Difference between indoor and outdoor figs(*Ficus carica*) in greenhouse in Kinmen area

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fig greenhouse

Summary

Is it possible to grow figs in an environment like Kinmen? Although figs are drought-tolerant, they are not cold-resistant and need a warm climate with a temperature of 15-25°C.However, we found that there are figs growing on the roadside and in the greenhouse in Kinmen. So we photographed figs grown in the wild and figs in the greenhouse to find out the factors that cause the difference in fig growth.

Research purposes

Compare the climatic conditions suitable for growing figs in the Kinmen area and Spain, observe the difference between the greenhouse and outdoor growth of figs in the Kinmen area, and analyze how to make the effect of the greenhouse close to that of Spain. We hope this study can explore the factors that cause differences in fig growth, further gain insight into the factors that affect fig growth, and provide a reference for the cultivation of figs in different climates.

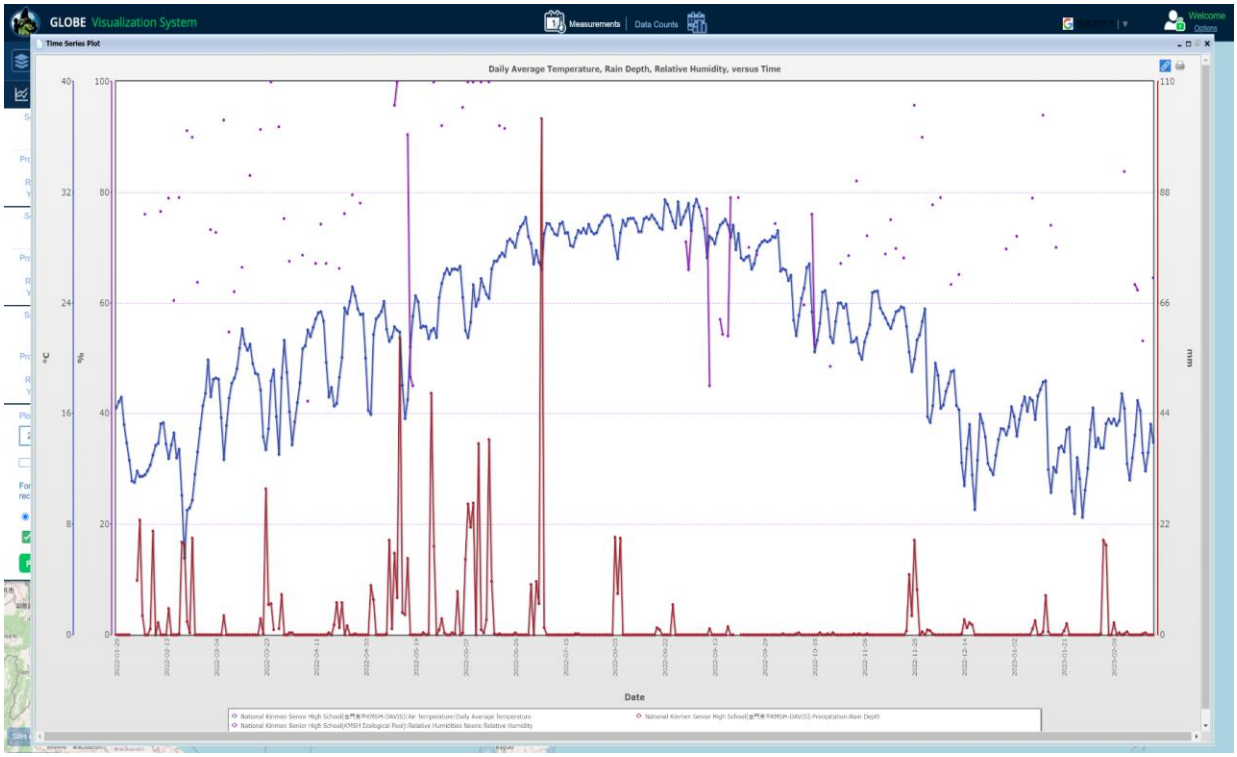
Research method

We take pictures of figs in the wild and figs in the greenhouse (25 degrees Celsius), observe the factors that affect the growth of figs such as temperature, rainfall, and wind in the figs in the wild and in the greenhouse, and summarize these variables and figs. Relationship.

Discussion

Figs like a warm and humid environment and usually require plenty of sunlight. The optimum growth temperature is 20 to 30°C, and the soil must be kept slightly moist. It needs sufficient scattered light and ventilation. When the light is weak in autumn and winter, it can be placed in a sunny spot to preserve the vibrant color of the leaves.Figs also have a certain degree of shade tolerance and can grow in a dark environment, but long-term insufficient light will cause growth stagnation and leaf drop.

