**Appendices to the paper**

Cruz-Tejada, D.M. et al. Macroclimatic convergence and habitat specialization shape the Mediterranean seed germination syndrome

**Table S1.** EUNIS habitats (Chytrý et al., 2020) included in the dataset with germination data and their attribution to the groups used in the analyses (Lowland *Mediterranean* and local *habitat-specialists*).

**Table S2.** Summary of phylogenetic mixed models with Bayesian estimation (MCMCglmms) examining interactive effect of experimental cues and the species group (*Mediterranean* or local *habitat-specialists*) on final seed germination proportion across the full dataset. Fixed and random effects (±95% CI) are presented. Significant effects are in bold. On average, models were the results of 4000 samples.

**Table S3.** Summary of phylogenetic mixed models with Bayesian estimation (MCMCglmms) examining interactive effect of experimental cues and the species group (*Mediterranean* or local *habitat-specialists*) on final seed germination proportion across the angiosperm clades. Fixed and random effects (±95% CI) are presented. Significant effects are in bold. On average, models were the results of 4000 samples.

**Figure S1.** (a) Dataset composition by clade grouped by number of species, seed lots, and germination tests. The numbers inside the bars indicate the total quantities for each category. (b) Phylogenetic tree at family level showing the number of species, germination experiments (test number) and *Mediterranean* species proportion (Med. Species proportion) per family included in the dataset.

**Figure S2.** Dataset contents: number and percentage of records for each experimental cue. The numbers correspond to the quantity of germination experiments included in the dataset for each experimental cue. In parenthesis there is the corresponded percentage. Not all experimental cues are exclusive.

**Figure S3.** Effect of the experimental cues on final germination proportions according to the MCMC meta-analysis of primary data across each major angiosperm clade. Dots indicate the posterior mean of the effect size, and whiskers its 95% credible interval. The line of zero effect is shown. When the credible intervals overlap with the zero-effect line, the effect is not significant. The figure shows the effect of experimental cue on seed germination in *Mediterranean* lowland species (orange), in local *habitat-specialists* pants (turkish blue) and the main effect (dark). The dark green point indicates the interactive effect of seed mass. A negative effect indicates that the response to the experimental cue (e.g. temperature) decreases when the mean temperature (environmental cue) is high.

**Figure S4.** Visualization of the seed germination niche of the Mediterranean plants through a Multiple Factor Analysis (MFA) coloured by major clade. Each dot is a species. Solid arrows correspond to loadings of the seed germination experimental conditions used to construct the ordination. Dashed arrows correspond to supplementary variables, not used to construct the ordination.

**R codes.** Codes for the analyses used in the manuscript.

**Table S1.** EUNIS habitats (Chytrý et al., 2020) included in the dataset with germination data and their attribution to the groups used in the analyses (Lowland *Mediterranean* and local *habitat-specialists*).

| EUNIS habitat level 3 | Groups | MacroHabitat |
|---|---|---|
| Acidophilous Quercus forest | *habitat-specialists* | forest |
| Alkaline, calcareous, carbonate-rich small-sedge spring fen | *habitat-specialists* | wetlands |
| Alnus cordata forest | *habitat-specialists* | forest |
| Alnus glutinosa-Alnus incana forest on riparian and mineral soils | *habitat-specialists* | forest |
| Alpine and subalpine calcareous grassland of the Balkans and Apennines | *habitat-specialists* | grassland |
| Alpine and subalpine ericoid heath | *habitat-specialists* | schrubland |
| Alpine and subalpine Juniperus scrub | *habitat-specialists* | schrubland |
| Annual anthropogenic herbaceous vegetation | *habitat-specialists* | Man-made |
| Arable land with unmixed crops grown by low-intensity agricultural methods | *habitat-specialists* | Man-made |
| Aralo-Caspian semi-desert | *habitat-specialists* | schrubland |
| Arctic-alpine calcareous grassland | *habitat-specialists* | grassland |
| Arctic-alpine rich fen | *habitat-specialists* | wetlands |
| Atlantic and Baltic broad-leaved coastal dune forest | *habitat-specialists* | coastal |
| Atlantic and Baltic coastal dune grassland (grey dune) | *habitat-specialists* | coastal |
| Atlantic and Baltic coastal dune scrub | *habitat-specialists* | coastal |
| Atlantic and Baltic coastal Empetrum heath | *habitat-specialists* | coastal |
| Atlantic and Baltic moist and wet dune slack | *habitat-specialists* | coastal |
| Atlantic and Baltic rocky sea cliff and shore | *habitat-specialists* | coastal |
| Atlantic and Baltic shifting coastal dune | *habitat-specialists* | coastal |
| Atlantic and Baltic soft sea cliff | *habitat-specialists* | coastal |
| Atlantic coastal Calluna and Ulex heath | *habitat-specialists* | coastal |
| Atlantic, Baltic and Arctic coastal shingle beach | *habitat-specialists* | coastal |
| Atlantic, Baltic and Arctic sand beach | *habitat-specialists* | coastal |
| Azorean open, dry, acid to neutral grassland | *habitat-specialists* | grassland |
| Balkan-Anatolian submontane genistoid scrub | *habitat-specialists* | schrubland |
| Balkan and Anatolian oromediterranean dry grassland | *habitat-specialists* | grassland |
| Baltic coniferous coastal dune forest | *habitat-specialists* | coastal |
| Bare tilled, fallow or recently abandoned arable land | *habitat-specialists* | Man-made |
| Black Sea broad-leaved coastal dune forest | *habitat-specialists* | coastal |
| Black Sea coastal dune grassland (grey dune) | *habitat-specialists* | coastal |
| Blanket bog | *habitat-specialists* | wetlands |
| Boreal and Arctic acidophilous alpine grassland | *habitat-specialists* | grassland |
| Broadleaved deciduous plantation of non site-native trees | *habitat-specialists* | forest |
| Broadleaved evergreen plantation of non site-native trees | *habitat-specialists* | forest |
| Broadleaved mire forest on acid peat | *habitat-specialists* | forest |
| Broadleaved swamp forest on non-acid peat | *habitat-specialists* | forest |
| Calcareous quaking mire | *habitat-specialists* | wetlands |
| Canarian xerophytic scrub | *habitat-specialists* | schrubland |
| Carpathian travertine fen with halophytes | *habitat-specialists* | wetlands |
| Carpinus and Quercus mesic deciduous forest | *habitat-specialists* | forest |
| Central Mediterranean mountain hedgehog-heath | *habitat-specialists* | schrubland |
| Coniferous plantation of non site-native trees | *habitat-specialists* | forest |
| Continental dry grassland (true steppe) | *habitat-specialists* | grassland |
| Continental dry rocky steppic grassland and dwarf scrub on chalk outcrops | *habitat-specialists* | grassland |

