

CHEMICAL EVALUATION OF *QUERCUS DILATATA* SEEDS AND ITS OIL

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Summary. Oil extracted from the seeds of *Quercus dilatata* with the help of soxhlet apparatus, using petroleum ether as solvent, was analysed for its physico-chemical constants and composition of fatty acids. The analytical data obtained were compared with those of oil from *Quercus ilex*, *Quercus incana* and *Quercus glauca*, (5, 6, 7, 8, 10). It was concluded that this oil, being non-drying in nature and have no toxic compounds, can be used for edible purposes. The seeds, which were analysed for protein, carbohydrate and ash, indicate that they can be utilized as poultry and livestock feed (9).

Introduction. *Quercus* seed oil is usually obtained from the seeds of *Quercus dilatata*, *Quercus ilex*, *Quercus incana* and other *Quercus* species. *Quercus* species grow extensively in Pakistan at Chitral, Dir, Swat, Galies, Haripur, Kaghan and Murree Forest Division at an elevation ranging from 1066-1188 meter. In Indian region it occurs in the inner arid tracts of Himalaya from Sutlej valley west-ward to Afghanistan (12). The leaves and acorns of *Quercus ilex*, *Quercus incana*, *Quercus glauca* and *Quercus dilatata* are used as winter fodder by live-stock and wildlife. As the oil is used for edible purposes, the present study was conducted with the object to find the yield and chemical composition of the oil from the seeds of *Quercus dilatata* and to compare it with the oils from the other *Quercus* 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 the oil obtained from these three species are: Specific gravity at 25°C, 0.9079-0.9089; refractive index, 1.4576-1.4588; saponification value, 188-192.2; iodine value, 81.5-90.3; and unsaponifiable matter, 0.8-2.3%(3). The oil has no toxic compounds, non-drying, has iodine value below 100 and is fit for edible purposes. The oil absorbs and retains odour and therefore could be used in cosmetic and perfumery (10). The fruits of the *Quercus ilex* and *Quercus subur* are used as human food in Spain and Morocco (6, 10). It has also been reported that the acorn could be used as a poultry feeding material provided its slight deficiency in protein contents is made up by mixing it with some suitable protein rich material (9).

Material and Method. *Quercus dilatata* seeds collected from Behrain Swat Forest Division were cleaned dried and the shells were separated from the kernels and the oil was extracted with the help of soxhlet apparatus from the deshelled kernels through solvent extraction using petroleum 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, refractive index, iodine value, acid value, saponification value and hehner value

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were determined by usual standard methods outlined by A.O.A.C. (1975), and Jacobs (1962). The isolation of individual fatty acids was carried out by fractional crystallisation and precipitation techniques prescribed by Rosenthaler (1930). The seeds were analysed for carbohydrates, proteins, 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 21.5% by weight of shell and 78.5% by weight of kernel. The kernel contained 14.5% and acorn 8.4% by weight of oil. It, is in close agreement to yield (15.25%) reported in case of *Quercus incana* and (14.55%) in case of *Quercus ilex* and (16.0%) in case of an exotic species of *Quercus incana* (6, 7, 10). The observed physico-chemical constants of the oil from *Quercus dilatata* are compared below with those of other *Quercus* species reported in literature (5, 6, 7, 8, 10).

