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Hemp Fiber

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Publication Information & Recommended Citation

Bromberg, Howard. "Hemp Fiber." Ming Y. Zheng, co-author. In *Encyclopedia of Global Resources*. 2nd ed., edited by Craig W. Allin. Pasadena, Calif.: Salem Press, 2019.

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ENCYCLOPEDIA OF
GLOBAL RESOURCES

Third Edition

Volume 2

Editor

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University of Utah

SALEM PRESS

A Division of EBSCO Information Services, Inc.

Ipswich, Massachusetts

GREY HOUSE PUBLISHING

7/29/20

Cover photo: iStock/YinYang. Lake Moraine, Banff National Park Emerald Water Landscape, Alberta, Canada.

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∞ The paper used in these volumes conforms to the American National Standard for Permanence of Paper for Printed Library Materials, Z39.48 1992 (R2009).

Publisher's Cataloging-In-Publication Data
(Prepared by The Donohue Group, Inc.)

Names: Madsen, Marianne Moss, editor.

Title: Encyclopedia of global resources / editor, Marianne Moss Madsen.

Description: Third edition. | Ipswich, Massachusetts : Salem Press, a division of EBSCO Information Services, Inc. ; Amenia, NY : Grey House Publishing, [2019] | Includes bibliographical references and index.

Identifiers: ISBN 9781642650563 (set) | ISBN 9781642653403 (v. 1) | ISBN 9781642653410 (v. 2) | ISBN 9781642653427 (v. 3) | ISBN 9781642653434 (v. 4) | ISBN 9781642650570 (ebook)

Subjects: LCSH: Natural resources—Encyclopedias. | LCGFT: Encyclopedias.

Classification: LCC HC85 .E49 2019 (print) | LCC HC85 (ebook) | DDC 333.703—dc23

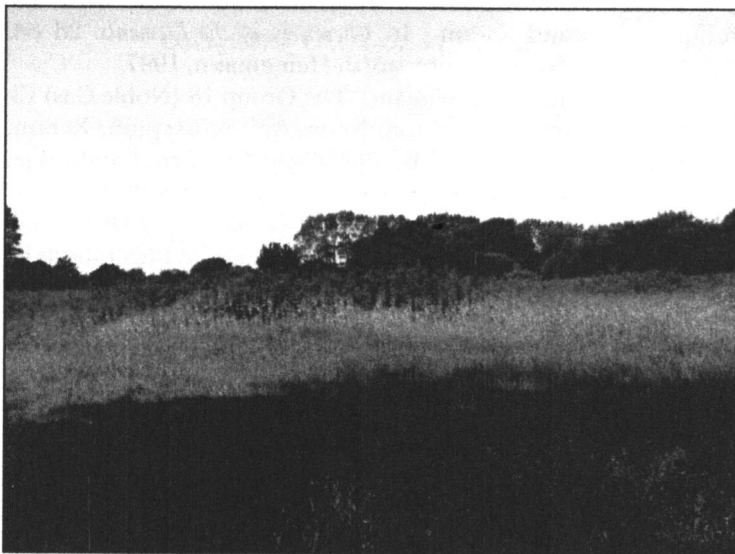
FIRST PRINTING

PRINTED IN THE UNITED STATES OF AMERICA

Hemp fiber

Hemp, Cannabis sativa, is indigenous to temperate regions in Asia. All major industrialized countries but the United States cultivate hemp for its fibers and oil-rich seeds. The former Soviet Union was the world's leading producer until the 1980s. As of 2018, China was the largest producer, with other significant industries in Ukraine, Russia, China, Canada, Austria, Australia, Great Britain, Hungary, Romania, Poland, France, Italy, and Spain.

Cannabis was initially spread around the world because of its fiber, not its intoxicant chemicals or its nutritious oil seeds. It is one of the oldest sources of textile fiber, whose use for cloth can be traced to 8000 B.C.E. in China and the Middle East. Hemp fiber is also used for the manufacture of cordage, sail cloth, and fish nets. Oil extracted from seeds is used in paints, medicines, and foods.



A field of hemp. (Evelyn Simak, via Wikimedia Commons)

WHERE FOUND

Hemp, *Cannabis sativa*, is indigenous to temperate regions in Asia. All major industrialized countries but the United States cultivate hemp for its fibers and oil-rich seeds. The former Soviet Union was the world's leading producer until the 1980s. As of 2018, China was the largest producer, with other significant industries in Ukraine, Russia, China, Canada, Austria, Australia, Great Britain, Hungary, Romania, Poland, France, Italy, and Spain.