| | | |
|---|---|---|
| Continental inland salt steppe | *habitat-specialists* | grassland |
| Continental subsaline alluvial pasture and meadow | *habitat-specialists* | grassland |
| Corylus avellana scrub | *habitat-specialists* | schrubland |
| Cryptogam- and annual-dominated vegetation on calcareous and ultramafic rock outcrops | *habitat-specialists* | grassland |
| Cryptogam- and annual-dominated vegetation on siliceous rock outcrops | *habitat-specialists* | grassland |
| Cyrno-Sardean oromediterranean siliceous dry grassland | *habitat-specialists* | grassland |
| Dark taiga | *habitat-specialists* | forest |
| Desert steppe | *habitat-specialists* | grassland |
| Dry heath | *habitat-specialists* | schrubland |
| Dry Mediterranean land with unpalatable non-vernal herbaceous vegetation | *lowland Mediterranean* | Man-made |
| Dry perennial anthropogenic herbaceous vegetation | *habitat-specialists* | Man-made |
| Dry steppic submediterranean pasture of the Amphi-Adriatic region | *habitat-specialists* | grassland |
| Eastern garrigue | *lowland Mediterranean* | schrubland |
| Eastern Mediterranean mountain hedgehog-heath | *habitat-specialists* | schrubland |
| Eastern Mediterranean spiny heath (phrygana) | *lowland Mediterranean* | schrubland |
| Extremely rich moss-sedge fen | *habitat-specialists* | wetlands |
| Fagus forest on acid soils | *habitat-specialists* | forest |
| Fagus forest on non-acid soils | *habitat-specialists* | forest |
| Forest fringe of acidic nutrient-poor soils | *habitat-specialists* | grassland |
| Heavy-metal dry grassland of the Balkans | *habitat-specialists* | grassland |
| Heavy-metal grassland in Western and Central Europe | *habitat-specialists* | grassland |
| Herbaceous forest clearing vegetation | *habitat-specialists* | grassland |
| Iberian oromediterranean basiphilous dry grassland | *habitat-specialists* | grassland |
| Iberian oromediterranean siliceous dry grassland | *habitat-specialists* | grassland |
| Iberian summer pasture (vallicar) | *habitat-specialists* | grassland |
| Ilex aquifolium forest | *habitat-specialists* | forest |
| Inland saline or brackish helophyte bed | *habitat-specialists* | wetlands |
| Inland sanddrift and dune with siliceous grassland | *habitat-specialists* | grassland |
| Intensive unmixed crops | *habitat-specialists* | Man-made |
| Intermediate fen and soft-water spring mire | *habitat-specialists* | wetlands |
| Inundated or inundatable cropland, including rice fields | *habitat-specialists* | Man-made |
| Larix light taiga | *habitat-specialists* | forest |
| Low and medium altitude hay meadow | *habitat-specialists* | grassland |
| Low steppic scrub | *habitat-specialists* | schrubland |
| Lowland moist or wet tall-herb and fern fringe | *habitat-specialists* | grassland |
| Lowland to montane temperate and submediterranean genistoid scrub | *habitat-specialists* | schrubland |
| Lowland to montane temperate and submediterranean Juniperus scrub | *habitat-specialists* | schrubland |
| Lowland to montane, dry to mesic grassland usually dominated by Nardus stricta | *habitat-specialists* | grassland |
| Macaronesian coastal dune scrub | *habitat-specialists* | coastal |
| Macaronesian garrigue | *habitat-specialists* | schrubland |
| Macaronesian heath | *habitat-specialists* | schrubland |
| Macaronesian heathy forest | *habitat-specialists* | forest |
| Macaronesian Juniperus forest | *habitat-specialists* | forest |
| Macaronesian laurophyllous forest | *habitat-specialists* | forest |
| Macaronesian rocky sea cliff and shore | *habitat-specialists* | coastal |
| Macaronesian thermophilous forest fringe | *habitat-specialists* | grassland |
| Madeiran oromediterranean siliceous dry grassland | *habitat-specialists* | grassland |

| | | |
|---|---|---|
| Madeiran xerophytic scrub | *habitat-specialists* | schrubland |
| Mainland laurophyllous forest | *habitat-specialists* | forest |
| Mediterranean and Balkan subalpine Pinus heldreichii-Pinus peuce forest | *habitat-specialists* | forest |
| Mediterranean and Black Sea coastal dune scrub | *habitat-specialists* | coastal |
| Mediterranean and Black Sea coastal shingle beach | *habitat-specialists* | coastal |
| Mediterranean and Black Sea moist and wet dune slack | *habitat-specialists* | coastal |
| Mediterranean and Black Sea rocky sea cliff and shore | *habitat-specialists* | coastal |
| Mediterranean and Black Sea sand beach | *habitat-specialists* | coastal |
| Mediterranean and Black Sea soft sea cliff | *habitat-specialists* | coastal |
| Mediterranean and Macaronesian coastal dune grassland (grey dune) | *habitat-specialists* | coastal |
| Mediterranean and Macaronesian riparian forest | *habitat-specialists* | forest |
| Mediterranean annual-rich dry grassland | *lowland Mediterranean* | grassland |
| Mediterranean closely grazed dry grassland | *lowland Mediterranean* | grassland |
| Mediterranean coniferous coastal dune forest | *habitat-specialists* | coastal |
| Mediterranean Cupressaceae forest | *lowland Mediterranean* | forest |
| Mediterranean evergreen Quercus forest | *lowland Mediterranean* | forest |
| Mediterranean gypsum scrub | *lowland Mediterranean* | schrubland |
| Mediterranean halo-nitrophilous scrub | *lowland Mediterranean* | schrubland |
| Mediterranean inland salt steppe | *lowland Mediterranean* | grassland |
| Mediterranean lowland to submontane Pinus forest | *habitat-specialists* | forest |
| Mediterranean maquis and arborescent matorral | *lowland Mediterranean* | schrubland |
| Mediterranean montane Cedrus forest | *habitat-specialists* | forest |
| Mediterranean montane Pinus sylvestris-Pinus nigra forest | *habitat-specialists* | forest |
| Mediterranean mountain Abies forest | *habitat-specialists* | forest |
| Mediterranean riparian scrub | *habitat-specialists* | schrubland |
| Mediterranean short moist grassland of lowlands | *lowland Mediterranean* | grassland |
| Mediterranean short moist grassland of mountains | *habitat-specialists* | grassland |
| Mediterranean subnitrophilous annual grassland | *lowland Mediterranean* | Man-made |
| Mediterranean tall humid inland grassland | *lowland Mediterranean* | grassland |
| Mediterranean tall perennial dry grassland | *lowland Mediterranean* | grassland |
| Mediterranean thermophilous deciduous forest | *lowland Mediterranean* | forest |
| Mediterranean to Atlantic open, dry, acid and neutral grassland | *habitat-specialists* | grassland |
| Mediterranean, Macaronesian and Black Sea shifting coastal dune | *habitat-specialists* | coastal |
| Mesic perennial anthropogenic herbaceous vegetation | *habitat-specialists* | Man-made |
| Mesic permanent pasture of lowlands and mountains | *habitat-specialists* | grassland |
| Mixed crops of market gardens and horticulture | *habitat-specialists* | Man-made |
| Moist or wet mesotrophic to eutrophic hay meadow | *habitat-specialists* | grassland |
| Moist or wet mesotrophic to eutrophic pasture | *habitat-specialists* | grassland |
| Montane to subalpine moist or wet tall-herb and fern fringe | *habitat-specialists* | grassland |
| Moss and lichen tundra | *habitat-specialists* | schrubland |
| Mountain hay meadow | *habitat-specialists* | grassland |
| Non-calcareous quaking mire | *habitat-specialists* | wetlands |
| Oceanic to subcontinental inland sand grassland on dry acid and neutral soils | *habitat-specialists* | grassland |
| Oceanic valley mire | *habitat-specialists* | wetlands |
| Olea europaea-Ceratonia siliqua forest | *lowland Mediterranean* | forest |
| Open Iberian supramediterranean dry acid and neutral grassland | *habitat-specialists* | grassland |
| Pannonian and Pontic sandy steppe | *habitat-specialists* | grassland |

