THE CLIMATOLOGY OF THE VINE (*VITIS VINIFERA* (L.) [2] A COMPARISON OF TEMPERATURE REGIMES IN THE AUSTRALIAN AND MEDITERRANEAN REGIONS

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SUMMARY

The distribution and areas of Australian viticultural locations have been illustrated on two maps and are shown to fall within the limits of 57°F (13·9°C) and 65°F (18·3°C) mean annual temperature and 8°F (4·4°C) and 15°F (8·3°C) temperature amplitude.

These temperature limits have been projected on a map of the Mediterranean region and the areas corresponding to Australian conditions indicated. These are in general concentrated round the western basin of the Mediterranean Sea.

The temperature characteristics of thirty-four European and Mediterranean stations and of thirty Australian stations have been listed and brought together on appropriate tables and diagrams. In general Mediterranean temperatures are later in phase than Australian stations.

In an earlier communication (1965) it was shown that the cool limits of the cultivation of the grape vine (*Vitis vinifera* L.) in Western Europe were determined by mean monthly temperatures of the warmest monthly period of 65·6° F. (18·7° C.) provided that this was associated with a period of six months during which the mean monthly temperature exceeded 10° C. The isotherm for this warmest monthly period was projected on a map of south-eastern Australia and it was shown that this was in general agreement with Australian experience with the cultivation of *Vitis vinifera*.

Temperature conditions in Australia, however, are such that for useful comparisons, the warmer climates of the Mediterranean region must be taken into account. This is further emphasised by the ready success in Australia of such wine-making procedures as the production of fortified sweet wines, corresponding to the styles of wines of the Douro Valley of Portugal and the *vins doux naturels* of southern France, of *vinos de Jerez* produced in Spain and the Marsala wines of Sicily. This is further exemplified by the production of dried grapes originally characteristic of the Aegean area of Greece and Turkey.

In the maps of Figs. 1 and 2 are shown the important areas under vines in south-eastern and south-western Australia and on these maps are projected the isotherms of the mean annual temperatures for 57° F. and 65° F. and of annual temperature amplitude of 8° F. and 15° F. based on wave-form analysis of the mean monthly temperatures. The annual mean isotherms are adapted from the Climatological Atlas of Australia and the amplitude curves from Prescott (1942).

It will be seen that for south-eastern Australia the viticultural areas fall within these limits which correspond approximately to 65° F. (18·3° C.) and 80° F. (26·7° C.) for the warmest months over the full range of conditions possible within these limits.

The localities in the Mediterranean region with similar temperature limits are illustrated in Fig. 3. In this case the isotherms are adapted from Prescott and Lane-Poole (1947). It will be noted that the areas corresponding to similar ones

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in Australia are primary in Portugal, eastern Spain, Morocco, northern Algeria, Tunis and Palestine, together with coastal regions of southern France, Italy, Yugoslavia and Greece and the islands of Sardinia, Corsica and Sicily. The island of Cyprus is too much under continental influences to come within the temperature limits adopted except for very small areas.

