CROP PROFILE

# Lupine and the Reawakened 25

**LUPINE, OR LUPIN, IS A LEGUME WELL KNOWN FOR ITS BEAUTIFUL PURPLE AND BLUE PEA-LIKE FLOWERS**. Its seed pods provide a highly nutritious bean. Lupine beans are excellent sources of protein and fiber among other nutrients and minerals. They can be eaten similarly to soybeans and have been consumed by humans for centuries. Today, they are more often used as animal feed for ruminants and poultry, but with an increase in interest as a sustainable food source, Lupine beans grown for humans are becoming a viable option. They were first grown in the Old World, in European and North African countries around the Mediterranean. It was later brought to the New World and is now grown across the Americas. There are quite a few different species including some which have been domesticated in Australia. In fact, Australia is the country where most lupine is grown. Lupine grows well in acidic soils and is highly resistant to drought. Given the potential to be grown around the world and being rich in nutrients, it is gaining popularity as a food source for humans.





LUPINE Lupinus

Origin: the Mediterranean and North Africa Grown across the Americas, Australia, Europe, and North Africa

Nutritious legume with the potential to lower the risk of heart disease, cancer, and diabetes

Lupine, or Lupin, is a legume well known for its beautiful purple and blue pea-like flowers. Its seed pods provide a highly nutritious bean. Lupine beans are excellent sources of protein and fiber among other nutrients and minerals. They can be eaten similarly to soybeans and have been consumed by humans for centuries. Today, they are more often used as animal feed for ruminants and poultry, but with an increase in interest as a sustainable food source, Lupine beans grown for humans are becoming a viable option. They were first grown in the Old World, in European and North African countries around the Mediterranean. It was later brought to the New World and is now grown across the Americas. There are quite a few different species including some which have been domesticated in Australia. In fact, Australia is the country where most lupine is grown. Lupine grows well in acidic soils and is highly resistant to drought. Given the potential to be grown around the world and being rich in nutrients, it is gaining popularity as a food source for humans.

#### BOTANY

Lupine species native to the Americas are herbaceous perennials, however, those that come from Europe and North and East Africa are most often annuals. All lupines are legumes, which means their root nodules host nitrogen-fixing Bradyrhizobiomes. Lupines grow in shrubs and range from a height of 0.3-1.5 meters, but some can reach as tall as 3 meters. Some species native to the Andean region of South America grow as trees. The leaves are palmately compound and are divided into five to 28 leaflets. Flowers frow in dense whorls and are pea-shaped, around 1-2 centimeters long. They consist of two lateral wings and a keel. The fruit grows in pods with multiple rather large seeds. In addition to a food crop, Lupines are typically grown ornamentally.

#### **CULINARY USE**

Lupines have been cultivated and consumed for a long time all over the world. They have a high amount of protein and can be cooked and eaten in many different ways similar to soybeans. Lupines do not have a distinct flavor and therefore can be used in a variety of food products similar to tofu, tempeh, milk, meat, baked goods, mayonnaise, and salad dressings. Lupine is even considered to be an excellent replacement for eggs and butter in baking because of its water retention and fat binding properties. It is also gluten-free and therefore can be used as flour to make many gluten-free products. Lupine seeds have a high potential for becoming a staple part of people's diets whether in home-cooked dishes similar to how other legumes are traditionally cooked or in food products as previously mentioned. Notably, lupines are a legume and those who have a peanut or legume allergy might find they are allergic to lupines.

### **NUTRITION AND MEDICINAL USE**

Lupine seeds are highly nutritious and have been studied to provide a food resource for both humans and animals. The seeds contain up to 40% protein and up to 20% lipid, fiber, and other secondary metabolites such as flavonoids and oligosaccharides. It also has a fatty acid profile considered beneficial for humans. Lupines have more recently been studied for their potential health benefits used as an ingredient in food products and pharmaceuticals. They have the potential to provide benefits to food intolerance, allergies, and hypolipidemic, hypoglycaemic, hypotensive, and anti-obesity activities in humans. In addition, legumes overall have beneficial bioactive compounds that have the potential to decrease the risk of coronary heart disease, cancer, and diabetes.

### AGRICULTURE

Old World species of Lupine tend to have a larger seed size and a well-formed embryo compared to the New World species. This makes the New World species less attractive for grain production. Lupine can grow in soils with a low pH (pH 4) and is highly resistant to drought. However, it produces a low yield and is susceptible to disease. Irrigation can help to increase the seed yield, but if it exceeds the crops water requirements, irrigation has been found to increase grey mold infestation. Commercially, lupine has mainly been grown as a garden ornamental because of its variety of flower colors and tall stems. The other main commercial use for lupines is for use in animal feed. The seeds can substitute the high protein soybean meal fed to livestock. It is a desirable feed product for ruminants because of the low levels of starch and high levels of fermentable carbohydrates. While people in the Mediterranean and Andean regions have consumed lupines for a long time, less than four percent of global lupine production (as of 2007) was used for humans. Over half of the world's lupine is grown in Australia, but it is grown in various quantities in many countries across five continents.

#### HISTORY

Lupines have a long history dating back around 15 million years. They likely originated in the Old World and were later dispersed in the New World. DNA sequence analysis shows three main lineages of lupines: the Mediterranean and northern Africa; North, Central, and South America; and Atlantic South America (Brazil). There are different interpretations of the word Lupin which derives from the Latin lupus meaning wolf. It is either able to grow in difficult environments, or able to capture large quantities of nutrients from the soil. Evidence of cultivated Lupine dates back to the Bronze Age in Greece, Cyprus, and Egypt over 4000 years ago in the tombs of Pharaohs. Later, cultivation became more common as people realized the bitter taste of lupines could be diminished by first soaking the seeds. Lupins remain underutilized with only about 650,000 hectares of cultivated lupines grown globally.

#### RESEARCH

Lupine species have been continuously researched and bred for domestication. One of the main desirable results of breeding is to lower the quinolizidine alkaloids that make lupine seeds bitter, unpalatable, and toxic to humans. One major difficulty in breeding for lower alkaloids is that they help provide resistance to insects, particularly aphids which are a huge pest for lupines. Although domesticated species have been the main focus of research, there is an effort to increase research on wild lupines. One study in particular by Ruiz-Lopez et al. (2019) looks at wild lupines in Mexico. This study suggests that wild lupines, like domesticated varieties, are highly nutritious and beneficial to humans. They are an excellent source of protein, fiber, and balanced amino acids. In addition, they contain bioactive compounds like oligosaccharides that have many physiological-metabolic effects. However, wild species have not been the focus of lupine studies and therefore could be expanded in order to take advantage of the diverse wild lupine species around the world.

## CUISINE

- Lupini Beans and Olives (How to Cook & Eat Lupini)
- Lupin Composition and Possible Use in Bakery- A Review

## SOURCING

- Lupine Seeds
- Lupine Seeds for Planting
- Lupine Seeds, Swallowtail Garden

## **COMMUNITY RESOURCES**

- <u>Can lupines be successfully grown in Iowa?</u>
- Lupins, RHS
- Native Plant Trust
- <u>Vegan Athletes</u>

## SOURCES

• Lupins in European Cropping Systems