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|---|---|---|
| Perennial rocky calcareous grassland of subatlantic-submediterranean Europe | *habitat-specialists* | grassland |
| Perennial rocky grassland of Central and South-Eastern Europe | *habitat-specialists* | grassland |
| Perennial rocky grassland of the Italian Peninsula | *habitat-specialists* | grassland |
| Phoenix canariensis vegetation | *habitat-specialists* | forest |
| Phoenix theophrasti vegetation | *habitat-specialists* | forest |
| Picea mire forest | *habitat-specialists* | forest |
| Pinus and Larix mire forest | *habitat-specialists* | forest |
| Pinus canariensis forest | *habitat-specialists* | forest |
| Pinus sylvestris light taiga | *habitat-specialists* | forest |
| Poor fen | *habitat-specialists* | wetlands |
| Pteridium aquilinum vegetation | *habitat-specialists* | grassland |
| Raised bog | *habitat-specialists* | wetlands |
| Ravine forest | *habitat-specialists* | forest |
| Relict mire of Mediterranean mountains | *habitat-specialists* | wetlands |
| Salix fen scrub | *habitat-specialists* | schrubland |
| Semi-desert riparian scrub | *habitat-specialists* | schrubland |
| Semi-desert salt pan | *habitat-specialists* | grassland |
| Semi-desert sand dune with sparse scrub | *habitat-specialists* | schrubland |
| Semi-dry perennial calcareous grassland (meadow steppe) | *habitat-specialists* | grassland |
| Shrub tundra | *habitat-specialists* | schrubland |
| Small-helophyte bed | *habitat-specialists* | wetlands |
| Snow-bed vegetation | *habitat-specialists* | grassland |
| Southern European mountain Betula and Populus tremula forest on mineral soils | *habitat-specialists* | forest |
| Spartium junceum scrub | *habitat-specialists* | schrubland |
| Subalpine and subarctic deciduous scrub | *habitat-specialists* | schrubland |
| Subalpine genistoid scrub of the Amphi-Adriatic region | *habitat-specialists* | schrubland |
| Subalpine Pinus mugo scrub | *habitat-specialists* | schrubland |
| Subarctic and alpine dwarf Salix scrub | *habitat-specialists* | schrubland |
| Submediterranean moist meadow | *habitat-specialists* | grassland |
| Submediterranean pseudomaquis | *habitat-specialists* | schrubland |
| Tall-helophyte bed | *habitat-specialists* | wetlands |
| Tall-sedge base-rich fen | *habitat-specialists* | wetlands |
| Tall-sedge bed | *habitat-specialists* | wetlands |
| Taxus baccata forest | *habitat-specialists* | forest |
| Temperate acidophilous alpine grassland | *habitat-specialists* | grassland |
| Temperate and boreal moist or wet oligotrophic grassland | *habitat-specialists* | grassland |
| Temperate and boreal mountain Betula and Populus tremula forest on mineral soils | *habitat-specialists* | forest |
| Temperate and submediterranean montane Pinus sylvestris-Pinus nigra forest | *habitat-specialists* | forest |
| Temperate and submediterranean thermophilous deciduous forest | *habitat-specialists* | forest |
| Temperate and submediterranean thorn scrub | *habitat-specialists* | schrubland |
| Temperate continental Pinus sylvestris forest | *habitat-specialists* | forest |
| Temperate forest clearing scrub | *habitat-specialists* | schrubland |
| Temperate hardwood riparian forest | *habitat-specialists* | forest |
| Temperate inland salt marsh | *habitat-specialists* | grassland |
| Temperate mountain Abies forest | *habitat-specialists* | forest |
| Temperate mountain Picea forest | *habitat-specialists* | forest |
| Temperate riparian scrub | *habitat-specialists* | schrubland |

| | | |
|---|---|---|
| Temperate Rubus scrub | *habitat-specialists* | schrubland |
| Temperate Salix and Populus riparian forest | *habitat-specialists* | forest |
| Temperate subalpine Larix, Pinus cembra and Pinus uncinata forest | *habitat-specialists* | forest |
| Thermomediterranean arid scrub | *lowland Mediterranean* | schrubland |
| Thermophilous forest fringe of base-rich soils | *habitat-specialists* | grassland |
| Trampled mesophilous grassland with annuals | *habitat-specialists* | Man-made |
| Trampled xeric grassland with annuals | *habitat-specialists* | Man-made |
| Western acidophilous garrigue | *habitat-specialists* | schrubland |
| Western basiphilous garrigue | *habitat-specialists* | schrubland |
| Western Mediterranean mountain hedgehog-heath | *habitat-specialists* | schrubland |
| Western Mediterranean spiny heath | *lowland Mediterranean* | schrubland |
| Wet heath | *habitat-specialists* | schrubland |

**Table S2.** Summary of phylogenetic mixed models with Bayesian estimation (MCMCglmms) examining interactive effect of experimental cues and the species group (lowland *Mediterranean* or local *habitat-specialists*) on final seed germination proportion across the full dataset. Fixed and random effects (±95% CI) are presented. Significant effects are in bold. On average, models were the results of 4000 samples.

| Model | Fixed effects | | | Random effects | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Post.mean | pMCMC | CI.95 | Phylogeny | Species | Id test | doi | Seedlot | Substrate |
| **Temperature** | | | | | | | | | |
| Main effect | 0.156 | 0 | (0.105;0.205) | 2.27(1.214;3.448) | 1.086(0.7;1.501) | 3.142(2.658;3.57) | 2.545(1.791;3.346) | 1.456(1.252;1.677) | 0.227(0;0.907) |
| *Mediterranean* | -0.16 | 0 | (-0.211;-0.11) | | | | | | |
| *Habitat-specialists* | 0.16 | 0 | (0.109;0.208) | 2.272(1.186;3.503) | 1.099(0.717;1.508) | 3.142(2.649;3.558) | 2.556(1.834;3.368) | 1.457(1.251;1.678) | 0.281(0;1.065) |
| Seed mass | -0.08 | 0 | (-0.104;-0.056) | 2.298(1.197;3.459) | 1.105(0.714;1.532) | 3.167(2.699;3.581) | 2.457(1.739;3.235) | 1.438(1.224;1.659) | 0.286(0;0.98) |
| **Alternating** | | | | | | | | | |
| Main effect | 0.31 | 0 | (0.231;0.386) | 2.424(1.281;3.717) | 1.107(0.69;1.51) | 3.118(2.632;3.571) | 2.664(1.835;3.429) | 1.464(1.261;1.677) | 0.21(0;0.847) |
| *Mediterranean* | -0.068 | 0.052 | (-0.135;0.001) | | | | | | |
| *Habitat-specialists* | 0.069 | 0.045 | (0.004;0.142) | 2.401(1.28;3.685) | 1.112(0.733;1.535) | 3.128(2.668;3.565) | 2.652(1.84;3.441) | 1.468(1.258;1.686) | 0.293(0;1.102) |
| Seed mass | -0.006 | 0.769 | (-0.044;0.028) | 2.264(1.18;3.435) | 1.101(0.721;1.533) | 3.197(2.724;3.615) | 2.481(1.782;3.291) | 1.429(1.216;1.643) | 0.332(0;1.159) |
| **Light** | | | | | | | | | |
| Main effect | 0.304 | 0 | (0.226;0.379) | 2.182(1.138;3.416) | 1.106(0.71;1.517) | 3.167(2.703;3.613) | 2.54(1.775;3.365) | 1.487(1.271;1.706) | 0.27(0;1.029) |
| *Mediterranean* | -0.088 | 0.016 | (-0.156;-0.018) | | | | | | |
| *Habitat-specialists* | 0.088 | 0.018 | (0.019;0.16) | 2.158(1.076;3.286) | 1.103(0.704;1.506) | 3.164(2.714;3.592) | 2.561(1.739;3.368) | 1.49(1.277;1.713) | 0.391(0;1.534) |
| Seed mass | -0.088 | 0 | (-0.123;-0.053) | 2.26(1.205;3.531) | 1.128(0.731;1.54) | 3.2(2.747;3.638) | 2.438(1.692;3.298) | 1.479(1.269;1.698) | 0.207(0;0.831) |
| **Cold str** | | | | | | | | | |
| Main effect | 0.299 | 0 | (0.236;0.37) | 2.502(1.323;3.831) | 1.198(0.799;1.655) | 3.082(2.639;3.534) | 2.677(1.904;3.538) | 1.485(1.267;1.697) | 0.35(0;1.09) |
| *Mediterranean* | -0.202 | 0 | (-0.265;-0.134) | | | | | | |
| *Habitat-specialists* | 0.202 | 0 | (0.138;0.267) | 2.529(1.36;3.917) | 1.191(0.77;1.636) | 3.083(2.649;3.505) | 2.694(1.91;3.533) | 1.48(1.278;1.695) | 0.329(0;0.975) |
| Seed mass | 0.087 | 0 | (0.057;0.117) | 2.463(1.311;3.843) | 1.084(0.676;1.485) | 3.158(2.68;3.587) | 2.669(1.893;3.478) | 1.456(1.237;1.659) | 0.306(0;1.169) |
| **Warm str** | | | | | | | | | |
| Main effect | -0.112 | 0 | (-0.175;-0.047) | 2.161(1.092;3.291) | 1.09(0.722;1.503) | 3.032(2.537;3.446) | 2.47(1.769;3.234) | 1.46(1.244;1.669) | 0.404(0;1.329) |
| *Mediterranean* | 0.459 | 0 | (0.393;0.529) | | | | | | |
| *Habitat-specialists* | -0.459 | 0 | (-0.523;-0.389) | 2.099(1.088;3.183) | 1.106(0.73;1.522) | 3.03(2.559;3.461) | 2.462(1.682;3.2) | 1.458(1.261;1.673) | 0.331(0;1.406) |
| Seed mass | 0.005 | 0.786 | (-0.028;0.038) | 2.231(1.209;3.448) | 1.097(0.679;1.472) | 3.188(2.699;3.615) | 2.476(1.761;3.254) | 1.43(1.236;1.663) | 0.28(0;1.046) |
| **Scarification** | | | | | | | | | |
| Main effect | 0.693 | 0 | (0.585;0.795) | 2.369(1.207;3.596) | 1.202(0.797;1.627) | 2.983(2.515;3.434) | 2.657(1.902;3.456) | 1.442(1.23;1.643) | 0.222(0;0.872) |
| *Mediterranean* | 0.115 | 0.013 | (0.022;0.204) | | | | | | |
| *Habitat-specialists* | -0.114 | 0.011 | (-0.202;-0.022) | 2.372(1.187;3.608) | 1.209(0.77;1.629) | 2.986(2.523;3.386) | 2.618(1.88;3.412) | 1.441(1.236;1.65) | 0.231(0;0.755) |
| Seed mass | 0.166 | 0 | (0.128;0.207) | 2.499(1.401;3.851) | 1.089(0.69;1.496) | 3.117(2.655;3.578) | 2.575(1.818;3.349) | 1.471(1.257;1.686) | 0.219(0;0.865) |
| **Fire** | | | | | | | | | |
| Main effect | 0.15 | 0.002 | (0.054;0.253) | 2.253(1.154;3.375) | 1.094(0.697;1.481) | 3.161(2.674;3.584) | 2.617(1.908;3.498) | 1.439(1.234;1.657) | 0.253(0;0.944) |
| *Mediterranean* | 0.003 | 0.935 | (-0.087;0.09) | | | | | | |
| *Habitat-specialists* | -0.003 | 0.965 | (-0.09;0.089) | 2.274(1.166;3.463) | 1.081(0.712;1.522) | 3.158(2.681;3.607) | 2.593(1.864;3.445) | 1.439(1.234;1.662) | 0.23(0;0.817) |
| Seed mass | -0.064 | 0.001 | (-0.102;-0.027) | 2.208(1.072;3.315) | 1.088(0.697;1.486) | 3.185(2.732;3.615) | 2.447(1.75;3.255) | 1.425(1.219;1.636) | 0.231(0;0.913) |

