

Nardostachys jatamansi Essential Oil Export

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Nardostachys jatamansi, also known as Jatamansi, Indian Nard, and Spikenard (Chauhan & Nautiyal, 2005), is a perennial rhizomatous herb that has been valued for centuries for its medicinal and aromatic values. It is mentioned in both the Quran and the Bible, was used in Ayurveda in India, Unani in ancient Greece and the Arab world, and in ancient Egypt and Rome (Rahman, Shaik, Madhavi, & Eswaraiah, 2011).

N. jatamansi grows from 10 to 60 cm in height (Purohit et al., 2012), with pink flowers and whose rhizomes (underground stems) measure 2.5 to 7.5 cm in length and are used for medicinal and aromatic uses (Rahman et al., 2011). *N. jatamansi* grows in the high altitudes of the Himalayas, between 3,000 and 5,000 feet asl in steep, moist and rocky areas (Airi, Rawal, Dhar & Purohit, 2000). It requires high moisture and nutrient content, and grows best on west facing slopes due to low light and high moisture (Airi et al., 2000). It reaches maturity after 3 years (Chauhan, Kaul, Kumar & Nautiyal, 2008).

Optimum pollination requires the help of pollinators, such as bees or butterflies (Chauhan et al., 2008). The two most effective types of pollination are active autogamy (transfer of pollen from anther to stigma of the same flower) at 70% and geitonogamy (transfer of pollen from anther of one flower to stigma of another flower on the same plant) at 86.67% (Chauhan et al., 2008). Anthesis (period in which flower is fully open and functional) takes place throughout the days, but optimal flowers open in morning hours (7:00 to 11:00 hours) in sunny sky and remain open for 72 to 96 hours (Chauhan et al., 2008).

Seed germination proved to be optimal in a laboratory at 15 degree temperature with continuous light, and in the field (80% germination) with a seed sowing depth of 0.5

cm in soil, sand, and FYM (farmyard manure) at 1:1:1 proportion in May (Chauhan & Nautiyal 2007). Vegetative propagation was superior over seedling transplant above 3,600 feet asl, and yield increased with increase in altitude in vegetatively transplanted plants (Chauhan & Nautiyal, 2005).

Seeds stored at a low temperature could maintain viability and germination for more than two years, whereas room temperature stored seeds become non-viable within a year of storage (Chauhan & Nautiyal, 2007).

N. jatamansi is critically endangered due to over cultivation of its rhizomes (Airi et al., 2000). Domestication and large scale cultivation is needed to both preserve endangered species and fulfill market demand (Chauhan et al., 2008). A mini cultivation trial is recommended prior to large-scale cultivation of aromatic plants in new areas to ensure it is suitable to grow there (Chauhan, 2010)

Essential oils (concentrated aromatic compounds) are extracted from the rhizomes through the relatively cheap process of steam distillation (Virendra & Diwaker, 2006). The dried rhizomes are placed on a screen and steam is passed through under pressure which allows the essential oils to escape in vapour form (Virendra & Diwaker, 2006). When allowed to cool, the water and oils condense and are separated by skimming the oils off the top or decantation (Virendra & Diwaker, 2006).

Essential oils are exported to overseas markets and are then used in the manufacturing of cosmetics, perfumes, and pharmaceuticals (Jenisch & Probst, 2011). A list of suppliers of jatamansi/spikenard essential oil and their links is included below.

N. jatamansi essential oil is often used in perfumes and fragrances. It has an earthy/woody scent, with sweet, spicy, and herbaceous tones (Gupta, n.d.). L'artisan Parmufeur is a perfume company that has a jatamansi perfume (link below). There is a huge market for perfume and fragrances in Canada. In 2014, the current value sales of fragrances grew by 2% to reach C\$734 million (Euromonitor International, 2015). Fragrances from natural plants, including jatamansi, have great potential for Canadians looking for perfumes made from natural ingredients.

N. jatamansi is also used as a sedative to treat insomnia (trouble sleeping) as it has tranquilizing and sleep inducing properties (Rahman et al., 2012). According to a 2002 Canadian Community Health Survey, an estimated 13.4% of Canadians aged 15 and older, or 3.3 million people, had some form of insomnia (Tjepkema, 2005). This indicates a large market for treatment for insomnia, and therefore a potential market for jatamansi oil as a natural treatment option.

N. jatamansi falls under the category of medicinal and aromatic plants, otherwise known as MAPs. Cultivation of MAPs have great potential to improve socioeconomic status of farmers. MAPs in Nepal are predominantly processed in hilly, mountainous regions that have a large number of deprived people (Jenisch & Probst, 2011), thus they provide an opportunity for impoverished people to grow plants where few crops can be grown. In Nepal, 300,000 families are engaged in medicinal herb collection in 58 districts (Jenisch & Probst, 2011). In many villages, 17 to 35% of household income comes from MAPs (Chauhan, 2010). Due to outbound male migration, it is estimated that 50% of workers are female; women are engaged in the collection, cleaning and grading of herbs (Jenisch & Probst, 2011). Cultivating MAPs gives women an

opportunity for additional income to provide for their families and have the opportunity to send more of their children to school. In a nursery (as mentioned earlier), germination was achieved up to 80% and therefore can easily be practised by farmers for raising seedlings for commercial cultivation. (Chauhan & Nautiyal, 2007).

