

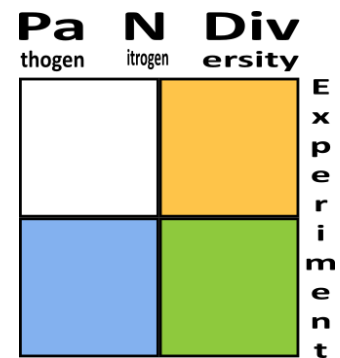
# The PaNDiv experiment

## Flora guide 5.0

07.2019 - Make PaNDiv great again

For the attention of the weeding helpers

**Seraina Cappelli, Mervi Laitinen, Tosca Mannall,  
Noémie Pichon, Hugo Vincent**



## Remember:

if you're not sure about what to take out of the plot, **ask for help.**





Licence to kill

If you want to learn some plants in an entertaining way, check out the homepage [www.biofotoquiz.ch](http://www.biofotoquiz.ch). In the section "Advanced"/"Fortgeschritten" under "Plants of the midland & jura"/"Pflanzen des Mittellandes & Juras" the lists "False Oatgrass meadow"/"Frommental-Wiesen" and "Cocksfoot & ryegrass meadows"/"Knaul- & Raigraswiesen" with many of the species and weeds of the PaNDiv experiment.

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**Please note:** Although there are fun facts saying which plants are edible, please do not eat any plants from the field even the weeds 😊

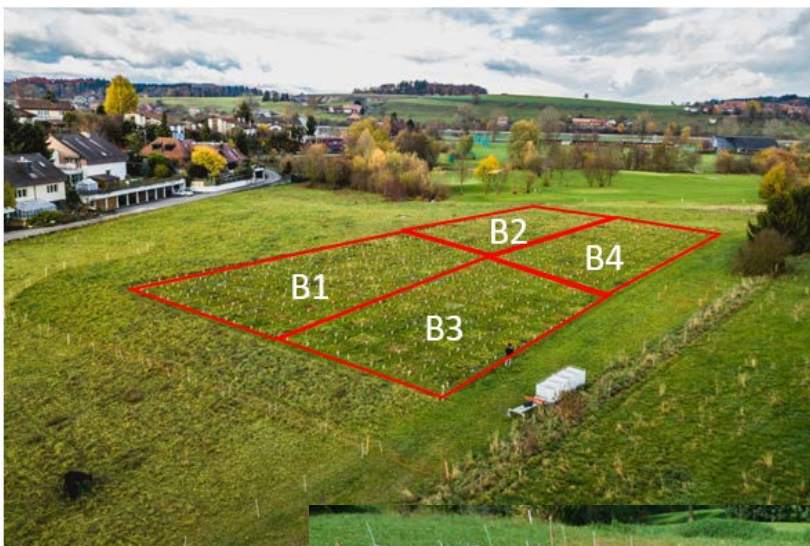


# PaNDiv Project

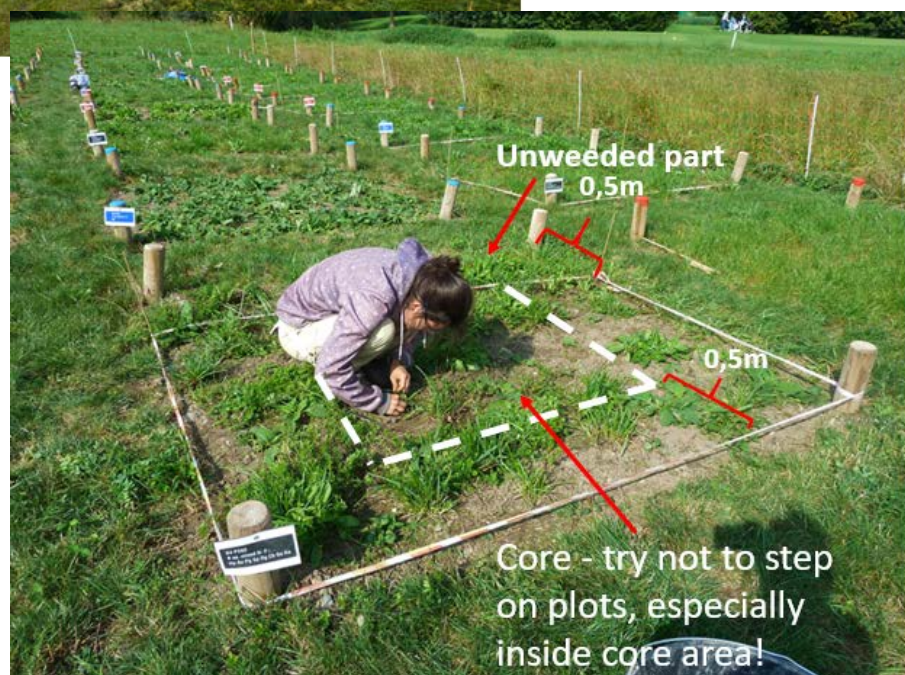
We have set up a large field experiment in Münchenbuchsee near Bern to investigate the mechanisms by which nitrogen enrichment affects ecosystem functioning. N enrichment changes soil chemistry and directly increases plant growth and ecosystem productivity. At the same time, it could indirectly affect ecosystem function by causing a loss of plant species richness, a shift in functional trait composition towards fast growing plant species and an increase in the abundance of plant enemies such as foliar fungal pathogens. This experiment factorially manipulates N addition, plant species richness, functional composition (two pools of fast and slow growing species defined based on leaf economic traits) and fungal pathogens (using fungicide) on 336 2m x 2m plots, which were sown in autumn 2015. We will measure a range of ecosystem functions related to productivity, biogeochemical cycling and litter decomposition and will monitor the diversity and abundance of the foliar pathogen communities.