**Table S3.** Summary of phylogenetic mixed models with Bayesian estimation (MCMCglmms) examining interactive effect of experimental cues and the species group (lowland *Mediterranean* or local *habitat-specialists*) on final seed germination proportion across the angiosperm clades. Fixed and random effects (±95% CI) are presented. Significant effects are in bold. On average, models were the results of 4000 samples.

| Model | Fixed effects | | | Random effects | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Post.mean | pMCMC | CI.95 | Phylogeny | Species | Id test | doi | Seedlot | Substrate |
| **MONOCOTS** | | | | | | | | | |
| **Temperature** | | | | | | | | | |
| Main effect | 0.401 | 0 | (0.324;0.485) | 3.346(0.948;6.677) | 1.051(0.479;1.697) | 1.396(0.895;1.909) | 2.259(1.012;3.64) | 1.227(0.935;1.517) | 1.496(0;5.765) |
| *Mediterranean* | 0.069 | 0.097 | (-0.015;0.149) | | | | | | |
| *Habitat-specialists* | -0.067 | 0.106 | (-0.147;0.013) | 3.244(0.91;6.461) | 1.064(0.468;1.706) | 1.396(0.866;1.852) | 2.264(1.015;3.646) | 1.223(0.942;1.526) | 1.545(0;6.241) |
| Seed mass | -0.168 | 0 | (-0.228;-0.101) | 3.129(0.604;6.044) | 1.172(0.571;1.846) | 1.47(0.951;1.934) | 2.311(1.115;3.645) | 1.178(0.912;1.479) | 1.473(0;6.142) |
| **Alternating** | | | | | | | | | |
| Main effect | 0.13 | 0.036 | (0.006;0.248) | 3.171(0.749;6.076) | 1.128(0.549;1.787) | 1.498(0.983;1.952) | 2.234(1.004;3.541) | 1.189(0.892;1.471) | 1.683(0;5.999) |
| *Mediterranean* | 0.01 | 0.877 | (-0.096;0.117) | | | | | | |
| *Habitat-specialists* | -0.01 | 0.856 | (-0.117;0.103) | 3.188(0.907;6.237) | 1.118(0.527;1.773) | 1.517(1.038;1.984) | 2.197(1.018;3.493) | 1.19(0.916;1.487) | 1.775(0;5.509) |
| Seed mass | -0.178 | 0 | (-0.247;-0.111) | 2.913(0.574;5.809) | 1.181(0.573;1.862) | 1.472(0.946;1.923) | 1.955(0.88;3.223) | 1.2(0.911;1.496) | 1.614(0;5.962) |
| **Light** | | | | | | | | | |
| Main effect | 0.114 | 0.013 | (0.025;0.208) | 2.859(0.479;5.567) | 1.105(0.518;1.723) | 1.49(0.99;1.996) | 2.32(1.115;3.814) | 1.192(0.907;1.48) | 1.861(0;7.371) |
| *Mediterranean* | 0.029 | 0.546 | (-0.063;0.123) | | | | | | |
| *Habitat-specialists* | -0.031 | 0.504 | (-0.123;0.061) | 2.746(0.631;5.4) | 1.114(0.581;1.805) | 1.497(0.955;1.943) | 2.286(1.01;3.679) | 1.193(0.905;1.483) | 1.783(0;6.469) |
| Seed mass | -0.1 | 0 | (-0.151;-0.054) | 2.993(0.725;5.833) | 1.097(0.539;1.769) | 1.496(0.972;1.961) | 2.306(1.053;3.767) | 1.166(0.886;1.453) | 2.113(0;8.243) |
| **Cold str** | | | | | | | | | |
| Main effect | 0.173 | 0.01 | (0.039;0.305) | 3.168(0.593;5.922) | 1.168(0.553;1.842) | 1.494(0.965;1.928) | 2.385(1.064;3.807) | 1.176(0.895;1.458) | 2.395(0;7.558) |
| *Mediterranean* | -0.023 | 0.717 | (-0.145;0.103) | | | | | | |
| *Habitat-specialists* | 0.025 | 0.708 | (-0.1;0.152) | 3.166(0.782;6.145) | 1.147(0.559;1.83) | 1.479(0.936;1.95) | 2.35(1.103;3.74) | 1.181(0.918;1.482) | 1.657(0;6.502) |
| Seed mass | -0.092 | 0.02 | (-0.166;-0.015) | 3.11(0.762;6.061) | 1.079(0.473;1.715) | 1.519(0.983;1.994) | 2.166(1.036;3.612) | 1.139(0.871;1.429) | 1.784(0;6.426) |
| **Warm str** | | | | | | | | | |
| Main effect | -0.112 | 0.092 | (-0.241;0.02) | 2.993(0.67;5.89) | 1.085(0.499;1.71) | 1.536(1.047;2.022) | 2.205(1.052;3.564) | 1.174(0.859;1.447) | 1.924(0;6.411) |
| *Mediterranean* | -0.015 | 0.827 | (-0.142;0.118) | | | | | | |
| *Habitat-specialists* | 0.015 | 0.831 | (-0.112;0.146) | 2.993(0.586;5.786) | 1.088(0.539;1.735) | 1.519(0.997;2) | 2.208(1.01;3.527) | 1.17(0.89;1.457) | 1.864(0;6.702) |
| Seed mass | -0.086 | 0.038 | (-0.171;-0.009) | 2.893(0.635;5.72) | 1.082(0.504;1.688) | 1.523(1.024;2.007) | 2.184(1.033;3.469) | 1.157(0.893;1.461) | 1.595(0;5.938) |
| **Scarification** | | | | | | | | | |
| Main effect | 0.034 | 0.472 | (-0.053;0.13) | 3.164(0.766;6.11) | 1.145(0.559;1.84) | 1.518(0.997;1.982) | 2.178(1.073;3.586) | 1.168(0.903;1.49) | 1.795(0;6.936) |
| *Mediterranean* | -0.053 | 0.252 | (-0.143;0.043) | | | | | | |
| *Habitat-specialists* | 0.055 | 0.233 | (-0.036;0.145) | 3.198(0.73;6.17) | 1.144(0.573;1.833) | 1.512(1.015;2.005) | 2.173(1.008;3.44) | 1.173(0.898;1.47) | 1.801(0;6.36) |
| Seed mass | -0.089 | 0.004 | (-0.146;-0.029) | 2.967(0.671;5.732) | 1.066(0.475;1.68) | 1.522(1.008;1.995) | 2.208(1.018;3.548) | 1.155(0.883;1.455) | 2.077(0;6.855) |
| **Fire** | | | | | | | | | |
| Main effect | 2.009 | 0.314 | (-1.91;6.038) | 2.962(0.639;5.806) | 1.132(0.558;1.786) | 1.524(1.009;2.002) | 2.264(1.014;3.612) | 1.165(0.886;1.47) | 1.654(0;5.864) |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Mediterranean* | -2.118 | 0.297 | (-6.269;1.859) | | | | | | |
