GENIUS LOCI LASZLOVSZKY 60

edited by
Dóra Mérai
and
Ágnes Drosztmér, Kyra Lyublyanovics,
Judith Rasson, Zsuzsanna Papp Reed,
András Vadas, Csilla Zatykó



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Budapest 2018

The publication of this volume was generously funded by



ISBN 978-615-5766-19-0

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2018

ARCHAEOLINGUA ALAPÍTVÁNY
H-1067 Budapest, Teréz krt. 13
www.archaeolingua.hu
Copy editing and language editing: the editors
Layout: Zsanett Kállai
Map: Viktor Lagutov, Zsuzsa Eszter Pető, Mária Vargha, István Gergő Farkas
Front cover design: Eszter Bence-Molnár

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Before and After the Great Heat and Drought of 1540: Multiannual Trends of Grape and Grain Harvest Dates in the Vienna Hospital Accounts

Andrea Kiss*

Broad-scale documentary-based investigation has revealed that 1540 was a year of outstanding drought and heat anomaly in most parts of Europe.1 The vast amount of documentary evidence available from different parts of Europe - with particular emphasis on Western and West-Central Europe – leaves little doubt about the extreme nature of this drought. As the hydroclimate reconstruction based on tree-ring evidence does not show the year 1540 as an exceptionally outstanding drought anomaly compared to other late medieval or early modern drought years, a debate has developed between groups applying documentary and tree-ring based evidence.2 Despite the debate over the level of extremity, both groups agree that a significant drought occurred in the (spring-) summer period of 1540. In Austria, two narratives discuss this great drought in detail, one from Gastein in the Salzburg area and the other from the Linz area in Upper Austria.3

This paper concentrates primarily on the heat aspect of 1540, with particular attention to multiannual trends. In the broader vicinity of Vienna, the annual accounts of the Vienna Hospital rather systematically preserve the dates of harvesting grapes in the vineyards owned by the hospital.4 This evidence provides almost continuous, mainly temperature-related, information, particularly from the early 1530s until the 1780s. A May-July temperature reconstruction based on the series containing the dates of the beginning of grape harvests was published in 2009.5 This reconstruction for the sixteenth, seventeenth and early eighteenth centuries is based on the Vienna Hospital grape harvest date dataset provided by Alfred Pribram in his book on the history of prices and wages in Austria.6 In some cases, recent archival investigations dealing with the

* Institute of Hydrology and Water Resources Management, Vienna University of Technology same source evidence have revealed considerable differences between the harvest date dataset provided by Pribram and the first dates of grape harvest available in the original archival evidence. Moreover, dates for the beginning of cereal (grain and oat) harvests were also recorded in the same source, providing further evidence for the analysis and inter-annual comparison of late spring—early summer temperature conditions in the Vienna region from the early sixteenth century onwards.

Applying new grape and grain harvest datasets taken directly from the original manuscripts of the Vienna Hospital accounts, the main aim of the present paper is to discuss the summer temperature conditions in the decades and years before and after 1540. This paper also pinpoints some interesting tendencies while comparing the event to other summers in the previous and following decades. A further aim is to draw attention to the potential differences that may arise when using datasets available in early publications developed with slightly different purposes than climatological reconstruction.

The beginning of the grape harvest from 1523 to 1582: comparing a published series and the manuscript

The Vienna Town Hospital grape harvest series was published by Alfred Pribram among the price and wage series⁷ as an additional set of information; the author did not necessarily mean to provide the very first date of the harvest in each case. The differences between the series in Pribram's work and the beginning of harvests in the original source may affect the continuity of the series and in some cases also the dates themselves.