In order to maintain the species richness and composition on each plot during the whole experiment it is necessary to remove unwanted weeds. We do this three times a year.

## Block design



## Plot design





## Plot label



There are 8 labels that are wrong and ugly corrected with violet paint. **Ao** has been replaced with **Am** in plot **51, 85, 203** and **254**. **Hs** has been replaced with **HI** in plot **84, 103, 192** and **277**!

## Species codes (20 sp.)

Poa trivialis = **Pt**

Lolium perenne = **Lp**

Holcus lanatus = **HI**

Helictotrichon pubescens = **Hp**

Festuca rubra = **Fr**

Dactylis glomerata = **Dg**

Bromus erectus = **Be**

Anthoxanthum odoratum = **Ao**

Centaurea jacea = **Cj**

Crepis biennis = **Cb**

Taraxacum officinale = **To**

Achillea millefolium = **Am**

Anthriscus sylvestris = **As**

Daucus carota = **Dc**

Salvia pratensis = **Sp**

Prunella grandiflora = **Pg**

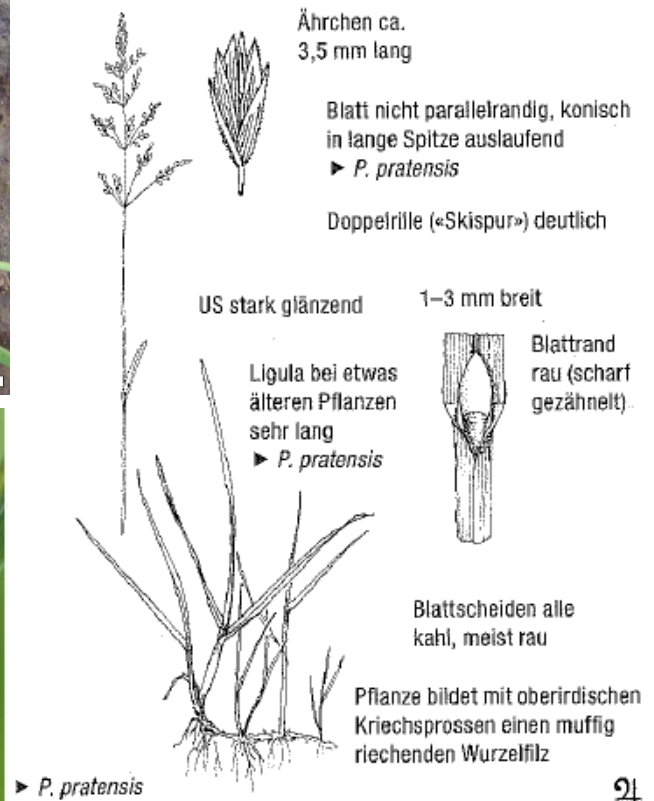
Plantago media = **Pm**

Galium album = **Ga**

Rumex acetosa = **Ra**

Heracleum sphondylium = **Hs**

# *Poa trivialis*



***Poa trivialis* s.str. L.** Gemeines Rispengras; 20–60 cm; kollin–subalpin; feuchte Fettwiesen und -weiden, Unkrautfluren, Ufer (Agropyrum, Rumex, Arrhenatherum, Convolvulus); holarkt; FH: 2841.

## Characteristics:

- Thin, soft and shiny leaves
- Runners
- Ligule long and pointy
- No hairs
- Can often be found in the shade of other plants





# Invaders that look like *Poa trivialis*

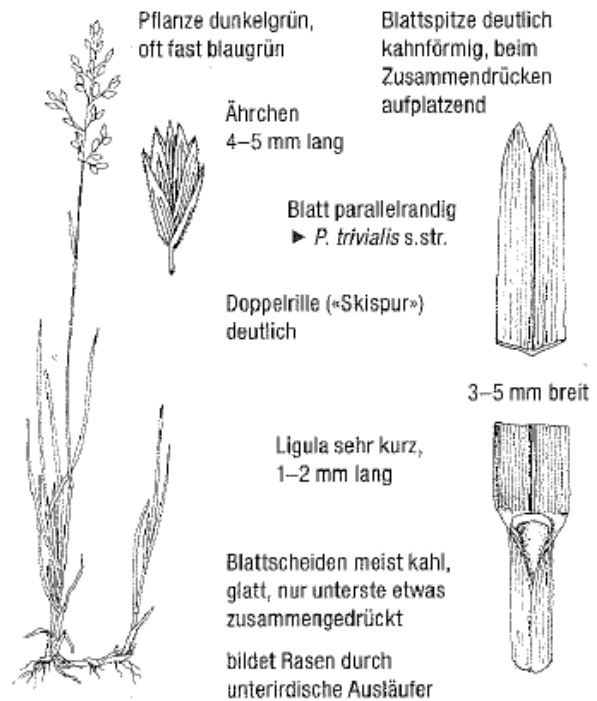
*Poa annua*



## Characteristics:

- Boat-shaped tip
- Smooth leaf blades
- Pointy ligule
- Slightly flattened stem
- Very common invader

*Poa pratensis*



► *P. angustifolia*, *P. palustris*, *P. trivialis* s.str.

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**Poa pratensis** L. Wiesen-Rispengras; 20–50 cm; kollin–subalpin; Fettwiesen und -weiden, Wegränder, Unkrautfluren (Arrhenatherion, Polygono-Trisetion, Aegopodion); gutes Futtergras; holarkt; FH: 2843.

