OREGON GRAPE

Mahonia aquifolium (Pursh.) Nutt.

Berberidaceae

Common Names in English: Oregon grape, Mountain grape, Tall Oregon grape, Holly grape, Mountain Holly, Mahonia,

Other species and subspecies:
Berberis nervosa (Pursh.) and Berberis repens (Lindl.) G. Don. are frequently substituted for B. aquifolium

Other taxonomic names in literature:
Berberis aquifolium Pursh[1].

Description of Plant

Mahonia aquifolium is an evergreen shrub that grows in mixed coniferous woods to 2000m. It grows to 2 metres tall with glossy green leaves made up of 5 – 9 spiny holly shaped leaflets. Each leaflet has one central vein[2]. Some of the leaves may turn red in wintertime.
It flowers in spring with bright yellow flowers. The flowers grow in erect clusters to 20cm long[3]. The flowers have a faint lemony fragrance. The fruits are blue berries with a whitish bloom that ripen in the late summer and autumn. The berries grow in clusters and each berry is about 1cm across. They have large seeds and are very sour.
B. aquifolium grows in full shade to part shade under the forest canopy.
The roots of *B. aquifolium* are bright yellow beneath the root bark.[4]
B.nervosa and *B. repens* are two other common species. They are both smaller than *B. aquifolium*. *B. nervosa* is a low-growing evergreen shrub that typically reaches 10 to 60cm in height. On exceptional sites, plants may grow to 2 m[5]. *B.nervosa* has three central leaf veins (vs. one in *B. aquifolium*)[6]. *B.repens* is an evergreen, perennial shrub with a low or prostrate growth form; stem heights of 4 to 10 to 30cm are common[7] *B. nervosa* and *B. repens* have smaller roots and are more rhizomatous than *B. aquifolium,* which has larger roots[8].

Range

Mahonia aquifolium is found in drier coniferous woodland up to 2000m in western North America. It is found in British Columbia, California, Idaho, Montana, Oregon and Washington.[9].
B. nervosa occurs across a wide range of habitats in submontane to montane forests of the Pacific Northwest. It is a characteristic shrub of spruce-fir forests but also occurs in northern coastal coniferous forests and in redwood, mixed evergreen, and bottomland forests. [10]
B.repens occurs throughout the western United States from western Texas (Guadalupe Mountains), New Mexico, Arizona, and California north to British Columbia and Alberta.

Common Misidentification Errors

Care must be taken not to confuse the plant with *Ilex aquifolium* (Christmas holly).

Berberis nervosa (dull or dwarf Oregon grape) and *Berberis repens* (creeping Oregon grape) are frequently substituted for *Mahonia aquifolium* [11], in trade and are accepted.
All three are medicinally active and used by herbalists[12],[13]. These three different species are all referred to as Oregon grape in the literature. The official medicinal product is *Mahonia .aquifolium*[14]
There is often confusion in the literature and therefore potential confusion with the product with other berberine containing plants in the Berberidaceae such as *Berberis vulgaris*[15],[16]. *B. vulgaris* (another medicinal plant) is not the

same is *B. aquifolium* and it should not be used as a substitute in trade

➢ *Part of the plant used medicinally*

Root, rhizome	BHP, 1983
Rootbark, rhizome	Drum 2005
Bark	Duke 2002
Root	Felter 1922
Root, rhizome and lower part of aerial stem	Gladstar 2000
Root, rhizome	Green
Root	Grieve 1975
Root	Harding 1936
Root, rhizome	Hoffman 1986
Root	King's American Dispensatory, 1898
Root	Kloss 1988
Root	Lonner 2002
Rootstock	Lust 1974
Root	McCutcheon 1994
Root, rhizome	Moore 1979 1993
Root and rootbark	Schauenberg and Paris 1977
Root, rhizome	Tilford 1997
Rootbark	Turner 1990
Rhizome	Turner,1983
Root	Vance 2001
Rootbark	Willard 1996
Root	Wren 1988

As can be seen from the above table the part of the plant that is used medicinally is the root and rhizome. The root must include the rootbark to be medicinally active.

➢ *Harvest Times*

The roots should be harvested in the late summer and fall[17],[18], [19],[20]. The alkaloid content is likely to be higher in the fall but this has not been scientifically proven[21]. Harvest the plant after the berries have fallen or have been eaten by wildlife in order to maximise regeneration potential and to minimise impact on wildlife food sources.

