Script\_Indval

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#Packages nécessaires

#Importation des données  
library(readr)  
#Calcul des paramètres écologiques  
#library(vegan) pas nécessaire  
#Réalisation de la méthode indval  
library(labdsv)

## Loading required package: mgcv

## Loading required package: nlme

## This is mgcv 1.8-28. For overview type 'help("mgcv-package")'.

## This is labdsv 2.0-1  
## convert existing ordinations with as.dsvord()

##   
## Attaching package: 'labdsv'

## The following object is masked from 'package:stats':  
##   
## density

#Manipulation des tableaux  
library(plyr)

#Importer et préparation des tableaux de données

##Réalisation du tableau croisé quadrat espèce  
#spe\_only1=table(campagne$`code quadrat`, campagne$espece)  
#Exportation du tableau puis importation  
#write.csv2(spe\_only1,file="spe\_only1.csv",row.names = TRUE)  
#Importation du tableau de données floristiques  
spe\_only1 <- read\_delim("spe\_only1.csv", ";", escape\_double = FALSE, trim\_ws = TRUE)

## Warning: Missing column names filled in: 'X1' [1]

## Parsed with column specification:  
## cols(  
## .default = col\_double(),  
## X1 = col\_character()  
## )

## See spec(...) for full column specifications.

head(spe\_only1)

## # A tibble: 6 x 311  
## X1 `Abrus canescen… `Abrus precator… `Acmella caulir… `Acmella uligin…  
## <chr> <dbl> <dbl> <dbl> <dbl>  
## 1 Ahou… 0 0 0 0  
## 2 Ahou… 0 0 0 0  
## 3 Ahou… 0 0 0 0  
## 4 Ahou… 0 0 0 0  
## 5 Ahou… 0 0 0 0  
## 6 Ahou… 0 0 0 0  
## # … with 306 more variables: `Acroceras gabunense` <dbl>, `Acroceras  
## # zizanioides` <dbl>, `Adenia cissampeloides` <dbl>, `Adenia  
## # dinklagei` <dbl>, `Adenia lobata` <dbl>, `Aeschynomene  
## # afraspera` <dbl>, `Aframomum alboviolaceum` <dbl>, `Ageratum  
## # conyzoides` <dbl>, `Albizia zygia` <dbl>, `Alchornea  
## # cordifolia` <dbl>, `Alchornea hirtella` <dbl>, `Alstonia  
## # boonei` <dbl>, `Alternanthera ramosissima` <dbl>, `Alternanthera  
## # sessilis` <dbl>, `Amaranthus spinosus` <dbl>, `Amaranthus  
## # viridis` <dbl>, `Ampelocissus gracilipes` <dbl>, `Andropogon  
## # gayanus` <dbl>, `Aneilema beniniense` <dbl>, `Anthonotha  
## # macrophylla` <dbl>, `Aspilia bussei` <dbl>, `Astraea lobata` <dbl>,  
## # `Asystasia gangetica` <dbl>, `Axonopus compressus` <dbl>, `Bacopa  
## # crenata` <dbl>, `Bacopa floribunda` <dbl>, `Bambusa vulgaris` <dbl>,  
## # `Bidens pilosa` <dbl>, `Bolboschoenus maritinus` <dbl>, `Borreria  
## # latifolia` <dbl>, `Brachiaria lata` <dbl>, `Bridelia micrantha` <dbl>,  
## # `Bulbostylis abortiva` <dbl>, `Calopogonium mucunoides` <dbl>,  
## # `Cardiospermum grandiflorum` <dbl>, `Carica papaya` <dbl>, `Cascabela  
## # thevetia` <dbl>, `Cassia hirsuta` <dbl>, `Cassia mimosoides` <dbl>,  
## # `Cassia occidentalis` <dbl>, `Cayratia gracilis` <dbl>, `Ceiba  
## # pentandra` <dbl>, `Cenchrus polystachios` <dbl>, `Centrosema  
## # pubescens` <dbl>, `Ceratophyllum demersum` <dbl>, `Chamaecrista  
## # mimosoides` <dbl>, `Chasmanthera dependens` <dbl>, `Chenopodium  
## # caudatum` <dbl>, `Christella dentata` <dbl>, `Chromolaena  
## # odorata` <dbl>, `Cissus aralioides` <dbl>, `Cissus arguta` <dbl>,  
## # `Cissus producta` <dbl>, `Cleistopholis patens` <dbl>, `Cleome  
## # rutidosperma` <dbl>, `Coccinia barteri` <dbl>, `Coix  
## # lacryma-jobi` <dbl>, `Cola caricaefolia` <dbl>, `Cola  
## # cordifolia` <dbl>, `Colocasia esculenta` <dbl>, `Combretum  
## # paniculatum` <dbl>, `Combretum racemosum` <dbl>, `Commelina  
## # benghalensis` <dbl>, `Commelina capitata` <dbl>, `Commelina  
## # diffusa` <dbl>, `Commelina erecta` <dbl>, `Costus afer` <dbl>, `Costus  
## # phyllocephalus` <dbl>, `Crinum jagus` <dbl>, `Crotalaria  
## # retusa` <dbl>, `Croton hirtus` <dbl>, `Cucumis melo` <dbl>, `Culcasia  
## # saxatilis` <dbl>, `Cyathula prostrata` <dbl>, `Cyclosorus  
## # oppositifolius` <dbl>, `Cynodon dactylon` <dbl>, `Cynometra  
## # megalophylla` <dbl>, `Cyperus articulatus` <dbl>, `Cyperus  
## # difformis` <dbl>, `Cyperus digitatus` <dbl>, `Cyperus  
## # dilatatus` <dbl>, `Cyperus distans` <dbl>, `Cyperus fertilis` <dbl>,  
## # `Cyperus haspan` <dbl>, `Cyperus imbricatus` <dbl>, `Cyperus  
## # longifolius` <dbl>, `Cyperus mariscus` <dbl>, `Cyperus  
## # sphacelatus` <dbl>, `Cyrtosperma senegalense` <dbl>, `Dalbergia  
## # afzeliana` <dbl>, `Desmodium adscendens` <dbl>, `Desmodium  
## # policarpum` <dbl>, `Desmodium salicifolium` <dbl>, `Desmodium  
## # tortuosum` <dbl>, `Desmodium triflorum` <dbl>, `Desmodium  
## # velutinum` <dbl>, `Digitaria ciliaris` <dbl>, `Digitaria  
## # delicatula` <dbl>, `Digitaria horizontalis` <dbl>, `Dioscorea  
## # alata` <dbl>, …