## Characteristics:

- Similar to *Poa annua* but ligule is very short
- Two deep “tramlines” down the centre of the leaf blade



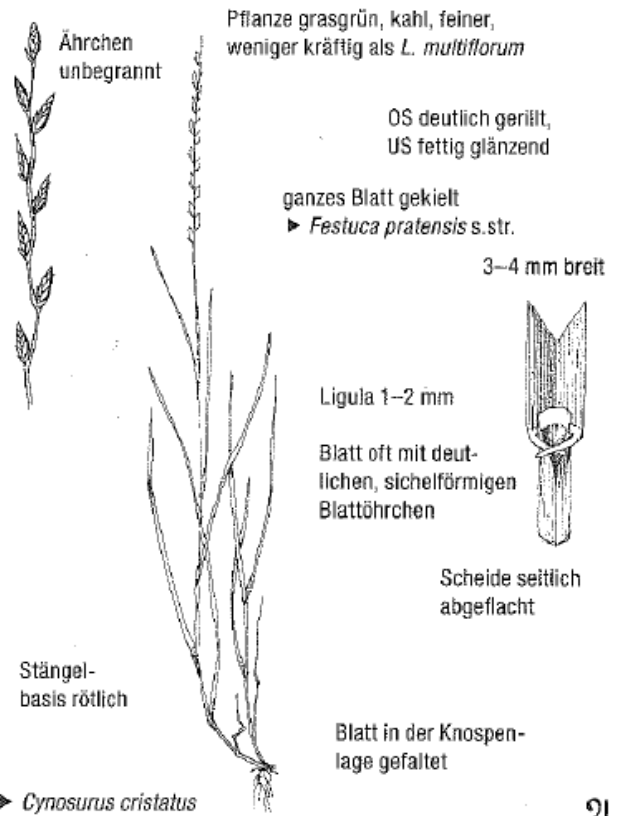
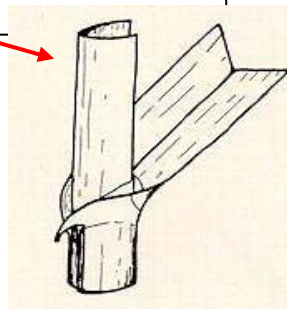


# *Lolium perenne*



## Characteristics:

- "Communist" auricles grip the stem
- Prominent parallel veins
- Dark green leaves (mostly)
- Back of the leaf is shiny
- Very short ligule
- No hairs
- Younger plants grow "star" like
- Leaf folded

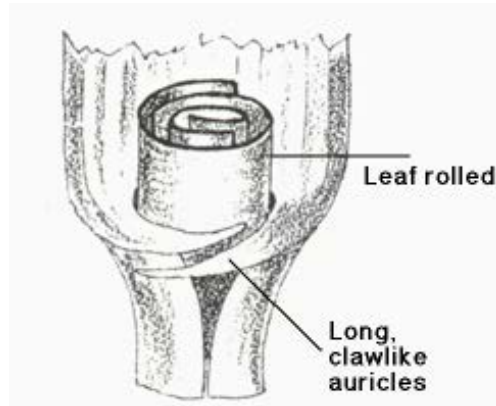


***Lolium perenne* L.** Englisches Raygras; 20–50 cm; kollin–montan; Fettweiden, Trittrassen, Parkrasen (Cynosurion); tritt- und schnittfester Pionier; eurasiat; Fl: 2865.



## Invaders that look like *Lolium perenne*

*Lolium multiflorum*



### Characteristics:

- Much bigger leaves
- "Hairs" on the flowers
- Bigger "communist" auricle



*Festuca arundinacea*



### Characteristics:

- Harsh leaves with fine "teeth" on the edges
- Hairs on auricle

*Elymus repens*



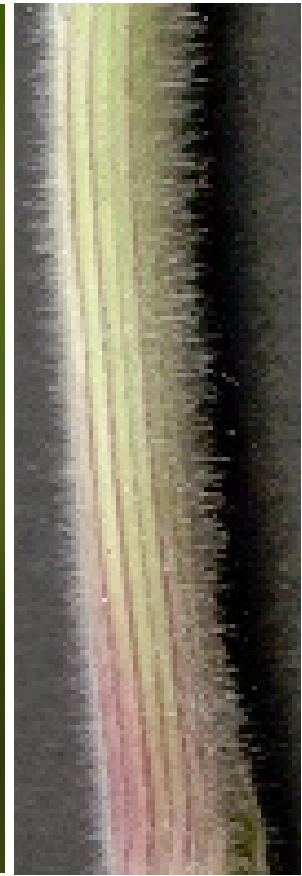
### Characteristics:

- Underside of the leaf is not shiny
- Smells like fresh grass when crushed





# Holcus lanatus



Pflanze hellgrün bis graugrün, ohne Ausläufer

5–8 mm breit

Ligula 2–3 mm,  
fein gezähnt



Blatt samtartig,  
weich behaart

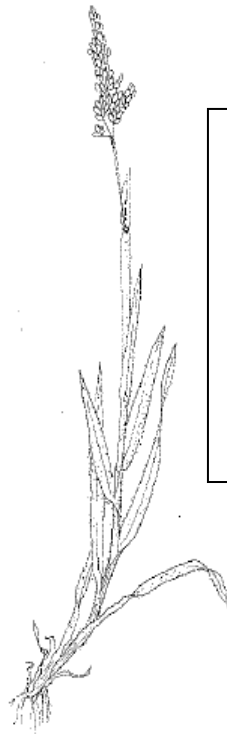
Blattscheide samtartig,  
gleichmässig weich  
behaart



Knoten kurz  
weichhaarig

Triebgrund weisslich, mit deutlichen  
rotvioletten Nerven

► *Bromus hordeaceus*



## Characteristics:

- Very soft and hairy
- The base of the stem is white with pink stripes (Pyjama)
- Hairs on leaves have all the same length ca 1mm (magnifying lens!)



