Medicinal Plants of Peru: Respiratory Treatments

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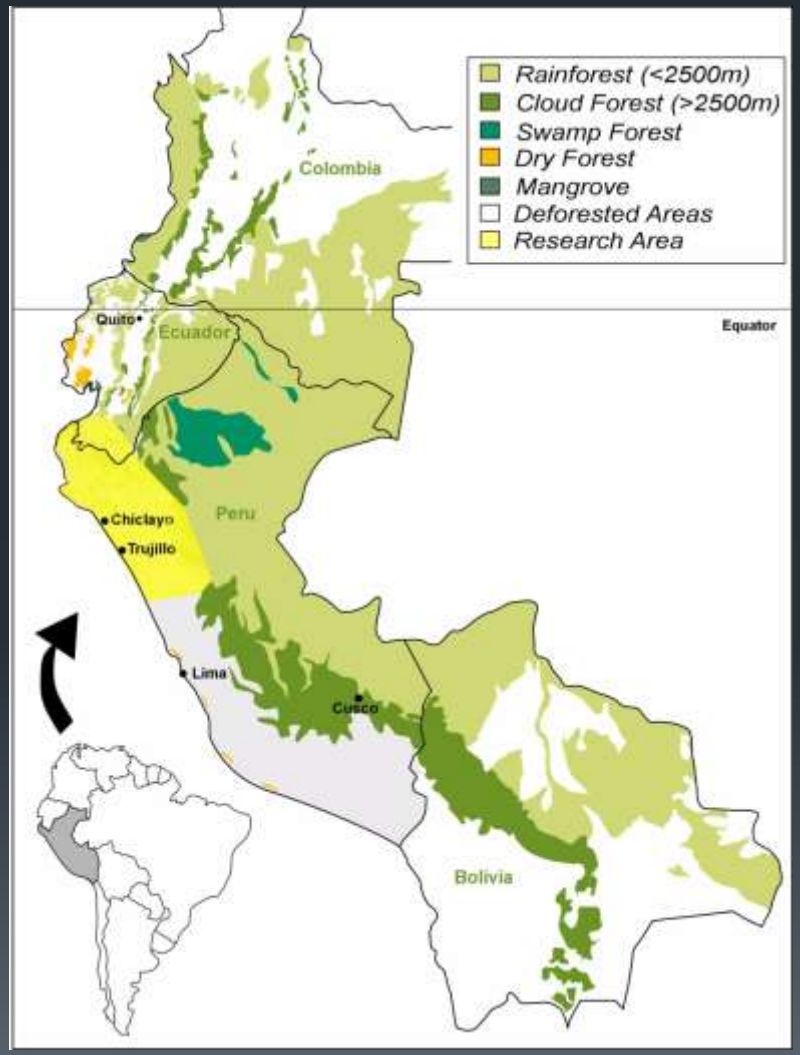
Introduction

- Traditional medicine use is growing in the world
- Northern Peru is key place in use and discovery of plant medicines
- Peru's plant medicines are being studied to observe what was used historically and what is used now
  - Ideally historical knowledge is preserved and given back to those to whom it belongs.
- An interest was taken in what plants were used in treating respiratory illnesses.

Research Area



Materials and Methods: Markets and Plants

- Herbal medicine data of market vendors were collected by Rainer Bussmann et al.
- Plants that were used was documented using numerical values 1 and 0 to represent presence in absence
- R Statistical Framework Vegan package was used to make distance measures of the data
- Data was clustered using method “Bray” and plotted as a dendrogram to observe and compare dissimilarities.
- Observations were made, noting dissimilarities between current plant use of market vendors and healers and historical surveys of plant use.

Material and Methods: Respiratory Plant Mixtures

- Presence absence data of medicinal plant mixtures was analyzed using cluster dendrograms with the R Statistical Framework vegan package.
- A separate cluster tree was created for data containing only information about respiratory plant mixtures
- Clustering of respiratory ailments on the respiratory tree were compared with how they clustered in the full list of illness mixtures
- Plants within the mixtures were reviewed to understand better how each mixture treats the various illnesses

R Statistical Framework

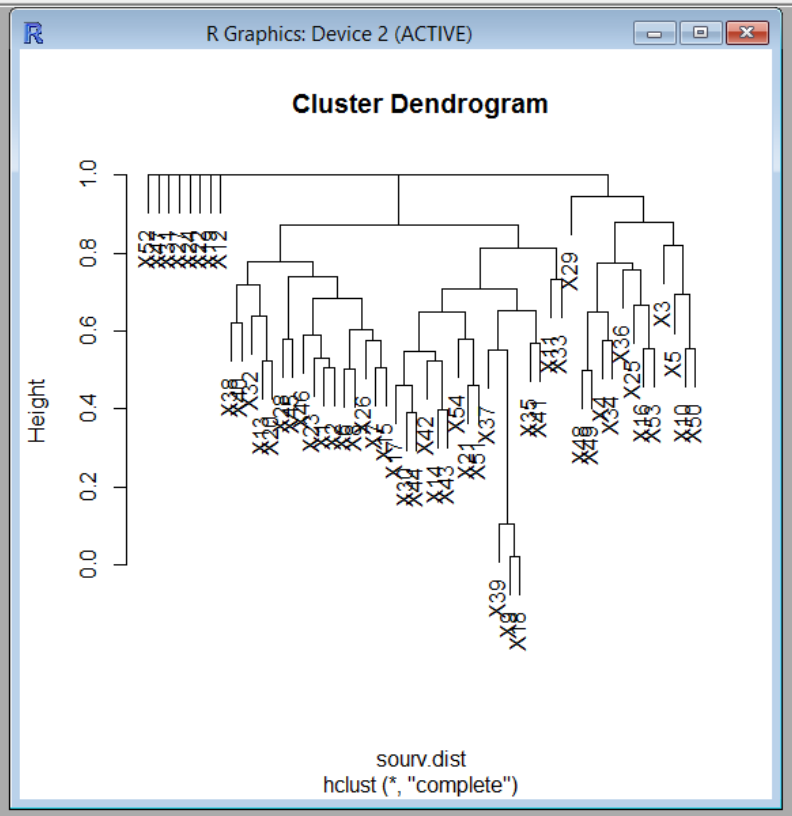
RGui (64-bit)

File History Resize Windows

R Console

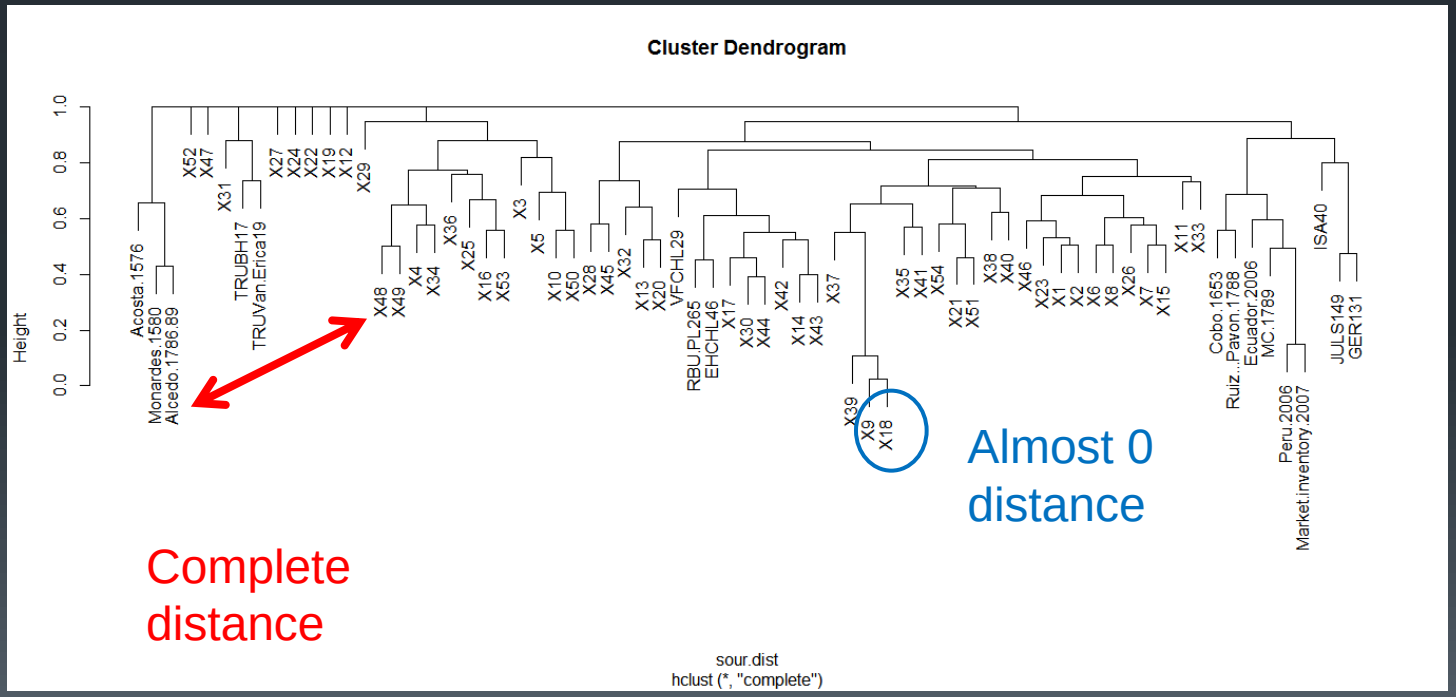
```
> > specr.dist<-vegdist(sourcesr)
Error: unexpected '>' in ">"
> > specr.clusters<-hclust(specr.dist)
Error: unexpected '>' in ">"
> > plot(specr.clusters)
Error: unexpected '>' in ">"
> sourcesr<-read.table('sourcesr.csv',h=T,sep=',',fill=0)
> sourcesr<-sourcesr[sourcesr$code!="",]
> row.names(sourcesr)<-sourcesr[,1]
> sourcesr<-sourcesr[,-1]
> sourcesr<-sourcesr[rowSums(sourcesr)>0,]
> specr.dist<-vegdist(sourcesr)
> specr.clusters<-hclust(specr.dist)
> plot(specr.clusters)
> sourr.dist<-vegdist(sourcesr)
> sourcesr.clusters<-hclust(sourr.dist)
> plot(sourcesr.clusters)
> sourr.dist<-vegdist(t(sourcesr))
> sourcesr.clusters<-hclust(sourr.dist)
> plot(sourcesr.clusters)
> sourv.dist<-vegdist(t(sourcesv))
> sourcev.clusters<-hclust(sourv.dist)
> plot(sourcev.clusters)
> plot(sourcev.clusters)
>
```

R Graphics: Device 2 (ACTIVE)



Tree Dendrogram

- Dendrograms are read according to the height scale on the left
- That axis is actually a measure of distance.
- Distance can be between “0” distance meaning having everything in common, or complete distance (which on here means a completely seperate branch).