| *Habitat-specialists* | 2.135 | 0.293 | (-1.794;6.286) | 2.91(0.743;5.909) | 1.13(0.514;1.756) | 1.525(1.013;1.998) | 2.234(1.097;3.666) | 1.161(0.875;1.461) | 1.833(0;6.807) |
| Seed mass | -0.038 | 0.126 | (-0.088;0.014) | 2.993(0.66;5.739) | 1.118(0.541;1.789) | 1.53(0.989;1.953) | 2.187(1.004;3.464) | 1.161(0.896;1.46) | 1.77(0;6.14) |
| **ROSIDS** | | | | | | | | | |
| **Temperature** | | | | | | | | | |
| Main effect | -0.146 | 0 | (-0.227;-0.055) | 2.937(0.707;5.515) | 0.938(0;1.812) | 3.284(2.773;3.775) | 2.772(1.723;3.91) | 0.878(0.575;1.154) | 1.007(0;3.909) |
| *Mediterranean* | -0.093 | 0.032 | (-0.182;-0.013) | | | | | | |
| *Habitat-specialists* | 0.092 | 0.028 | (0.01;0.176) | 3.01(0.823;5.831) | 0.925(0;1.815) | 3.279(2.727;3.782) | 2.797(1.682;3.911) | 0.878(0.608;1.19) | 1.224(0;4.394) |
| Seed mass | -0.069 | 0 | (-0.101;-0.04) | 3.04(0.776;5.663) | 0.941(0;1.832) | 3.263(2.754;3.805) | 2.692(1.623;3.779) | 0.874(0.603;1.172) | 1.43(0;5.467) |
| **Alternating** | | | | | | | | | |
| Main effect | 0.22 | 0 | (0.091;0.342) | 2.825(0.673;5.369) | 0.971(0.034;1.855) | 3.254(2.706;3.742) | 2.998(1.98;4.268) | 0.878(0.604;1.19) | 0.938(0;3.459) |
| *Mediterranean* | -0.2 | 0 | (-0.307;-0.084) | | | | | | |
| *Habitat-specialists* | 0.2 | 0 | (0.093;0.316) | 2.993(0.858;5.702) | 0.912(0;1.774) | 3.243(2.709;3.747) | 3.007(1.922;4.265) | 0.891(0.597;1.189) | 1.121(0;3.834) |
| Seed mass | 0.037 | 0.099 | (-0.006;0.083) | 2.958(0.799;5.608) | 0.94(0;1.83) | 3.288(2.759;3.778) | 2.889(1.787;4.03) | 0.879(0.612;1.195) | 1.099(0;4.113) |
| **Light** | | | | | | | | | |
| Main effect | 0.115 | 0.014 | (0.024;0.207) | 2.797(0.646;5.558) | 1.096(0.517;1.728) | 1.495(0.992;1.972) | 2.363(1.044;3.74) | 1.195(0.905;1.479) | 1.658(0;7.022) |
| *Mediterranean* | 0.029 | 0.533 | (-0.06;0.125) | | | | | | |
| *Habitat-specialists* | -0.03 | 0.527 | (-0.118;0.063) | 2.822(0.652;5.747) | 1.106(0.547;1.767) | 1.488(0.952;1.95) | 2.349(1.112;3.796) | 1.194(0.91;1.491) | 2.132(0;6.776) |
| Seed mass | -0.1 | 0 | (-0.146;-0.052) | 3.144(0.787;6.115) | 1.08(0.501;1.711) | 1.492(1.003;2.015) | 2.303(1.161;3.759) | 1.17(0.893;1.463) | 2.164(0;8.939) |
| **Cold str** | | | | | | | | | |
| Main effect | 0.31 | 0 | (0.169;0.45) | 3.567(1.078;6.778) | 0.959(0;1.872) | 2.921(2.434;3.396) | 3.711(2.352;5.181) | 0.986(0.704;1.304) | 1.195(0;4.794) |
| *Mediterranean* | -0.458 | 0 | (-0.582;-0.322) | | | | | | |
| *Habitat-specialists* | 0.459 | 0 | (0.325;0.58) | 3.596(1.082;6.833) | 0.936(0;1.853) | 2.915(2.413;3.442) | 3.68(2.346;5.115) | 0.989(0.694;1.292) | 1.323(0;4.758) |
| Seed mass | 0.175 | 0 | (0.138;0.211) | 4.706(1.519;8.024) | 0.768(0;1.672) | 3.053(2.517;3.538) | 4.067(2.583;5.685) | 0.942(0.658;1.254) | 1.104(0;4.1) |
| **Warm str** | | | | | | | | | |
| Main effect | -0.182 | 0 | (-0.291;-0.08) | 2.727(0.692;5.343) | 0.924(0;1.779) | 3.179(2.665;3.703) | 2.805(1.718;3.957) | 0.926(0.633;1.218) | 1.648(0;5.139) |
| *Mediterranean* | 0.212 | 0 | (0.121;0.316) | | | | | | |
| *Habitat-specialists* | -0.213 | 0 | (-0.314;-0.116) | 2.736(0.651;5.375) | 0.942(0;1.81) | 3.191(2.635;3.661) | 2.855(1.815;4.048) | 0.923(0.635;1.222) | 1.666(0;5.659) |
| Seed mass | -0.103 | 0 | (-0.132;-0.074) | 2.571(0.552;4.971) | 0.882(0;1.702) | 3.22(2.712;3.718) | 2.658(1.675;3.776) | 0.923(0.628;1.225) | 1.259(0;4.644) |
| **Scarification** | | | | | | | | | |
| Main effect | 1.274 | 0 | (1.139;1.409) | 2.841(0.295;5.706) | 1.188(0.198;2.297) | 2.569(2.039;3.017) | 3.429(2.235;4.763) | 0.766(0.537;1.028) | 0.864(0;3.442) |
| *Mediterranean* | 0.068 | 0.304 | (-0.067;0.193) | | | | | | |
| *Habitat-specialists* | -0.065 | 0.327 | (-0.202;0.062) | 2.911(0.501;5.924) | 1.174(0.171;2.182) | 2.569(2.061;3.04) | 3.433(2.278;4.758) | 0.768(0.545;1.027) | 0.86(0;3.178) |
| Seed mass | 0.251 | 0 | (0.202;0.307) | 3.856(1.344;7.032) | 0.949(0;1.826) | 3.065(2.532;3.555) | 3.625(2.309;5.135) | 0.896(0.616;1.21) | 1.142(0;4.27) |
| **Fire** | | | | | | | | | |
| Main effect | 0.349 | 0 | (0.201;0.496) | 2.785(0.742;5.353) | 0.97(0;1.825) | 3.201(2.706;3.718) | 3.207(2.06;4.479) | 0.894(0.62;1.207) | 1.072(0;3.831) |
| *Mediterranean* | 0.021 | 0.767 | (-0.129;0.162) | | | | | | |
| *Habitat-specialists* | -0.02 | 0.791 | (-0.171;0.122) | 2.781(0.663;5.365) | 0.985(0;1.864) | 3.197(2.695;3.691) | 3.214(2.033;4.463) | 0.889(0.604;1.19) | 1.437(0;4.6) |
| Seed mass | -0.075 | 0.015 | (-0.133;-0.017) | 2.696(0.706;5.186) | 0.968(0;1.833) | 3.289(2.753;3.79) | 2.767(1.722;3.936) | 0.87(0.588;1.167) | 1.323(0;4.764) |

