THE UK GERMINATION TOOLBOX - USING THE TOOLBOX

Some hints and tips for using the toolbox and interpreting data output.

Data Entry

The input screen asks for the species name and collection details. While the **names accepted by PLANTATT are preferred**, an attempt has been made to convert synonyms; e.g. for Bluebell, entering both *Hyacinthoides non-scripta* and *Endymion non-scriptus* returns the same information. **'Genus' is** the only **mandatory** field.

Wildcards using '*' are accepted for both Genus and Species; but must be preceded by at least three characters; *e.g.*, 'rho' is valid, 'r' is not.

Searches are all inclusive; so that, if both a genus and a species are entered, only results for that species in that genus are returned.

At present, latitude and longitude must be entered as **decimal degrees**, taking care to include a negative sign for locations in the western hemisphere. If longitude is entered, then latitude is also required. For many users this will not be the most convenient format. However, it is quite straightforward to locate the collection site on 'Google Earth' (or 'Google Maps') or 'Streetmap', for example; from which the coordinates in decimal degrees can be copied. 'Streetmap', for example has the added advantage that users can search for locations by UK Postcode and Ordnance Survey Grid Reference. Future versions may include in-built facilities to convert from other formats.

A pull down list is provided for month of collection (dispersal), if entered.

Output & Interpretation

If the name entered is not recognised as a UK native species, an error message is returned; e.g., attempting to enter '*Triticum aestivum*', results in 'value you submitted is not an accepted name of a UK Native Species'. Please check the spelling or try using a wildcard.'

Otherwise, a summary page is returned first. If MSB germination test information is available, then this shows a link to the species name. Where only Genus is entered, there will be a list of species within the genus, for which MSB test data are available.

If latitude and longitude have been entered, the summary page will also display a Google Earth map of the locality, so users can confirm that they have entered the coordinates correctly.

Clicking any of the species names on the summary screen will link to the full page for that species, containing up to three sections:

1. A list of all successful germination conditions applied to MSB collections. Please note that more than one successful treatment may be displayed for an individual collection. Where possible, the sources of UK collections are given to the level of county, to help distinguish seeds collected from different localities. For collections of species that are native to, but not collected in the UK, the source will be given to the level of country, wherever possible.

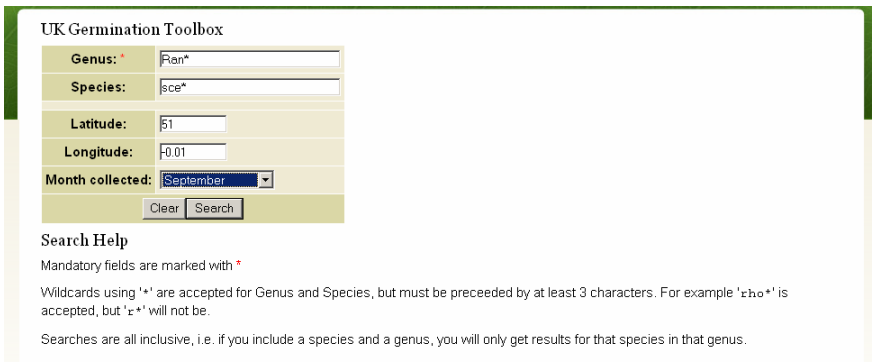
2. If available, a summary of information from the published literature. At present, this refers mainly to Baskin and Baskin (1998); and users should consult that work for full bibliographic citations. A full citation is given where information has been abstracted from publications appearing since that compilation and its update to 2001.

3. If valid coordinates have been entered, a table of interpolated monthly mean maximum, minimum and median temperatures are displayed; with the month of collection (if entered) in bold.

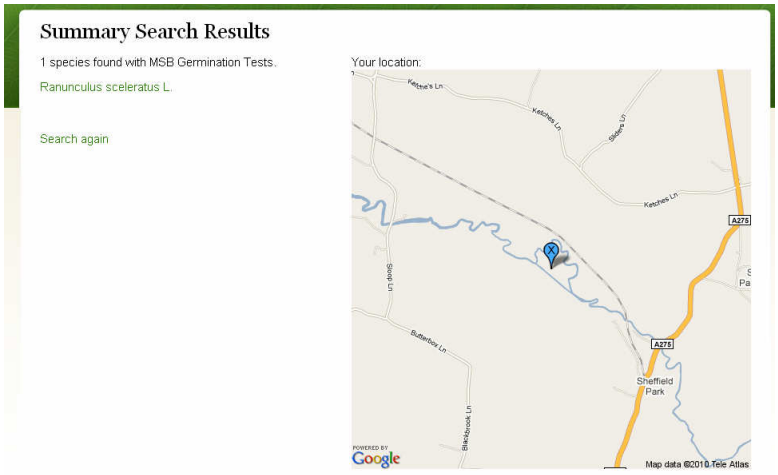
The following screenshots of examples are intended to help with use and interpretation of the output from the database.