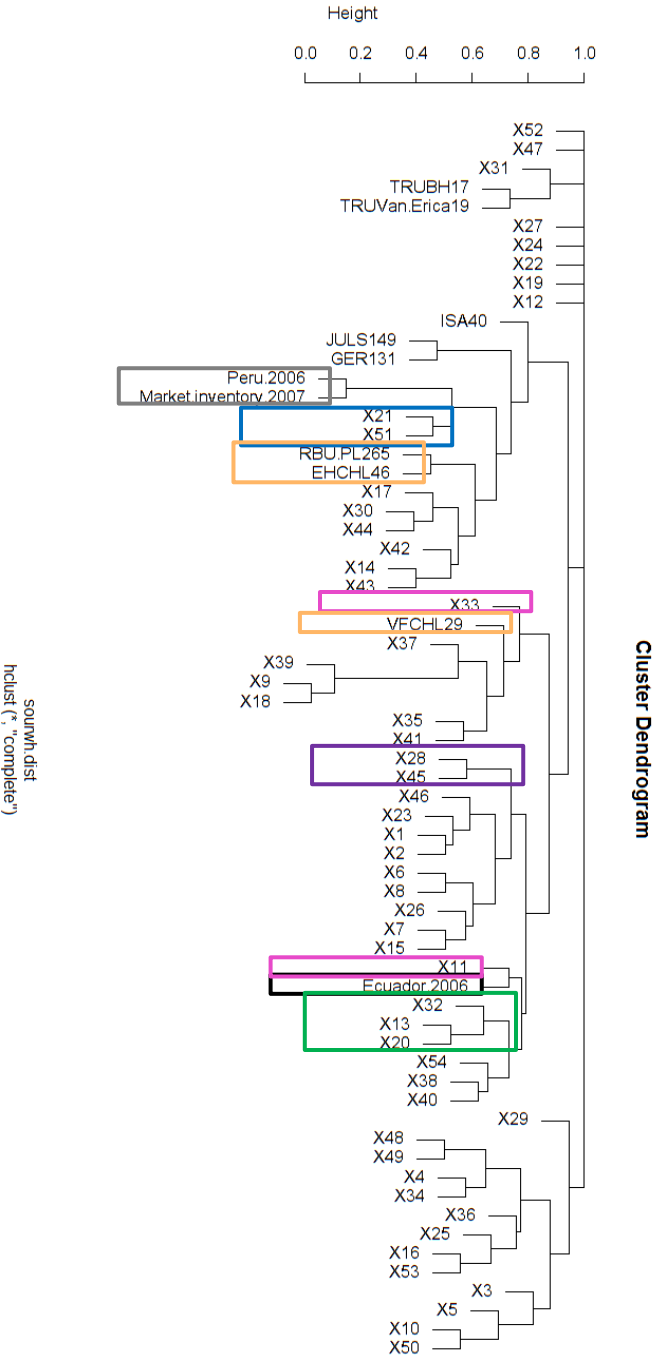


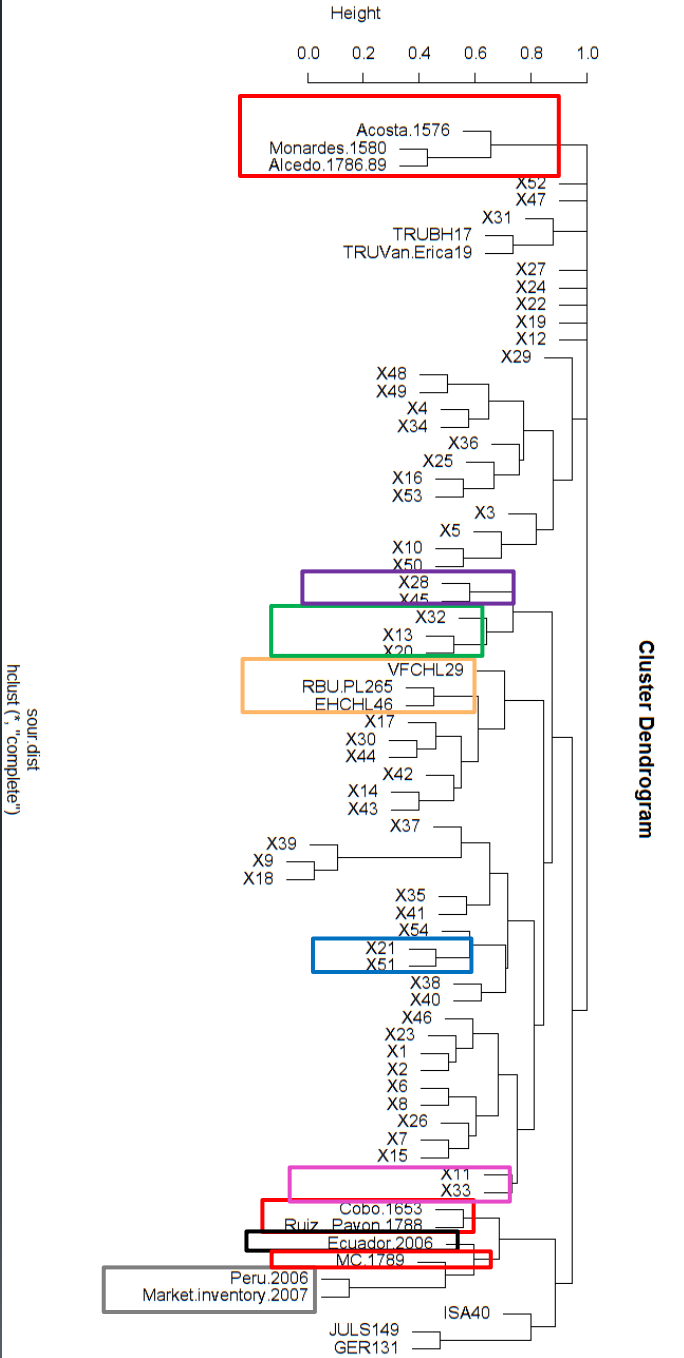
Market Results

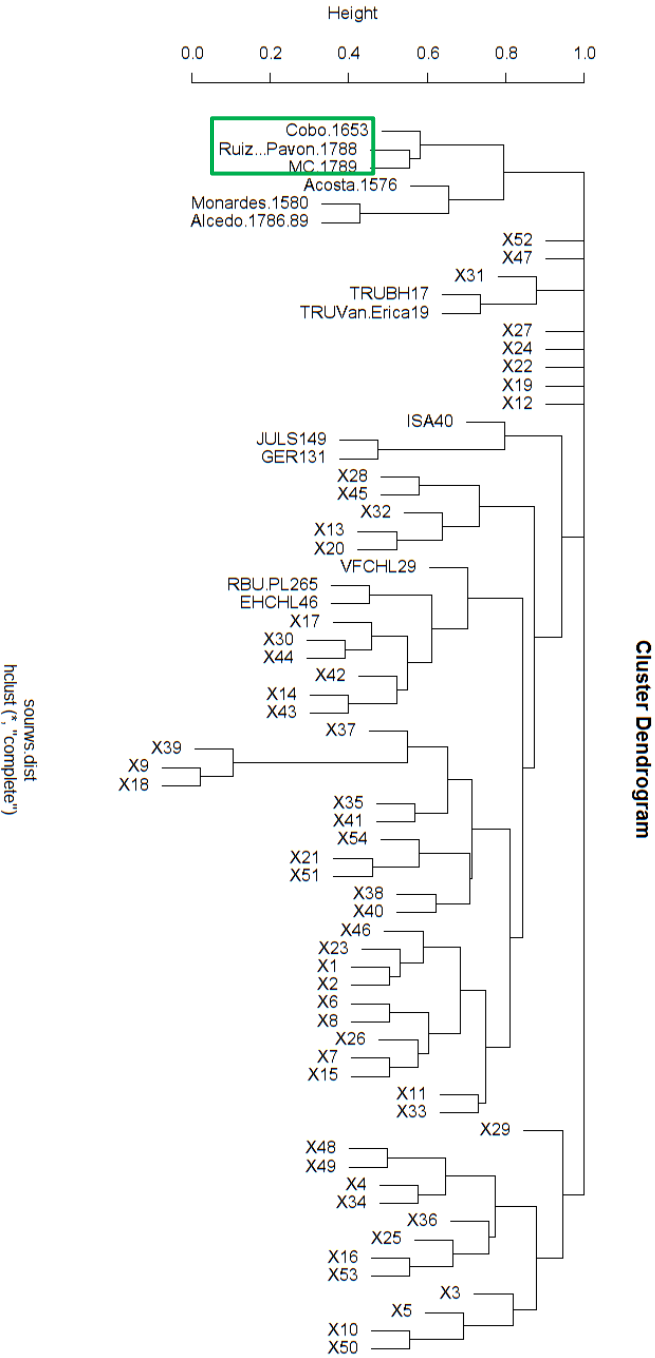
To the right shows how market vendors, healers, surveys, and historical sources cluster

On the left and right colors mark the resulting changes from them being removed.