# modief dans excel le tableau pour le convertir en un dataframe  
spe.only1<- spe\_only1[ , 2 :310]  
  
#aussi enlever les expèces qui n’apparaissent dans aucun site  
spe.only1[ , !apply(spe.only1==0,2,all)]

## # A tibble: 760 x 309  
## `Abrus canescen… `Abrus precator… `Acmella caulir… `Acmella uligin…  
## <dbl> <dbl> <dbl> <dbl>  
## 1 0 0 0 0  
## 2 0 0 0 0  
## 3 0 0 0 0  
## 4 0 0 0 0  
## 5 0 0 0 0  
## 6 0 0 0 0  
## 7 0 0 0 0  
## 8 0 0 0 0  
## 9 0 0 0 0  
## 10 0 0 0 0  
## # … with 750 more rows, and 305 more variables: `Acroceras  
## # gabunense` <dbl>, `Acroceras zizanioides` <dbl>, `Adenia  
## # cissampeloides` <dbl>, `Adenia dinklagei` <dbl>, `Adenia  
## # lobata` <dbl>, `Aeschynomene afraspera` <dbl>, `Aframomum  
## # alboviolaceum` <dbl>, `Ageratum conyzoides` <dbl>, `Albizia  
## # zygia` <dbl>, `Alchornea cordifolia` <dbl>, `Alchornea  
## # hirtella` <dbl>, `Alstonia boonei` <dbl>, `Alternanthera  
## # ramosissima` <dbl>, `Alternanthera sessilis` <dbl>, `Amaranthus  
## # spinosus` <dbl>, `Amaranthus viridis` <dbl>, `Ampelocissus  
## # gracilipes` <dbl>, `Andropogon gayanus` <dbl>, `Aneilema  
## # beniniense` <dbl>, `Anthonotha macrophylla` <dbl>, `Aspilia  
## # bussei` <dbl>, `Astraea lobata` <dbl>, `Asystasia gangetica` <dbl>,  
## # `Axonopus compressus` <dbl>, `Bacopa crenata` <dbl>, `Bacopa  
## # floribunda` <dbl>, `Bambusa vulgaris` <dbl>, `Bidens pilosa` <dbl>,  
## # `Bolboschoenus maritinus` <dbl>, `Borreria latifolia` <dbl>,  
## # `Brachiaria lata` <dbl>, `Bridelia micrantha` <dbl>, `Bulbostylis  
## # abortiva` <dbl>, `Calopogonium mucunoides` <dbl>, `Cardiospermum  
## # grandiflorum` <dbl>, `Carica papaya` <dbl>, `Cascabela  
## # thevetia` <dbl>, `Cassia hirsuta` <dbl>, `Cassia mimosoides` <dbl>,  
## # `Cassia occidentalis` <dbl>, `Cayratia gracilis` <dbl>, `Ceiba  
## # pentandra` <dbl>, `Cenchrus polystachios` <dbl>, `Centrosema  
## # pubescens` <dbl>, `Ceratophyllum demersum` <dbl>, `Chamaecrista  
## # mimosoides` <dbl>, `Chasmanthera dependens` <dbl>, `Chenopodium  
## # caudatum` <dbl>, `Christella dentata` <dbl>, `Chromolaena  
## # odorata` <dbl>, `Cissus aralioides` <dbl>, `Cissus arguta` <dbl>,  
## # `Cissus producta` <dbl>, `Cleistopholis patens` <dbl>, `Cleome  
## # rutidosperma` <dbl>, `Coccinia barteri` <dbl>, `Coix  
## # lacryma-jobi` <dbl>, `Cola caricaefolia` <dbl>, `Cola  
## # cordifolia` <dbl>, `Colocasia esculenta` <dbl>, `Combretum  
## # paniculatum` <dbl>, `Combretum racemosum` <dbl>, `Commelina  