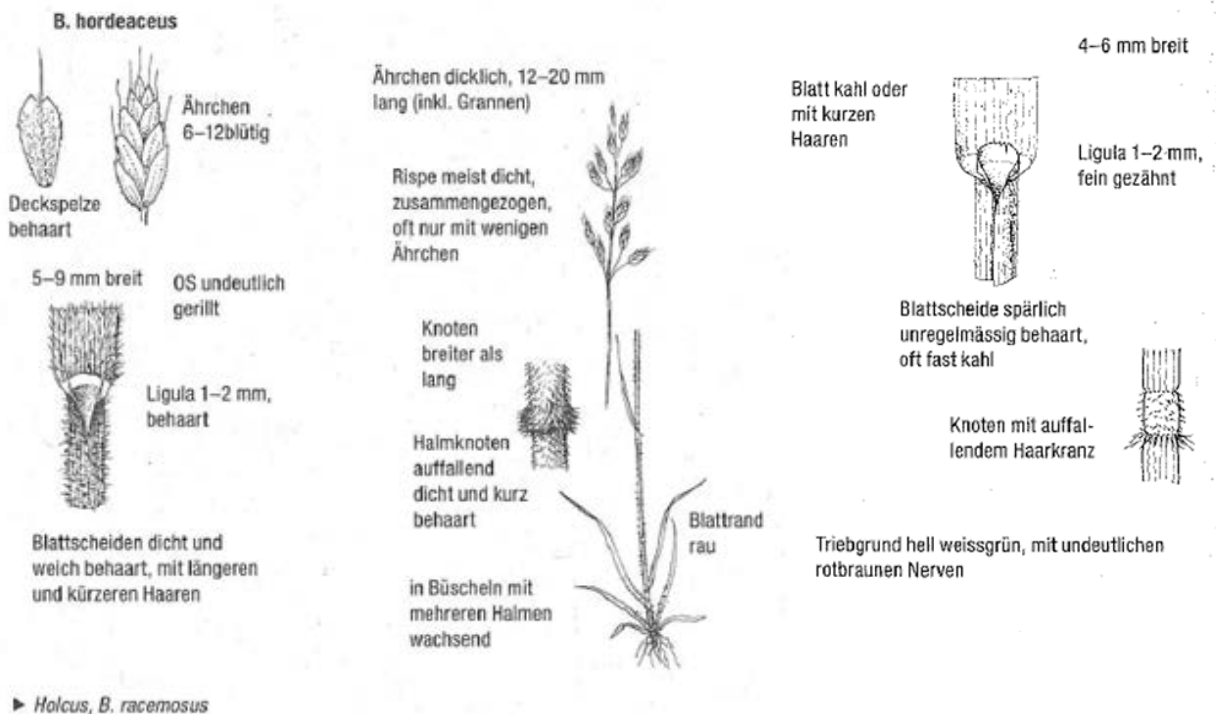
**Holcus lanatus** L. Wolliges Honiggras;  
30–60 cm; kollin–montan; frische, nasse  
Fettwiesen und -weiden (Calthion, Arrhenather-  
ion); schlechtes Futtergras; europ;  
FH: 2907.





# Invaders that look like *Holcus lanatus*

## *Bromus hordeaceus*



**Bromus hordeaceus** L. (*B. mollis*); Gersten-Trespe; 20–50 cm; kollin–montan; trockene Unkrautgesellschaften, Fettwiesen, Wegränder (Sisymbrium, Arrhenatherion); Wiesenunkraut; eurasiat; FH: 2788.

in warmen Gebieten sich ausbreitend

### Characteristics:

- Hairs at the tip of the flower
- The base of the stem has reddish dots and green lines
- Hairs on leaves have different lengths 1-3mm (magnifying lens!)
- Nodium ("knot" on the stem) wider than long



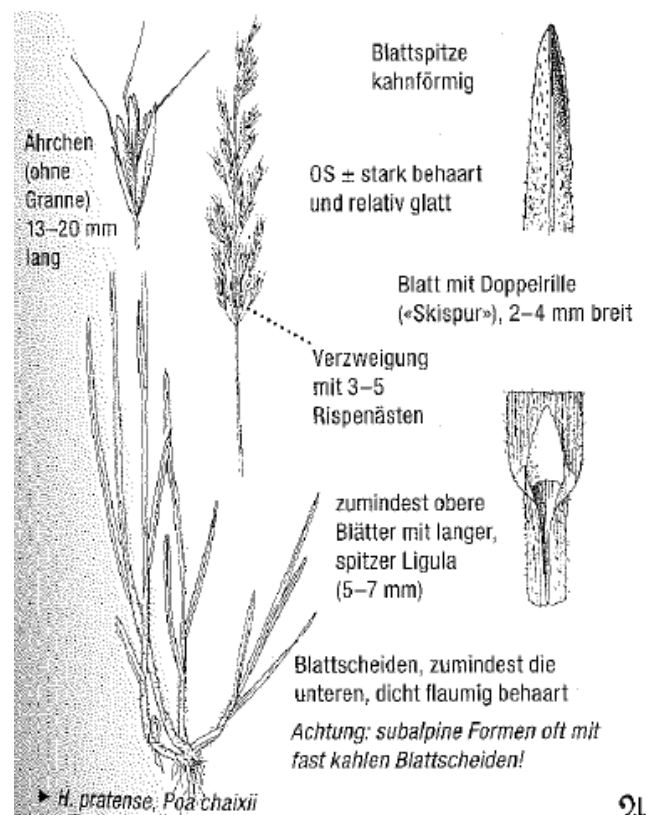
Also have a look at *Trisetum flavescens*, described as lookalike of *Anthoxanthum odoratum*!