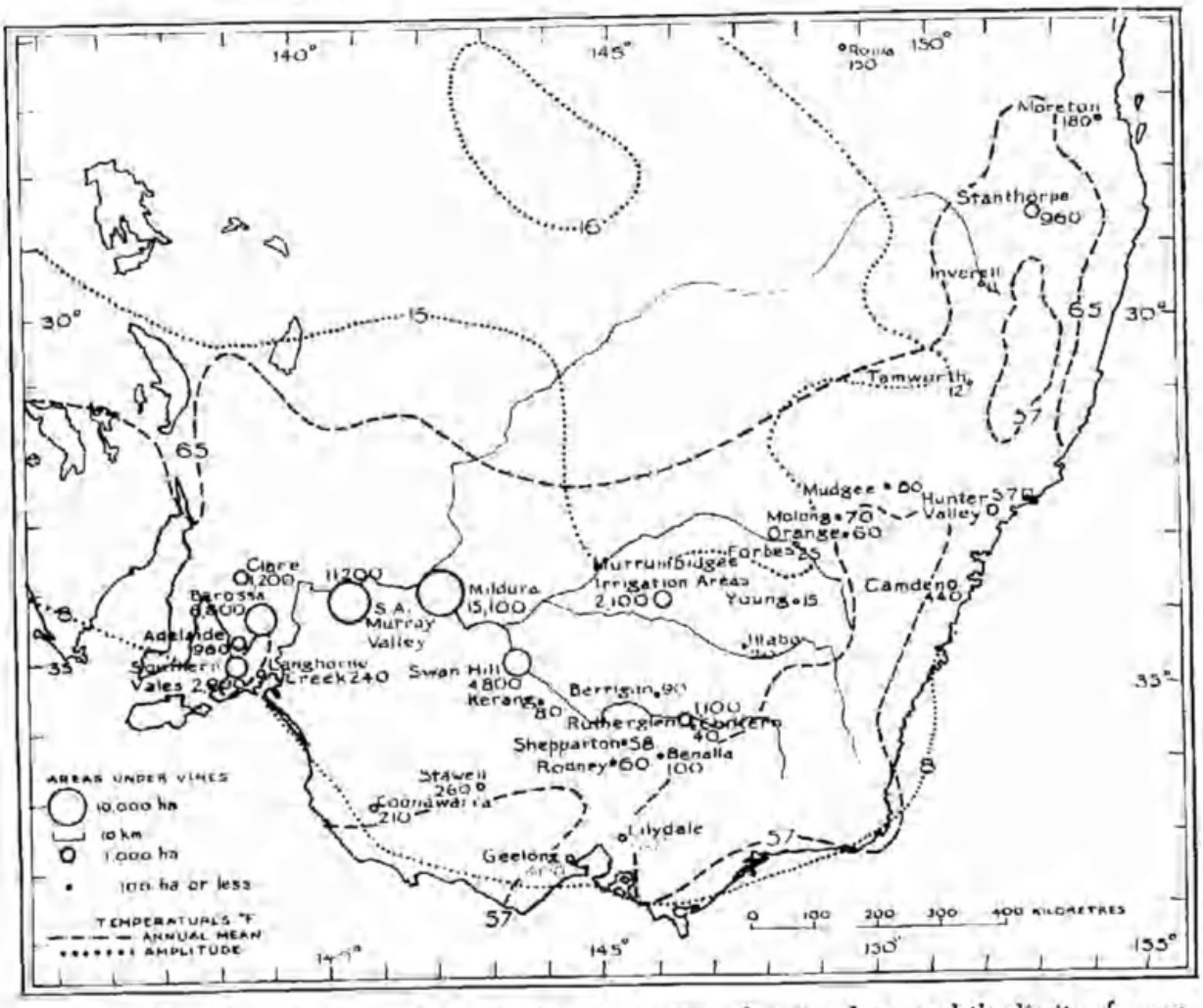

Fig. 1. Map of south-eastern Australia showing areas under viticulture and the limits of mean annual temperatures between 57° F. and 65° F. and amplitudes 8° F. and 15° F. The areas given are substantially correct for the year 1960 except for the two areas of Geelong and Lilydale, no longer functioning, but included for historical reasons.

In order to bring out more particularly the closer parallels between Australian and Mediterranean stations, the temperature characteristics of annual mean and amplitude have been plotted against each other in the diagram of Fig. 4. In this method of presentation the temperature of the warmest month can be indicated by a diagonal line where the sums of the means and amplitudes have a constant value. It will be seen that within the temperature limits adopted, Australian and Mediterranean stations can be readily compared. The stations represented in the preparation of this diagram are listed in Tables 1a and 1b. This table provides a key to the abbreviations used in Fig. 4 and gives latitudes and longitudes and the temperature phase for each station, 64 stations in all. It is noteworthy that this phase value, expressed as lag in days behind solar radiation, is in general much higher for Mediterranean stations than for those in Australia.