What does this all imply about historical sources

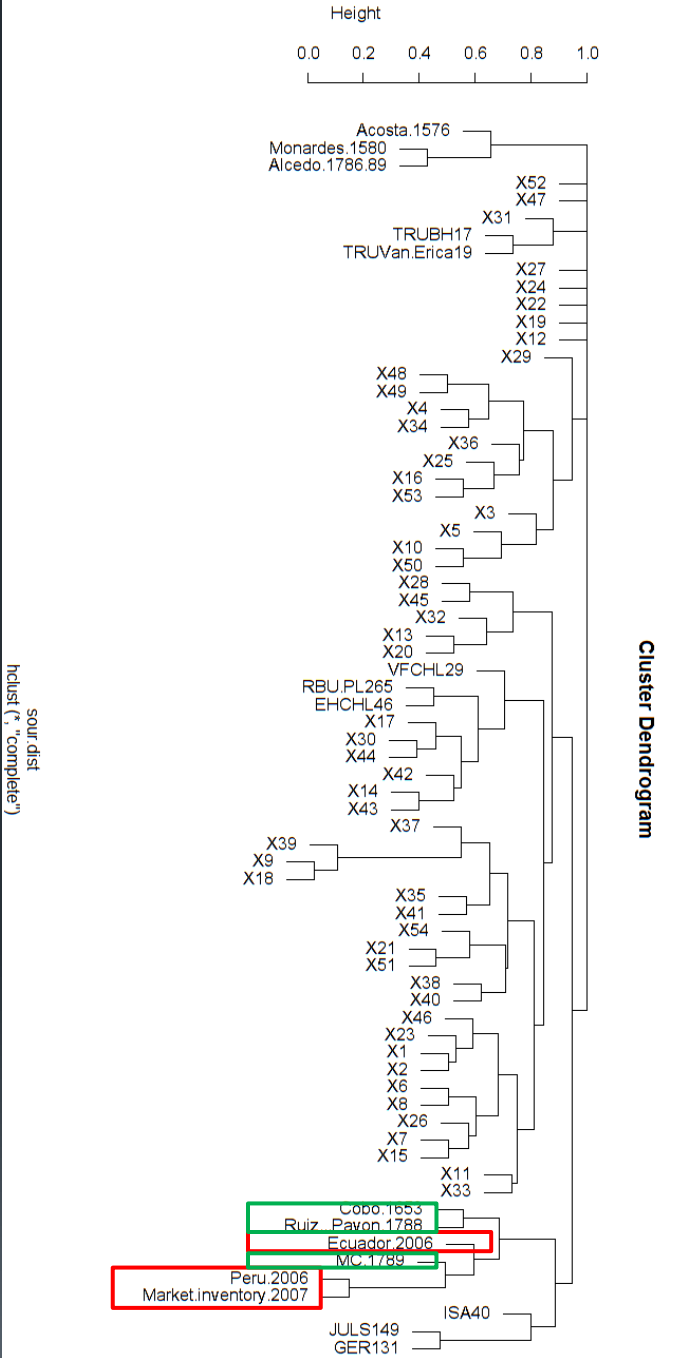


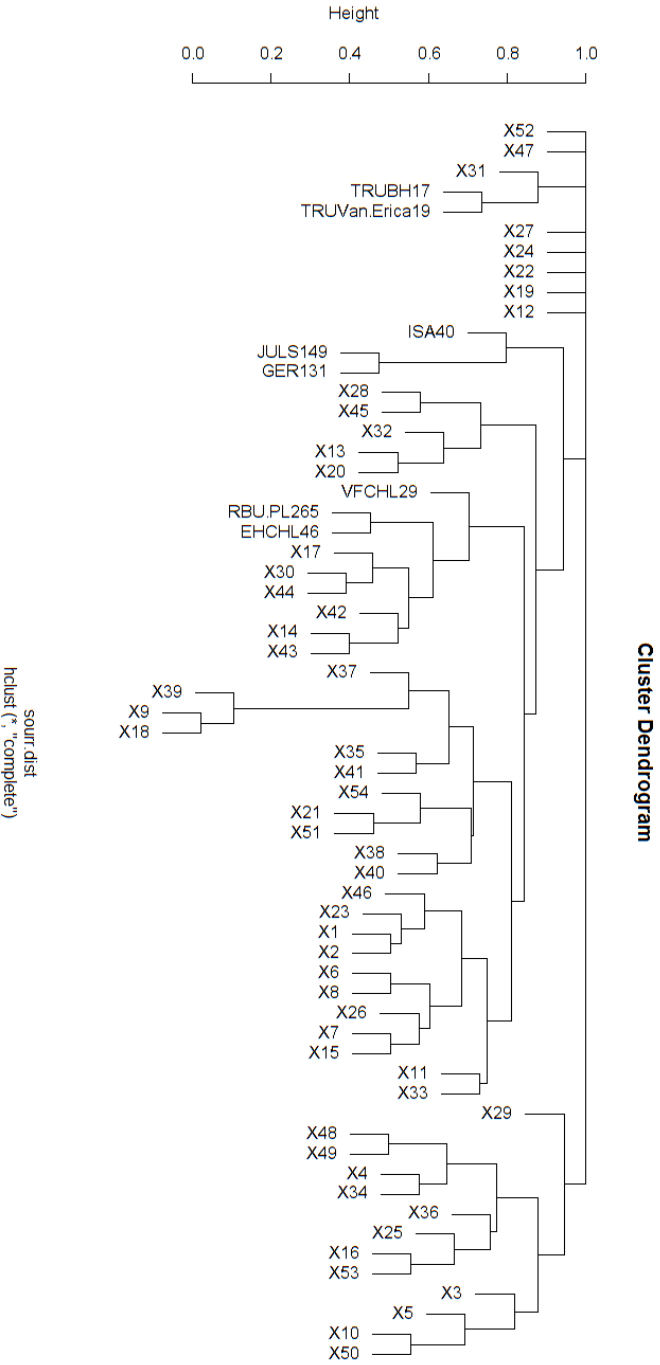




Except for the deletions and historical sources clustering together, there are zero things that changed!

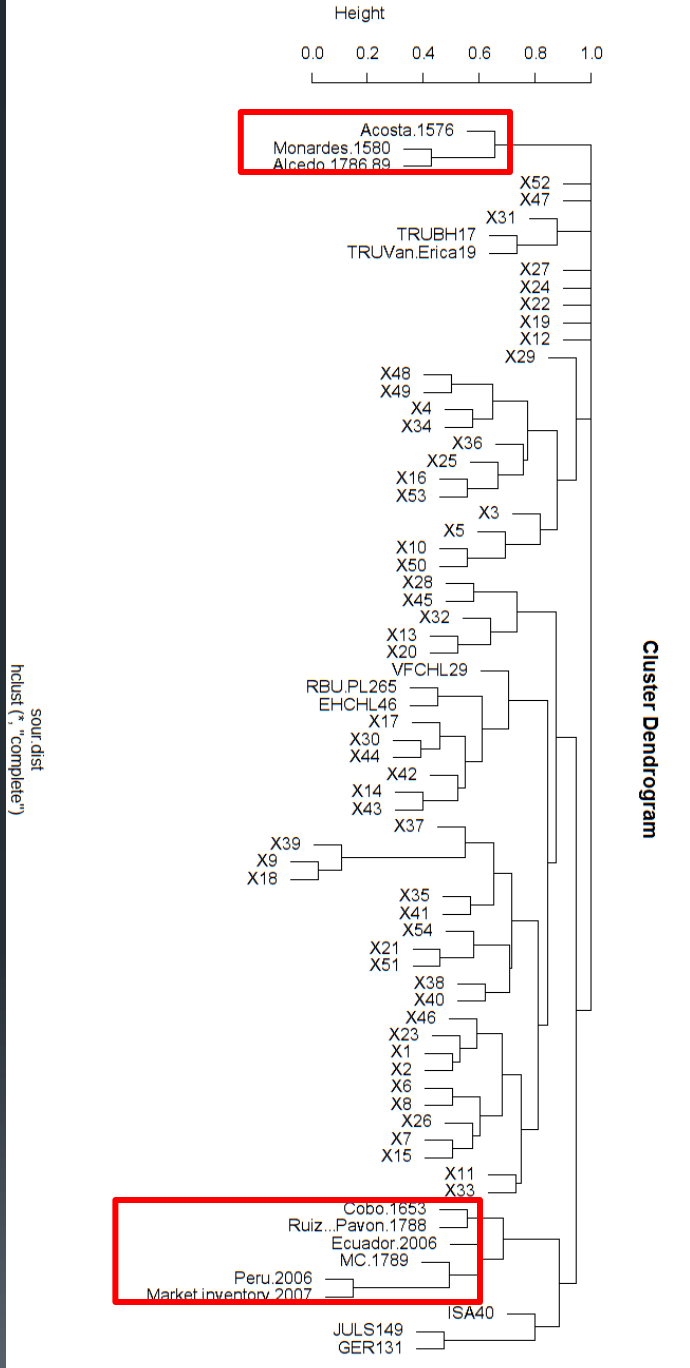
So What does this mean?

