Tabla de contenido

Introduction ....................................................................................................................... 3

Chapter I - Ecology ........................................................................................................ 4
  1.1 Origin ....................................................................................................................... 4
    1.1.1 where it is produced .......................................................................................... 4
  1.2 Water ...................................................................................................................... 4
  1.3 Height and spacing ................................................................................................. 4
  1.4 Climate ................................................................................................................... 5
  1.5 Vegetation type ...................................................................................................... 5
  1.6 Chemical Composition ......................................................................................... 5
  1.7 Associated species ............................................................................................... 6
    1.7.1 Root system character and influence on the soil environment ....................... 6
    1.7.2 Parasites .......................................................................................................... 6

Chapter II - Biology ...................................................................................................... 6
  2.1 Chromosomes complement ................................................................................ 6
  2.2 Life cycle ............................................................................................................... 7
  2.3 Reproduction ........................................................................................................ 7

According to NW Creation Network 2015 ................................................................. 7
  2.4 Peppermint plant image ....................................................................................... 7

Chapter III - Propagation and management ............................................................... 8
  3.1 Natural Regeneration: ......................................................................................... 8
    3.2.1 Propagation from seeds; .................................................................................. 8
    3.2.1.1 Storage ....................................................................................................... 9
  3.3 Planting .................................................................................................................. 9
    3.4.1 Pest and diseases control: ............................................................................... 9

Chapter IV - Marketing ................................................................................................. 10
  4.1 Production: ............................................................................................................ 10
  4.2 The sale price ....................................................................................................... 11
  4.3 Uses ....................................................................................................................... 11
    4.3.1 Industrial ......................................................................................................... 11
    4.3.2 Cosmetic ........................................................................................................ 11
    4.3.3 Medicinal and therapeutic ............................................................................. 11
    4.3.4 other .............................................................................................................. 12

Bibliography ............................................................................................................... 12
Introduction

Mentha x Piperita more commonly known as peppermint, is mostly known in the world for the cool scent the stems produce or for the spice in the red peppermint candy. This plant came to my attention because I like peppermint candy, so I decided to investigate more in depth all I could from this marvelous plant. My first step was finding out the origin of this plant and where is it produced today. Then I got to learn the basic for this plant to grow healthy, such as the climate and the water needed to grow. Continuing on, I wanted to research how this plant looks like and from what chemical it´s formed. My second step for my research was finding out all the biology surrounding this plant, such as the life cycle of the plant and how is reproduced. After having some knowledge about this plant, I started thinking how to actually plant this mint, so I researched about seed propagation, storage of the plant and how to evade and destroy all those pests. The last step in my research was finding out the marketing of peppermint, where is produced and what is the price of the plant. After knowing the price of the plant, I wanted to know what other uses does peppermint have, such as my beloved peppermint candy. Finally I ended my research and ready to start planting my own peppermint plants and harvests their precious oil. Making this project increased my interest in plants and can´t wait to figure out about different species.
Chapter I - Ecology

1.1 Origin
Peppermint is a hybrid cross between the *Mentha citrata* and *Mentha spicata*; which is native to Europe, however it is present almost everywhere around the globe (Landis, 2016). Earliest sightings of peppermint where found on Egypt tombs way back to 1000 B.C. and there is proofs that peppermint has a long record in European countries (Sanchi, 2015) This happened because European that colonized foreign land brought mints such as peppermint with them. This mints that are easily grown, expanded throughout the whole globe (Landis, 2016).

1.1.1 where it is produced
Peppermint is a perennial plant found in Europe, Asia and North America. Although there are over twenty-five species of peppermint produced by these areas, the majority of peppermint is produced in the United States (Teun Van, 2016).

1.2 Water
Peppermint plant needs constant irrigation in order to live. This irrigation cannot flood the plant because this will create fungi that will damage the plant (Zach, 2016). It also needs full or partial sunlight to flourish; this means that it needs 4-6 hours of sunlight to able to grow (Zach, 2016).

1.3 Height and spacing
Peppermint grows to around 31 to 46 centimeters tall, and the spacing between each plant should be around 46 to 61 centimeters (Landis, 2016). The spacing is really important because its roots can damage nearby crops.
1.4 Climate
Peppermint is present in temperate climates where the weather is not too cold or too hot. Temperate climates fall in the range of latitudes between 23.5 degrees and 66.5 degrees. It is mostly grown in the 1000 meters of altitude above sea level (Landis, 2016).

