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

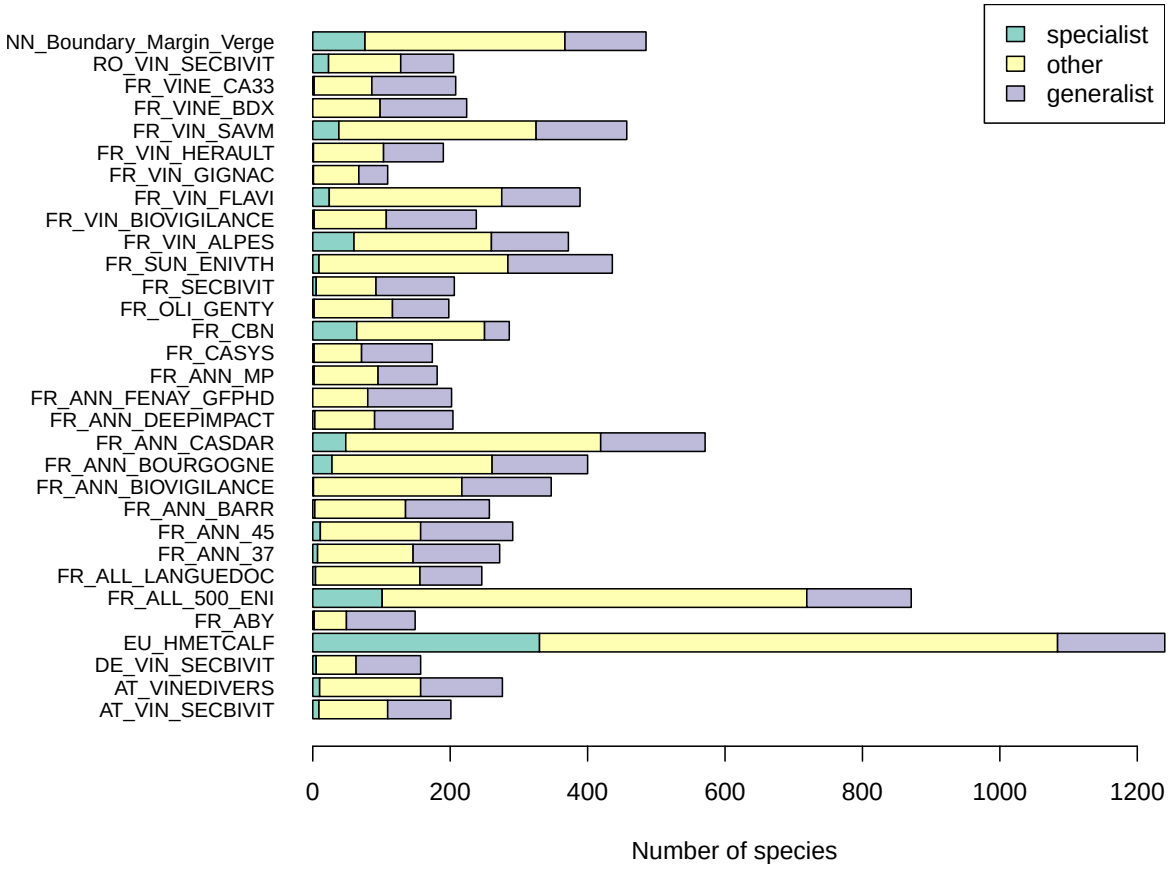
Description of the species list

We compiled the species lists from 31 datasets. After cleaning and harmonization, there were 2102 unique taxa.