**ASTERIDS**

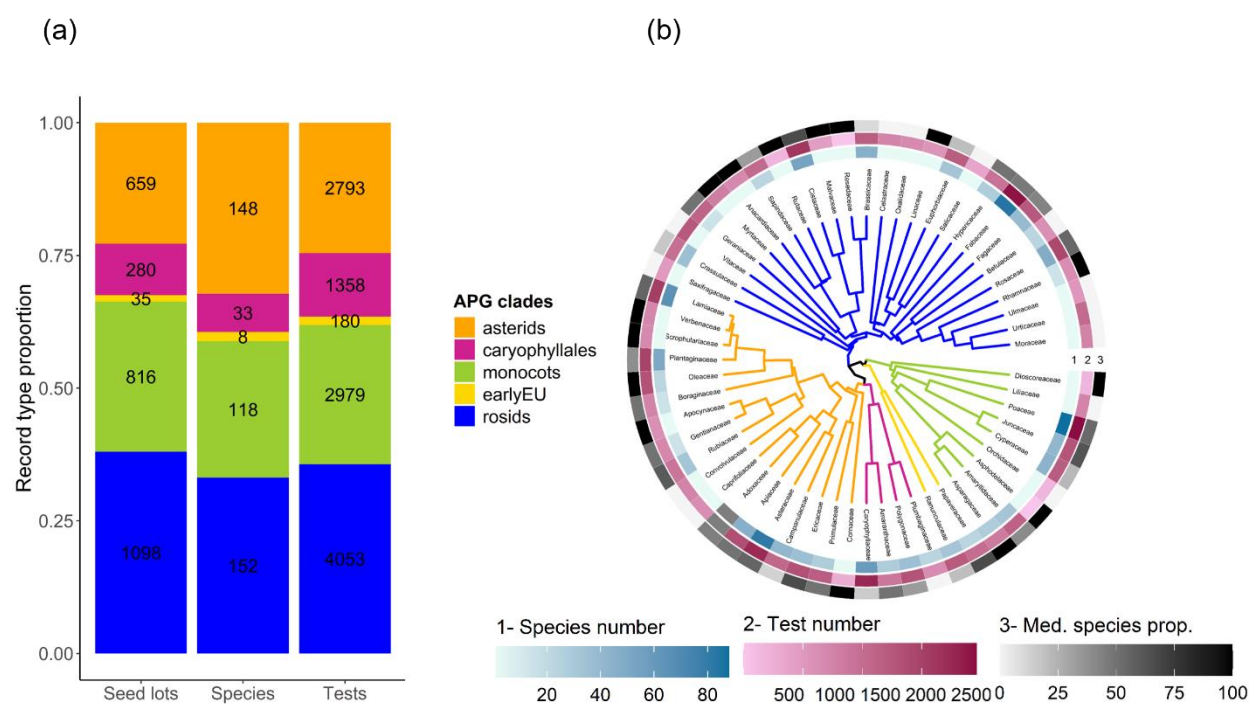| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Temperature** | | | | | | | | | |
| Main effect | 0.327 | 0 | (0.221;0.426) | 2.574(0.421;5.328) | 1.083(0.232;1.956) | 3.598(3.038;4.174) | 1.782(0.666;3.017) | 2.44(1.738;3.181) | 0.636(0;2.382) |
| *Mediterranean* | -0.392 | 0 | (-0.495;-0.289) | | | | | | |
| *Habitat-specialists* | 0.392 | 0 | (0.293;0.495) | 2.581(0.361;5.156) | 1.089(0.239;1.964) | 3.6(3.02;4.168) | 1.804(0.651;3.053) | 2.425(1.692;3.134) | 0.62(0;2.493) |
| Seed mass | -0.108 | 0 | (-0.163;-0.053) | 2.569(0.478;5.32) | 1.049(0.18;1.949) | 3.824(3.241;4.412) | 1.787(0.659;3.053) | 2.301(1.629;3.022) | 0.61(0;2.602) |
| **Alternating** | | | | | | | | | |
| Main effect | 0.656 | 0 | (0.48;0.83) | 2.483(0.194;5.097) | 1.147(0.28;2.056) | 3.682(3.09;4.279) | 2.353(0.966;3.886) | 2.448(1.707;3.139) | 0.517(0;2.198) |
| *Mediterranean* | -0.216 | 0.004 | (-0.361;-0.059) | | | | | | |
| *Habitat-specialists* | 0.214 | 0.004 | (0.066;0.367) | 2.619(0.486;5.44) | 1.133(0.285;2.037) | 3.66(3.067;4.22) | 2.309(0.978;3.725) | 2.439(1.779;3.24) | 0.665(0;2.409) |
| Seed mass | 0.028 | 0.5 | (-0.057;0.11) | 2.52(0.403;5.161) | 1.043(0.252;1.96) | 3.863(3.239;4.412) | 1.794(0.695;3.058) | 2.291(1.669;3.048) | 0.701(0;2.413) |
| **Light** | | | | | | | | | |
| Main effect | 0.647 | 0 | (0.521;0.789) | 2.503(0.44;5.202) | 1.018(0.246;1.953) | 3.518(2.979;4.101) | 1.85(0.604;3.233) | 2.64(1.877;3.376) | 0.612(0;2.525) |
| Mediterranean | -0.396 | 0 | (-0.527;-0.273) | | | | | | |
| Habitat-specialists | 0.397 | 0 | (0.267;0.527) | 2.504(0.342;5.16) | 1.039(0.201;1.958) | 3.499(2.923;4.056) | 1.852(0.569;3.168) | 2.631(1.927;3.438) | 0.645(0;2.444) |
| Seed mass | -0.163 | 0 | (-0.228;-0.102) | 2.569(0.361;5.275) | 1.106(0.233;2.086) | 3.802(3.238;4.407) | 1.577(0.572;2.747) | 2.346(1.679;3.08) | 0.62(0;2.521) |
| **Cold str** | | | | | | | | | |
| Main effect | 0.163 | 0.028 | (0.021;0.31) | 2.744(0.394;5.769) | 1.112(0.248;2.051) | 3.85(3.224;4.397) | 1.771(0.701;3.07) | 2.31(1.617;3.036) | 0.54(0;2.233) |
| *Mediterranean* | -0.12 | 0.088 | (-0.262;0.01) | | | | | | |
| *Habitat-specialists* | 0.119 | 0.085 | (-0.008;0.255) | 2.703(0.397;5.563) | 1.099(0.233;2.003) | 3.836(3.294;4.415) | 1.781(0.674;3.036) | 2.304(1.574;2.994) | 0.608(0;2.196) |
| Seed mass | -0.029 | 0.372 | (-0.093;0.034) | 2.614(0.511;5.495) | 1.045(0.301;2.002) | 3.853(3.249;4.453) | 1.761(0.661;3.024) | 2.301(1.645;2.989) | 0.569(0;2.245) |
| **Warm str** | | | | | | | | | |
| Main effect | 0.33 | 0 | (0.168;0.507) | 2.571(0.349;5.209) | 1.106(0.264;2.039) | 3.634(3.056;4.202) | 1.766(0.579;3.05) | 2.538(1.821;3.3) | 0.584(0;1.874) |
| *Mediterranean* | 0.172 | 0.024 | (0.025;0.323) | | | | | | |
| *Habitat-specialists* | -0.173 | 0.031 | (-0.334;-0.02) | 2.607(0.485;5.366) | 1.085(0.21;1.965) | 3.633(3.075;4.214) | 1.766(0.609;3.044) | 2.541(1.847;3.3) | 0.568(0;2.072) |
| Seed mass | 0.255 | 0 | (0.186;0.327) | 2.621(0.346;5.397) | 1.042(0.2;1.976) | 3.688(3.125;4.269) | 1.753(0.685;3.026) | 2.507(1.798;3.265) | 0.546(0;1.933) |
| **Scarification** | | | | | | | | | |
| Main effect | -0.182 | 0.079 | (-0.389;0.013) | 2.501(0.393;5.293) | 1.113(0.302;2.046) | 3.874(3.293;4.434) | 1.627(0.504;2.772) | 2.25(1.616;2.981) | 0.584(0;2.125) |
| *Mediterranean* | 0.112 | 0.218 | (-0.075;0.282) | | | | | | |
| *Habitat-specialists* | -0.111 | 0.228 | (-0.291;0.056) | 2.435(0.343;5.126) | 1.135(0.223;2.038) | 3.886(3.299;4.45) | 1.592(0.629;2.789) | 2.263(1.572;2.976) | 0.538(0;2.208) |
| Seed mass | 0.038 | 0.297 | (-0.037;0.11) | 2.667(0.394;5.526) | 1.021(0.186;1.924) | 3.851(3.263;4.413) | 1.673(0.576;2.878) | 2.331(1.611;3.003) | 0.555(0;2.087) |
| **Fire** | | | | | | | | | |
| Main effect | -0.163 | 0.128 | (-0.378;0.042) | 2.525(0.348;5.309) | 1.025(0.217;1.946) | 3.856(3.247;4.448) | 1.606(0.492;2.75) | 2.279(1.626;2.998) | 0.571(0;2.386) |
| *Mediterranean* | -0.091 | 0.334 | (-0.26;0.092) | | | | | | |
| *Habitat-specialists* | 0.091 | 0.317 | (-0.098;0.262) | 2.494(0.319;5.196) | 1.046(0.238;2.004) | 3.869(3.278;4.446) | 1.578(0.516;2.709) | 2.277(1.594;2.995) | 0.571(0;2.264) |
| Seed mass | -0.14 | 0.016 | (-0.249;-0.025) | 2.559(0.402;5.274) | 1.043(0.177;1.876) | 3.851(3.216;4.377) | 1.717(0.652;2.961) | 2.289(1.64;3.015) | 0.738(0;2.151) |