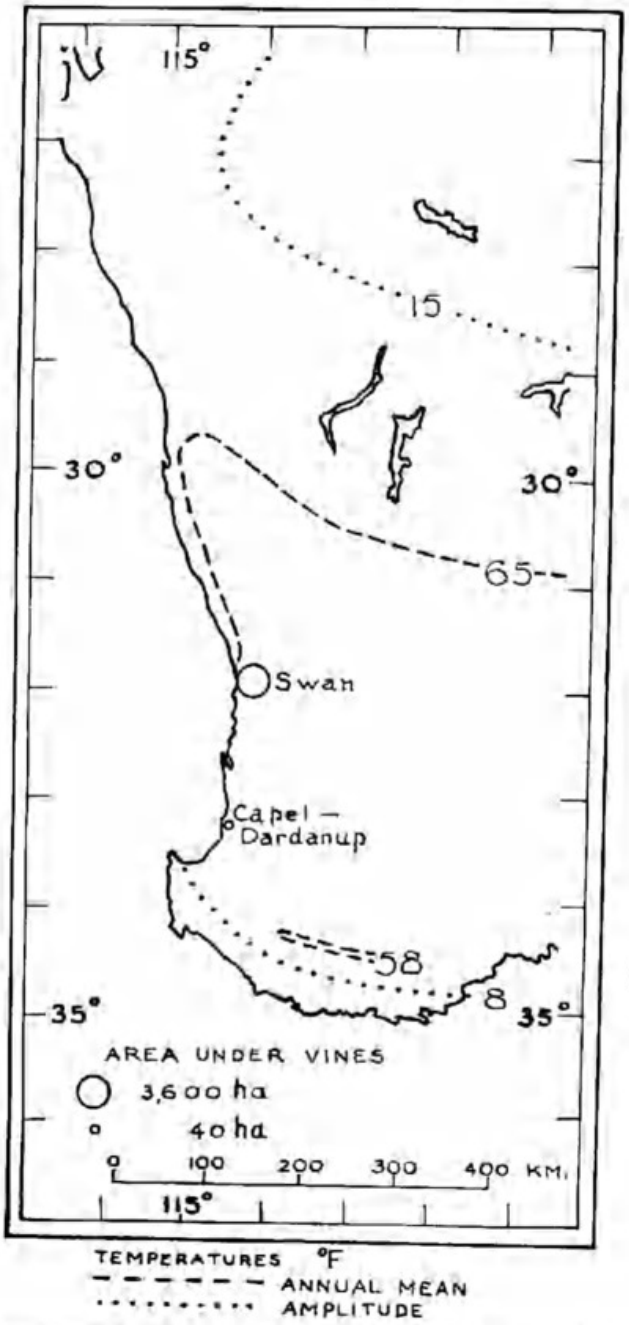

Fig. 2. (*Left*) Map of south-western Australia showing areas under viticulture and the limits of mean annual temperatures between 58° F. and 65° F. and of amplitudes 8° F. and 15° F.