FAMILY	GENUS	SPECIES	SUBSPECIES	VARIETY
15	261	1694	121	11

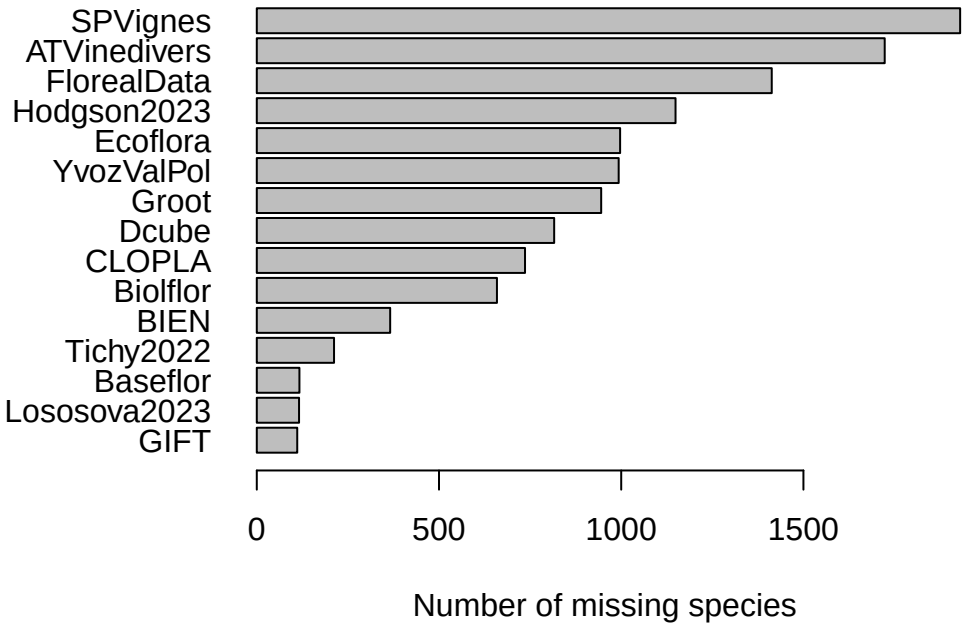
Let's define:
specialist: a taxa that occurred only in a singe database
generalist: a taxa that is listed in 50% of the databases (16 out of 31)

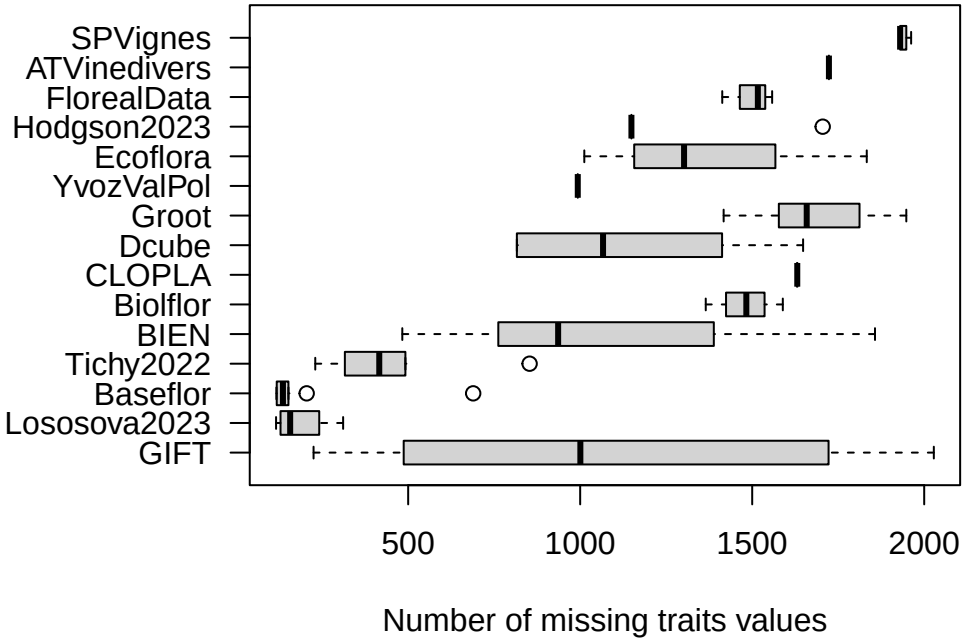
```
sp_class
specialist      other generalist
       873       1072        157
```