Medicinal and aromatic plants are one of the 19 sectors which have been identified by the Government of Nepal as having a significant export potential that would enable the country to diversify its exports. (Jenisch & Probst, 2011). Nepal exported US\$6 million worth of MAPs in 2010 (Jenisch & Probst, 2011) and the demand is continuously increasing (Chauhan, 2010). Nepal's Department of Forestry indicates that annually about 50,000 MT of MAPs could be harvested; out of this, currently only 20-30% are collected, processed, and traded. (Jenisch, 2011), therefore there is much potential to increase production of MAPs in Nepal and raise the socioeconomic status of its impoverished farmers.

Many Nepalese companies are in place to promote the MAPs business (links below). They help farmers start their businesses and help with export documentation and permits. Malé International is a Nepalese company that cultivates, processes and markets organic medicinal and aromatic plants of Nepal. It aims to provide rural employment and fair prices to farmers, market products unique to Nepal (including jatamansi), and contribute to environmental protection and bio-diversity by purchasing products from sustainable sources. Another company, Nepal Herbs and Herbal Product Association is an organization of producers, manufacturers, and traders whose goal is to improve the livelihood of the underprivileged by providing farmers with market access to create income opportunities. The Federation of Community Forest Users, Nepal is another organization that aims to generate opportunities to reduce poverty through management and utilization of resources. It promotes

and protects the rights of users through capacity strengthening, economic empowerment, sustainable resource management, technical support, advocacy and lobbying, policy development, and national and international networking and to uphold the values of inclusive democracy, gender balance, and social justice. It is associated with various domestic and international partner organizations. The Micro-Enterprise Development Programme also promotes income earning opportunities and sustainable development of Nepalese villages through development of local resources and small businesses. A list (including links) of international suppliers of jatamansi/spikenard essential oil is also included below.

More research is needed to make reproduction of *N. jatamansi* more efficient; more information is also needed for cultivation, post harvest practices, and conservation in different growing areas in Nepal. Additionally, more organizations or small businesses are needed to distribute seeds. Training facilities are also required to teach farmers how to grow and cultivate aromatic and medicinal plants. More distillation facilities are needed to extract the essential oils, therefore a mobile distillation unit is a potential small business for a farmer.

N. jatamansi essential oil has much potential for poor farmers in mountainous regions of Nepal as an export to Canada and elsewhere for its aromatic and medicinal uses. Cultivation of it could greatly improve the socioeconomic status of farmers, especially women.

List of International Suppliers of Spikenard/Jatamansi Essential Oil (and links)

Astral Extracts - <http://www.astralextracts.com/products.htm>

Azelis - <http://www.azelis.com/en/>

Berjé - <http://www.berjeinc.com/essqt.html>

Camden-Grey Essential Oils - <http://www.camdengrey.com/essential-oils/Raw-Materials-Essentials-Oils-P-Z/spikenard.html>

India Essential Oils - <http://www.indiaessentialoils.com/spikenard-oil.html>

Indukern F&F - <http://www.indukern-ffingredients.com/en/all/spikenard-oil-110885.html>

Liberty Natural Products - <http://www.libertynatural.com>

Lluch Essence - <http://www.lluche.com/en/products/naturalproducts/Pages/naturalproducts.aspx?prodID=1465&oldURL=%2fen%2fproducts%2fnaturalproducts%2fPages%2fnaturalproducts.aspx%3fpnCat%3dae&pnCat=ae>

Moellhausen - http://www.moellhausen.com/spikenard_india_eo-9-detail-1000044.aspx

Reincke and Fichtner - http://www.reincke-fichtner.de/uk/our_bus/index.html

Robertet - http://www.robertet.com/uk/matieres_premieres/matieres_premieres_parfumerie.php?type=1&alpha=j&changelg=uk

Silverline Chemicals - <http://www.silverlinechemicals.com/products.htm>

The Lebermuth Company - <http://www.lebermuth.com/store/essential-oils/#view=image&mpp=36&pg=6>

The Perfumers Apprentice - <https://shop.perfumersapprentice.com/p-6593-spikenard-extra-organic-nepal-jsteele.aspx>

Ultra International - <http://www.ultrainternational.com/essentialoillist.php>

White Lotus Aromatics - http://www.whitelotusaromatics.com/recipes/earthyoriental/black_musk_base

Other Links Mentioned in Paper

Federation of Community Forest Users, Nepal - <http://fecofun.org.np>

L'artisan Parfumeur - <http://www.artisanparfumeur.com/shop/perfumes/fresh/jatamansi-eau-de-toilette-1163959.html>

Malé International Pvt. Ltd. - <http://www.male.com.np/index.php>

Micro-Enterprise Development Programme (MEDEP) - http://www.np.undp.org/content/nepal/en/home/operations/projects/poverty_reduction/medep/home.html

Nepal Herbs and Herbal Product Association - <http://www.nepalherb.org>

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