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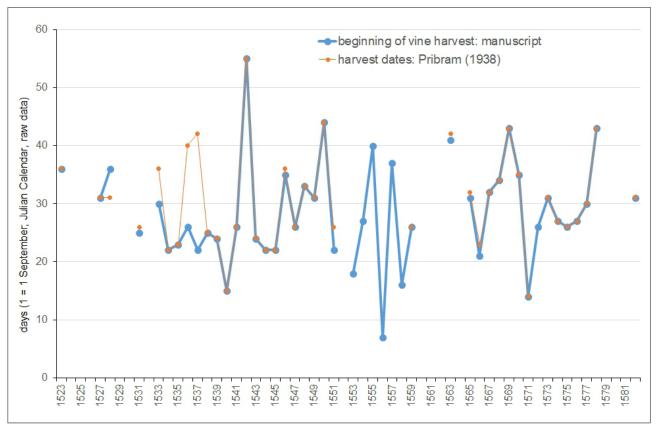
Concerning missing values in the 1523 to 1582 period, with the reinvestigation of the original evidence the gaps from 1552 to 1558 and 1572 could be filled with dates (see Fig. 1). Furthermore, in some cases there are differences between the original manuscripts and the information provided by Pribram for the reported first dates of the harvest. In four cases, these differences do not exceed one or two days in the study period, which has only a minor effect on the temperature reconstruction. More considerable differences, however, occur in 1533 (six days), 1536 (fourteen days), 1537 (twenty days) and 1551 (four days; see Fig. 1).

From the viewpoint here, the great differences in 1536 and 1537 especially have particular importance because – based on the dates published by Pribram – no clear trend can be identified in summer temperatures in the 1530s, which is primarily due to the relatively late harvest dates in 1536 and 1537. Applying the evidence in the original archival source, it becomes apparent that the grape harvest, similarly to the previous and following years, started early in both years. Based on the new dataset, a clear tendency of early

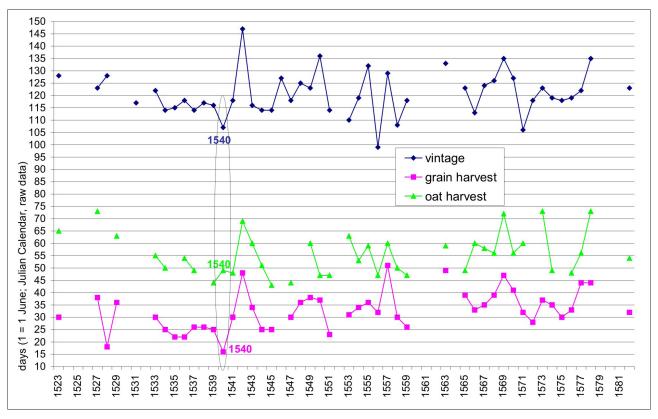
grape harvests, meaning higher summer temperatures, can be followed at least from 1534 until 1540 (see Fig. 1).

The beginning of grape and cereal harvests in the Hospital accounts: trends and comparisons

In the vineyards of the Hospital, the grape harvest in 1540 started on September 15 (in the Gregorian calendar [GC]: September 25), which is a very early date, among the earliest in the century, but not the earliest (Fig. 2). In 1553, the harvest started on September 7 or 10 (GC September 17 or 20),8 and in 1571 on September 14 (GC September 24). Furthermore, some decades later, in the famous drought year of 1616, the harvest started as early as September 14 according to the Gregorian calendar. As grape harvest dates are mainly dependent on May-July (and to some extent April-August) temperatures,9 based solely on these dates, 1540 was "only" the third hottest summer in the 60-year period studied.



▶ Fig. 1. Grape harvest dates in the vineyards of the Vienna Town Hospital presented by Pribram (1938) and the beginning of the grape harvest in the Vienna Town Hospital accounts between 1523 and 1582



▶ Fig. 2. Beginning of grape, grain, and oat harvests in the lands of the Vienna Town Hospital in 1523-1582, based on the original (manuscript) accounts

Before 1540, the years 1534 to 1539 were characterized by steadily early grape harvests and little inter-annual variation compared to other parts of the century (except for the mid-1570s). In 1540, even compared to these relatively early dates, the grape harvest started, significantly, 8 to 10 days earlier. In light of the previous years, the 1540 early harvest date is not a dramatic change. Compared to the high inter-annual variability of the following years with a clear tendency towards later harvests, however, the difference is much more striking. The latest harvest of the study period occurred in 1542; there was a 40(!)-day difference in the beginning of grape harvests between 1540 and 1542. Thus, in light of the following years, 1540 was a strikingly hot year.

