Exploration of FELLOW trait dataset

The objective of this document is to:

- visually explore the trait database
- understand trait coverage / data gaps
- check for possible inconsistencies

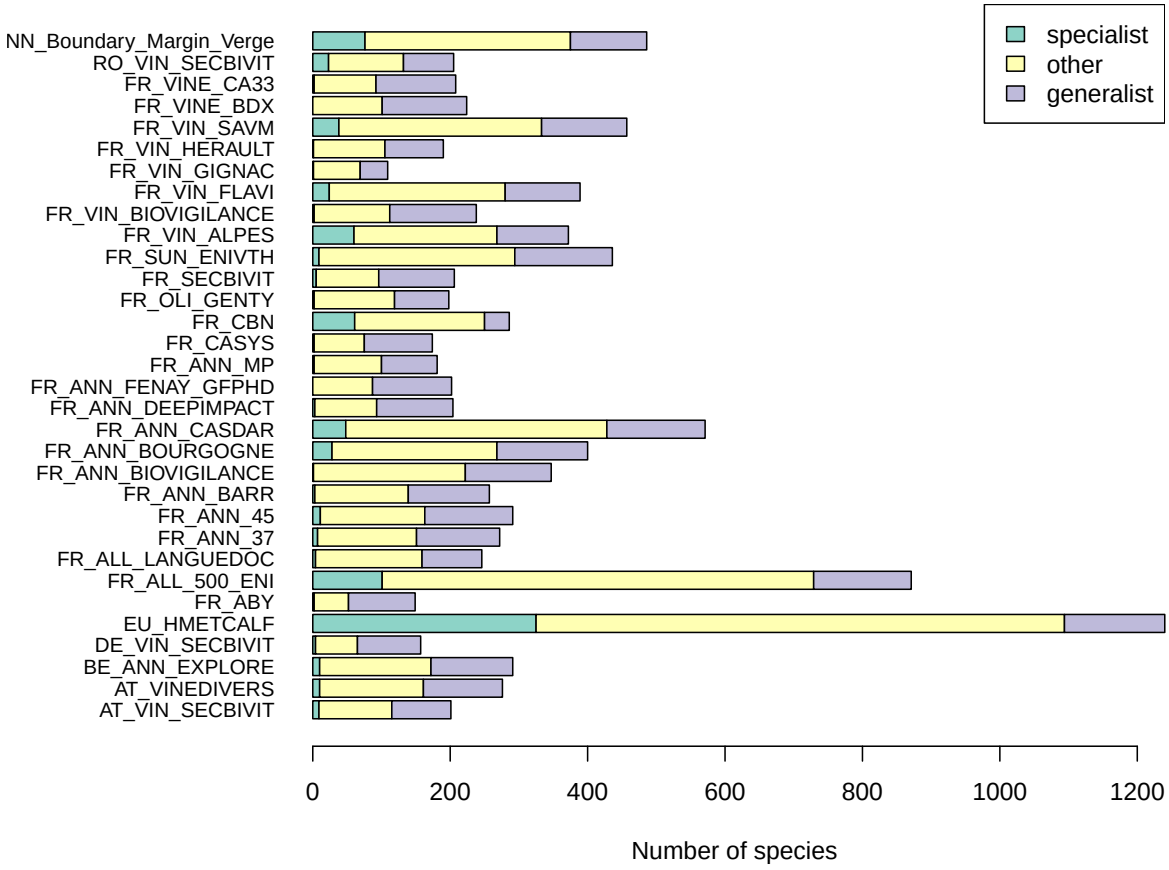
Description of the species list

We compiled the species lists from 32 datasets. After cleaning and harmonization, there were 2113 unique taxa.