# *Helictotrichon pubescens*



## Characteristics:

- Boat tip
- More or less hairy
- Long ligule



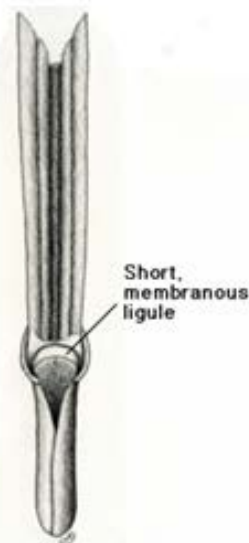
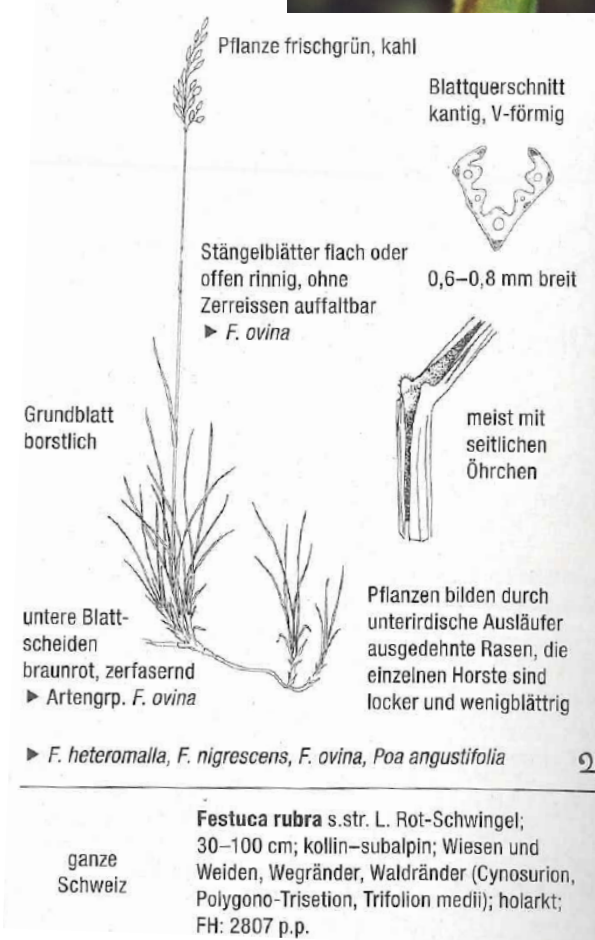
24



***Helictotrichon pubescens*** Pilg. (*Avenula p.*);  
Flaumhafer; 30–100 cm; kollin–subalpin;  
Fettwiesen, Halbtrockenrasen (Arrhenatherion,  
Polygono-Trisetion, Mesobromion); mässiges  
Futtergras; eurasiat; FH: 2926.



# *Festuca rubra*



## Characteristics:

- Leaves are narrow and needle like
- The base of the stem is reddish
- Leaf "breaks" when bent back
- No hairs

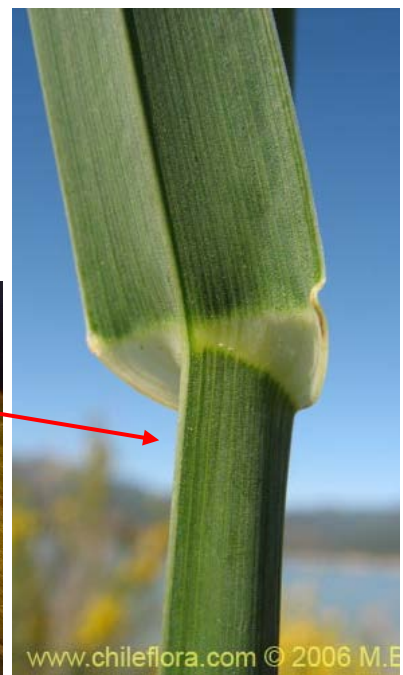
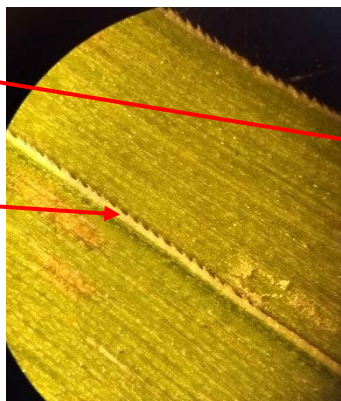


# *Dactylis glomerata*

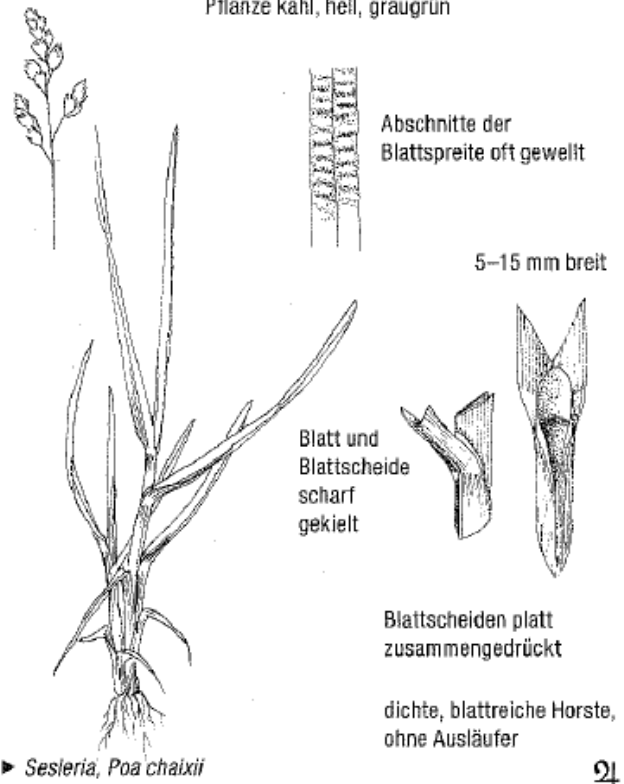


## Characteristics:

- Broad, grey-green leaves
- Flattened stem
- No hairs
- Back of the midrib has a cutting edge when slid down with fingers