(a)

(b)

APG clades
- asterids
- caryophyllales
- monocots
- earlyEU
- rosids

1- Species number
2- Test number
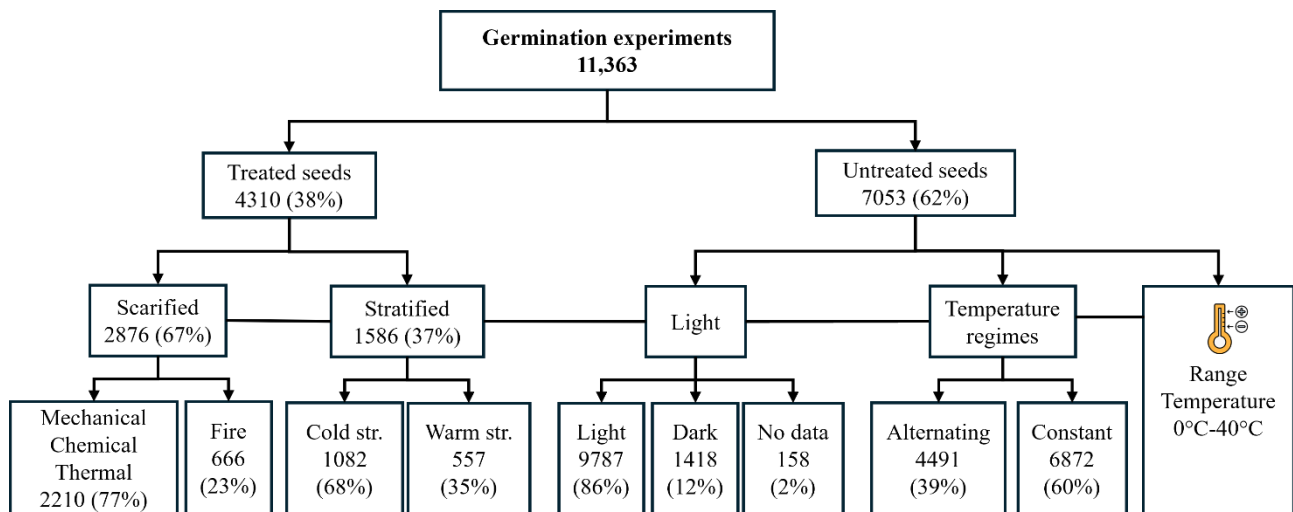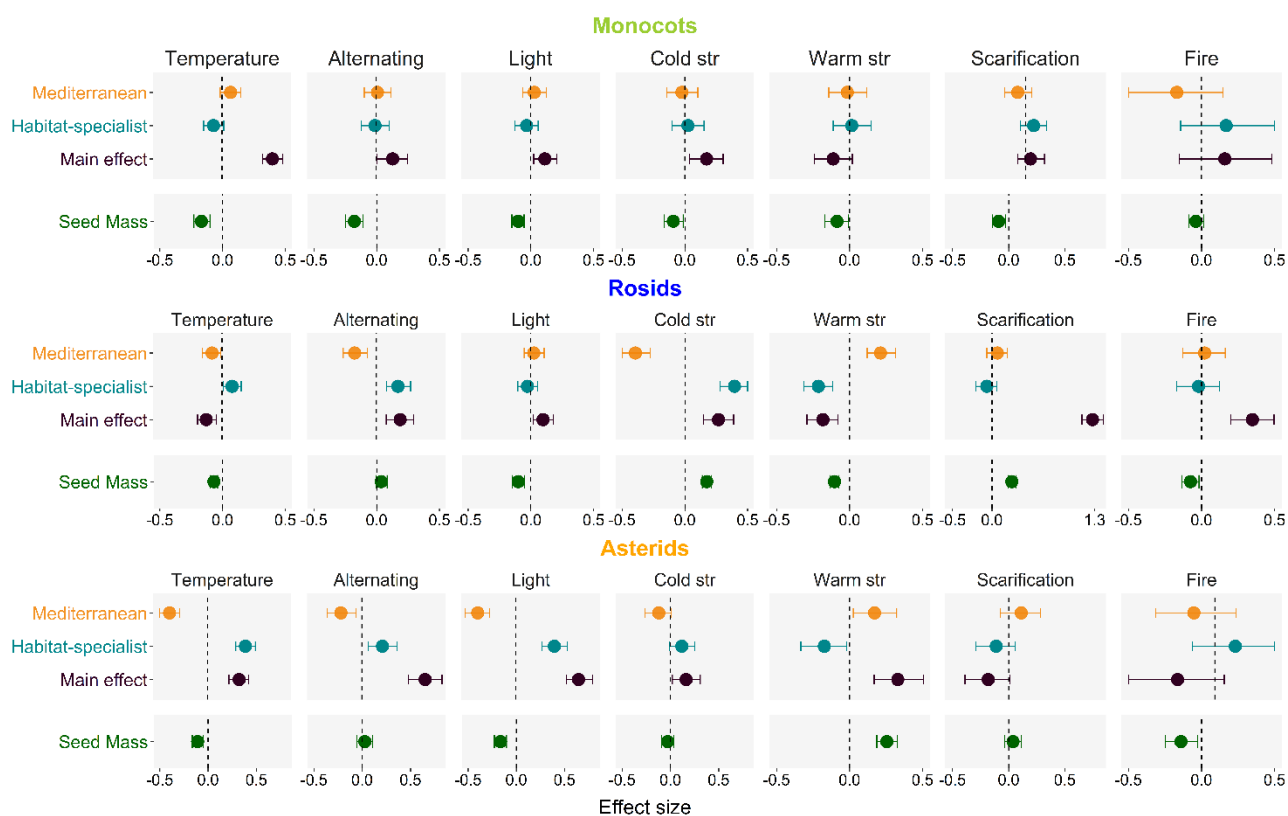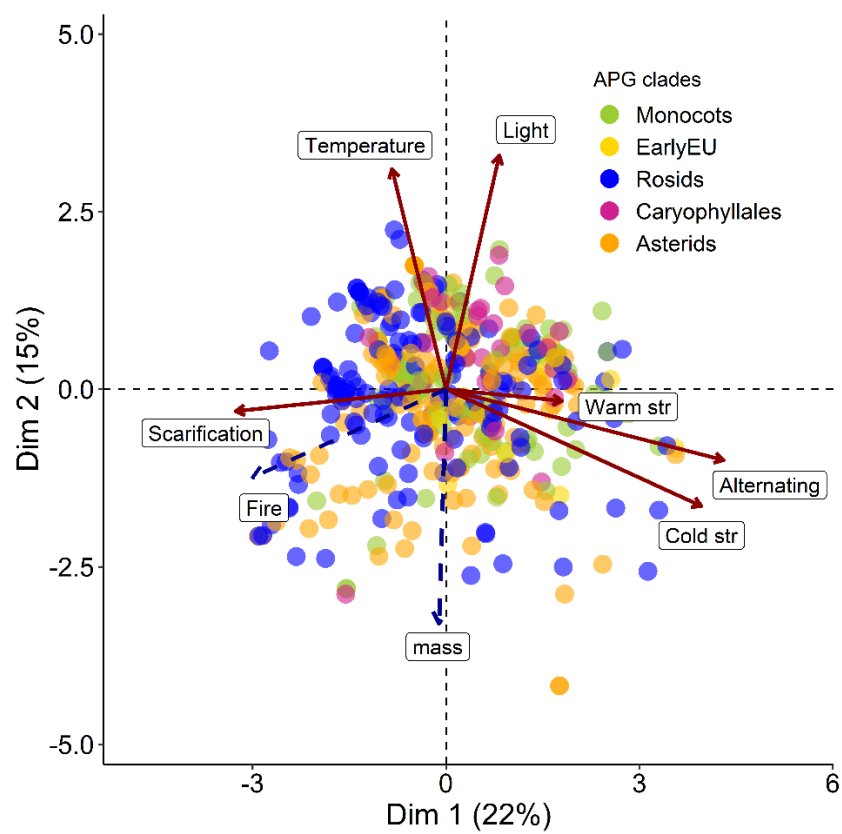3- Med. species prop.