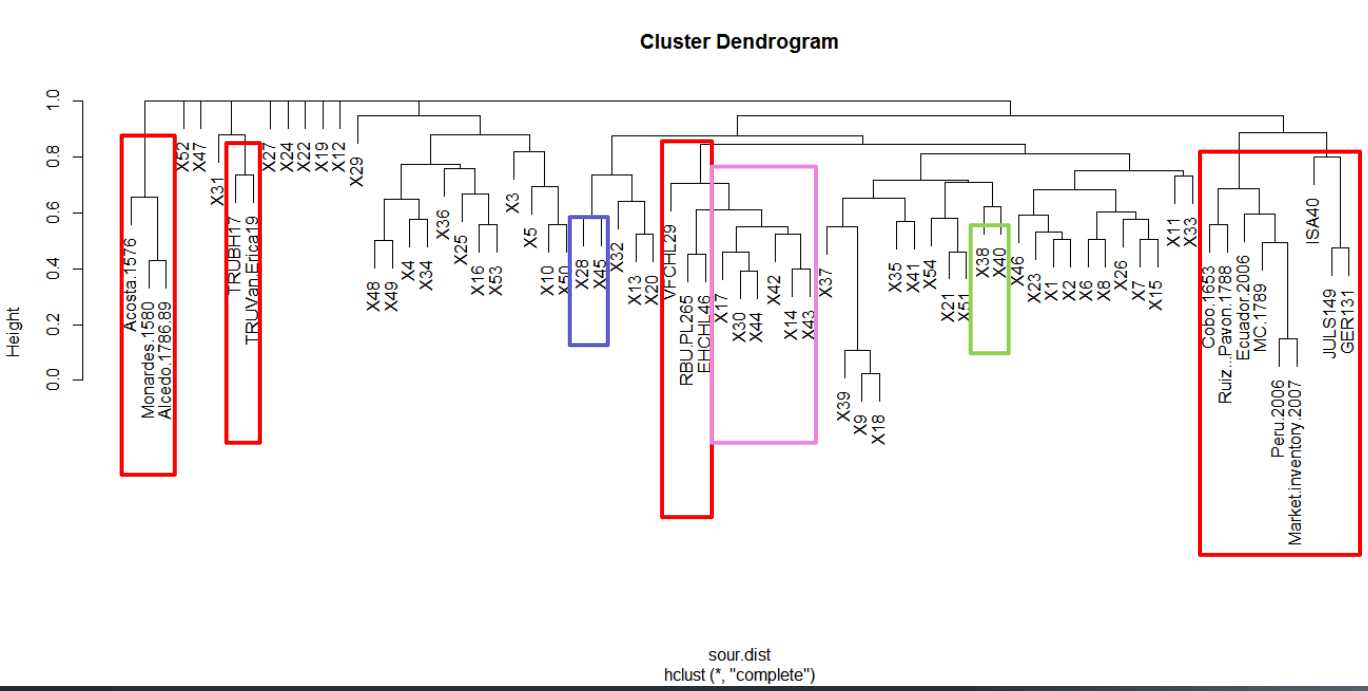


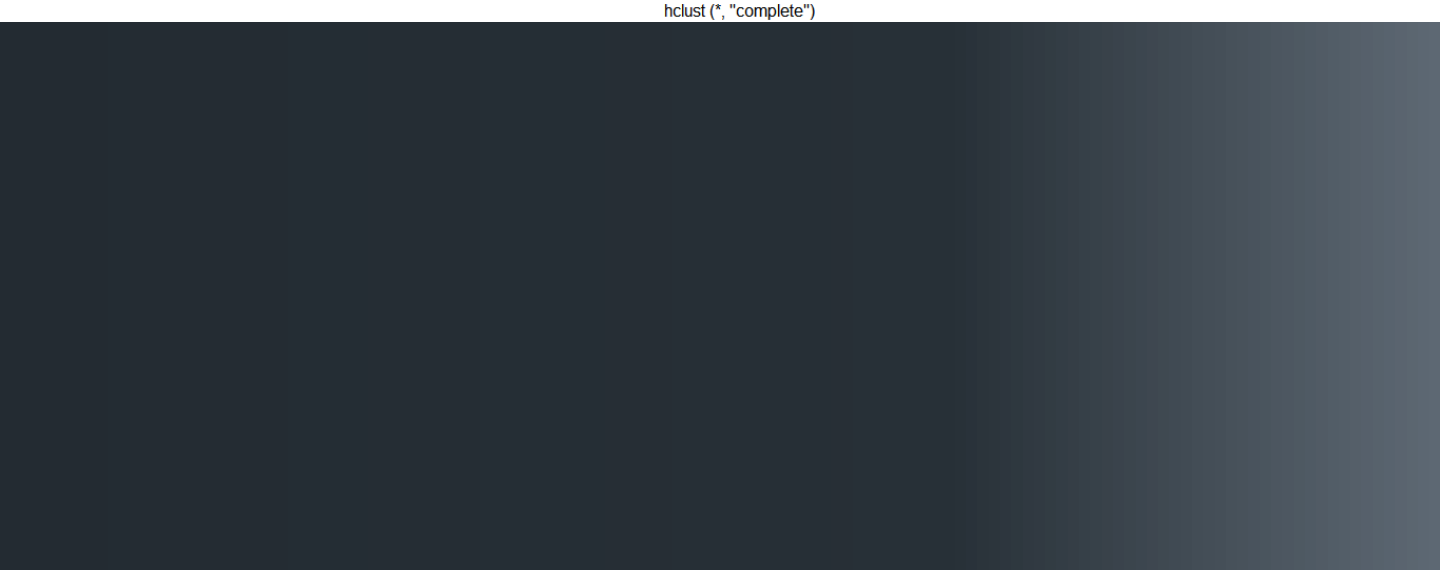


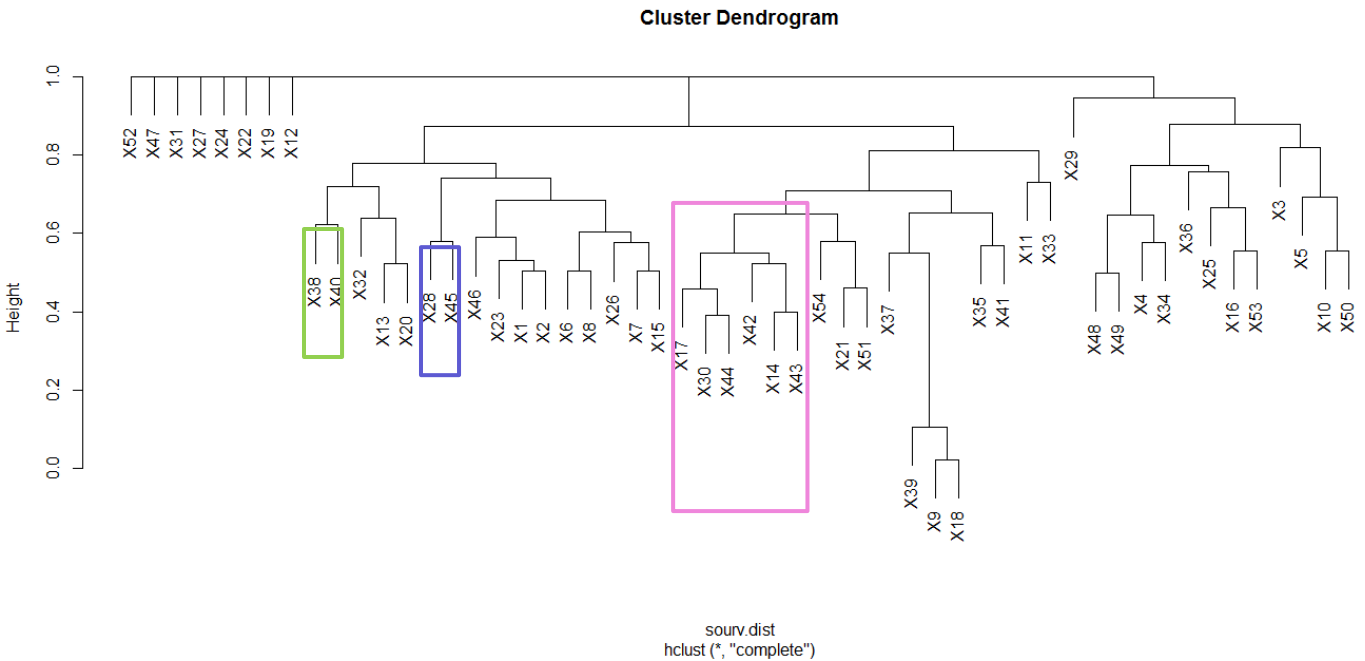
No changes occurred

Why would removing historical sources cause so much change before but zero change now that surveys have been removed too?




Cluster Dendrogram
Height
0.0
0.2
0.4
0.6
0.8
1.0
Acosta.1576
Monardes.1580
Alcedo.1786.89
X52
X47
X31
TRUBH17
TRUVanErica19
X27
X24
X22
X19
X12
X29
X48
X49
X4
X34
X36
X25
X16
X53
X3
X5
X10
X50
X28
X45
X32
X13
X20
VFCHL29
RBU.PL265
EHCHL46
X17
X30
X44
X42
X14
X43
X37
X39
X9
X18
X35
X41
X54
X21
X51
X38
X40
X46
X23
X1
X2
X6
X8
X26
X7
X15
X11
X33
Cobo.1653
Ruiz..Pavon.1788
Ecuador.2006
MC.1789
Peru.2006
Market.inventory 2007
ISA40
JULS149
GER131
sour.dist
hclust (*, "complete")