Climatic comparison between Kinmen and suitable fig planting areas (Spain)



Kinmen average temperature (blue), rainfall (red) and relative humidity (purple) map. Taken from Kinmen High School Automatic Weather Station

Horizontal axis: date (year/month/day)

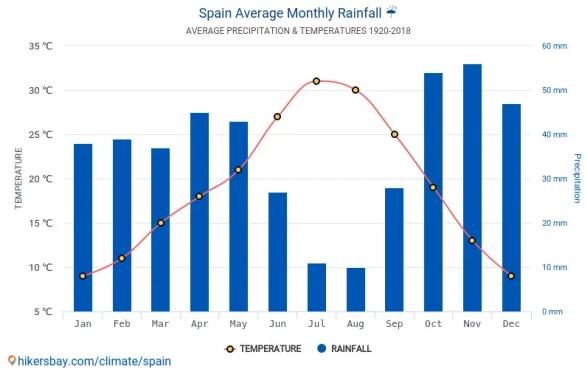
Vertical axis: temperature (°C)

Kinmen climate

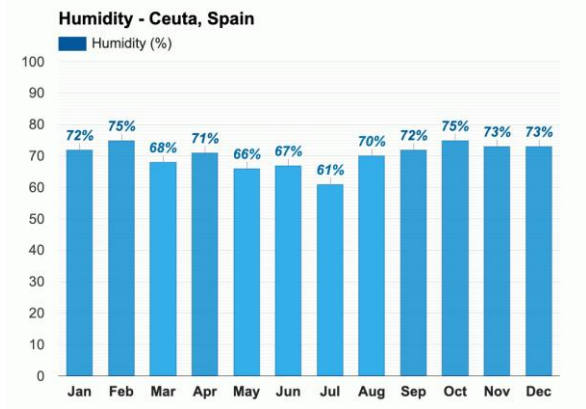
Winter is affected by the northeast monsoon, which is dry and quite strong, so Kinmen's chances of rainfall in winter are also reduced, resulting in a dry season. In summer, it is affected by the southwest monsoon. It can be seen from the chart that the rainfall is the highest in summer from the end of June to mid-July, and the temperature is gradually rising, similar to the monsoon climate.

The temperature in Kinmen is too low in winter, and the wind is strong in winter; the temperature in summer is moderate, but there is too much rainfall and humidity, which makes it difficult for figs to survive.

Spanish climate



Map of Spain's average temperature (red) and rainfall (blue) from 1920 to 2018. Taken from HikersBay



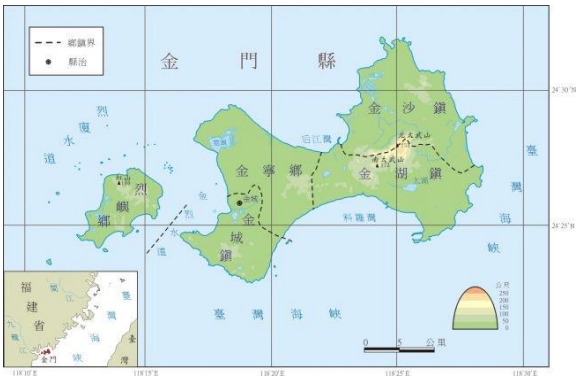
Spain average relative humidity map. Taken from the Weather -Atlas

Spain's winter climate zone is influenced by the westerly winds, which bring moist air from the ocean, making the climate milder and wetter. Affected by subtropical low pressure in summer, there is less rainfall in summer. From the chart, it can be seen that summer is dry and winter rains, so it belongs to the Mediterranean climate, and the sufficient sunshine and low rainfall in summer are the seasons suitable for figs.

Humidity

Figs have high requirements on humidity. Generally speaking, it is best to maintain a relative humidity of 40% to 60%. Figs have adapted to the Mediterranean climate, so they need a certain amount of moisture to maintain their normal growth. Spain's climate is very suitable for the humidity requirements of figs, but the relative humidity of Kinmen is much higher than 60% most of the time, so we infer that when figs grow outdoors, their growth may be affected by too high humidity.

Latitude effect



The latitude of Kinmen is from 24°05' north latitude to 24°44' north latitude, taken from the Central Meteorological Bureau

The latitude of Spain is between 36 degrees 00 minutes and 43 degrees 22 minutes north, taken from the 地之圖

Kinmen is located in the south of 30 degrees north latitude, so the summer climate is mainly affected by the southwest monsoon. When the ground receives the sun's heat, a wide area of low pressure is formed, causing the air over the Indian Ocean to blow towards the land. Known in Asia as the southwest monsoon, this airflow can bring moist ocean air inland, producing abundant and sometimes torrential rain. Therefore, the summer climate in the Kinmen area is usually relatively humid.