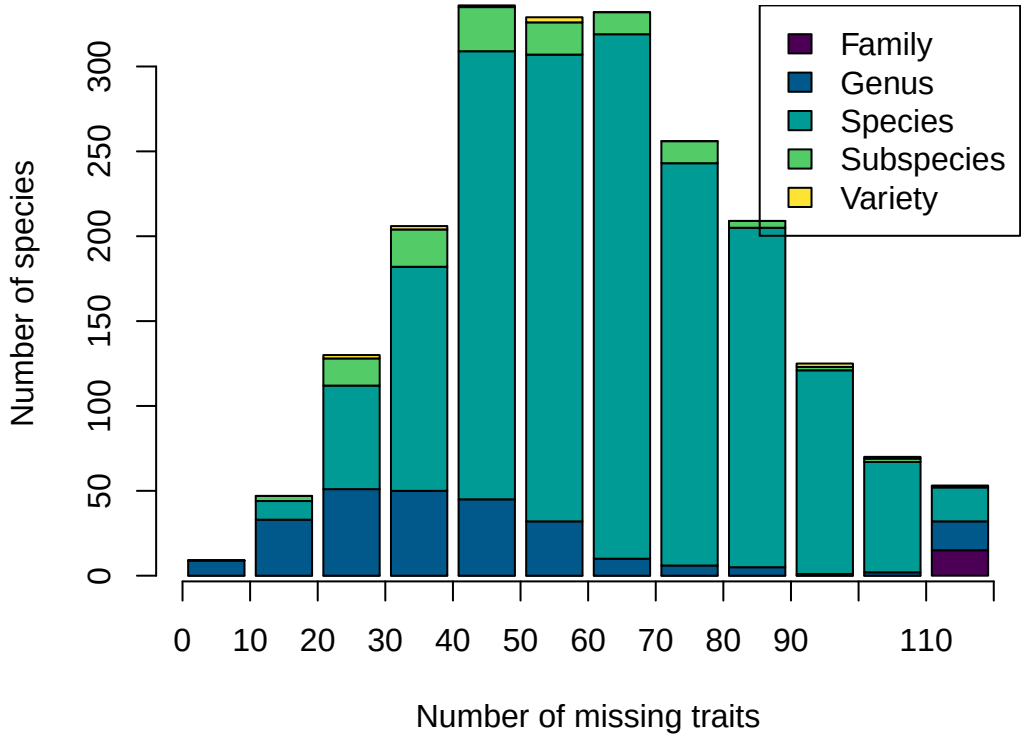


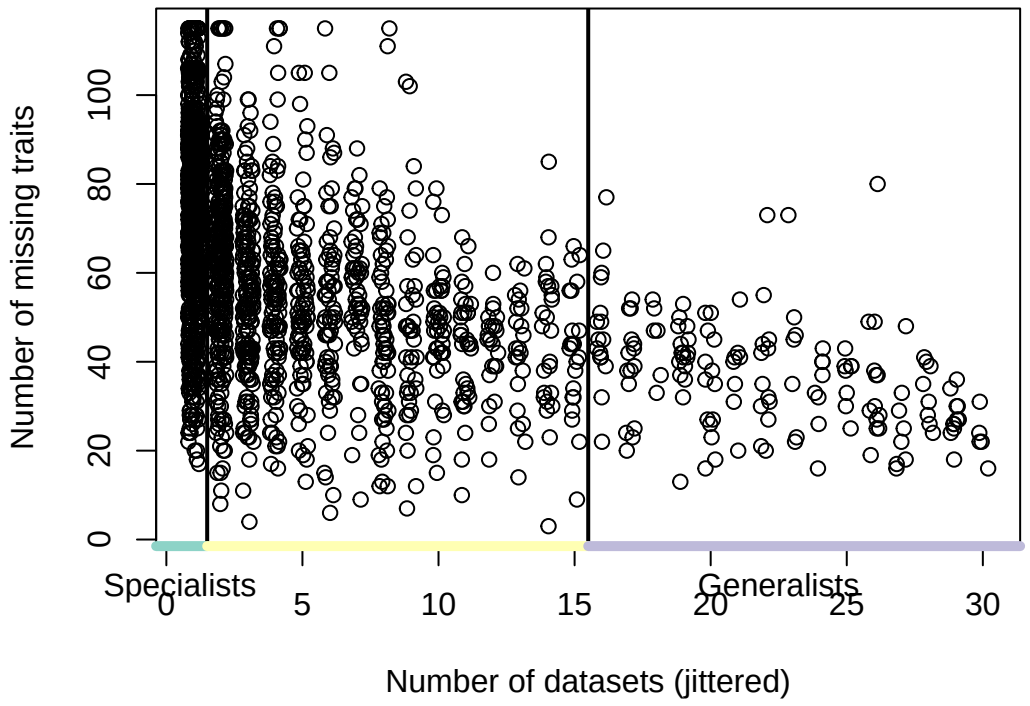
Description of trait databases

So far, we compiled 115 traits for 2102 taxa gathered from 15 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=41).

```
 [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] "Geraniaceae"              "Imbribryum subapiculatum"
[23] "Lamiaceae"                "Lavandula"
[25] "Leontodon autumnale"      "Liliaceae"
[27] "Matthiola"                "Milium"
[29] "Moehringia"               "Orchis"
[31] "Paronychia"               "Piptatherum"
[33] "Poaceae"                  "Primulaceae"
[35] "Pulmonaria"               "Rhizogemma staphylina"
[37] "Riccia sorocarpa"         "Riccia warnstorfii"
[39] "Roemeria hispida"         "Rosaceae"
[41] "Rubiaceae"
```

Open question:

How to deal with families taxa?

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

Summary of trait completness

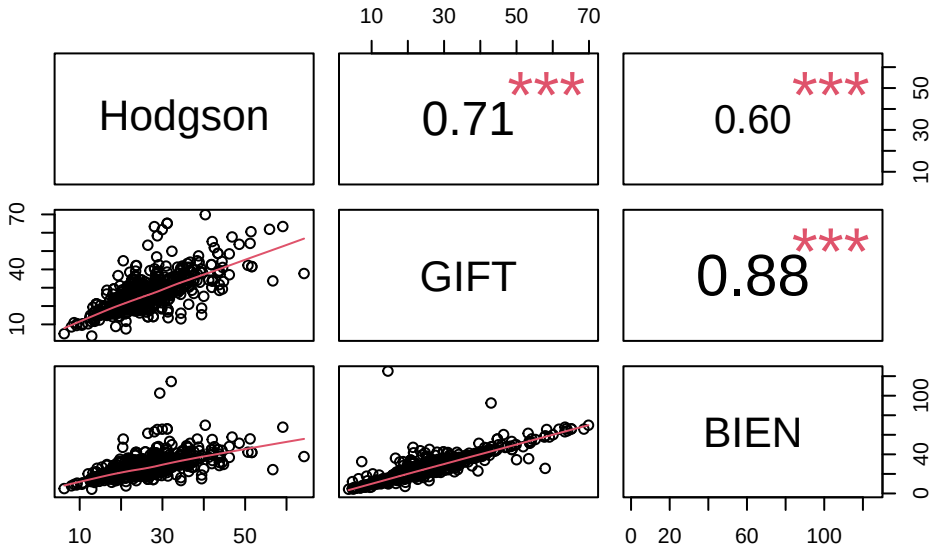