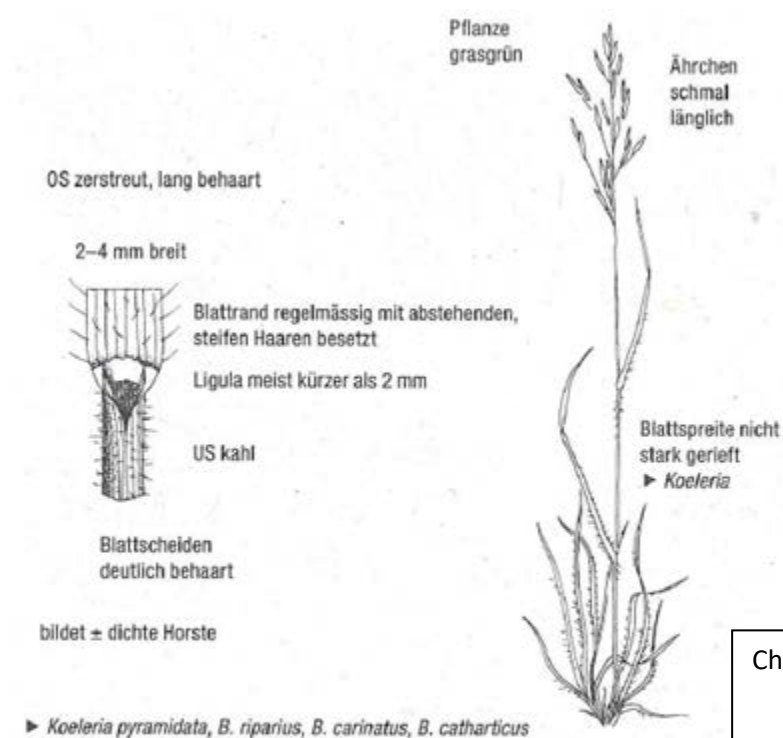


Pflanze kahl, hell, graugrün



**Dactylis glomerata** L. Gemeines Knäuelgras; 30-100 cm; kollin-subalpin; Fettwiesen und Unkrautgesellschaften, Weg- und Waldränder (Arrhenatherion, Cynosurion, Alliarion); eurasiat; FH: 2850.

# *Bromus erectus*



**Bromus erectus** s.str. Huds. Aufrechte Trespe;  
30–80 cm; kollin–montan; bestandbildend in  
Magerrasen (Mesobromion, Xerobromion, auch  
trock. Arrhenatherion); mittelwertiges Futter-  
gras; europ; FH: 2783.

## Characteristics:

- Stiff hairs on the leaves  
➔ Leaf edges feel rough when slid down with fingers
- Hairs form more or less a 45° angle with the leaf and are regularly spaced



# Anthoxanthum odoratum



Pflanze zerrieben mit Kumaringeruch



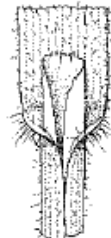
Rispe ährenähnlich,  
2–6 cm lang, früh im Jahr  
erscheinend

Blatt rollt sich nach dem  
Abreißen erst spät ein

OS und US mattgrün

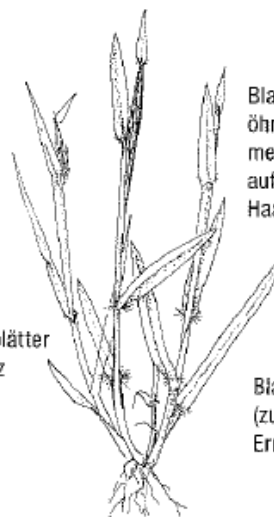
3–5 mm breit

Blattgrund  
öhrchenartig,  
meist rötlich, mit  
auffälligen  
Haarbüscheln



obere  
Stängelblätter  
sehr kurz

Blattscheiden behaart  
(zumindest die unteren der  
Erneuerungstriebe)

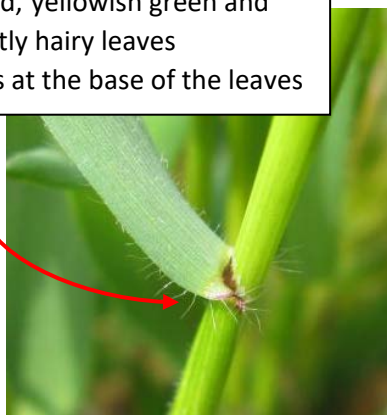


► *Agrostis capillaris*

24

## Characteristics:

- Strong smell when crushed, especially on the roots
- Broad, yellowish green and slightly hairy leaves
- Hairs at the base of the leaves



**Anthoxanthum odoratum** L. Gemeines  
Ruchgras; 15–40 cm; kollin–alpin; Wiesen,  
Weiden, lichte Laubwälder (Arrhenatherion,  
Cynosurion, Mesobromion, Poion alpinae);  
eurasiat; FH: 2975.



