Final Exam Question

*Rhynchosporium commune* is a fungus that causes the disease ‘leaf blotch’ on wheat and barley. Though it originated in northern Europe, it has spread worldwide. Researchers implemented an experiment to test if *R. commune* isolated from different counties grew at different rates when exposed to different temperatures. Below is a table adapted from Stefansson et al. listing the country the fungus was collected from and the measured growth rates of the isolates grown in petri dish lab conditions at varying temperatures. These growth rate assays were done under controlled conditions only varying in temperature.

|  |  |  |  |
| --- | --- | --- | --- |
| Country where *R. commune* was isolated | Rate of growth at 12C (54F) | Rate of growth at 18C (64F) | Rate of growth at 22C (72F) |
| Australia | 0.83 | 1.05 | 0.61 |
| Finland | 1.19 | 1.09 | 0.96 |
| Norway | 1.13 | 1.16 | 0.82 |
| Spain | 1.01 | 1.25 | 0.62 |
| United States | 1.04 | 0.95 | 0.61 |

Stefansson T.S., B.A. McDonald, and Y. Willi. 2014. The Influence of Genetic Drift and Selection on Quantitative Traits in a Plant Pathogenic Fungus. PLoS ONE 9(11): e112523. doi:10.1371/journal.pone.0112523

Q1: Draw a line graph of each *R. commune* strain growing at each of the three temperatures. Which country had the highest rate of growth at 22C; which had the lowest at 22C? Does *R. commune* grow at different rates depending on the temperature? Pick a country and hypothesize why the *R. commune* isolated from grew at the measured rates.

Q2: Which county do you think is the most unlike Northern Europe (where the fungus originated), and why? Quantify this difference in fungal growth rate in that country to isolates from Northern Europe (Finland and Norway)?

Q3: What is the mechanism for selection in this example? Do you think it is natural or artificial selection? Why?

Q4: Make a model explaining what you think is happening to the fungus as it spreads across the globe. Make sure to identify the characteristic that is the target of selection, the results of selection, and the relevant environmental variables. Write down assumptions to simplify or help explain your model.