Trait	N database	N taxa	Completness (%)
Growth.form	5	2047	97
Dispersal.mode	4	2034	97
Plant.height	8	1990	95
Chorology	1	1985	94
Habitat	1	1984	94
Sexuality	1	1975	94
Pollination	1	1974	94
Fruit.type	2	1973	94
Flower.color	5	1961	93
Dispersal.distance	1	1960	93
Inflorescence	2	1954	93
Lifecycle	2	1907	91
Ellenberg.Salinity	1	1872	89
Seed.mass	5	1869	89
Flowering	3	1805	86
Ellenberg.Light	1	1786	85
Photosynthetic.pathway	1	1761	84
Ellenberg.Reaction	1	1756	84
Ellenberg.Moisture	1	1616	77
Ellenberg.Nutrients	1	1610	77
SLA	3	1507	72
Pollination.syndrome	3	1469	70
Flower.UV.reflectance	3	1315	63
Diaspore.exposure	1	1286	61
Diaspore.type	1	1286	61
Leaf.area	2	1257	60
Ellenberg.Temperature	1	1249	59
Floral.symmetry	1	1109	53
Flower.class	1	1109	53
Flower.type	1	1109	53
Nectar.quantity	1	1109	53
Pollen.quantity	1	1109	53
PV.Bees	1	1109	53
PV.Bumblebees	1	1109	53
PV.butterflies	1	1109	53
PV.Hoverflies	1	1109	53
Leaf.dry.mass.content	1	1106	53
Anemochory	1	1099	52
Leaf.dry.mass	1	1055	50