## Invaders that look like *Anthoxanthum odoratum*

*Arrhenatherum elatius*



### Characteristics:

- Leaves are bright green, broad, slightly hairy and rough



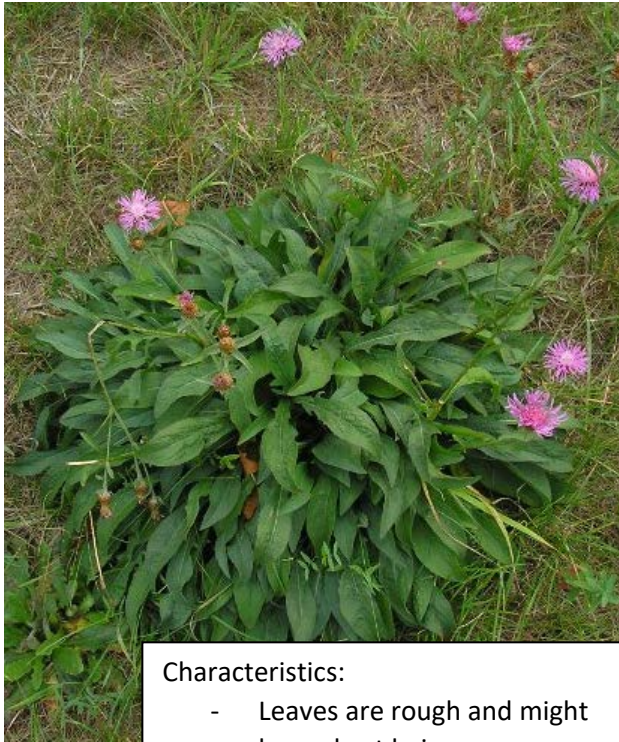
*Trisetum flavescens*



### Characteristics:

- “unshaved legs”: Hairs at the leaf sheath > 1 mm, facing downwards

# Centaurea jacea



## Characteristics:

- Leaves are rough and might have short hairs
- Leaves alternate

## alle Unterarten



Hüllblatt-Anhängsel überdecken sich  
► *C. nigrescens*



Blätter wechselständig  
► *Knautia*

Stängel an der Basis spinnwebig

untere Blätter schmal oder breit eiförmig, in einen Stiel verschmälert, selten gelappt  
► *C. nigrescens*

Pflanze fast kahl  
Korbstiel etwas verdickt  
Stängel wenig verzweigt, Zweige eher kurz  
Stängelblatt kürzer als Internodien



Hüllblatt



**Centaurea jacea** s.str. L. Gemeine Flockenblume; 30–60 cm; kollin-subalpin; trockene bis feuchte Wiesen und Weiden (Arrhenatherion, Mesobromion); eurasiat (suboz-submed); FH: 2233.

Pflanze spinnwebig-flockig behaart  
Korbstiel nicht verdickt  
Stängel stark verzweigt, Zweige rutenförmig verlängert  
Stängelblatt länger als Internodien



Hüllblatt



**Centaurea jacea** ssp. *angustifolia* Gremli. (*C. pannonica*); Schmalblättrige Flockenblume; 40–100 cm; kollin-montan; Halbtrockenrasen, oft auf wechselfeuchten Böden (Mesobromion, Molinion); europ(subkont); FH: 2234.

Pflanze spinnwebig-flockig behaart  
Korbstiel nicht verdickt  
Stängel wenig verzweigt  
Stängelblatt länger als Internodien



Hüllblatt



**Centaurea jacea** ssp. *gaudinii* Gremli (*C. bracteata*); Gaudins Flockenblume; 20–50 cm; kollin-montan; felsige Hänge, Trockenrasen (Xerobromion, Diplachnion); europ(mittel-süd); FH: 2235.



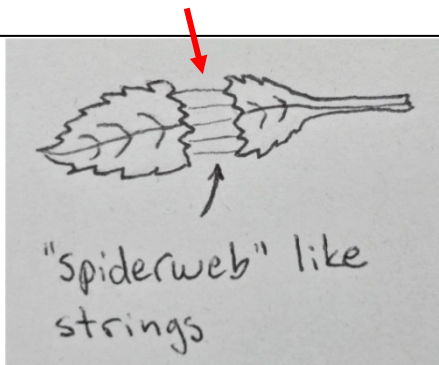
## Invaders that look like *Centaurea jacea*

*Knautia arvensis*



### Characteristics:

- Leaves are very hairy and greyish green
- Leaves opposite
- If the leaf is carefully ripped in two parts, there are thin strings connecting the parts



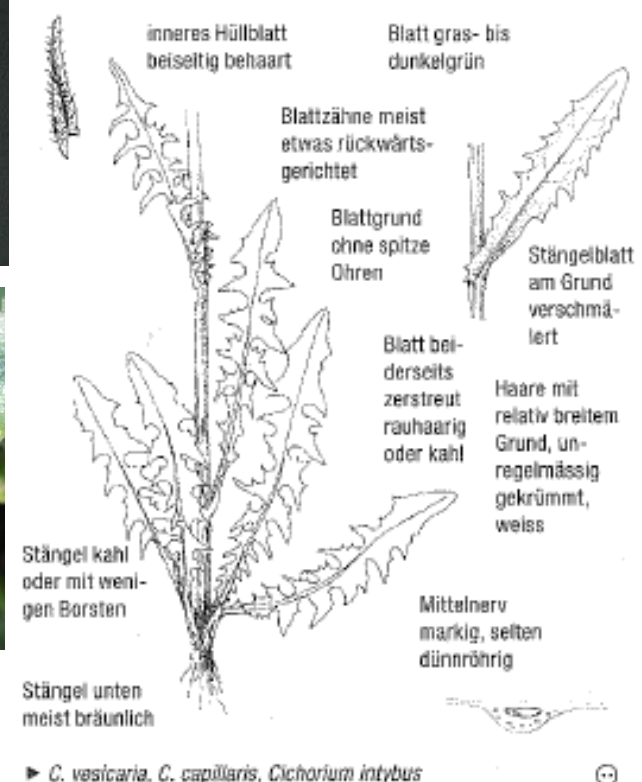


# *Crepis biennis*



## Characteristics:

- Looks like *Taraxacum officinale* but is almost always hairy
- Has at least tiny hairs/ "spines" on the back of the midrib



**Crepis biennis** L. Wiesen-Pippau; 60–120 cm; kollin–montan; Fettwiesen, Wegränder (Arrhenatherion, Polygono-Trisetion, Sisymbrium); mässiger Futterwert; europ(subkont), verschleppt; FH: 2325.