FAMILY	GENUS	SPECIES	SUBSPECIES	VARIETY
15	261	1705	121	11

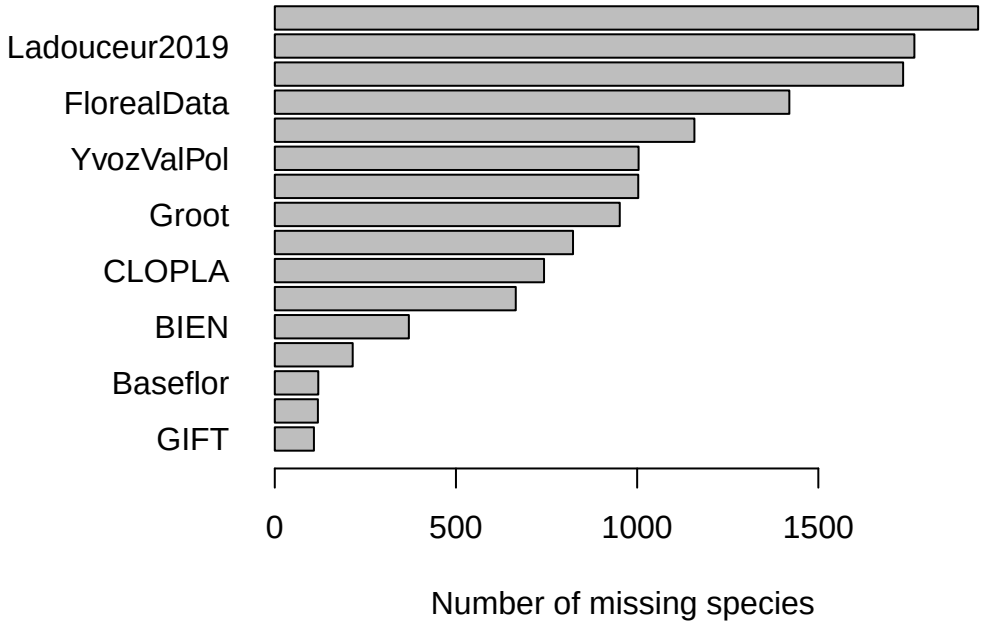
Let's define:
specialist: a taxa that occurred only in a singe database
generalist: a taxa that is listed in 50% of the databases (17 out of 32)

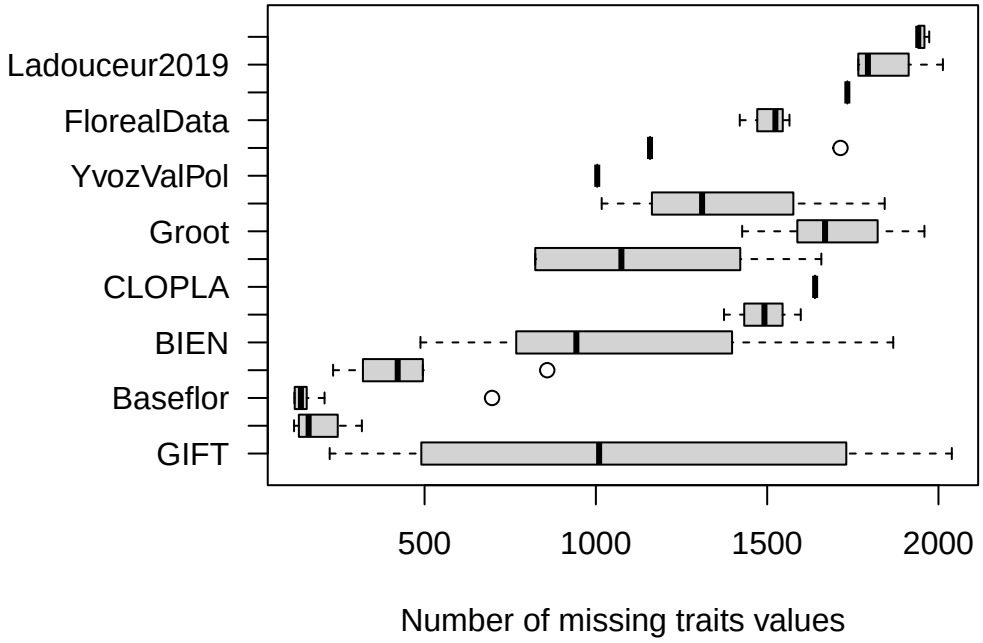
```
sp_class
specialist      other generalist
       874       1092        147
```