Trait	N database	N taxa	Completness (%)
Epizoochory	1	972	46
Canopy.diameter	1	953	45
Canopy.height	1	953	45
Diaspore.mass	1	895	43
Leaf.width	1	786	37
Lifeform	2	741	35
Root.mycorrhizal.colonization	1	685	33
Root.mass.fraction	1	632	30
Seed.length	1	619	29
Grassland.specialization	1	587	28
Specific.root.length	1	549	26
Flower.length	2	533	25
Root.lateral.spread	1	500	24
Root.diameter	1	496	24
Diaspore.height	1	484	23
lateral.spread	1	473	23
offspring	1	471	22
offspring.wsmall	1	471	22
clonal.index	1	470	22
Root.tissue.density	1	469	22
Hydrochory	1	454	22
Strategy	2	427	20
Root.N.concentration	1	418	20
Vegetative.propagation	1	397	19
Root.depth	2	384	18
Plant.lifespan	1	379	18
Leaf.nitrogen.content	1	372	18
Root.C.concentration	1	325	15
Leaf.length	1	306	15
Root.dry.matter	1	304	14
Root.C.N.ratio	1	276	13
Leaf.carbon.to.nitrogen.content	1	245	12
Germination	2	172	8
Root.length.density	1	154	7
Flower.width	2	148	7
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).



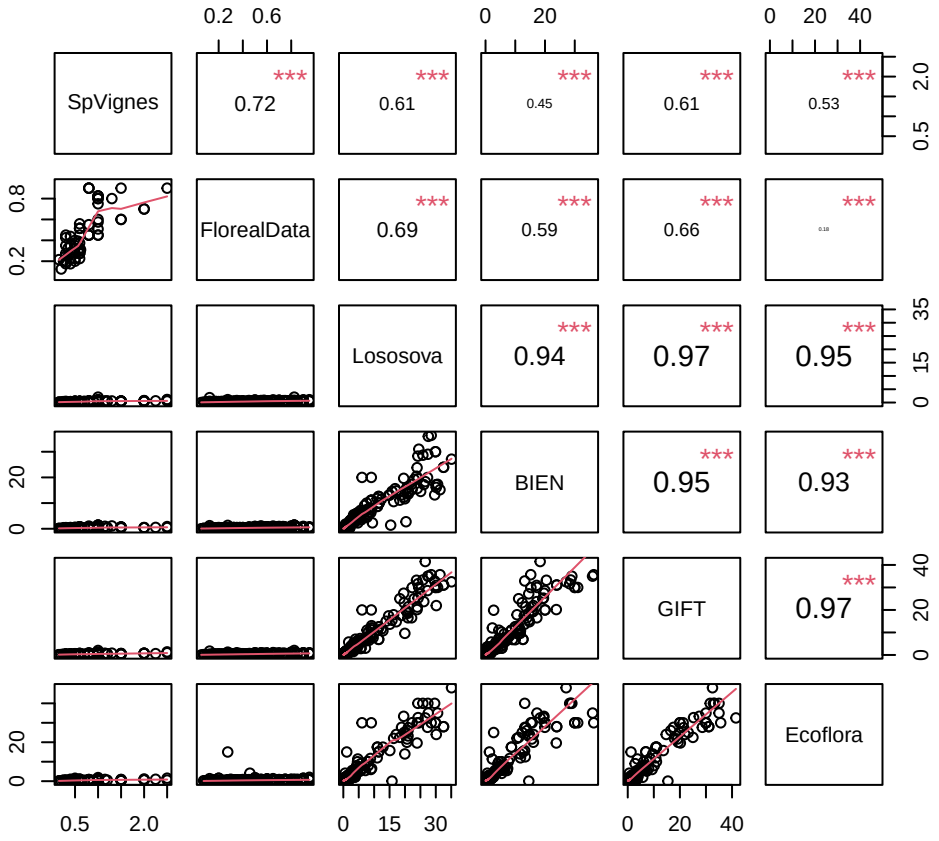
Values are highly correlated, so we could imagine filling the missing values (using preferred data sources or averaging them).