## # benghalensis` <dbl>, `Commelina capitata` <dbl>, `Commelina  
## # diffusa` <dbl>, `Commelina erecta` <dbl>, `Costus afer` <dbl>, `Costus  
## # phyllocephalus` <dbl>, `Crinum jagus` <dbl>, `Crotalaria  
## # retusa` <dbl>, `Croton hirtus` <dbl>, `Cucumis melo` <dbl>, `Culcasia  
## # saxatilis` <dbl>, `Cyathula prostrata` <dbl>, `Cyclosorus  
## # oppositifolius` <dbl>, `Cynodon dactylon` <dbl>, `Cynometra  
## # megalophylla` <dbl>, `Cyperus articulatus` <dbl>, `Cyperus  
## # difformis` <dbl>, `Cyperus digitatus` <dbl>, `Cyperus  
## # dilatatus` <dbl>, `Cyperus distans` <dbl>, `Cyperus fertilis` <dbl>,  
## # `Cyperus haspan` <dbl>, `Cyperus imbricatus` <dbl>, `Cyperus  
## # longifolius` <dbl>, `Cyperus mariscus` <dbl>, `Cyperus  
## # sphacelatus` <dbl>, `Cyrtosperma senegalense` <dbl>, `Dalbergia  
## # afzeliana` <dbl>, `Desmodium adscendens` <dbl>, `Desmodium  
## # policarpum` <dbl>, `Desmodium salicifolium` <dbl>, `Desmodium  
## # tortuosum` <dbl>, `Desmodium triflorum` <dbl>, `Desmodium  
## # velutinum` <dbl>, `Digitaria ciliaris` <dbl>, `Digitaria  
## # delicatula` <dbl>, `Digitaria horizontalis` <dbl>, `Dioscorea  
## # alata` <dbl>, …

#Tableau des sites  
group1 <- read\_delim("group1.csv", ";", escape\_double = FALSE, trim\_ws = TRUE)

## Warning: Missing column names filled in: 'X1' [1]

## Parsed with column specification:  
## cols(  
## X1 = col\_character(),  
## statut = col\_double()  
## )

head(group1)

## # A tibble: 6 x 2  
## X1 statut  
## <chr> <dbl>  
## 1 AhouatiEnd-32 2  
## 2 AhouatiEnd1-1 2  
## 3 AhouatiEnd1-10 2  
## 4 AhouatiEnd1-11 2  
## 5 AhouatiEnd1-12 2  
## 6 AhouatiEnd1-13 2

# Calcul de la valeur Indval (Dufrene and Legendre)

# Indicator species based sur les statut, Témoin (1), Faible (2) et Endémique (3)  
  
iva<-indval(spe.only1, group1$statut )  
# Imprimer le résulats pour voir les informations générées  
#iva

# Ne prendre en compte que les espèces pour lesquelle la valeur inval est significative et qui apparaissement au moins dans 2 sites.  
gr <- iva$maxcls[iva$pval<=0.05]  
iv <- iva$indcls[iva$pval<=0.05]  
pv <- iva$pval[iva$pval<=0.05]  
fr<-apply(spe.only1>0,2, sum)[iva$pval<=0.05]  
  
# Faire un tableau pour sauvegarder tous les résultats (RsultatIndval)  
RsultatIndval=data.frame(group=gr,   
 indval=iv,   
 pvalue=pv,   
 freq=fr)  
#Imprimer les résultats ordonnée selon le groupe  
RsultatIndval <- RsultatIndval[order(RsultatIndval$group, -RsultatIndval$indval),]  
RsultatIndval