Cluster Dendrogram
Height
0.0
0.2
0.4
0.6
0.8
1.0
X52
X47
X31
X27
X24
X22
X19
X12
X38
X40
X32
X13
X20
X28
X45
X46
X23
X1
X2
X6
X8
X26
X7
X15
X17
X30
X44
X42
X14
X43
X54
X21
X51
X37
X39
X9
X18
X35
X41
X11
X33
X29
X48
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X4
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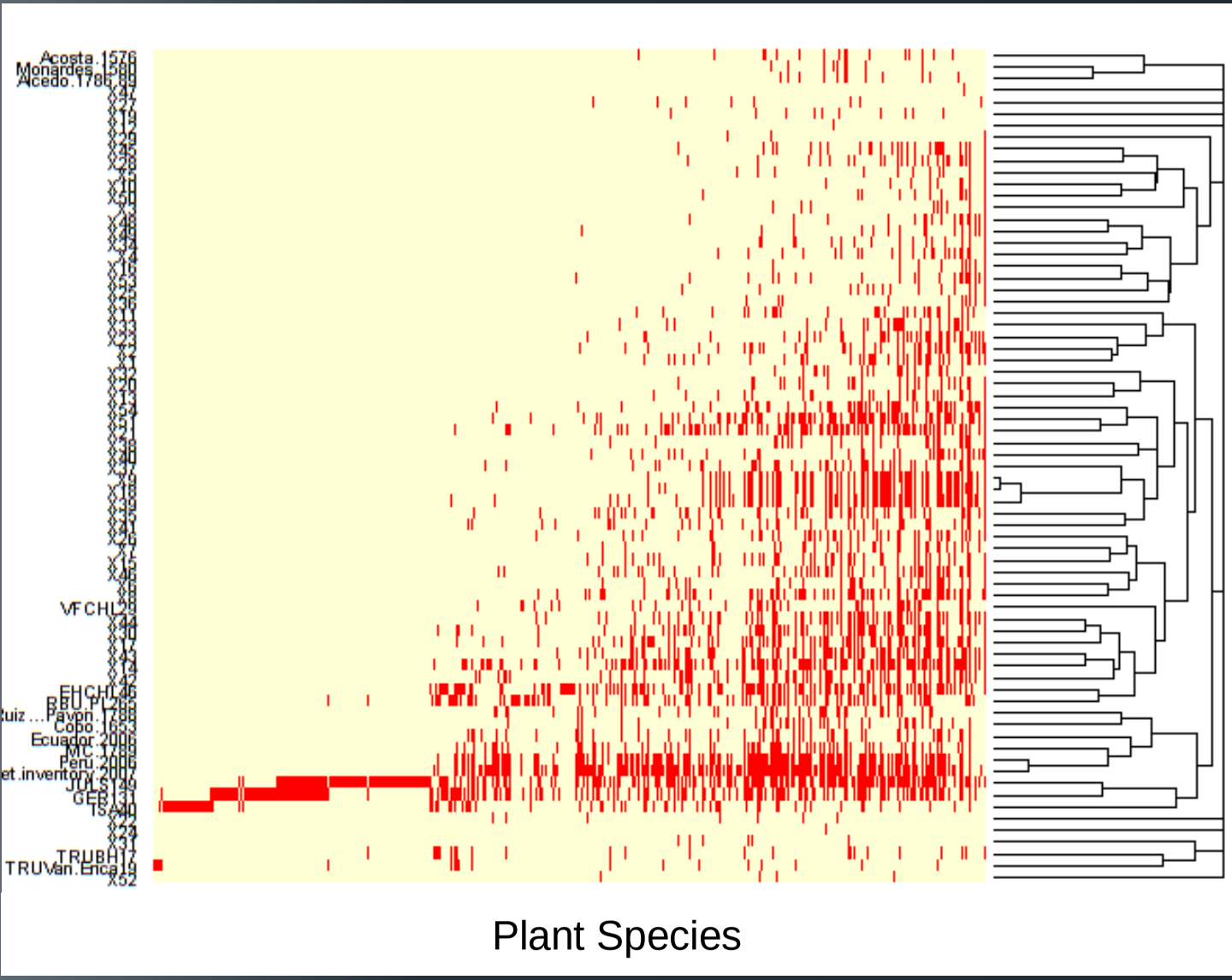
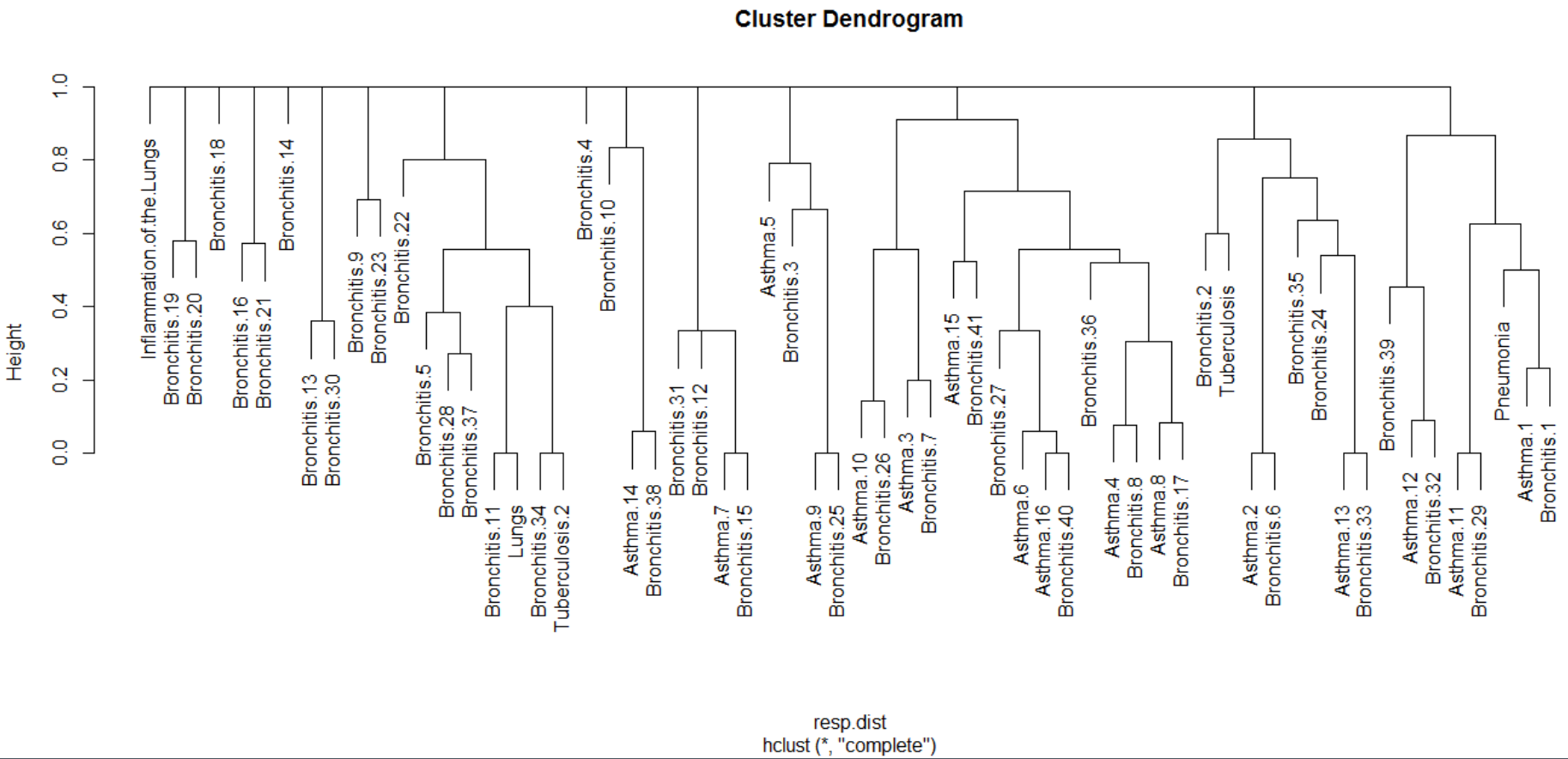
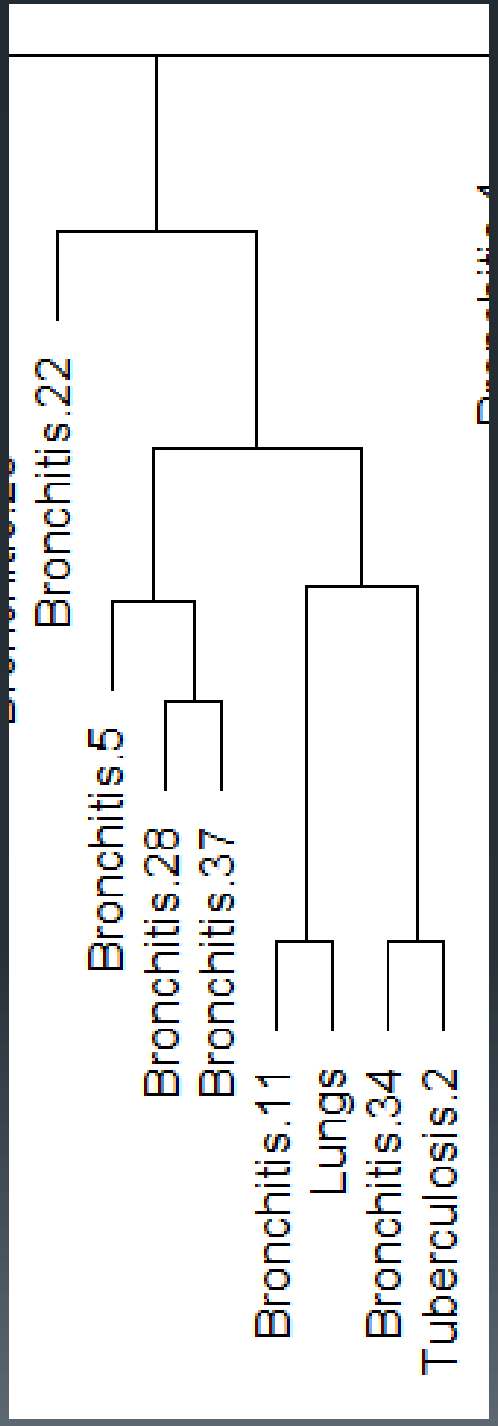
X36
X25
X16
X53
X3
X5
X10
X50
sourv.dist
hclust (*, "complete")

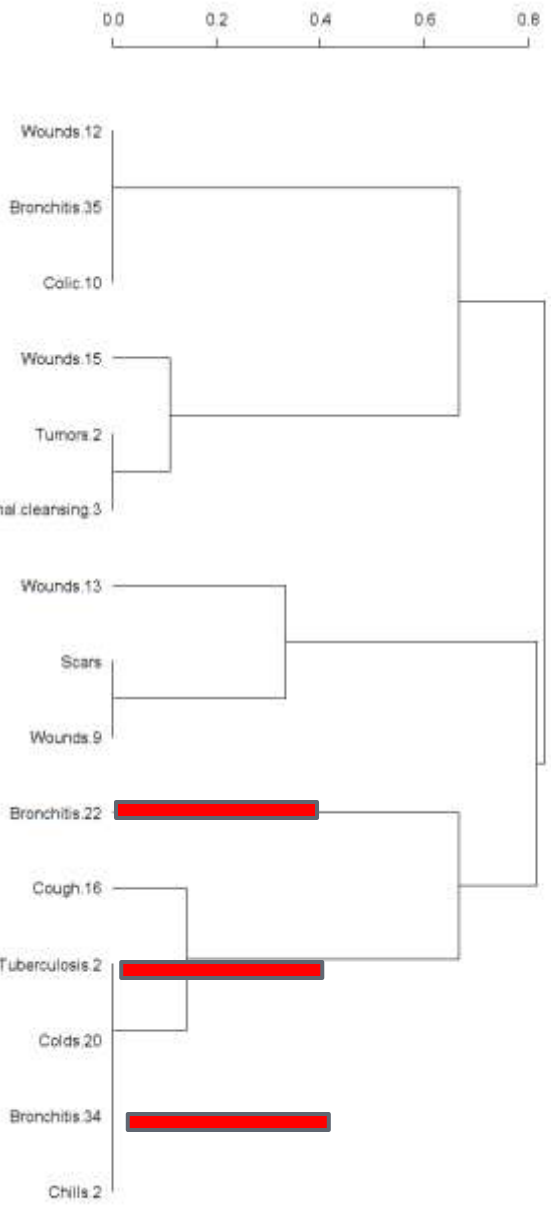

Acosta.1576
Monardes.1580
Acedo.1785
VFCHL
EHCHL46
Peru.2006
TRUBH17
TRUVan.Erica19
X52
Plant Species