The first example shows a fictitious collection of *Ranunculus sceleratus* L. collected near Sheffield Park, East Sussex [51 (N), -0.01 (W)], in September.

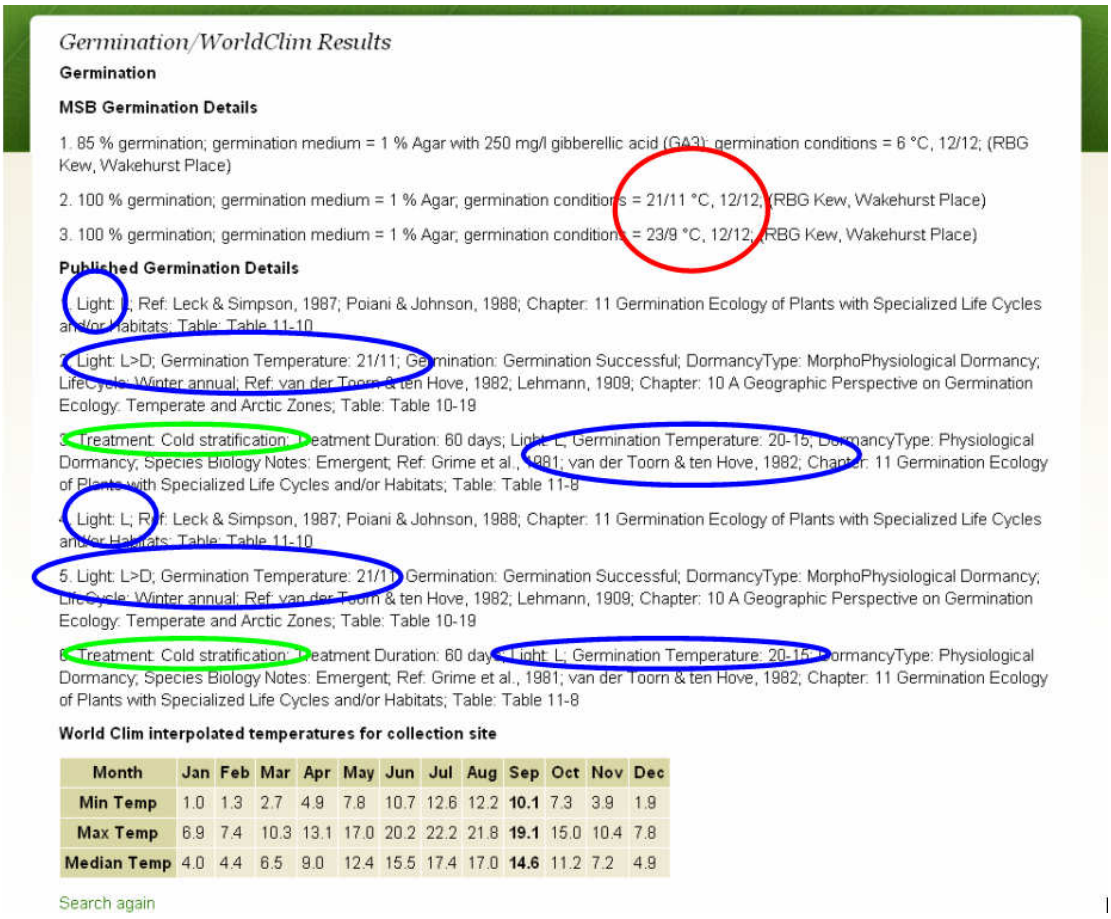
The input fields look like this, using wildcards for the name:



Pressing ‘Search’ returns the summary output:



This shows that there is information from at least one successful germination test on this species from the MSB collection: and the map confirms the locality. Clicking the link from the species name returns the detailed information:



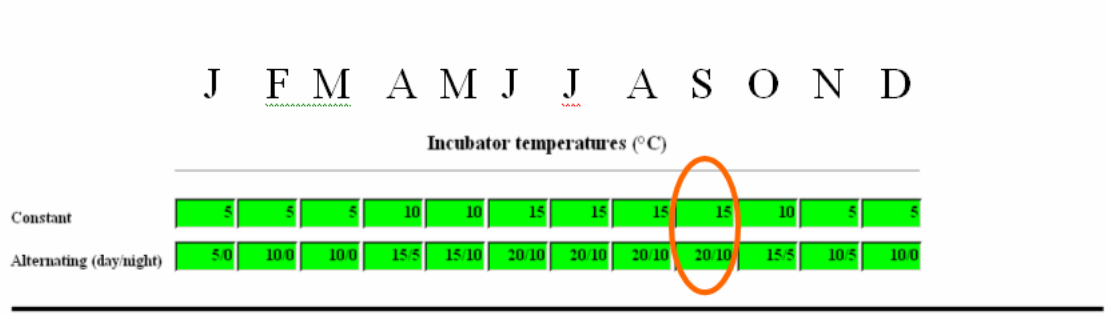
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Min Temp	1.0	1.3	2.7	4.9	7.8	10.7	12.6	12.2	**10.1**	7.3	3.9	1.9
Max Temp	6.9	7.4	10.3	13.1	17.0	20.2	22.2	21.8	**19.1**	15.0	10.4	7.8
Median Temp	4.0	4.4	6.5	9.0	12.4	15.5	17.4	17.0	**14.6**	11.2	7.2	4.9

The MSB test results, especially items 2. and 3., show high germination in response in light to fluctuating temperatures with a relatively high diurnal amplitude [21ºC day (light), 11ºC night (dark); or, 23ºC day (light), 9ºC night (dark) – see red outlines

above. Although Item 1. shows an accepted germination test result, it is not as high as the other two, possibly as a result of being carried out at a lower, constant temperature. As it also involves application of Gibberellic Acid (GA_3) as germination promoter, these test conditions are not recommended to users, at least in the first instance.

For this species there is also information abstracted from published work, and this is summarised next. The salient points are outlined in blue; confirming the positive effect of light and alternating temperatures. Outlined in green are indications of a positive response to a period of chilling or cold stratification. Although the MSB tests above show full germination without stratification, ECOFLORA shows an absolute requirement for it in this species. Users should remember that conditions giving high percentage germination can vary among seed-lots of a species. In some cases, dormancy may be removed or imposed during storage, leading to differences between fresh and stored seeds. MSB test are on stored seeds. Within a species, dormancy levels may vary among seed-lots, depending on year and/or site of collection.

On the table of interpolated temperatures for the site of collection, those for the month of collection are shown in bold type. This would allow users to plan an appropriate sequence of artificial environments to be applied immediately following harvest, to promote germination. Assuming availability of a series of constant and fluctuating temperature incubators, as an example they could be set at the temperatures shown in the table below, where the month of collection (September) is outlined in orange.



The second example is of a fictitious collection of *Pimpinella saxifraga* L. collected on the South Downs near Brighton.

Germination/WorldClim Results

Germination

MSB Germination Details

1. 95 % germination; pre-sowing treatments = imbibed on 1% agar for 56 days at 06 ºC; germination medium = 1 % Agar; germination conditions = 23/9 °C, 12/12; (RBG Kew, Wakehurst Place)

2. 86 % germination; pre-sowing treatments = imbibed on 1% agar for 42 days at 06 ºC; germination medium = 1 % Agar; germination conditions = 26 °C, 12/12; (RBG Kew, Wakehurst Place)

World Clim interpolated temperatures for collection site

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Min Temp	0.7	1.0	2.2	4.5	7.5	10.4	12.1	11.9	**9.7**	7.1	3.7	1.6
Max Temp	6.6	7.1	9.9	12.7	16.5	19.8	21.6	21.3	**18.6**	14.7	10.1	7.5
Median Temp	3.7	4.1	6.1	8.6	12.0	15.1	16.9	16.6	**14.2**	10.9	6.9	4.6

Search again

The output shows MSB test results giving high percentage germination following stratification (chilling) at for six or seven weeks, characteristic of many temperate Apiaceae. However, it is possible that not all viable seeds had germinated in those tests. The interpolated median monthly temperatures from 'WorldClim' indicate that a much longer period at 5-6ºC (up to four months, or 120 days, or longer) following dispersal may be necessary before full germination would occur in rising temperatures in the Spring. Recent experience at the MSB, with some temperate Apiaceae and other families, has shown that longer stratification periods are very effective at completely removing dormancy in this way. Indeed, complete germination sometimes occurs at the low temperature over such durations, without the need to transfer seeds to warmer conditions.