1.5 Vegetation type
Peppermint has small green flowers. The leaves are mint green and stand crosswise opposite each other on the stem. The peppermint leaves are oval and have saw tooth shape and have menthol smell (Zach, 2016).

1.6 Chemical Composition
The main chemical composition for peppermint is: Ethereal oil, tannins, bitters matter, Carotenes, Choline, Flavonoids and Rosemary acid. These chemicals are the ones that together compose peppermint plant (Teun Van, 2016).
1.7 Associated species
Peppermint is from the Labiatae family, which is quite large with 250 main species and around 8,000 secondary species (Zach, 2016). From those species there are some like the: apple mint, spearmint, horsemint, water mint etc. The mint species vary so much because it is really easy for mint to create hybrid specie by combining with one another (Zach, 2016).

1.7.1 Root system character and influence on the soil environment
Peppermint roots as many mints, grow fast and with no problem, however this roots can be invasive for other plants because the mint root are “runners”(runner roots or stolon, horizontal connections between organisms). These roots expand really fast and invade other plants around overtaking their space (Teun Van, 2016).

1.7.2 Parasites
There are four major parasites present in mint: Spider Mites (Tetranychidae), Aphids (Aphidoidea), Loppers (Achaea janata) and Flea Beetles (Alticini). The way to know if your mint is infested by parasites is: if Leaves speckled with yellow spots and thin webbing, then they have spider mites (NW Creation Network, 2015). If small winged and wingless insects on leaves, then they have aphids. If the plant is missing or large holes in foliage then they have loppers. If the plant has clusters of small holes in foliage then it has flea beetles (Landis, 2016).

Chapter II - Biology

2.1 Chromosomes complement
Peppermint plant has normally 2 n = 66–72 chromosome numbers. (NW Creation Network, 2015)
2.2 Life cycle
Peppermint is a perennial plant which means that it can live for 2 years in good conditions. Good conditions include full sun or partial shade. The minimum temperature peppermint can resist is (-10 F to -5 F), and the highest temperature peppermint can resist varies from (40 F to 50 F). It is also recommended to plant peppermint near bees of butterflies because these are the ones responsible for its reproduction. (Prank, F, Schrader, O., Marx, G., & Schmidt, W, 1999)

2.3 Reproduction
According to NW Creation Network 2015

- Peppermint reproduces sexually
- The purple flowers and smell are used to attract pollinators
- Peppermint has a stamen, which includes the anther, and this anther holds the plant pollen grains.
- This anther also includes the pistol; which is the equivalent of the female reproductive part.
- Inside the pistol is the stigma which is equivalent to the ovaries of a female.
- When fertilized, the ovule would develop the seed.

2.4 Peppermint plant image

- This image shows all the parts of the peppermint plant
Chapter III - Propagation and management

3.1 Natural Regeneration:

The mint plant, such as peppermint is all over the world and can be propagated easily. One of the reasons why the mint plant is easily propagated is because it has runner roots. These runner roots, are roots that cover a large area on any surface (Andrews, M. 2013). This quick growth needs to be watched as these runners can eliminate another species in the same place— it is thus an invasive species. For mint to successfully propagate in a wide area there needs to be a humid environment with partial shade. To stop mint to invade other plantations, you should plant apart from other plants or in a pot (Andrews, M. 2013).

3.2.1 Propagation from seeds;
According to (Andrews, M. 2013), mint propagation, can be done by cutting the best ends of the mint plant. After cutting these ends it is necessary to cut all leaves on the sides, leaving only the ones on the top, doing this will stimulate the plant to grow more and make new roots. After making this cutting, you need to take your mint cutting and place it in a recipient with water that only covers the node part. After doing this you need to wait around 2 months for the mint to star regenerating roots. After the first root is out, you now may place the mint in a garden or a pot.

3.2.1.1 Storage

Peppermint essential oil should be deposited in a cool environment; it is also necessary for the environment to be a dry environment. Once you have used the essential oil, close it in a closed container or refrigerate it to make it last longer (Directorate of Plant Production, 2012).

3.3 Planting

When planting the mint plant in its pot, or a garden it is needed to irrigate frequently. This irrigation of the soil would make it humid and would make a perfect environment for the mint. A humid environment would make a huge impact in the mint growth because it can take all its energy of growing than to maintain alive. Mint plant may take a while to show new leaves because it takes some tome to get use to their new environment. Andrews, M. (2013).