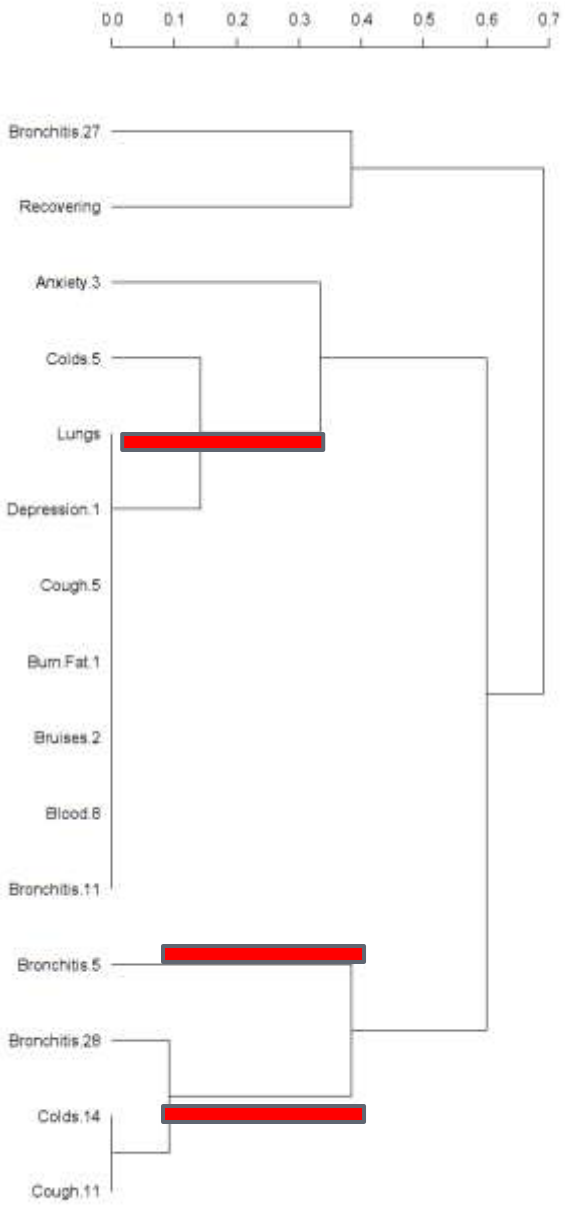
Respiratory Results

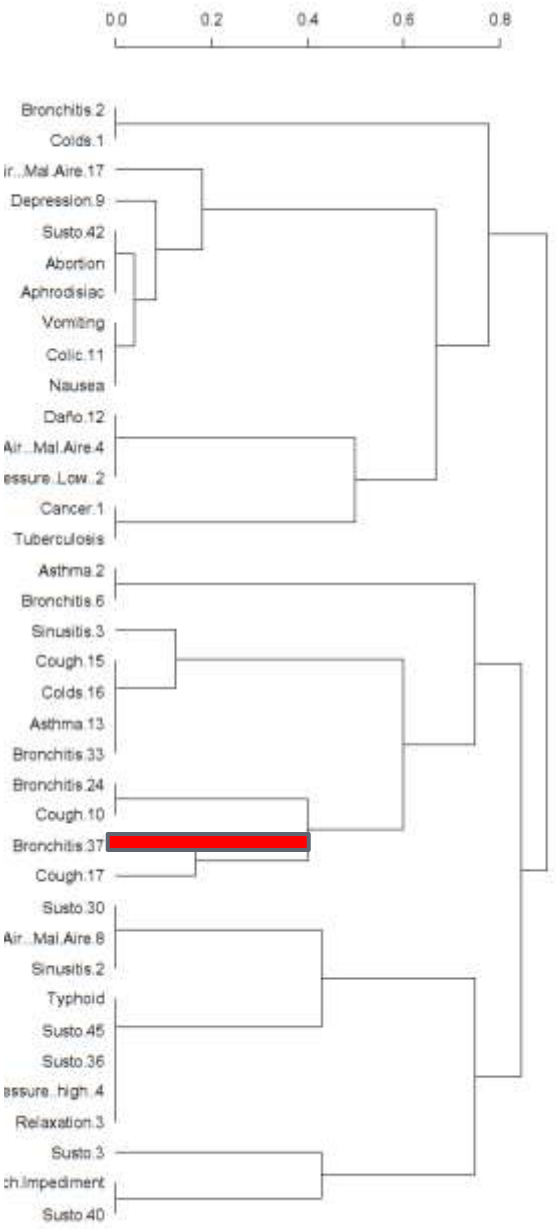


- This clade contains many asteraceae and is likely analgesic, aka a painkiller mixtures

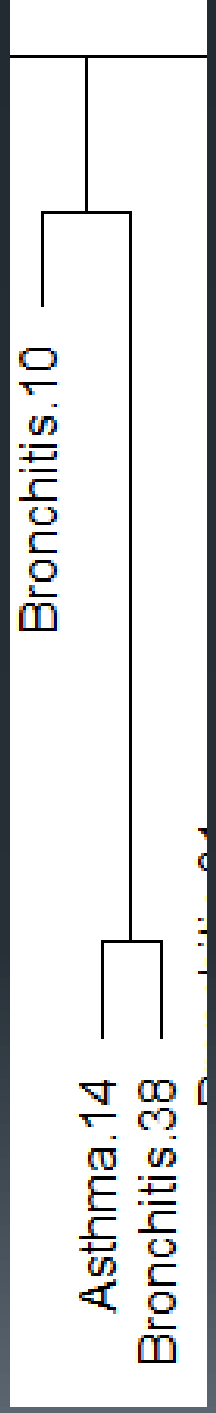


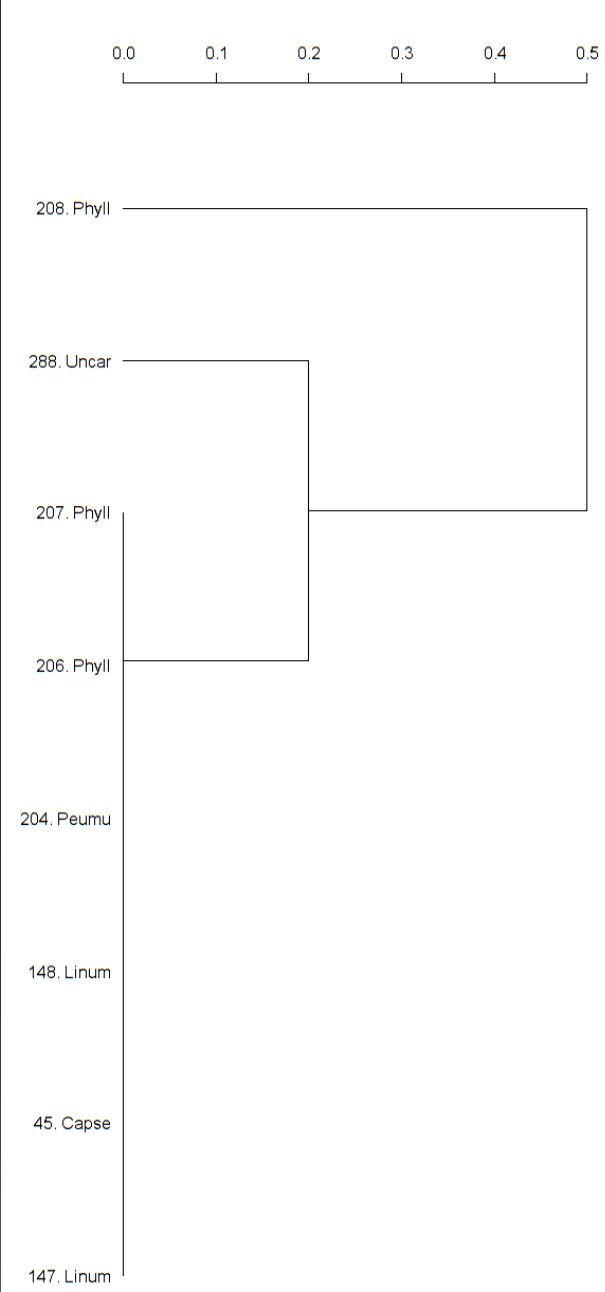

0.0
0.2
0.4
0.6
0.8
Wounds.12
Bronchitis.35
Colic.10
Wounds.15
Tumors.2
al cleansing.3
Wounds.13
Scars
Wounds.9
Bronchitis.22
Cough.16
Tuberculosis.2
Colds.20
Bronchitis.34
Chills.2


0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Bronchitis.27
Recovering
Anxiety.3
Colds.5
Lungs
Depression.1
Cough.5
Burn Fat.1
Bruises.2
Blood.6
Bronchitis.11
Bronchitis.5
Bronchitis.28
Colds.14
Cough.11


0.0
0.2
0.4
0.6
0.8
Bronchitis.2
Colds.1
ir...Mal Aire.17
Depression.9
Susto.42
Abortion
Aphrodisiac
Vomiting
Colic.11
Nausea
Daño.12
Air...Mal Aire.4
essure..Low..2
Cancer.1
Tuberculosis
Asthma.2
Bronchitis.6
Sinusitis.3
Cough.15
Colds.16
Asthma.13
Bronchitis.33
Bronchitis.24
Cough.10
Bronchitis.37
Cough.17
Susto.30
Air...Mal Aire.8
Sinusitis.2
Typhoid
Susto.45
Susto.36
ssure..high..4
Relaxation.3
Susto.3
ch.Impediment
Susto.40

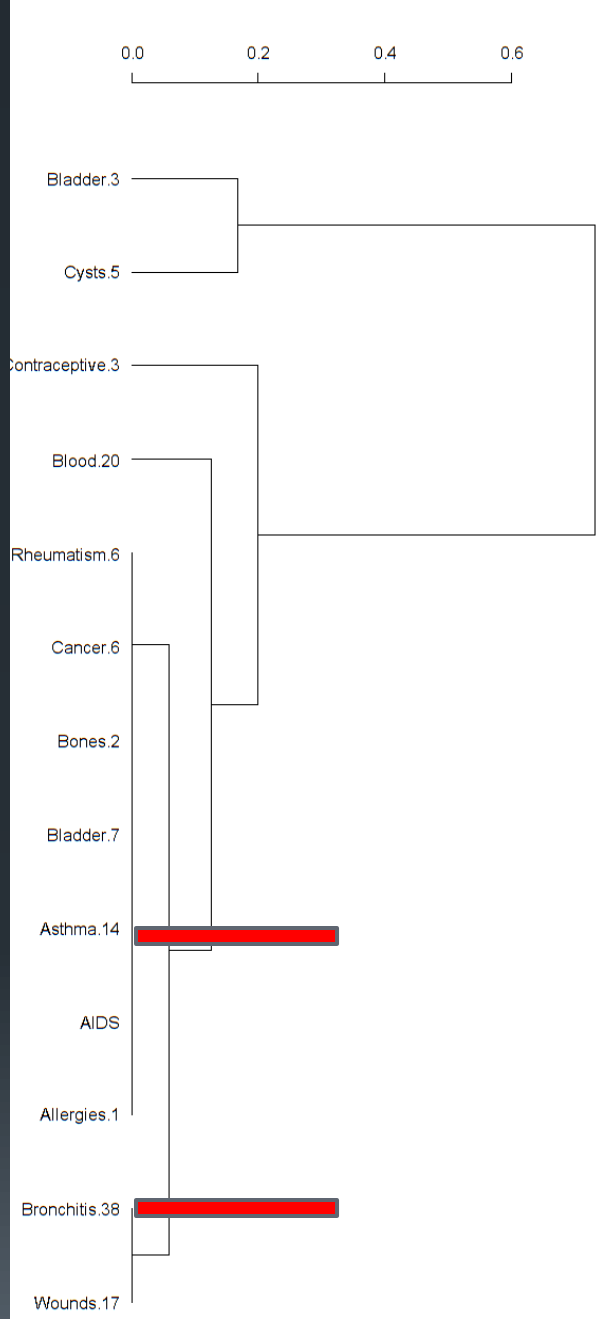
- This little branch alone has a very interesting plant mixture
- This branch has a mixture with diuretics (promote urine flow), anti-inflammatories, and antibacterial