*Figure S1.*

*Figure S2*

*Figure S3*

*Figure S4*

```
# R codes used in the study to fit the MCMCglmms models are available below.

library(MCMCglmm)
# This script shows as a sample the code to fit the MCMCglmms models.

# MCMCglmm analyses
## Binomial models
priors <- list(R = list(V = 1, nu = 50),
        G = list(G1 = list(V = 1, nu = 1, alpha.mu = 0, alpha.V = 500),
             G2 = list(V = 1, nu = 1, alpha.mu = 0, alpha.V = 500),
             G3 = list(V = 1, nu = 1, alpha.mu = 0, alpha.V = 500),
             G4 = list(V = 1, nu = 1, alpha.mu = 0, alpha.V = 500),
             G5 = list(V = 1, nu = 1, alpha.mu = 0, alpha.V = 500)))

# Read the phylogenetic tree ####
phangorn::nnls.tree(cophenetic(ape::read.tree("data/seedArc_treeV0.tree")),
          ape::read.tree("data/seedArc_treeV0.tree"), method = "ultrametric") -> nnls
nnls$node.label <- NULL
nnls.a<- drop.tip(nnls, unique(data$animal))
nnls<- drop.tip(nnls, nnls.a$tip.label)

nite = 500000
nthi = 100
nbur = 100000

# Models ####
model.par <-c(
  "scale(Tmean)+scale(Tmean):scale(p1)","scale(Tmean)+scale(Tmean):scale(p2b)",
  "scale(Alternating)+scale(Alternating):scale(p1)","scale(Alternating)+scale(Alternating):scale(p2b)",
  "scale(Scarification)+scale(Scarification):scale(p1)","scale(Scarification)+scale(Scarification):scale(p2b)",
  "scale(cold_str)+scale(cold_str):scale(p1)","scale(cold_str)+scale(cold_str):scale(p2b)",
  "scale(warm_str)+scale(warm_str):scale(p1)","scale(warm_str)+scale(warm_str):scale(p2b)",
  "scale(Fire)+scale(Fire):scale(p1)","scale(Fire)+scale(Fire):scale(p2b)")

### List of random factors ####
random_factors <- list(
  c("animal", "ID", "id_test", "doi", "seedlot", "substrate"),
  c("animal", "ID", "id_test", "doi", "seedlot", "substrate"),
  c("animal", "ID", "id_test", "doi", "seedlot", "substrate"),
  c("animal", "ID", "id_test", "doi", "seedlot", "substrate"),
  c("animal", "ID", "id_test", "doi", "seedlot", "substrate"),
  c("animal", "ID", "id_test", "doi", "seedlot", "substrate"),
  c("animal", "ID", "id_test", "doi", "seedlot", "substrate"),
  c("animal", "ID", "id_test", "doi", "seedlot", "substrate"),
  c("animal", "ID", "id_test", "doi", "seedlot", "substrate"),
  c("animal", "ID", "id_test", "doi", "seedlot", "substrate"),
  c("animal", "ID", "id_test", "doi", "seedlot", "substrate"),
  c("animal", "ID", "id_test", "doi", "seedlot", "substrate"))

# RUN MODELS global p1 and p2 ####
library(doParallel); library(foreach)

parallel::detectCores()
n.cores <- 2
my.cluster <- parallel::makeCluster(n.cores, type = "PSOCK")
doParallel::registerDoParallel(cl = my.cluster)
```

```r
clusterEvalQ(my.cluster, {
  library(MCMCglmm)
})

clusterExport(my.cluster, varlist = c("data", "nnls", "nite", "nthi", "nbur", "priors", "model.par",
"random_factors"))
model.res <- foreach(i = 1:length(model.par), .packages = "foreach") %dopar% {
  fixed <- as.formula(paste("cbind(Germinated, Germinable-Germinated) ~", model.par[i], sep = ""))
  random <- random_factors[[i]]

  mm <- MCMCglmm(fixed = fixed,
          random = as.formula(paste("~", paste(random, collapse = "+"))),
          family = "multinomial2", pedigree = nnls, prior = priors, data = data,
          nitt = nite,thin = nthi,burnin = nbur,verbose = FALSE
  )
}
parallel::stopCluster(cl = my.cluster)
```