Comparing seed dormancy patterns of 22 annual tropical weeds

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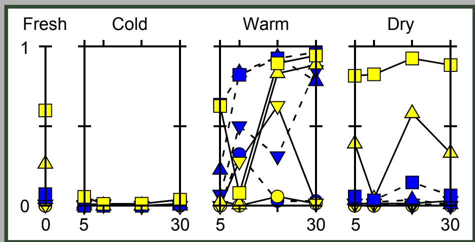
Introduction

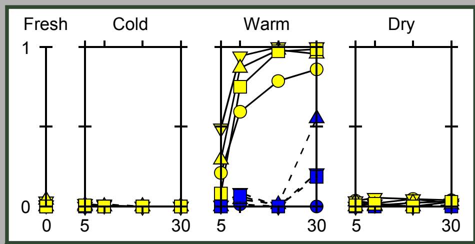
Seed dormancy pattern is an important species attribute involved in determination of germination. Knowledge of changes of degree of dormancy, in combination with knowledge of germination preferences, can help in understanding emergence timing in different climates, and in predicting potential distribution ranges. We investigated 22 annual weedy species common on arable land in eastern Ethiopia; most of them were non-native.

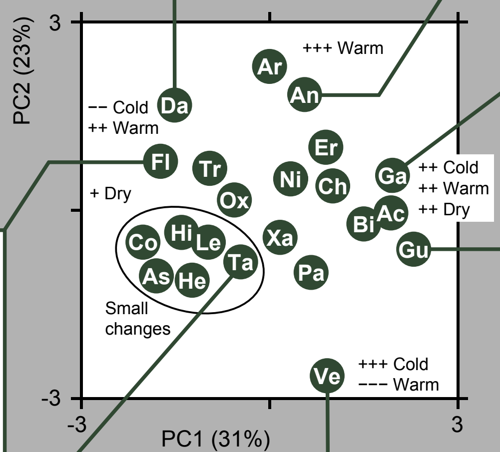
Methods

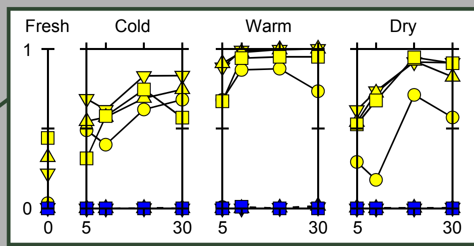
Seeds were subjected to three different pre-treatments: cold (5°C) or warm (23°C) incubation, or dry storage. Germination was tested (4 wks) in different environments when fresh and after different time periods of pre-treatment. The differences between germination of fresh seeds and germination after pre-treatments were used in principal component analysis.

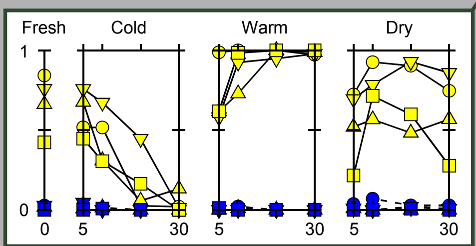
Code	Species
Ac	*Acanthospermum hispidum* (Asteraceae)
An	*Anagallis arvensis* (Primulaceae)
Ar	*Argemone ochroleuca* (Papaveraceae)
As	*Asystasia schimperi* (Acanthaceae)
Bi	*Bidens pilosa* (Asteraceae)
Ch	*Chenopodium procerum* (Chenopodiaceae)
Co	*Conyza bonariensis* (Asteraceae)
Da	*Datura stramonium* (Solanaceae)
Er	*Erucastrum arabicum* (Brassicaceae)
Fl	*Flaveria trinervia* (Asteraceae)
Ga	*Galinsoga parviflora* (Asteraceae)
Gu	*Guizotia scabra* (Asteraceae)
He	*Heliotropium zeylanicum* (Boraginaceae)
Hi	*Hibiscus trionum* (Malvaceae)
Le	*Leucas martinicensis* (Lamiaceae)
Ni	*Nicandra physalodes* (Solanaceae)
Ox	*Oxygonum sinuatum* (Polygonaceae)
Pa	*Parthenium hysterophorus* (Asteraceae)
Ta	*Tagetes minuta* (Asteraceae)
Tr	*Trichodesma zeylanicum* (Boraginaceae)
Ve	*Verbesina encelioides* (Asteraceae)
Xa	*Xanthium strumarium* (Asteraceae)

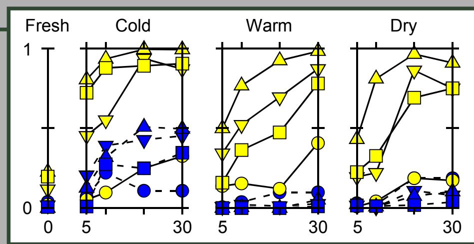


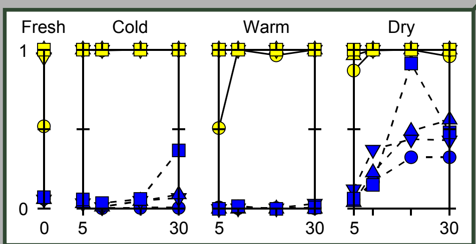


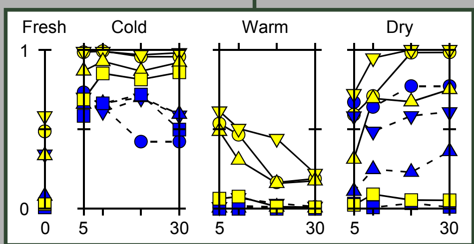


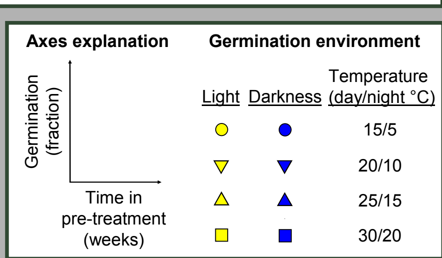












Results

Five different dormancy patterns could be distinguished: 1) positive response to only warm pre-treatment, 2) positive response to all three pre-treatments, 3) positive to warm and negative to cold, 4) negative to warm and positive to cold, and 5) little response and that mostly to dry storage.

Seven species (An, Ar, Hi, Le, Ni, Pa and Tr) did not germinate, or germinated very little, when fresh, and could therefore not show a negative response to pre-treatment.

Discussion

Despite the fact that these species co-occur in different combinations, their responses to environmental events preceding germination tests varied substantially. For example, *Verbesina encelioides* responded positively to cold pre-treatment, but negatively to warm, while the opposite was true for *Flaveria trinervia* and *Datura stramonium*. In the area for collection, the emergence pattern is similar for these three species, which can be explained by an annually occurring dry period after dispersal.

It is noteworthy that so many species, occurring as tropical weeds, responded positively to a cold pre-treatment. Such a dormancy pattern may allow some of the species to increase their geographical distribution into cold temperate climates.

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