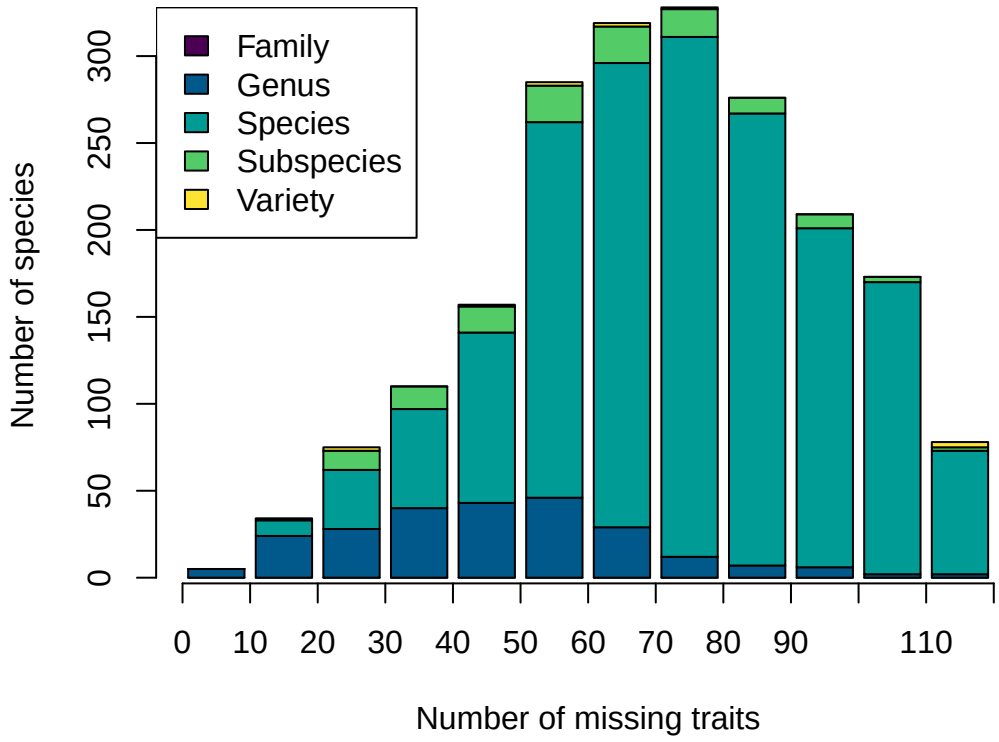


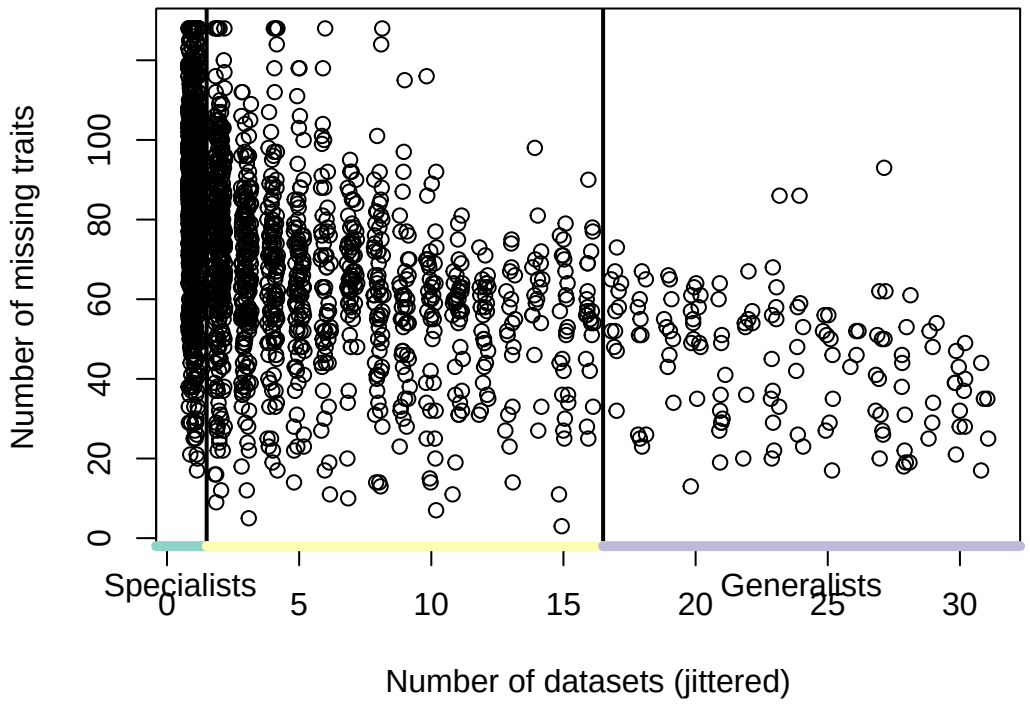
Description of trait databases

So far, we compiled 128 traits for 2113 taxa gathered from 16 trait databases. But there are many missing values.






Family
Genus
Species
Subspecies
Variety
Number of species
0
50
100
150
200
250
300
0
10
20
30
40
50
60
70
80
90
110
Number of missing traits


Number of missing traits
0
20
40
60
80
100
Specialists
Generalists
0
5
10
15
20
25
30
Number of datasets (jittered)

Taxa with no or limited trait information (N=43).

```
 [1] "Abies"                     "Acacia"
 [3] "Agrimonia agrimonoides"    "Agropyron"
 [5] "Amaranthaceae"             "Apiaceae"
 [7] "Asparagaceae"              "Aster"
 [9] "Boraginaceae"              "Brassicaceae"
[11] "Bryum dichotomum"          "Caryophyllaceae"
[13] "Chaenomeles x superba"     "Chrysanthemum"
[15] "Circaea"                   "Cochlearia"
[17] "Cosmos"                    "Crambe abyssinica"
[19] "Cupressus"                 "Dysphania aristata"
[21] "Ephippiger perforatus"     "Geraniaceae"
[23] "Imbribryum subapiculatum" "Lamiaceae"
[25] "Lavandula"                 "Leontodon autumnale"
[27] "Liliaceae"                 "Matthiola"
[29] "Milium"                    "Moehringia"
[31] "Orchis"                    "Paronychia"
[33] "Piptatherum"               "Poaceae"
[35] "Primulaceae"               "Pulmonaria"
[37] "Rhizogemma staphylina"     "Riccia sorocarpa"
[39] "Riccia warnstorfii"        "Roemeria hispida"
[41] "Rosaceae"                  "Rubiaceae"
[43] "Vicia nigra"
```

Open question:

How to deal with families taxa?