Number of NAs:

```
Hodgson    GIFT    BIEN  filled
   1149     883     876     595
```

Plant height

There are six sources of information for plant height.



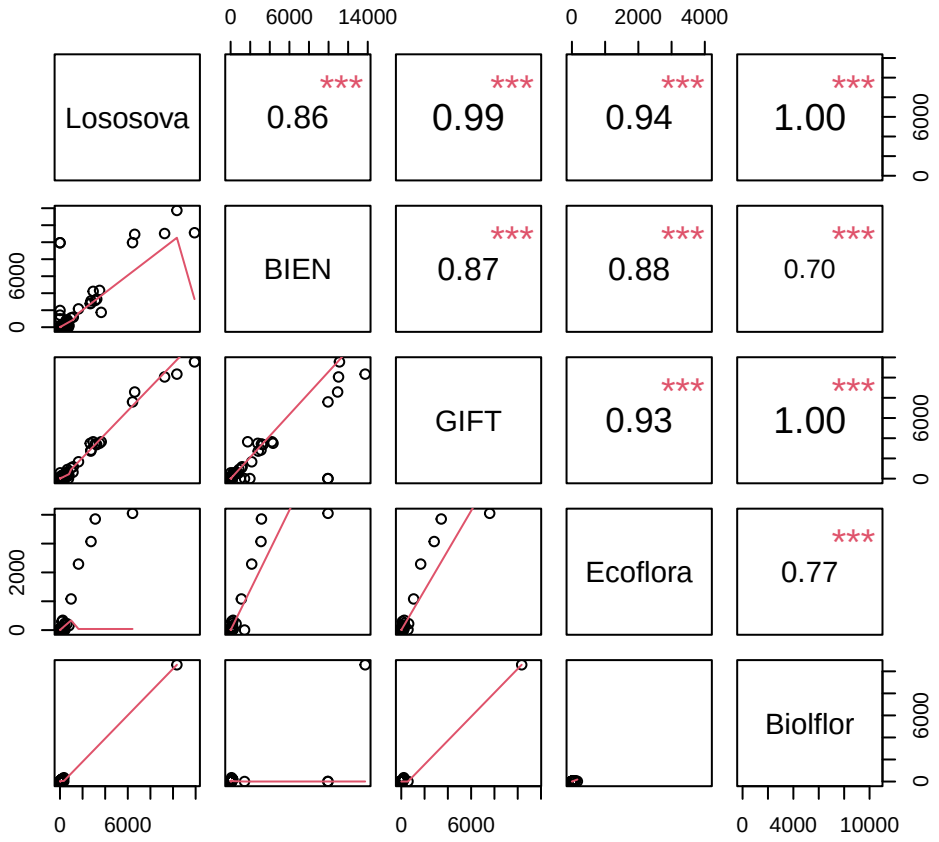
SPVignes and FlorealData are limited to small plants (<1m) (no trees) *but FlorealData>100cm must be clean.*

Number of NAs:

```
SpVignes FlorealData    Lososova        BIEN        GIFT    Ecoflora
    1962        1641         172         744         601        1012
  filled
     133
```

Seed mass

There are five sources of information for seed mass



Number of NAs:

```
Lososova      BIEN      GIFT Ecoflora Biolflor    filled
     311       741       373      1302      1589       233
```

Flower colour

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

```
   Baseflor        BIEN        GIFT FlorealData  YvozValPol
        205        1825        1802        1518         993
```

```
baseflor
             Blanc       Blanc, jaune Blanc, jaune, bleu Blanc, jaune, rose
               362                 33                  3                   4
       Blanc, rose  Blanc, vert, rose               Bleu        Bleu, blanc
                54                  1                152                  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                313                263                  14
 Vert, jaune, rose         Vert, rose
                 1                 36
```