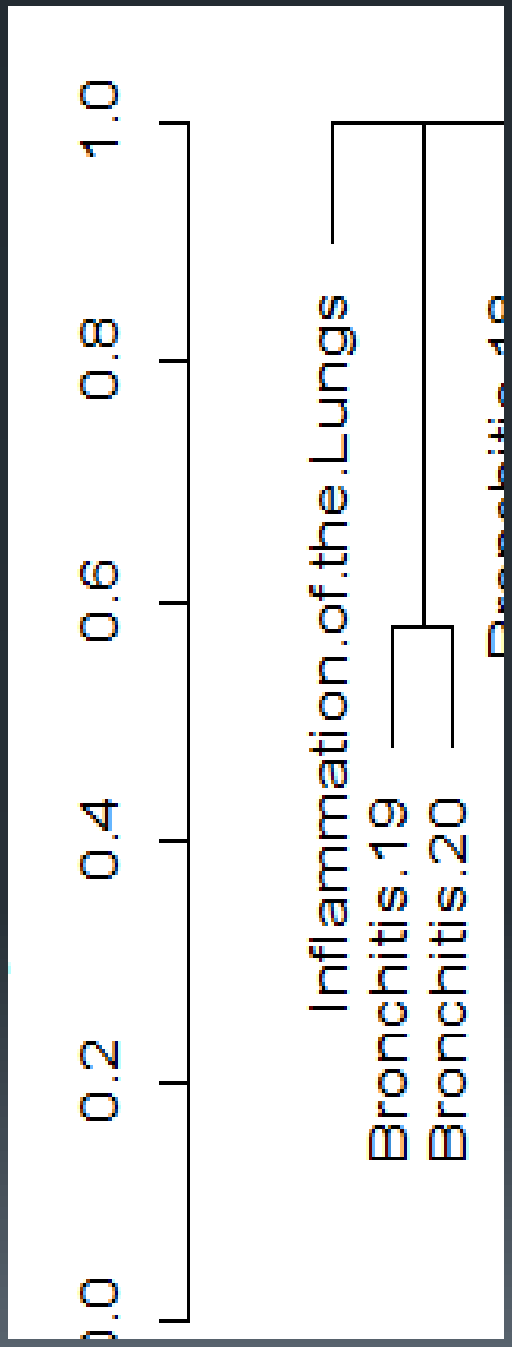


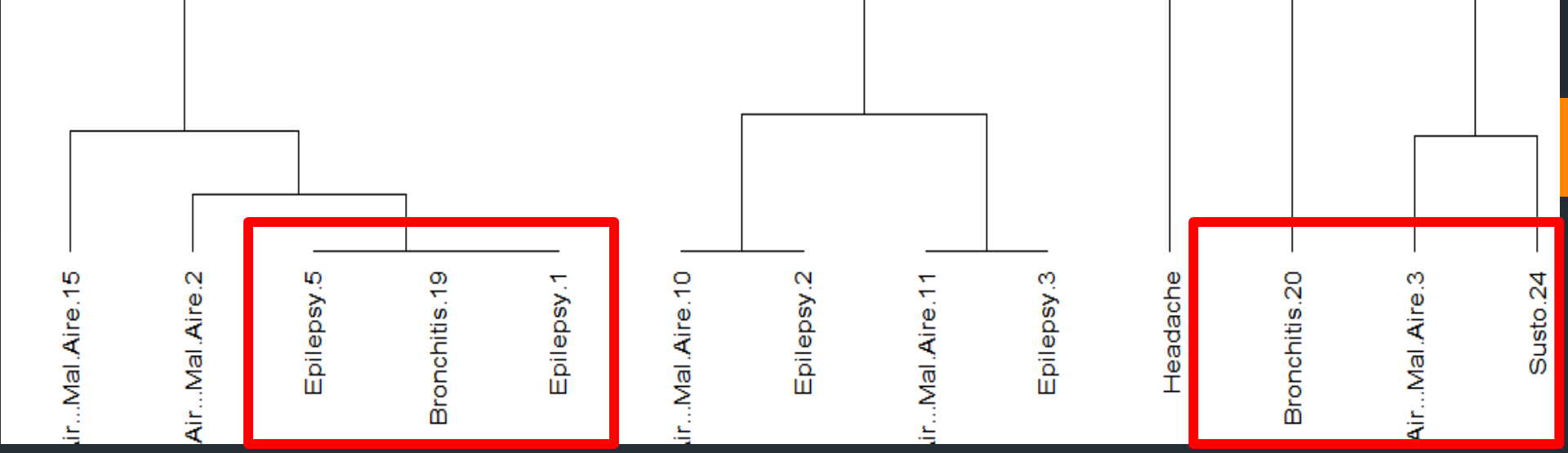
To the right are other illnesses that the previous mention asthma and bronchitis clusters with

To the left there's the plant mixture responsible.
Linum sativum – anti-inflammatory and diuretic
Peumus boldus – anti-inflammatory and antibacterial



- Focus is on bronchitis 19 and bronchitis 20
- Nothing very interesting about their clustering together until you look at the how they cluster with other mixtures

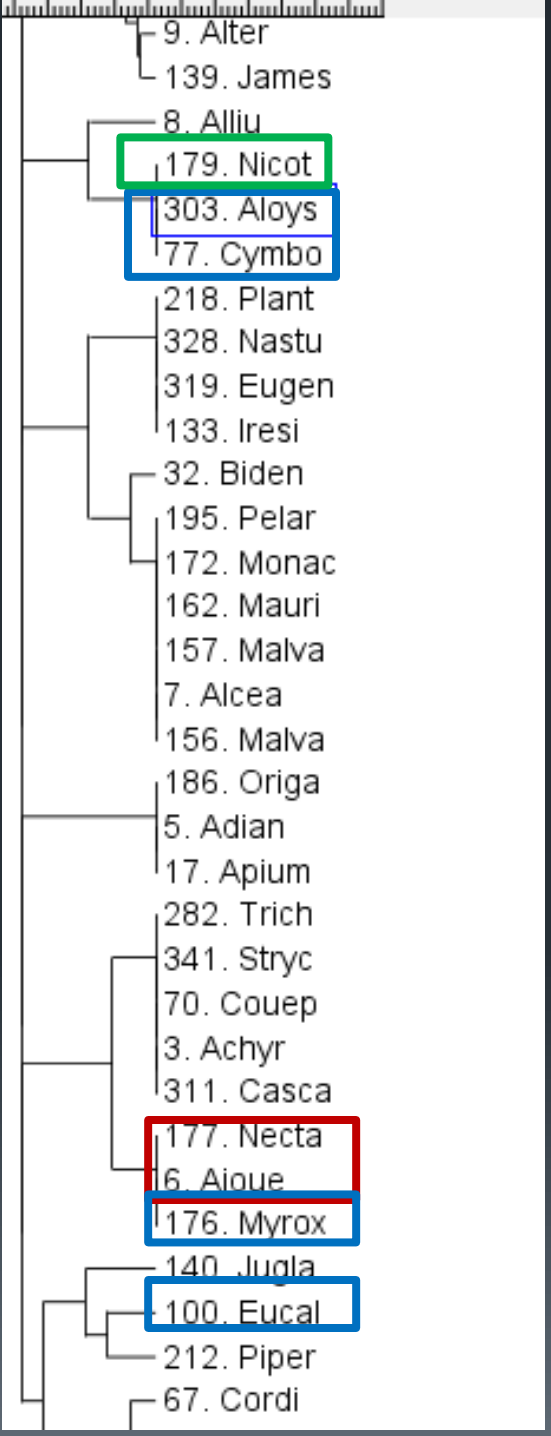




Bronchitis 19 clusters with Epilepsy????

Bronchitis 20 clusters with Mal Aire and Fear(Susto)???

Why???

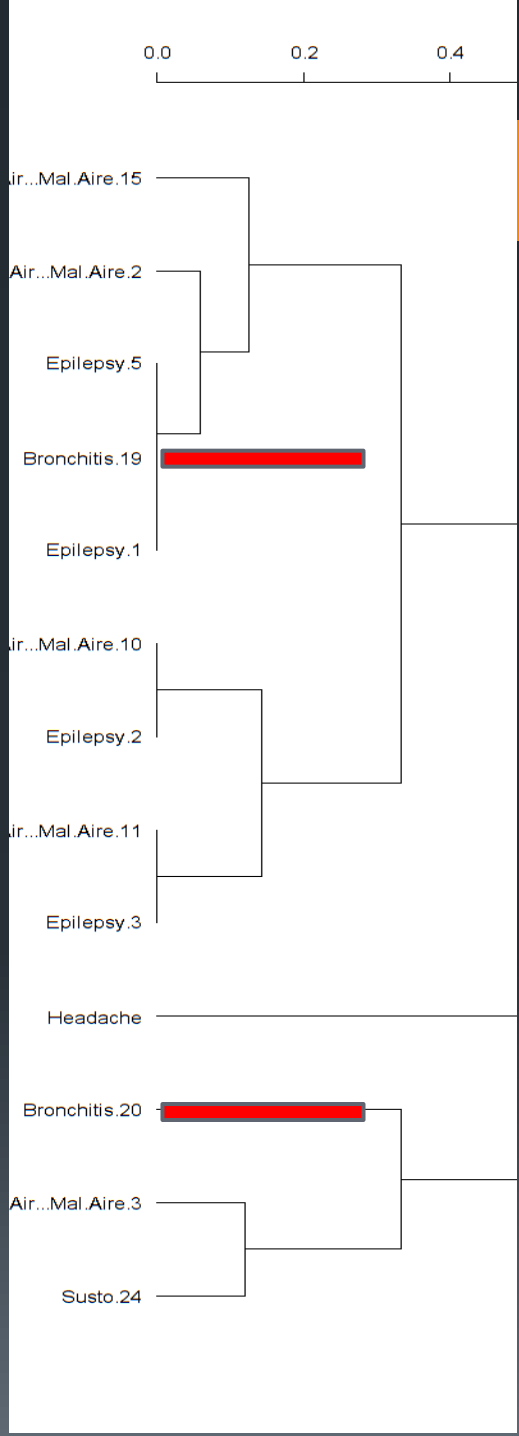


- Plants on the left, highlighted red are plants that are psychotropic
- Plants highlighted blue are neuroactive

