	16.00	18.00	Jacobs, M.B. and Rosenthaler, L.
Unsaturated fatty acids	83.50	48.00	82.00	Jacobs, M.B. and Rosenthaler. L.
Unsaponifiable matter	2.68	1.61	0.80	Rosenthaler. L.
Oleic acid	55.25	57.05	82.00	Rosenthaler. L,
Palmatic acid	10.65	12.40	17.10	Rosenthaler. L,
Linoleic acid	32.50	30.50		Rosenthaler, L,

The unsaponifiable matter (2.68%) is high as compared to (1.61%) reported for *Quercus ilex* and (0.8-2.3%) reported in case for other Quercus species. (6.7).

The nutritive components, as determined, of the seeds of *Quercus glauca* are compared below with those of the seeds of *Quercus ilex* and *Quercus incana.*

Name of constituents	Quercus glauca lab. work %	Quercus ilex (reported) %	Quercus incana (reported) %
Moisture	12.60	11.25	12.20
Ash	1.26	2.09	1.40
Oil	5.0	14.55	16.00
Protein	3.35	4.04	3.00
Cellulose	1.89	1.85	1.40
Carbohydrate	59.50	60.05	61.00

It is obvious from the results that this species can also be used as a poultry and livestock feeding stuff.

Conclusion. The oil of *Quercus glauca* like those of the other *Quercus species* can be used in the manufacture of cosmetics, varnishes, perfumes and food products. Its commercial exploitation on the Industrial scale, because of low oil yield, is not economic.

The seed of *Quercus glauca* as its results are encouraging, could be used for the manufacture of poultry food.

References

1. Association of official analytical Chemists. (1975) Official Methods of Analysis 12th Ed. Washington. D.C. pp. 485-500.
2. GRIFFIN, R.C. (1955) Technical Methods of Analysis 2nd Ed. Mc. Graw Hill Book Co., Inc, New York, pp. 298-319.
3. HILDITCH, T.P. (1956) The Chemical Constitution of Natural Fats, 3rd Ed. John Wiley and Sons Inc., New York, U.S.A. p. 178.
4. JACOBS, M.B. (1962) The Chemical Analysis of Foods and Food Products D. Van Nostrand Co., London p. 44.
5. JAMIESON, G.S. (1943) Vegetable Fats and Oils. 2nd Ed. Reinhold Publishing Corp. New York, pp. 38-39.
6. KHAN, F.W., PAZIR GUL and A.G. MARWAT. (1977) Chemical Evaluation of Quercus ilex seed and its oil. Pakistan J. For. 27(2) pp. 98-100.
7. PUNTAMBEKAR, S.V. and S. KRISHNA. (1934) J. Indian Chem. Soc. Vol. II. p. 721.
8. PUNTAMBEKAR, S.V. and B.S. VARMA. (1934) Utilization of Indian Acorns. The Indian Forester Vol. LX, Dehra Dun, India pp. 752-754.
9. ROSENTHALER, L. (1930) The Chemical Investigation of Plants. G. Bell and Sons Ltd. London pp. 83-85.
10. TROUP, R.S. (1921) The Silviculture of Indian Trees Vol. III. pp. 938-939.