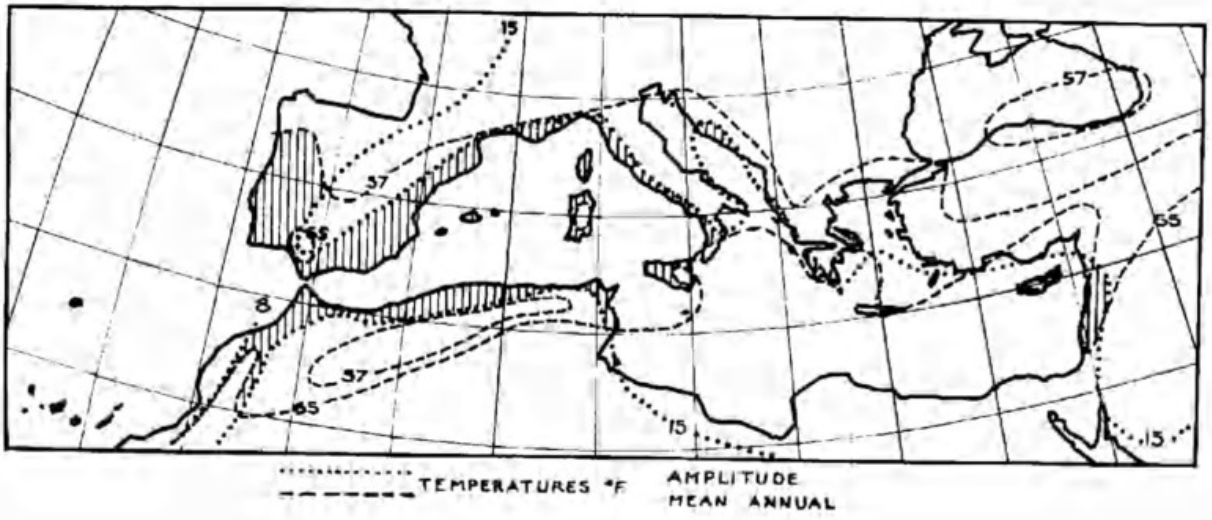

Fig. 3. (*Below*) Map of the Mediterranean region on which have been projected the isotherms of 57° F. (13·9° C.) and 65° F. (18·3 C.) mean annual temperatures and 8° F. (4·4° C.) and 15° F. (8·3° C.) annual amplitudes. Locations which fall within these limits are shaded and have in consequence the temperature conditions prevailing within the zones of Australian viticulture.

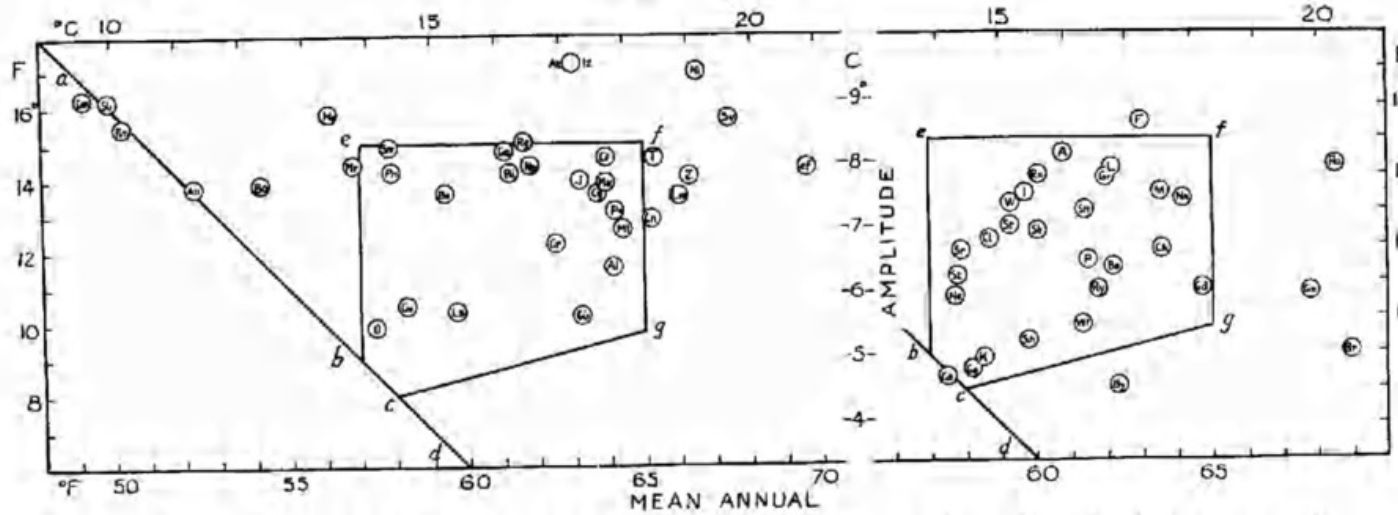

Fig. 4. Diagram illustrating the temperature characteristics (mean and amplitude) of stations in the Me terranean (left) and Australia (right) regions. The line a.b.c.d. corresponds to a warmest mon of 66° F. (18·9° C.). The area defined by e.f.g.c.b. corresponds to the temperature limits of Australian viticultural experience. The key to the abbreviations is given in Tables 1a and 1b. A f European stations near the cool limit of viticulture are included.