➢ *Harvest Area*

It is important to ensure that the harvest area is not contaminated with heavy metals, industrial pollutants, pesticides or herbicides, oil run off from roads, or run off from mines.
The harvest area should not be within the fall out area for industrial pollutants as the plants can absorb pollutants through their leaves even if the pollutants are not found in significant amounts in the soil[22].
Check with landowner that harvest area has not been sprayed with herbicide or pesticides. If the history of the harvest site or any adjacent waterway is not known, a soil sample should be tested for the above pollutants. Harvesting should not take place within 50metres of main roads[23].

➢ *Harvesting Methods*

The plant should be identified using "Good Practices for Plant Identification for the Herbal Industry"[24]. If there is any doubt about the identity of the plant seek an experienced person to confirm identity.

Oregon grape roots and rhizomes should be lifted with a fork and pulled up by hand until the root or rhizome stops lifting, then cut with a sharp knife[25],[26]. Care must be taken not to destroy the duff or surrounding plant life when harvesting. The soft outer bark is easily removed so care must be taken that is not stripped off and lost during harvesting. Roots and rhizomes without rootbark are unacceptable to buyers.
Harvest in areas where the soil is not easily compacted.
Mechanical harvesting destroys other plants in the area, compacts the soil, and damages the root bark resulting in an inferior product. Mechanical harvesting will negatively affect any regeneration of the plant. Organic certification would not be obtainable for mechanically harvested plants as it would not meet the standards for wild harvested medicinal species[27],[28].
Oregon grape should be harvested in areas where it grows abundantly and densely rather than in areas where it grows more sparsely as it will regenerate better. There are some resource management plans that suggest one in four plants can be harvested every two years – or 25% of the total area can be cut every two years. Such harvesting regimes of either one in four plants or 25% of total area were tested and found to be unsustainable[29].

It is also suggested that only the top 10cm of rhizome is harvested, but regeneration seems to occur at the same rate as if the whole rhizome is harvested if the method described above is used. This is probably because part of the rhizome usually remains in the ground. The advantage of taking more than the top 10cm of rhizome is that fewer plants have to be harvested to meet the demand[30].

The stems and leaves are considered medicinal by many First Nations peoples[32] and herbalists[33],[34] in addition to the roots. Herbalists will often include the lower part of the stem (as long as it contains the yellow berberine) along with the roots[35]. However wildcrafters should check the exact requirements of the buyers before including any part of the stem when drying the roots and rhizomes.

Harvested plant material should be collected in clean containers and harvesting containers or tarps must be cleaned between harvest batches. Tools must be cleaned between harvest batches.
In order to ensure that the harvesting is not negatively impacting the stands you are collecting from you must monitor and record the sustainability of your harvesting operations on an on-going basis.

- always make sure there are enough mature plants left after harvesting to maintain habitats that other wildlife depend on;
- avoid damage to neighbouring species, especially rare or threatened species;
- take particular care with species that have symbiotic relationships or otherwise depend on each other;
- avoid harvesting operations that lead to erosion or damage to sensitive habitat, and
- take and keep samples of each batch harvested[36].

Harvester must have clean hands and be free of any disease that is transmittable through food.

➢ *Regeneration*

The plant regenerates from rhizomes and spreads slowly. It will also regenerate from seed, but less effectively. The plant will sprout from rhizomes after above ground portions of the plant have been cut[37], [38]. As noted in the above section on harvesting, regeneration will depend on the site therefore harvest monitoring and a permanent sample plot must be set up if possible to monitor and assess sustainability and harvest impact. This will almost certainly be required should certification become available in the future.
Seeds require freezing to germinate.[39]

➢ *Harvest Records*

The harvester must keep records of each harvest batch which should include identification of the plant, name of plant in latin, common name, harvest date, harvest location (using map reference or indicated on a map), part harvested, quantity harvested, sustainable harvest rate for area, harvest rate for this harvest, quality of material collected, unusual weather during the growing season that might influence plant constituents, delays in getting the plant to drying stage which would affect quality. Each harvest batch must be given a batch code that will correspond with the record for the harvest batch and with the batch sample and this code will follow the batch through drying, processing and storage or to whatever point the material is sold. Sale details must be recorded including name and contact details of buyer. Records should be kept for two years. CHSNC[40] is in the process of developing templates for GAP records that can be used for wildcrafting. The “Good Practices for Plant Identification for the Herbal Industry”[41] can be used to document plant identity.

➢ *Preparation for Drying*

The roots and rhizomes should be washed with some care to avoid removing the root bark. A brush should not be used. Commercial ginseng root washers can be employed for larger amounts. Roots and rhizomes should be cut prior to drying unless access to commercial cutting machinery is available as the roots become very hard when they are dry. Water used for washing roots must be potable. Equipment must be cleaned between harvest batches.