How to deal with missing trait values? Trait imputation, discarding taxa, …

Summary of trait completness

Trait	N database	N taxa	Completness (%)
Growth.form	5	2056	97
Dispersal.mode	4	2042	97
Plant.height	9	1998	95
Chorology	1	1993	94
Habitat	1	1992	94
Sexuality	1	1983	94
Pollination	1	1982	94
Fruit.type	2	1981	94
Flower.color	5	1969	93
Dispersal.distance	1	1966	93
Inflorescence	2	1961	93
Lifecycle	2	1918	91
Ellenberg.Salinity	1	1880	89
Seed.mass	6	1875	89
Flowering	2	1805	85
Ellenberg.Light	1	1793	85
Photosynthetic.pathway	1	1776	84
Ellenberg.Reaction	1	1762	83
Ellenberg.Moisture	1	1621	77
Ellenberg.Nutrients	1	1618	77
SLA	4	1516	72
Pollination.syndrome	3	1474	70
Flower.UV.reflectance	3	1317	62
Diaspore.exposure	1	1290	61
Diaspore.type	1	1290	61
Leaf.area	2	1261	60
Ellenberg.Temperature	1	1255	59
Leaf.dry.mass.content	1	1110	53
Floral.symmetry	1	1109	52
Flower.class	1	1109	52
Flower.type	1	1109	52
Nectar.quantity	1	1109	52
Pollen.quantity	1	1109	52
PV.Bees	1	1109	52
PV.Bumblebees	1	1109	52
PV.butterflies	1	1109	52
PV.Hoverflies	1	1109	52
Anemochory	1	1101	52
Leaf.dry.mass	1	1059	50

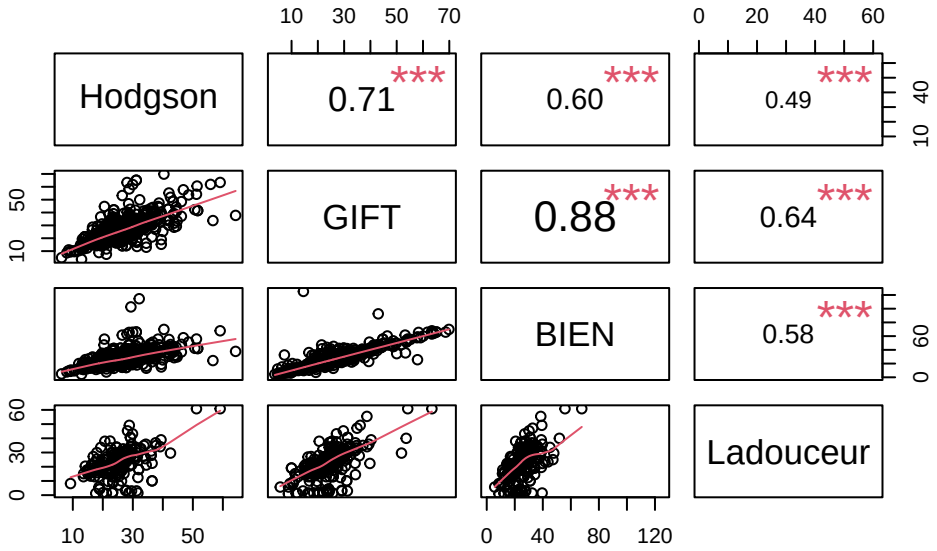
Trait	N database	N taxa	Completness (%)
Epizoochory	1	976	46
Canopy.diameter	1	955	45
Canopy.height	1	955	45
Diaspore.mass	1	899	43
Leaf.width	1	787	37
Lifeform	2	745	35
Root.mycorrhizal.colonization	1	686	32
Root.mass.fraction	1	634	30
Seed.length	1	621	29
Grassland.specialization	1	591	28
Specific.root.length	1	549	26
Flower.length	2	535	25
Root.lateral.spread	1	501	24
Root.diameter	1	496	23
Diaspore.height	1	484	23
Clonal.index	2	482	23
lateral.spread	1	475	22
offspring	1	473	22
offspring.wsmall	1	473	22
Root.tissue.density	1	470	22
Flowering.onset	2	465	22
Hydrochory	1	455	22
Root.N.concentration	1	418	20
Vegetative.propagation	1	399	19
Root.depth	2	385	18
Plant.lifespan	1	379	18
Strategy.Grime	1	379	18
Leaf.nitrogen.content	1	372	18
Flowering.duration	1	347	16
Seeding.onset	1	347	16
Seeding.season	1	347	16
Root.C.concentration	1	325	15
Clonal.presence	1	319	15
Leaf.length	1	310	15
Root.dry.matter	1	305	14
Clonal.cyclicity	1	303	14
Root.C.N.ratio	1	276	13
Leaf.carbon.to.nitrogen.content	1	245	12
Seed.dormancy	1	200	9
Clonal.spread	1	192	9
Germination.range	1	172	8

