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Keywords
Northern viticulture, climate change, climatic classification system indexes, Geoviticulture MCC system, RCP scenarios

Research Question
The study mapped the current climate and growth conditions in Southern Finland, and compared them against the growth conditions in four northern wine growing areas of the Central Europe

Methods
The air temperatures were obtained from the observations of the meteorological institutes of Finland, Germany and France. and the climatic classification according to Geoviticulture MCC system in 2014 - 2016

Results
According to Geoviticulture MCC system, Helsinki region belongs currently to the categories cool - very cool, but the predicted climate warming may change it to the category cool.

Abstract
The climate in the Northern hemisphere has been warming from the end of the 19th century by 0.7°C compared to the average in 1881 – 1980. Temperatures have been rising slowly in Finland since 1860. Within the last 100 years, the annual average of the air temperature in the southernmost parts of Finland has increased by 1°C. The increase has been most noticeable in spring and in winter. In spite of this, the snow and cold in March still restrict photosynthesis until the second half of April. In this study, the current climatic and growing conditions of a vineyard located in Southern Finland, Helsinki Region, Tuusula (60°N) to the climatical and growing conditions in vineyards in Neubrandenburg (53°N) and Freyburg (51°N), located in North Germany, as well as Herrlisheim-prés-Colmar (48°N), in Alsace Region in France were compared. According to Köppen-Geiger climate classification, these localities belong currently to the temperate climate zone (Cfb or Dfb). Based on climate scenarios RPC 2.6 (Representative Concentration Pathways), it was estimated how the viticulture conditions in Tuusula would change with the climate warming by 2°C by the end of the year 2100. According to the Climatic Classification System (Geoviticulture MCC System), in Southern Finland, the current wine growing conditions in Helsinki Region belong to the category ’very cool’, where the maturation of the crop requires a good local micro climate. For instance, a temperature that is 1°C above the surrounding area lengthens the growing season by 1.5 weeks. According to the Heliothermal index (HI) and the Amerine-Winkler Index, Tuusula, Neubrandenburg, Freyburg and Herrlisheim-prés-Colmar belong to the ’very cool’ class of viticultural climate. The Amerine-Winkler Index correlates well with the Heliotherm Index, although it has been calculated in a simpler way by adding together the daily temperatures that exceed 10°C. Based on the growing season rainfall, the category of Tuusula is ’moderatetely dry-subhumid’, which is sufficient for grapevine cultivation. According to the Cool Night Index (CI), Tuusula belonged to the category ’very cool nights’, but the other localities were in the group ’cool nights’. Based on the Dryness Index (DI), the potential water balance of Tuusula was between ’moderately dry – subhumid’. The DI was not calculated for the other locations, but based on rainfall during growing season they probably belong to the same category. The Hydrothermic index (HyI) is about the rainfall and temperature in a growth season. HyI was lower in Tuusula than in the other locations, even though the difference in rainfalls was not more than a few tens of millimeters. Thus, the lower HyI of Tuusula is probably due to the lower temperatures in the growing season. The frost-free growing

season in Tuusula lasts 170 - 180 days, which is shorter than in every other place. This is because of the early frost which occurs in the locality at the turn of September and October. The air temperature decreases for 1 – 2 days down to about -1°C, after which the next frost period will not occur until November. Due to the short cold period in September or October, also the number of days with 10°C or above was in Tuusula smaller than in the other localities. The lowest winter temperature in Tuusula was -17°C in 2015 and 2016 , and in Neubrandenburg, Freyburg and Herrlisheim-prés-Comar -4.1 - -6.1°C. The frost only lasted there for a couple of days, but in Tuusula the air was clearly colder than in the other localities. The predicted 2°C temperature increase would bring the spring and autumn temperatures in Helsinki Region close to Freyburg temperatures, which means that the growing season in Tuusula could begin at the end of March, i.e. 3 to 4 weeks earlier than present, which would suffice for Vitis vinifera varieties than today. Anyway, with the realization of global warming and predicted scenarios, South and Central European crops would replace some of the northern varieties of plants, and the cultivation of many plants from North Europe would move to higher latitudes. The scenarios are, however, not a law of nature, but an internally consistent estimate of future events, which also requires estimates of the future magnitude of emissions. A scenario is merely an estimate or a guess, the realization of which is impossible to predict. According to scenarios RCP8.5 and RCP6.0 the surface temperature of Earth may rise in less than 100 years by 6°C and more. It means that some current plant and animals species will not have time to adapt to the new climate and conditions. They end up a wrong environment in a way, and they may become extinct, but most of them will survive. If the consumption of fossil fuels can be brought to a decrease quickly, then the global temperature increase may even turn into a decline by the end of the century. If the climate change actualizes, the predicted climate warming and lengthening of growing season will have a positive or negative impact on the growth of present crops and on the quantity and quality of crop in Nordic counties.