Besides the beginning of the grape harvest, data in the Hospital accounts are also often available for grain – probably wheat, rye, barley – and oat harvests (Fig. 2). With a June 16 (GC: June 26) grain harvest date, 1540 stands out as the earliest known grain-harvest date in the 60-year study period. The beginning of the oat harvest on July 19 (GC: June 29) is one of the earlier dates, but not extraordinarily early (see Fig. 2). Grain harvest

dates usually refer to late spring-(early/mid) summer temperature conditions. ¹⁰ Compared to grape harvest dates, the strikingly early grain and the still fairly early oat harvest dates in 1540 increase the possibility that the late spring and the early/mid-summer, namely the early part of the vegetation period, was even more outstandingly warm than the rest of the summer itself.

Concerning multiannual trends, conclusions – rather similar to those of the grape harvest series – can be drawn for the 1530s, particularly the years 1534 to 1540. In fact, a trend towards earlier grain harvests can be detected through the entire decade; very early harvest dates are typical with little inter-annual variation, which is particularly visible compared to the rest of the 60-year study period. Unlike the case of the grape harvest dates, no comparable years were noted in the mid-1570s.

Conclusion

Based on the dates of the beginning of grape and grain harvests between 1523 and 1582, preserved in the original manuscripts of the Vienna Hospital

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accounts, this paper discusses the temperature-related harvest-date trends, variability, and extremes around the outstanding year of heat and drought, 1540. A multiannual tendency for early grape and grain harvests, reflecting very warm late spring-early summer temperatures with little inter-annual variation, was detected prior to 1540, but especially between 1534 and 1540, immediately followed by a very changeable period with some outstandingly late harvests (e.g., 1542) and an overall tendency for later harvest dates, suggesting cooler May-July conditions after 1540. Between 1523 and 1582 the grain harvest was the earliest in 1540 while both the oat and grape harvests were very early but not the earliest in the study period, which suggests that the (mid-)late spring-early summer period was more outstandingly warm than the mid-(late) summer itself.

Notes

Oliver Wetter, Christian Pfister, Johannes P. Werner, Eduardo Zorita, Sebastian Wagner, Sonia I. Seneviratne, Jürgen Herget, Uwe Grünewald, Jürg Luterbacher, Maria-Joao Alcoforado, Mariano Barriendos, Ursula Bieber, Rudolf Brázdil, Karl H. Burmeister, Chantal Camenisch, Antonio Contino, Petr Dobvrovolný, Rüdiger Glaser, Iso Himmelsbach, Andrea Kiss, Oldřich Kotyza, Thomas Labbé, Danuta Limanówka, Laurent Litzenburger, Øyvind Nordl, Kathleen Prybil, Dag Retsö, Dirk Riemann, Christian Rohr, Werner Siegfried, Johan Söderberg, and Jean-Laurent Spring, "The Year-Long Unprecedented European Heat and Drought of 1540 – A Worst Case," Climatic Change 125, no. 3-4 (2014): 349–363.

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- ⁷ Pribram, Materialien zur Geschichte, 364-366.
- Since after September 7 the next date mentioned in the accounts was September 10: it is not sure whether September 7 was the real start of the harvest or it was only the "Vorlese" (pre-harvest of grapevine).
- 9 See Maurer et al., "BACCHUS temperature reconstruction." D22106.
- In Kőszeg, located ca. 90 km south-southeast of Vienna, grain harvest dates are best correlated with May-July temperatures. See: Andrea Kiss, Rob S. Wilson and István Bariska, "An Experimental 392-year Documentary-based Multi Proxy (Vine and Grain) Reconstruction of May-July Temperatures for Kőszeg, West-Hungary," International Journal of Biometeorology 55, no. 4 (July 2011): 595–611.