Trait	N database	N taxa	Completness (%)
Germination.start	1	172	8
Root.length.density	1	154	7
Strategy	1	154	7
Flower.width	2	148	7
Radial.growth	1	100	5
Fruit.color	1	74	4

Comparison

SLA

There are three sources of information for Specific leaf area (SLA) : Hodgson et al. 2023 (in mm2/mg), GIFT (in cm2/g) and BIEN (in m2/kg = mm2/mg).



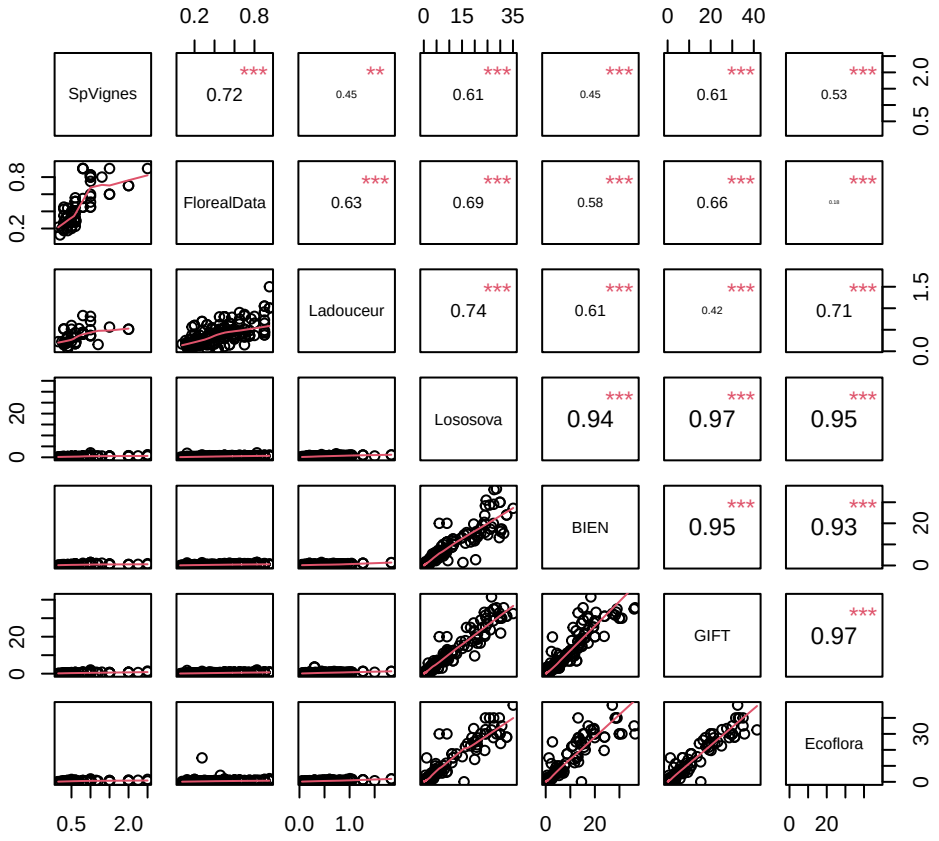
Values are highly correlated, so we could imagine filling the missing values (using preferred data sources or averaging them).

Number of NAs:

```
Hodgson       GIFT       BIEN Ladouceur     filled
   1158        890        882       1819        597
```

Plant height

There are six sources of information for plant height.