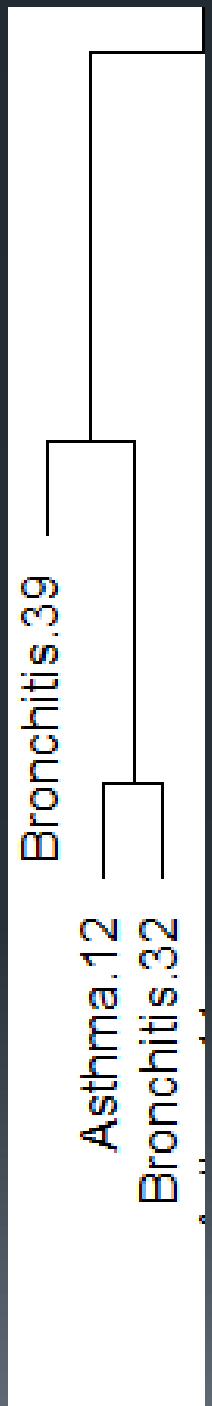
Eucalyptus globulus

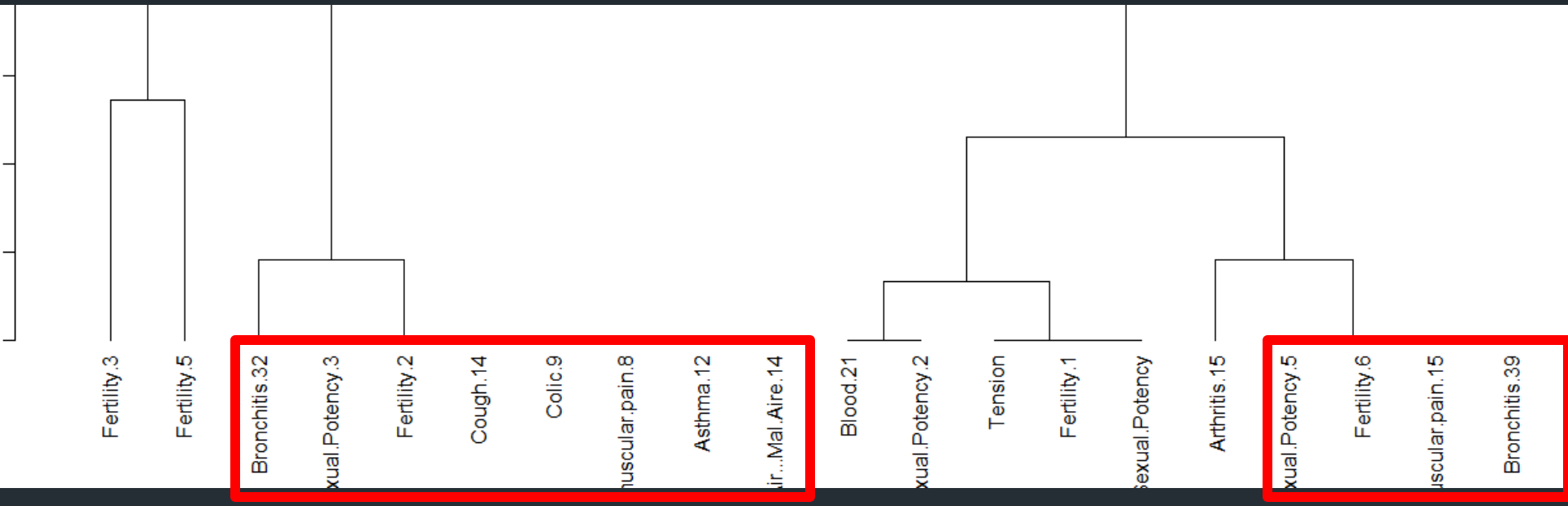
The plant, green highlighted, *Nicotiana tabacum,* relieves cramps. So essentially a muscle relaxer. Good for constricting bronchioles that prevent breathing

Nicotiana tabacum

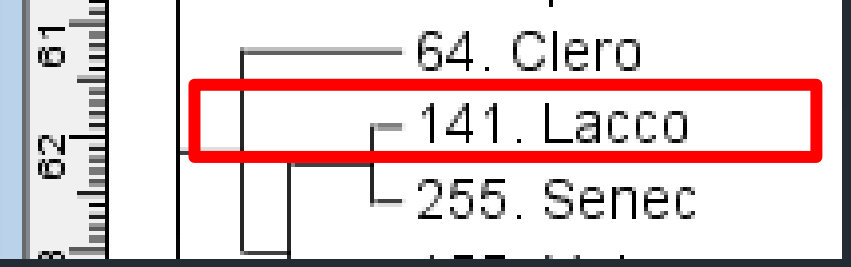


- This clade, to me, was also very surprising. Once again we look at the mixtures dendrogram to see why

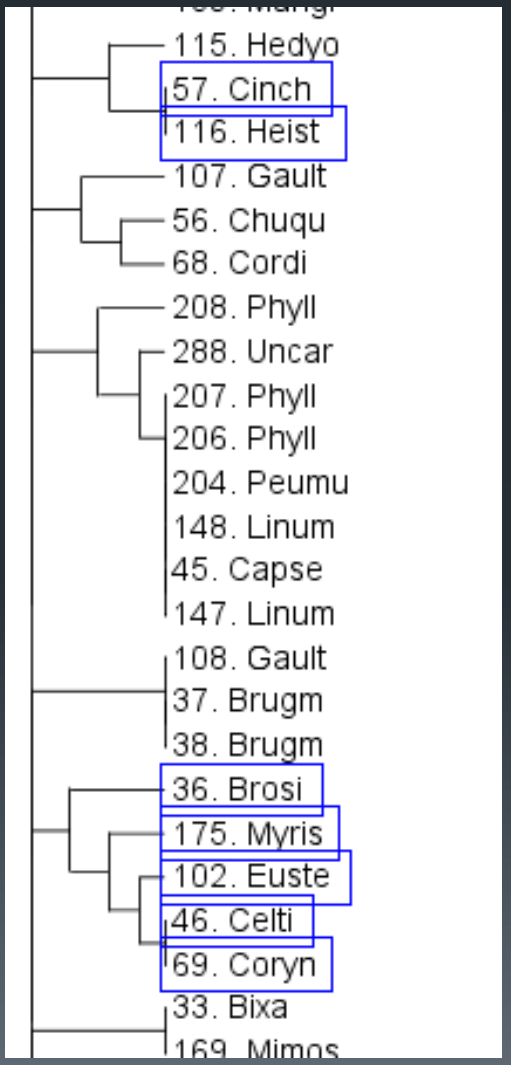




Bronchitis and asthma clustering with sexual potency and fertility



Laccopetalum giganteum

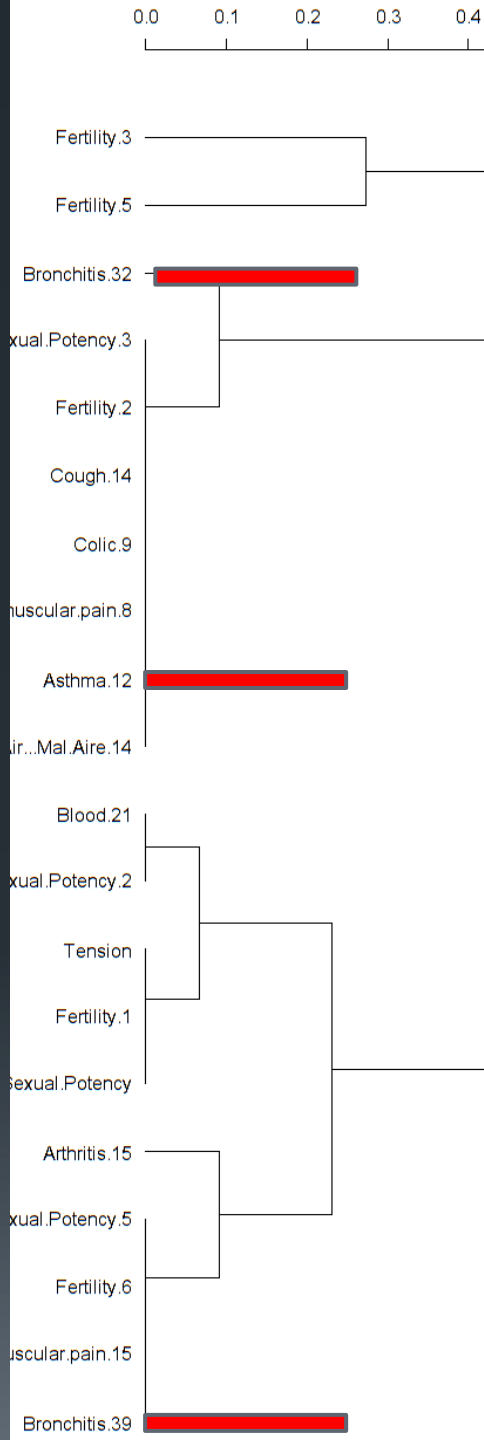


In the image above, the highlighted *Laccopetalum giganteum* is highly anti-inflammatory and is mostly responsible for the treatment of respiratory diseases

These others highlighted on the left, mixed with the laccopetalum help fertility and sexual potency.

Cinchona officinalis

Brosimum rubscens



Conclusion

- Had to answer two questions.
- Past v present
  - Can conclude that compared to historical data much plant knowledge has been gained and much of it lost too many but a select few.
- How is respiratory treated
  - As would expect with experimentation many treatments
  - Treatment largely dependent on how they determine the cause
  - Treatments rarely specific to body parts or illnesses. Rather general.
- A lot of value in this type of study
- Great for this type of comparative study
- In terms of ethno botany
  - Not just surveying what's used, for what, and how
- Gives some more in depth analysis to see people in plants relationship on a more specific level such why it's used for what, who knows how to use it for what, where its used, and more.

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- Alyse Kuhlman
- Robbie Hart
- Andrew Townesmith
- Eric Feltz
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