

Agro-climatological and phenological characteristics of the Middle Moselle valley.
Effects of climate change to grapevine, Moselle River Region.

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Summery:

This dissertation overviews the agro-climatological and phenological characteristics of the Middle Moselle valley. The observed time was the second half of the past 20th century. In particular, the wine-growing district around the small city of Bernkastel-Kues was researched and strong evidence has been found regarding considerable climate and phenologic changes and their effects to the cultivated grapevine.

The time series of the mean annual air temperature shows a clear dichotomy considering the years 1945 to 2000. A decrease (−0.7 K) in the first half of the time series and a distinct increase (+1.1 K) in the second half could be proved. Similar patterns show the annual means of the daily temperature maxima and minima. A significant warming could be observed in April and May, August and October and January and December. The least changes of climate elements show February, July and November. The annual sum of precipitation shows no discernible trend considering the complete period 1945 to 2000. But seasonal adjustments prove substantial changes in the precipitation characteristics. The season with the highest precipitation rate during the year has moved from August to June/July (strong decrease in August), and the driest season has moved from March to February. An increase of precipitation shows mainly September and October. The annual sum of sunshine duration shows a strong decline during the years 1945 to 1981 and a trend reversal during the years to 2000. In particular, the month August shows a strong increase of sunshine hours in the last two decades.

The mean annual growth of the grapevine starts in the beginning or middle of April. The shoot and greening follows mid May. The average flowering of the vine plant is taking place between 21st of June and 26th of June. Mid July the berries reaching the size of a pea (start of lag phase). The berry growth and fruit ripening continues in general to early October. The coloring and fall of leaves occurs between mid October and early November. The trends of all growing stages observed in Bernkastel-Kues show a forward displacement of the phenological stage dates between −6 days and −15 days during the years 1967 to 2001. The berry growth and fruit ripening in summer and early autumn extends at 10 days. The warmer months March and April (lesser frost damage) result in a significant earlier beginning of the growing season. The increased temperature and sunshine duration in combination with drier conditions in May and June lead to a considerable forward displacement of the flowering dates and to a fortunate displacement of the fruit ripening stages into the hot, dry and sunny midsummer. The optimal ripening of the berries in September and October is on the one hand supported by the warmer conditions otherwise delayed or handicapped by the observed increased precipitation rates. The phenological stage dates of bud break, shoot, flowering and degree of ripeness are suited as an excellent indicator to observe the climate change throughout the years. A strong correlation between the flowering dates and the temperature factors and between the degree of ripeness 60 °Oe and the cumulative temperature sums and the cumulative sunshine duration between May and August respectively is another evidence of the ongoing climate change in the Moselle River Region, especially during the months March to June and August and October.