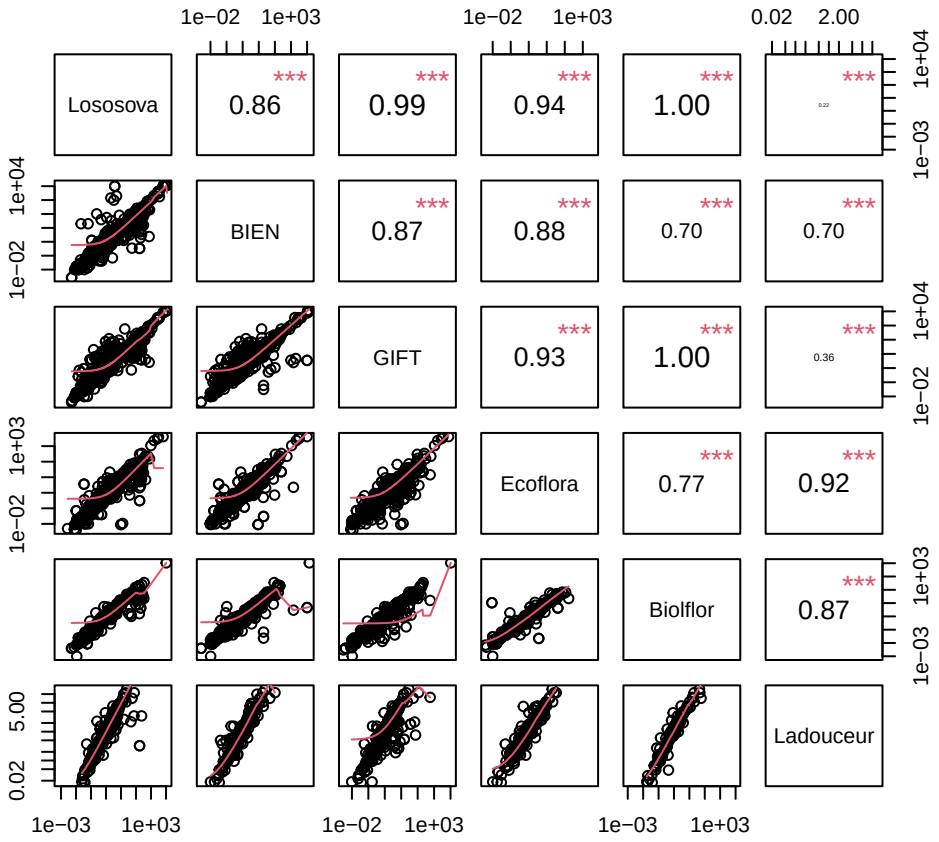
SPVignes, FlorealData, and Ladouceur_2019 are limited to small plants (<1m) (no trees) *but FlorealData>100cm must be clean.*

Number of NAs:

```
  SpVignes FlorealData   Ladouceur    Lososova        BIEN        GIFT
      1973        1648        1782         176         749         604
 Ecoflora      filled
      1017         136
```

Seed mass

There are five sources of information for seed mass



Number of NAs:

Lososova	BIEN	GIFT	Ecoflora	Biolflor	Ladouceur	filled
317	745	377	1310	1598	1782	238

Flower colour

There are five sources of information for flower colour, but it must be cleaned

```
   Baseflor        BIEN        GIFT FlorealData  YvozValPol
        208        1836        1814        1526        1004
```

```
baseflor
             Blanc       Blanc, jaune Blanc, jaune, bleu Blanc, jaune, rose
               364                 33                  3                   4
       Blanc, rose  Blanc, vert, rose               Bleu        Bleu, blanc
                54                  1                154                  11
 Bleu, blanc, rose        Bleu, jaune  Bleu, jaune, rose         Bleu, rose
                11                  5                  2                  10
             Jaune        Jaune, rose        Jaune, vert             Marron
               487                  3                  1                  28
              Noir               Rose               Vert         Vert, bleu
                 2                315                265                  14
 Vert, jaune, rose         Vert, rose
                 1                 36
```