TABLE 1a

Information regarding European and Mediterranean stations used in the preparation of Fig. 4

Symbol	Locality	Latitude °N	Longitude °	Lag of temperature behind solar radiation days
Al	Algiers	37·1	3·1 E	47
An	Angers	47·4	0·6 W	29
At	Athens	38·0	23·7 E	39
Ba	Barcelona	41·4	2·2 E	37
Bi	Bari	41·2	16·9 E	43
Bo	Bordeaux	44·9	0·6 W	32
Cg	Cagliari	39·2	9·1 E	43
Cn	Candia	35·3	25·1 E	43
Cr	Cartagena	37·6	0·9 W	42
Cm	Coimbra	40·3	8·4 W	35
Cf	Corfu	39·5	19·9 E	43
eF	El Fayum	29·3	30·9 E	34
Gm	Geisenheim	50·0	8·0 E	26
Ga	Genoa	44·4	8·9 E	40
Gb	Gibraltar	36·2	5·3 W	39
Iz	Izmir	38·4	27·2 E	39
J	Jerusalem	31·8	35·2 E	43
Lm	Limassol	34·6	33·0 E	49
Ls	Lisbon	38·7	9·1 W	39
Ml	Malta	35·8	14·5 E	52
Mr	Marseilles	43·3	5·4 E	33
Mo	Montpellier	43·6	3·9 E	32
Mu	Murcia	38·0	1·1 W	37
Np	Naples	40·8	14·2 E	41
Ni	Nicosia	35·2	33·3 E	40
O	Oporto	41·2	8·6 W	36
Po	Palermo	38·2	13·3 E	43
Pn	Perpignan	42·7	2·9 E	33
Rg	Ragusa	42·6	18·1 E	41
Rm	Reims	49·3	4·0 E	28
Sm	Samsun	41·3	36·4 E	49
Sv	Seville	37·4	6·0 W	35
Sb	Strasbourg	48·6	4·9 E	29
T	Taormina	37·8	15·3 E	42
Z	Zakinthos	37·8	20·9 E	45

TABLE 1b

Information regarding Australian stations used in the preparation of Fig. 4

Symbol	Locality	Latitude °S	Longitude °E	Lag of temperature behind solar radiation at the limits of the atmosphere days
A	Albury	36·1	147·0	27
Be	Berri	34·3	140·6	24
Br	Brisbane	27·5	153·0	27
By	Bunbury	33·3	115·6	41
Ck	Cessnock	32·9	151·4	26
Cl	Clare	33·8	138·6	29
Ca	Coonawarra	37·3	140·9	31
F	Forbes	33·5	148·1	26
Gn	Gatton	27·6	152·3	23
Gg	Geelong	38·1	144·4	34
Gr	Griffith	34·3	146·1	26
Gd	Guildford	31·9	116·0	40
I	Inverell	29·8	151·2	27
K	Kew	37·8	145·0	32
L	Leeton	34·5	146·4	27
M	Mildura	34·2	142·2	25
Nm	Northam	31·7	116·6	35
Na	Nuriootpa	34·5	139·1	31
P	Picton	34·2	150·6	26
Ra	Roma	26·5	148·7	21
Ry	Roseworthy	34·1	138·7	32
Rn	Rutherglen	36·0	146·5	29
Sr	Seymour	37·0	145·1	30
Sh	Shepparton	36·4	145·4	29
St	Stanthorpe	28·6	151·9	24
Sl	Stawell	37·0	142·8	31
Sn	Strathalbyn	35·3	138·9	32
SH	Swan Hill	35·4	143·6	28
WI	Waite Institute	35·0	138·6	33
W	Wangaratta	36·3	146·3	29