➢ *Drying*

The roots and rhizomes should be spread out on racks for drying. A good airflow around the roots and rhizomes is essential. Drying temperature should be kept low at around 35°C to 40°C to allow for even drying. The roots and rhizomes can be tested for dryness by snapping a root and rhizome. They are dry when they snap cleanly but are not brittle. Larger pieces of root will take longer to dry than the rhizome and it is essential that larger pieces of root are dried through to the middle otherwise there is the possibility of mould destroying the entire crop.
Outdoor drying or drying without heat can present problems with mould developing due to the fact that harvest is in late summer and fall, and Oregon Grape is usually growing in areas of relatively high humidity at that time of year.
Drying racks should be labeled individually with the name of the drying herb and the code applied at harvesting. Any problems associated with drying must be recorded with the corresponding batch records.
Drying, processing and storage facilities should provide protection of the plant-material against pests, rodents, insects, birds, and pets and other domestic animals[42].
Drying racks must be cleaned between harvest batches.

➢ *Storage*

The dried roots and rhizomes must be stored in dry conditions out of direct light. Store in new polypropylene sacks. Each harvest batch must be labeled appropriately with the name of the plant, quantity and the code applied at harvesting. Details of any problems that occurred during storage (eg. Loss of heat, overheating, insect infestation in building etc.) must be recorded with the corresponding batch records.
Drying, processing and storage facilities should provide protection of the plant-material against pests, rodents, insects, birds, and pets and other domestic animals[43].
The storage area should be heated to avoid damp and mould, but not at high temperatures as degradation of the product will occur.

➢ *Toxicity or Health and Safety Cautions for Harvesters.*

No known toxicity or cautions.

➢ *Extraction Techniques*

Tincture, Fluid Extract, Encapsulation, Infusion and Decoction are all used.

➢ *Identification of Commercial Finished Product*

Pharmaceutical name: *Radix Berberis aquifolii.*
The roots must have the rootbark intact or they will not be acceptable for medicinal use.[44],[45].

Cut Root: The rootstock and roots of Oregon grape are more or less knotty, in irregular pieces of varying lengths, and about 1-4cm in diameter, with brownish bark and hard and tough yellow wood, showing a small pith and narrow rays.

Powder: Yellowish brown powder. Microscopical: Yellow brown powder consisting of medullary ray cells contaning starch grains 3-20um in diameter, 2-3 compound; pitted and reticulate vessels, thick walled lignified xylem fibres, fragments of thick walled pith parenchyma.[46]
Taste: Very bitter
Odour: Not strong, but distinct.
Historically, Sayre[47] advises that the product must be "without the admixture of more than 5 per cent. of the overground parts of the plant or other foreign matter" to be acceptable for use in the United States Dispensary in 1917, and "Berberis without the bark should be rejected".

➢ *Official Monographs*

English language monographs:

British Herbal Pharmacopoeia[48]

See "*Classic Herbal Texts"* for historical monographs. Available online at: http://www.henriettesherbal.com/eclectic/index.html

➢ *Organic certification*

Standards for organic certification of wildcrafted plants has not yet been formalised in Canada[49]. The Soil Association (organic certifying body in the UK) has standards for Wild Harvesting. These standards are recognized in the EU. The standards address endangered species, harvesting areas, requirements for sustainable harvest management plans, processing, personnel training, batch tracking, samples and record keeping. The full Wild Harvesting Standards can be ordered from the Soil Association[50].

➢ *Land Access for Harvesting*

Private Land: Written permission to harvest must be obtained from the land owner.
Crown Land: No permission or license is required however harvesting must be carried out within provincial Ministry guidelines. In BC such harvesting is subject to the Forest and Range Practices Act.[51]
First Nations Reserve Land: Permission must be obtained from the Band with details of exactly what you wish to harvest. For many First Nations harvesting of medicinal plants is a spiritual practice with strict rules about how the harvest is carried out. Knowledge of and respect for these practices should be a part of any request for permission to harvest.
National or Provincial Parks: It is illegal to harvest in National or Provincial Parks

➢ *Points of Concern*

On United Plant Savers "Plants to Watch" list.[52]
In many areas the plant is abundant, but local stocks should be assessed before any harvesting is started. Oregon Grape is frequently cited as a substitute for goldenseal (*Hydrastis canadensis*) and is therefore being harvested more heavily than in the past due to the endangered status of goldenseal. Claims for safety and efficacy based on First Nations knowledge must be accompanied with details of benefit sharing as per the Convention on Biological Diversity.

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