Spain is located between 30 and 40 degrees north latitude and has a Mediterranean climate. During the summer, subtropical high pressure or trade winds move into this climate zone, coupled with the cooling effect of coastal currents, creating a dry and hot climate with little precipitation. Therefore, Spain's summer climate typically exhibits the characteristics of a dry summer and a rainy winter.

How to make the environment of the greenhouse close to Spain

Temperature control: The climate in Spain is usually warm and dry, so the temperature needs to be controlled in the greenhouse to keep it between 15°C and 30°C. Temperature can be controlled using heating or cooling systems such as air conditioning, geothermal or heating systems.

Humidity Control: Spain's climate is generally relatively dry, but plants need the right amount of humidity to grow. Therefore, a humidifier or dehumidifier can be installed in the greenhouse to adjust the humidity, or automatic spraying can be used to increase the air humidity in the greenhouse and keep it between 40% and 60%.

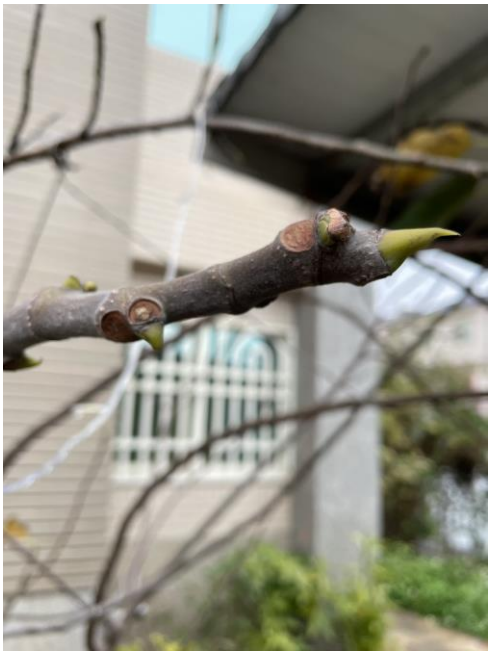
Light Control: Spain's climate generally has plenty of sunshine, but light control is required in greenhouses, especially in the heat of summer to protect plants from the sun. Lighting can be controlled using blackout curtains, lamps, etc., or monitoring equipment such as light meters can be used to adjust the lighting time and intensity.

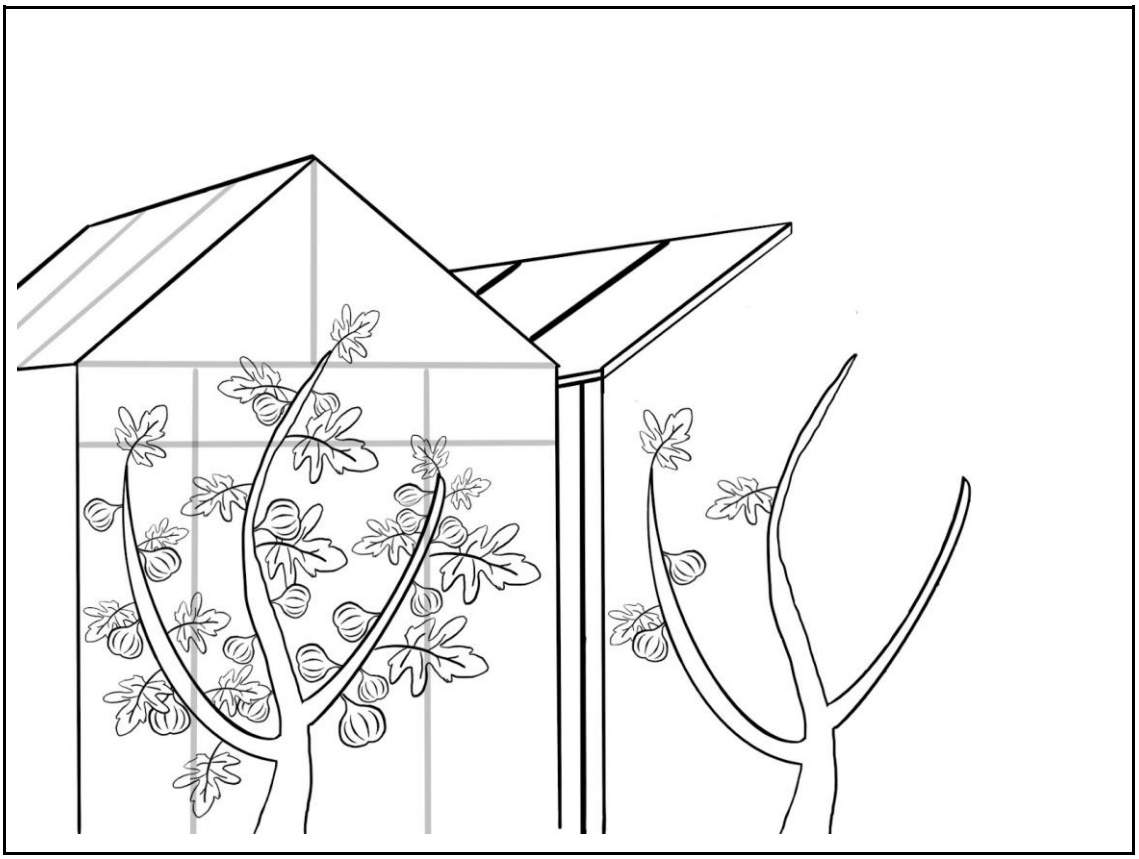
Air circulation: Spain's climate generally has cool nights, but air circulation is needed in the greenhouse to maintain a stable temperature and humidity. A ventilation system can be installed in the greenhouse and the air should be changed regularly, or devices such as fans can be used to increase air circulation.