Physico-chemical constants	<i>Quercus dilatata</i> lab. work	<i>Quercus incana</i> Puntambe- kar S.V. & S. Krishna	<i>Quercus ilex</i> Khan, F. W. Pazir Gul & A.G. Marwat	<i>Quercus glauca</i> Marwat. A.G. Pazir Gul & F.W. Khan	<i>Quercus incana</i> Khan Pazir Gul F.W. Khan & A.G. Marwat	Reference of methods adopted for work in the laboratory
Specific gravity at 25°C	0.9081	0.9081	0.9086	0.9062	0.9075	A.O.A.C. and Jacobs, M.B.
Refractive index at 25°C	1.4568	1.4576	1.4701	1.4660	1.4575	A.O.A.C., Griffin R.C. & Jacobs M.B.
Peroxide No.	77.4 m.e./ 1000g	—	74 m.e./ 1000g	76 m.e./ 1000g	78 m.e./ 1000g	A.O.A.C., Griffin R.C. & Jacobs, M.B.
Saponification value	190.10	192.20	189.05	185.13	191.50	A.O.A.C., Griffin R.C. & Jacobs, M.B.
Acid value	4.30	13.00	3.70	4.20	10.80	A.O.A.C., Griffin, R.C. & Jacobs, M.B.
Iodine value	89.40	81.50	90.80	99.55	87.80	A.O.A.C., Griffin R.C. & Jacobs, M.B.
Hehner value	78.40	96.10	72.50	85.95	95.70	Jacobs, M.B. & Griffin R.C.

It was observed that these values compare favourably well with those of *Quercus ilex*, *Quercus incana* and *Quercus glauca*. The iodine value of this oil is below 100 and so this falls in the non-drying class and could be used for edible purposes.

The chemical composition of the oil from *Quercus dilatata* is like-wise compared as follows with those of the oils from *Quercus ilex*, *Quercus incana* and *Quercus glauca*.

Name of constituents	<i>Quercus dilatata</i> lab. work	<i>Quercus ilex</i> Khan, F. W. Pazir Gul & A. Marwat	<i>Quercus incana</i> Puntambekar S.V. & S. Krishna	<i>Quercus incana</i> Khan, Pazir Gul, F.W. Khan & A.G. Marwat	<i>Quercus glauca</i> Marwat A.G. Pazir Gul & F.W. Khan	Reference of methods adopted for work in the laboratory
	%	%	%	%	%	
Unsaponifiable matter	1.80	1.61	0.80	0.79	2.68	Jacobs, M.B. & Rosenthaler, L.
Saturated fatty acids.	18.50	16.00	18.00	17.80	16.50	Jacobs, M.B. & Rosenthaler, L.
Unsaturated fatty acids.	81.50	84.00	82.00	82.20	83.50	Rosenthaler, L.
Oleic acid.	79.90	57.05	82.00	81.50	55.25	Rosenthaler, L.
Palmitic acid.	15.50	12.40	17.10	16.50	10.65	Rosenthaler, L.
Linoleic acid	29.90	30.50	—	28.50	32.50	Rosenthaler, L.

The nutritive components as determined, of the seeds of *Quercus dilatata* are compared in the following table with those of seeds of *Quercus ilex*, *Quercus incana* and *Quercus glauca* (6, 7, 8).

Name of constituents	<i>Quercus dilatata</i> lab. work	<i>Quercus ilex</i> Khan, F.W. Pazir Gul & A.G. Marwat	<i>Quercus incana</i> Puntambekar S.V. & S. Krishna	<i>Quercus glauca</i> Marwat, A.G. Pazir Gul & F.W. Khan	<i>Quercus incana</i> Khan, Pazir Gul, F.W. Khan & A.G. Marwat
	%	%	%	%	%
Moisture	10.40	11.25	12.20	12.60	9.60
Ash	1.90	2.09	1.40	1.26	1.30
Oil in seed	8.40	10.27	N.A.	5.00	11.25
Oil in kernel	14.50	14.55	16.00	6.5	15.25
Protein	4.15	4.00	3.00	3.35	4.50
Cellulose	1.50	1.85	1.40	1.89	1.60
Tannin	4.55	—	4.20	—	3.80
Carbohydrate	62.20	60.05	61.00	59.50	62.70

The above data indicate that the seeds of the *Quercus dilatata* can also be used as a poultry and live-stock feeding stuff provided its slight deficiency in protein content is made up by mixing with it some suitable protein rich material.

Conclusion. The oil of *Quercus dilatata* like those of the other *Quercus* species is non-drying in nature and thus it can be used for the manufacture of edible fats.

The seeds of *Quercus dilatata* as its results are comparable with those of the other *Quercus* species, could be used for the manufacture of poultry food.

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