## group indval pvalue freq  
## Ipomoea batatas 1 0.30882353 0.001 21  
## Commelina diffusa 1 0.25428564 0.001 127  
## Lindernia crustacea 1 0.23529412 0.001 16  
## Acroceras gabunense 1 0.19326519 0.001 19  
## Phyllanthus amarus 1 0.17284426 0.001 46  
## Christella dentata 1 0.16594826 0.001 16  
## Commelina erecta 1 0.16037248 0.001 68  
## Ipomoea aquatica 1 0.14705882 0.001 10  
## Eichhornia crassipes 1 0.14699708 0.001 25  
## Ipomoea triloba 1 0.13424678 0.001 56  
## Struchium sparganophorum 1 0.12698016 0.002 84  
## Synedrella nodiflora 1 0.11440471 0.001 49  
## Melanthera scandens 1 0.07070608 0.002 13  
## Bolboschoenus maritinus 1 0.05882353 0.001 4  
## Costus afer 1 0.05772733 0.002 12  
## Aspilia bussei 1 0.04411765 0.002 3  
## Cyperus articulatus 1 0.03257919 0.027 8  
## Axonopus compressus 1 0.02941176 0.011 2  
## Lasimorpha senegalensis 1 0.02941176 0.010 2  
## Nymphaea lotus 1 0.02694871 0.016 3  
## Heliotropium indicum 1 0.02658691 0.017 3  
## Vernonia cinerea 1 0.02425713 0.042 4  
## Panicum maximum 2 0.18471766 0.001 138  
## Centrosema pubescens 2 0.16291090 0.003 165  
## Cynodon dactylon 2 0.10937500 0.001 35  
## Alternanthera sessilis 2 0.10076764 0.008 72  
## Persicaria lanigera 2 0.09687500 0.002 31  
## Setaria barbata 2 0.07864792 0.002 27  
## Rhynchospora corymbosa 2 0.07620733 0.002 28  
## Cleome rutidosperma 2 0.07187500 0.003 23  
## Culcasia saxatilis 2 0.07187500 0.001 23  
## Rottboellia cochinchinensis 2 0.06683501 0.007 41  
## Pennisetum purpureum 2 0.06343189 0.029 50  
## Phaulopsis ciliata 2 0.05937500 0.003 19  
## Pycreus flavescens 2 0.05937500 0.007 19  
## Dioscorea minutiflora 2 0.05625000 0.008 18  
## Cyclosorus oppositifolius 2 0.05255907 0.045 46  
## Phaseolus lunatus 2 0.05236876 0.020 30  
## Physalis angulata 2 0.05143805 0.021 25  
## Alchornea cordifolia 2 0.05085412 0.014 31  
## Pergularia daemia 2 0.04687500 0.006 15  
## Laportea aestuans 2 0.04514563 0.013 18  
## Ludwigia octovalvis 2 0.03896204 0.010 16  
## Paspalum conjugatum 2 0.03750000 0.019 12  
## Panicum brevifolium 2 0.03437500 0.014 11  
## Aeschynomene afraspera 2 0.03389622 0.043 16  
## Mucuna pruriens 2 0.02877475 0.050 11  
## Laportea ovalifolia 2 0.02812500 0.032 9  
## Stachytarpheta indica 2 0.02812500 0.049 9  
## Ficus asperifolia 2 0.02500000 0.023 8  
## Abrus canescens 2 0.02187500 0.019 7  
## Ceiba pentandra 2 0.02187500 0.023 7  
## Cissus producta 2 0.02187500 0.020 7  
## Pouzolzia guineensis 2 0.02187500 0.030 7  
## Commelina capitata 2 0.01948102 0.041 8  
## Panicum laxum 3 0.16404676 0.003 167  
## Acroceras zizanioides 3 0.13523909 0.022 152  
## Imperata cylindrica 3 0.13415424 0.001 52  
## Leersia hexandra 3 0.12196098 0.002 63  
## Chromolaena odorata 3 0.11347518 0.005 87  
## Mimosa pudica 3 0.09367032 0.002 43  
## Paspalum distichum 3 0.08064516 0.002 30  
## Schrankia leptocarpa 3 0.07493770 0.031 64  
## Echinochloa colona 3 0.06982265 0.010 34  
## Ipomoea asarifolia 3 0.05376344 0.013 20  
## Nelumbo nucifera 3 0.04838710 0.018 18  
## Calopogonium mucunoides 3 0.04569892 0.010 17  
## Cyperus fertilis 3 0.04301075 0.010 16  
## Telosma africana 3 0.04301075 0.008 16  
## Ipomoea sagittata 3 0.04032258 0.002 15  
## Ludwigia hyssopifolia 3 0.03494624 0.026 13