Fig growth status in the greenhouse and in the field

	Greenhouse Figs It's almost winter and it's not in the fig production season, but the fruit trees are still growing
	2023/1/1 Field Figs fruit tree with few leaves

	2023/2/5 Greenhouse Figs Pruned, has grown many leaves.
	2023/2/5 Field Figs Fig tree in the wild with few leaves and fruit visible

	2/5/2023 Field Figs The foliage and fruit grow noticeably better under the eaves
	2/5/2023 Field Figs Unshaded branches are just sprouting



Schematic diagram of fig growth

	Wild figs vulnerable to insects and birds

In the greenhouse vs. in the wild

The fig is a highly adaptable plant that can grow in the wild by itself. Figs grown in greenhouses are better controlled. Adjusting the greenhouse to 25 to 35 degrees Celsius, maintaining good ventilation, and irrigating with an appropriate amount of water is conducive to the growth and development of fruit trees, but it also requires more management and care, such as irrigation, fertilization, and pruning. High cost and effort,in contrast, figs grown in the wild can require less management but require more observation and dealing with issues such as pests and diseases.

Greenhouse figs are grown in a controlled indoor environment and usually grow faster because of factors such as artificially controlled lighting, temperature and humidity. Wild figs grow in a natural environment and need to withstand more climate change and external environmental factors, so the growth rate may be slower.

Different growing environments and management methods will also affect the fruit quality of figs. Greenhouse-grown figs may produce larger, sweeter and more graceful fruit due to better growing conditions and management practices. However, figs grown in the wild may have stronger vitality because they have experienced more challenges in the natural environment, and can adapt to harsher environments in comparison.

Conclusion

1. In terms of the natural environment of Kinmen, the benefits of growing figs outdoors are not good. The control of the greenhouse can provide a more suitable growth environment for figs. By analogy, the planting of plants can provide a more suitable growth environment through artificial facilities.

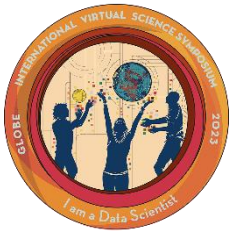
2. Greenhouse figs provide stable and consistent quality characteristics, while wild fig quality is affected by factors such as climate and soil conditions, resulting in outdoor figs that are vulnerable to insect damage or slow to grow.

Badges

I am a collaborator:

1. Observe and photograph figs
2. Analyze the impact of climate on figs
4. Organize photos and data
5. Create charts and tables
6. Write a report and summarize the conclusions
7. Together we discuss our observations and findings

I am a data scientist:



1. We analyzed the climate differences between the two places by comparing the climate data of Kinmen and Spain
2. Analyze the factors that cause the climate difference between the two places through the latitude map and climate data

I am an engineer:

We discussed various solutions in temperature control, humidity control, light control, air circulation and other projects to change the setting of the greenhouse, so that the greenhouse can simulate the environment in Spain and increase the production efficiency of figs

References

1. Wu,Wan-ling, Fruit Ornamental Plants - Potted Fig Cultivation, Taoyuan Agricultural News Issue No. 109
2. Wu,Junyan、Huang,Jia-jun、Huang, Yu-wen, Legends in the Wind - Exploring the Relationship between the Orientation of Kinmen Ancient Houses and the Monsoon, The 46th Science Fair for Primary and Secondary Schools of the Republic of China
3. Fig daily maintenance and care methods (planting, fertilizing, pruning, watering), PictureThis
4. Liao,Bo-ji、Lai,Jian-yuan、Liu,Fu-zhi,Wheat Seed Preparation and Storage in Kinmen Area - Seedling Improvement Breeding Farm, Special Issue on Seedling Science and Technology