PRIMARY USES

Cannabis was initially spread around the world because of its fiber, not its intoxicant chemicals or its nutritious oil seeds. It is one of the oldest sources of textile fiber, whose use for cloth can be traced to 8000 BCE in China and the Middle East. Hemp is an easily cultivated, versatile crop with numerous agricultural and industrial uses. It is high in tensile strength and is pest-resistant. Hemp fiber is also used for the manufacture of cordage, sail cloth, and fish nets, as well as specialized types of plastics and building materials. Oil extracted from seeds is used in paints, medicines, and foods, and the seeds themselves may be used as food as well.

TECHNICAL DEFINITION

Cannabis sativa is a multipurpose plant that has long been cultivated for its (bast) fiber in the stem, versatile oil in the seeds, and a resin secreted by its leaves that contains a compound, tetrahydrocannabinol

(THC), known to have psychotropic effects. The somewhat confusing common names hemp and marijuana have been applied loosely to all three forms of *Cannabis sativa*. However, this essay focuses primarily on its fiber and seed uses. The plants are dioecious annual herbs that produce fibers of the best quality when cultivated under temperate and warm conditions. Hemp produces the longest bast fiber among plants. Its seeds are rich in oil, which may be extracted and used in a variety of products.

DESCRIPTION, DISTRIBUTION, AND FORMS

Cannabis is the generic name for hemp, a highly adaptive and successful species cultivated throughout temperate and tropical regions across the globe. The classification of *Cannabis* has been a source of much controversy for a long time. It was first thought a relative of the nettle and later considered a member of the Moraceae family. Finally, *Cannabis* was classified into its own family, Cannabaceae, in which the genus *Cannabis* and *Humulus lupulus* (hops) are included. It was first named in 1753 by Carl Linnaeus as *Cannabis sativa*, which means "useful hemp" in Latin.

More confusion concerning the taxonomy of *Cannabis* resulted from the naming of two other closely related "species." The name *Cannabis indica* was applied to hemp plants in India by Jean-Baptiste Lamarck, and a Russian botanist used the name *Cannabis ruderalis* for wild *Cannabis* plants he observed in western Siberia and central Asia. Even today, some still doubt that *Cannabis sativa* and *Cannabis indica* are two different species.

Nevertheless, *Cannabis sativa* is the most widespread among the three. It is a tall, thin annual that grows from 1.5 to 4.5 meters, with most leaves concentrated at the top. The leaves are dark green in color, and each consists of five to nine serrated tapering leaflets with sharp ends and measures at 5 to 13 centimeters long and 0.76 to 2 centimeters wide. The stem is angular, hollow, branched on top, and covered by fine hairs. Plants can grow in both loamy soil and poor sandy soil. They can grow in altitudes as high as 2,500 meters. *Cannabis* requires plenty of light and is less tolerant to low temperatures. Male plants are generally taller than female ones. Male

flowers also bloom two to four weeks earlier than female flowers and are small, with colors ranging from pale green, yellow, and brown to purple-red. Female flowers are bundled tightly together into clusters.

The cultivation of *Cannabis sativa* is easy. Seeds are planted 15 to 20 centimeters apart. Plants grow quickly, up to 15 centimeters a day, with an average daily growth of 2 to 5 centimeters in height. Fruits (achenes) mature 10 to 35 days after fertilization, each containing one seed. The entire life cycle can be completed within 70-110 days. *Cannabis sativa* can grow in almost any soil, requiring little fertilizer, and is resistant to pests and tolerant to weeds. Hemp cultivation and processing was one of the world's most significant industries until the mid-1800s. The labor-intensive work of harvesting and extracting fibers from the stalk, combined with the emergence of more easily extracted fiber sources such as cotton and jute, doomed hemp's status as the top fiber crop.

HISTORY

Cannabis is generally believed to have originated from the temperate regions of central Asia, near the Irtys River, along the edge of the Gobi Desert, or the Taklimakan Desert in China's Xinjiang Uygur Province, north of Tibet. Hemp cultivation and use date back to prehistoric times in the Middle East and China, where the fiber was used for textiles, the seeds for food, and the oil for various products. Hemp fiber imprints found in pottery shards in Taiwan were dated to about 8000 BCE. Later ancient Asian societies used hemp fibers to make clothes, shoes, ropes, and a primitive form of paper. Evidence for such uses was uncovered in the Great Wall of China and dates back to as early as 10,200 years ago.

Hemp was introduced to western Asia and Egypt and, subsequently, to Europe between 1000 and 2000 BCE. Extensive hemp cultivation in Europe began around 500 BCE. From 1500 to 1700 CE, hemp (along with flax) was the major fiber crop in Russia and Europe. In 1545, the Spanish brought hemp to South America (Chile). The earliest cultivation of hemp in North America took place in 1606, by French botanist Louis Hébert in Port Royal, Acadia (now in Nova Scotia). Hemp was first grown in New England by Puritans in 1645. By 1850, hemp was the third largest crop in the United States.