To illustrate this point comparisons are made in Fig. 5 between two pairs of Australian and Mediterranean stations, namely Leeton is compared with Naples and Mildura with Cagliari. The differences in phase are clearly indicated in the curves which are based on values calculated from the wave-form characteristics. For a further comparison the curve for Mildura is shown with that of Izmir in Turkey. The annual mean is much the same in each case, but Izmir is already more continental with a much higher amplitude than Mildura. This higher amplitude, together with a late phase leads to higher and later summer temperatures which are of importance to the dried vine-fruit industry.

Station	Temperature characteristics mean ° F.	amplitude ° F.	phase lag behind radiation days
Leeton	62·2	14·2	27
Naples	61·8	14·4	41
Mildura	63·5	13·5	25
Cagliari	63·7	13·6	43
Izmir	63·0	17·2	39

The vertical lines ss correspond to the longest day.

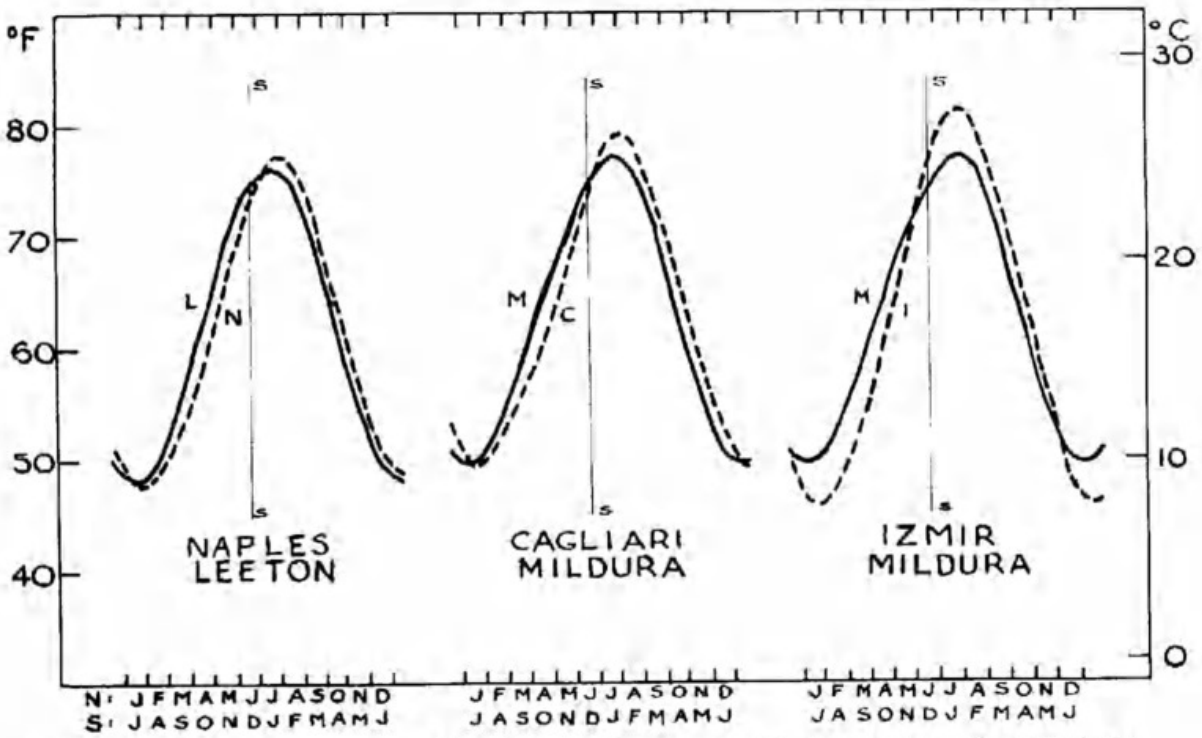

Fig. 5. Temperature curves of stations having comparable temperature characteristics.

ACKNOWLEDGEMENT

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