

Climatic requirements of temperate perennials in Oman

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Introduction

In the hot and arid Sultanate of Oman, many temperate and subtropical perennial crops can only be grown in the mountain oases of Al Jabal al Akhdar. To investigate the climatic requirements of these crops, three settlements along an elevation gradient were chosen and compared for their climatic conditions and species composition.

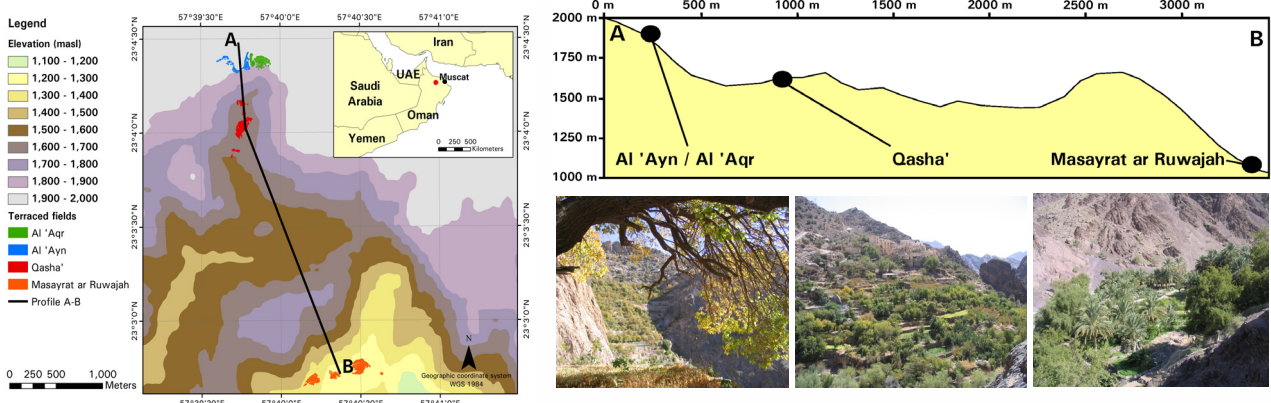


Figure 1. Location of the study sites (indicated by the red dot) in the Oman Mountains (left). The line connecting the letters A and B in the map is shown on the top right as a topographical cross-section. The photographs on the bottom right show impressions from the three studied oasis systems.

Materials and Methods

- 3 study sites (Fig. 1): Al 'Ayn / Al 'Aqr (1950 meters above sea level), Qasha' (1750 masl) and Masayrat ar Ruwajah (1050 masl)
- All fruit trees (incl. rose bushes) were recorded and classified into temperate, subtropical and tropical species
- Temperatures in the fields were measured at half-hourly intervals using Onset Hobo-Pro® climate loggers

Results

- 22 tree or shrub crop species, among which were 5 predominantly temperate, 12 subtropical and 5 tropical species (Tab. 1)
- Mean and extreme daily temperatures, as well as hours below 7° C (needed to satisfy a tree's chilling requirement), differed substantially (Fig. 2), decreasing with increasing elevation

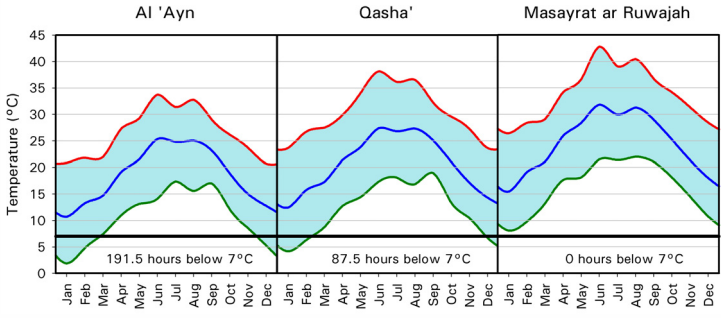


Figure 2. Minimum, average, and maximum temperatures and hours below 7° C in the oases (Apr 2005 to Apr 2006).

Discussion and Conclusions

- Temperate species were common at high elevation, and absent at the lowest oasis, where tropical species were more frequent (Fig. 3)
- The most likely reason is the number of chilling hours, which is only sufficient for temperate crops in the higher oases
- Without fulfilling their chilling requirement (e.g. ~100 hours for pomegranates, ~400 for apples), trees do not develop acceptable yields
- In the season of 2005/06, the warmest year since (at least) 1979, the climatic limit of pomegranates lay between Qasha' and Al 'Ayn
- The cultivation of temperate and many subtropical species in Oman (Fig. 4) might be threatened by global warming.

Acknowledgements

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Table 1. Relative frequency of species found in the oases.

| Crop name | Percentage of all perennial crops of the oasis | | |
|----------------------------|--|--------|---------------------|
| | Al 'Ayn / Al 'Aqr | Qasha' | Masayrat ar Ruwajah |
| Temperate species | | | |
| Rose | 39.4 | 12.4 | 0.0 |
| Walnut | 0.8 | 2.3 | 0.0 |
| Apple | 0.9 | 0.6 | 0.0 |
| Pear | 0.5 | 0.2 | 0.0 |
| Plum | 0.5 | 0.1 | 0.1 |
| Subtropical species | | | |
| Pomegranate | 45.9 | 57.1 | 0.3 |
| Date | 0.0 | 0.2 | 65.6 |
| Peach | 4.3 | 13.1 | 2.1 |
| Lime | 2.7 | 3.4 | 8.7 |
| Grape | 1.0 | 2.2 | 2.1 |
| Sweet lime | 0.3 | 1.5 | 2.9 |
| Apricot | 1.9 | 1.6 | 0.1 |
| Fig | 0.4 | 0.7 | 1.0 |
| Sour orange | 0.1 | 0.3 | 0.0 |
| Sweet orange | 0.0 | 0.3 | 0.0 |
| Lemon | 0.1 | 0.2 | 0.0 |
| Pigeon Pea | 0.0 | 0.3 | 0.0 |
| Tropical species | | | |
| Banana | 0.0 | 3.2 | 14.8 |
| Papaya | 1.1 | 0.1 | 1.0 |
| Guava | 0.0 | 0.3 | 1.2 |
| Mango | 0.0 | 0.0 | 0.2 |
| Sapodilla | 0.0 | 0.1 | 0.0 |

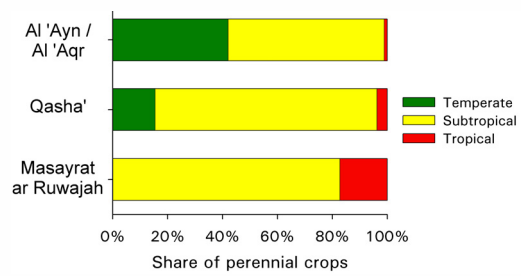


Figure 3. Shares of predominantly temperate, subtropical and tropical specimens among the total perennial crops of the three oases.



Figure 4. Pomegranate shells in a field in Al 'Aqr. The background shows the village of Qasha' and the road to Masayrat ar Ruwajah.

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