3.4.1 Pest and diseases control:

<table>
<thead>
<tr>
<th>PEST</th>
<th>DISEASE</th>
<th>CONTROL</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPIDER MITES</td>
<td>Leaves speckled with yellow spots and thin</td>
<td>• Lower the heat</td>
</tr>
<tr>
<td><em>Tetranychidae</em></td>
<td></td>
<td>• Have lots of air</td>
</tr>
</tbody>
</table>
### Pest and disease control Table - Table 3.1. (Zach, 2016)

<table>
<thead>
<tr>
<th>Pest Type</th>
<th>Description</th>
<th>Control Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>APHIDS</strong>&lt;br&gt; <em>Aphidoidea</em></td>
<td>Small winged and wingless insects on leaves</td>
<td>• Physical removal&lt;br&gt;• High pressure water&lt;br&gt;• Neem oil</td>
</tr>
<tr>
<td><strong>LOPPERS</strong>&lt;br&gt; <em>Achaea</em></td>
<td>Missing or large holes in foliage</td>
<td>• Row covers&lt;br&gt;• Plant marigolds, calendula, sunflower, daisy, alyssum, or dill</td>
</tr>
<tr>
<td><strong>FLEA BEATLES</strong>&lt;br&gt;(<em>Landis</em>)&lt;br&gt;<em>Alticini</em></td>
<td>Clusters of small holes in foliage then it has flea beetles (<em>Landis</em>)</td>
<td>• Yellow stick traps&lt;br&gt;• Remove trash&lt;br&gt;• Nematodes to soil</td>
</tr>
</tbody>
</table>

**Chapter IV - Marketing**

**4.1 Production:**

Peppermint global production, is around 4000 metric tons per year, the United States is responsible of 80 percent of this production. Most of the production that the Americans get is destined for export; they export around 25 tons of herbage (Directorate of Plant Production, 2012). The Americans also export the oil which is extracted from the plant, around 78.3 kg of oil. Also the other producers of *Mentha x Piperita* are: Canada, Europe and Britain, Australia, Tasmania and New Zealand. There is also a huge production of mint oil in Asia, however they are not too interested in peppermint because even though is the best quality; there are mints
such as *Mentha arvensis* that contain a much higher menthol content (Directorate of Plant Production, 2012).

4.2 The sale price

Peppermint such as all mints value is determined by supply and demand, currently mint prices are low because most of its production comes from countries such as China and India (Directorate of Plant Production, 2012). These countries are known to have low labor costs, cause of the low price of the product making it impossible for other countries to compete with this market.

4.3 Uses

4.3.1 Industrial

Industrially peppermint essential oil is used as flavorings in toothpaste, ice cream, confectionery, soft drinks, tobacco and chewing gum, however there are all sorts of new used that come the market that have peppermint oils like: shampoos, soaps, balms and liniments (Mary, 2013). In other cases is used to cure fever because it has a cooling effect that calms the pain. Peppermint is also found in beverages such as tea and tea blends, which are constantly growing in demand for curing harsh heart palpitations and nausea (Directorate of Plant Production, 2012).

4.3.2 Cosmetic

There are not a lot of cosmetic uses for mint, however there are certain perfumes or acne treatments that uses peppermint oils.

4.3.3 Medicinal and therapeutic

There are lots of medical uses with peppermint, in fact since ancient times it was used to relax the muscles, nowadays it is found that peppermint is useful for: relieving flatulence, relieving colic and eliminates certain bacteria (Mary, 2013).
Other effects peppermint cause are: increase sweeting, stimulates secretion of bile, assists in curing ulcers, also relieves from nervous headaches and it is used as a cure for cholera and diarrhea (Directorate of Plant Production, 2012). Also peppermint is really useful in medicine because it can be used to mask unpalatable drugs with its scent. In the therapeutic, peppermint is used for aromatherapy, stimulates hot and cold nerve endings, which increase blood flow (Mary, 2013).

4.3.4 other

One of the current discoveries in the *Mentha x Piperita* uses has been crucial for better methods to eradicate pests such as: mice, ants and other insects (Directorate of Plant Production, 2012). Scientist has discovered that peppermint and spearmint oil is really effective in reducing these pests (Mary, 2013). This discovery is of huge importance because the current methods of pest control like methyl bromide damages the ozone layer, so peppermint plant is helping to save the Earth.

Bibliography


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