OBTAINING HEMP

Hemp is raised and harvested in temperate regions. Upon harvest, seeds are separated from the stalks, whose leaves had been stripped off. The stalks are then processed to extract fibers through retting, pounding, and scutching. Retting begins with submerging the flax stems in water and ends with bacteria rotting away cellular tissues and gummy substances, leaving the outer fibers intact. Following retting, the stalk is pounded and broken up into short bits, leaving the fiber unharmed. The scutching acts to comb nonfiber residues out of the fiber.

Following these steps, the well-processed hemp fiber appears creamy white and soft and has a silky sheen. Hemp fiber so extracted was used by Levi Strauss to make the original set of jeans. However, most hemp fiber is extracted as quickly and inexpensively as possible. As a result, hemp is mostly used for cordage, rope, canvas, and sailcloth. Fibers for human cloth, including jeans, are obtained primarily from cotton.

USES OF HEMP

All parts of *Cannabis* plants are useful. For centuries, *Cannabis* has been the source of a versatile natural fiber and oil-rich seeds. Major uses of industrial hemp include, but are not limited to, body care products, construction, essential oils, food, livestock bedding and feed, medicines, molded plastics, nutritional supplements, paper products, and textiles.

Hemp oil contains omega-3, -6, and -9 fatty acids, which nourish skin and thus can be included in many cosmetic products, such as baby moisturizer, facial cream, shaving cream, shampoo, and conditioner. For construction, hemp plants can be used to make caulking, cement, fiberboard, flooring, insulation, paneling, plaster, plywood, and roofing. Hemp oil can be used to produce nontoxic paint, varnish, and detergent. The essential oil is used as emulsion in medicines and is a key ingredient in nutritional supplements. More important, hemp seeds contain high levels of proteins and essential fatty acids, which make hemp a premier food source.

The plant residues that remain after harvest and processing are an excellent source of animal bedding. The meal left after oil extraction from seeds contains 30 percent proteins, carbohydrates, and mineral nutrients and is often used as feed for livestock. Because of its high biomass in a wide range of

habitats, hemp has significant potential to be a source of biofuel, either ethanol or biodiesel.

Above all, however, is the versatility of hemp fiber. Hemp fiber has been valued for three characteristics: length, strength, and durability. The primary bast fibers in the bark can reach up to 40 millimeters long, making it a great raw material for papers, clothing, and textiles. The use of hemp fibers in cloth was more common than that of linen until the fourteenth century. Hemp paper is bleached with hydrogen peroxide, a much more environmentally friendly chemical than chlorine bleach, which is required by tree-based paper mills and pollutes water sources heavily. By the 1820s, hemp fibers were used to make 90 percent of the canvas sails, caulks, fish nets, and rigging for ships because of their strength and resistance to decay and salt water. Hemp was considered to provide the very best canvas for painting. Estimates indicate that five thousand textile products and as many as twenty-five thousand other products could be produced using hemp for a global market.

LEGAL ISSUES

Because hemp and marijuana are both produced from varieties of cannabis, US drug enforcement laws have restricted the growth of cannabis and the production of hemp in the United States. Under the Controlled Substances Act (CSA), the federal law regulating drugs in the United States, hemp is an illegal plant. For the purposes of the CSA, all varieties of the cannabis plant are defined as illicit marijuana, regardless of botanical categories or concentrations of THC. Hemp byproducts and finished goods imported to the United States must meet controlled substance standards. However, the twenty-first century saw gradual easings of these restrictions, paralleling the movement towards the legalization of marijuana. In 1999 Hawaii was granted the ability to research hemp production with federal oversight. This led to several other states considering legislation regarding industrial hemp and increased public awareness of the issue. In 2013 an industrial hemp harvest in Colorado was the first of its kind recorded in the United States since the 1950s.

Major changes to the legality of hemp came with passage of the omnibus Agricultural Acts of 2014 and 2018 (also known as the Farm Bills). The federal Agricultural Act of 2014, passed by Congress and signed by President Barack Obama, officially allowed

further research groups and state agricultural departments to grow industrial strains of cannabis for hemp production in those states that had already legalized hemp, and protected them from prosecution by federal law enforcement. The Agriculture Improvement Act of 2018 worked even more substantial changes, in effect finally legalizing hemp under federal law. This version of the farm bill defines hemp as cannabis plants containing less than 0.3% of THC on a dry weight basis, thus excluding hemp from the CSA definition of marijuana, removing most of the restrictions to the cultivation, processing, manufacture, and commercial use of hemp. Supporters of hemp production in the United States, a bipartisan group, claim that the industry will provide a boost to agriculture and fuel further growth in the domestic market for hemp products otherwise filled by imports from China and Canada.

Ming Y. Zheng, updated by Howard Bromberg

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<http://thehia.org/>

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INC.
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Derived from: "Hemp fiber." *Encyclopedia of Global Resources*. Salem Press. 2013.