## Invaders that look like *Crepis biennis*

*Sonchus oleraceus*



### Characteristics:

- Small spines on leaf margins



*Leontodon* sp.



### Characteristics:

- Leaves in basal rosette
- Often hairy, star hairs (magnifying lens!)



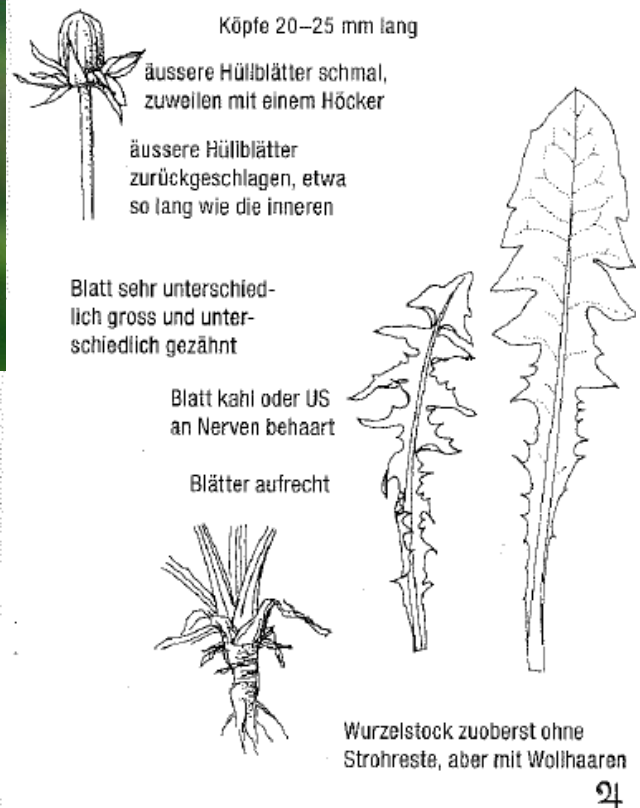


# Taraxacum officinale



## Characteristics:

- Looks like *Crepis biennis* but doesn't have a row of hairs/ "spines" on the back of the midrib
- Leaves in basal rosette
- Flowering stem has only one flower head



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**Taraxacum officinale** agg. Löwenzahn; 5–30 cm; kollin–subalpin; Fettwiesen und -weiden, Wegränder, Unkrautfluren (Arrhenatherion, Polygonion avicularis, Cynosurion); formenreich; eurasiat (heute weltweit); FH: 2295.



# Achillea millefolium



Pflanze frischgrün–dunkelgrün

Blattspindel ohne  
Zwischenfiedern

Blatt wirkt «plump», Endzipfel  
kaum länger als breit

Seitenfiedern ± flach

zerstreut behaart



## A. millefolium

Dolden > 3 cm breit

Endzipf. so lang wie breit

Pflanze kräftig

Stängel am Grund dicker  
als 2 mm, aufrecht

## A. roseo-alba

Dolden 2–3 cm breit

Endzipf. länger als breit

Pflanze zart

Stängel am Grund dünner  
als 2 mm, aufsteigend



**Achillea millefolium** s.l. L. Gemeine Schafgarbe; 15–50 cm; kollin–subalpin; Fettwiesen und -weiden, Wegränder (Arrhenatherion, Cynosurion); formenreich!; eurasiat(suboz); FH: 2105.



**Achillea roseoalba** Ehrend. Hellrosafarbene Schafgarbe; 20–40 cm; kollin–montan; wechselfeuchte Wiesen und Wälder (Arrhenatherion); alp(süd); FH: 2108.

## Characteristics:

- Has a strong smell



# Galium album



## Characteristics:

- Stem 4-edged

### beide Arten

Pflanze meist kahl  
(selten flaumig be-  
haart)

Blattrand rau, mit nach  
vorne gerichteten Sta-  
chelborsten

6–8 Blättchen  
im Quirl

Internodien  
relativ lang

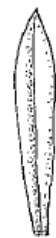
Stängel  
4kantig

24

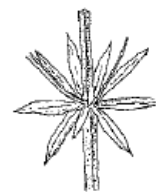
### G. album

Blatt fast parallel-  
randig, langsam in  
die Spitze ver-  
schmälert

Blatt meist etwas  
dicklich, ältere Blätter  
oft etwas ledrig



OS schwach  
glänzend



Stängel auch unten  
gerade, nicht bogig

► *G. anisophyllum*, *G. lucidum*



**Galium album** Miller. Weisses Labkraut;  
30–150 cm; kollin–subalpin; Fettwiesen und  
Halbtrockenrasen, Auenwälder, Säume (Ar-  
rhenatherion, Trifolium medii, Mesobromion,  
Fraxinion); eurasiat(suboz); FH: 1456.

Apiaceae

Lamiaceae

## *Salvia pratensis*



Pflanze schwach aromatisch riechend



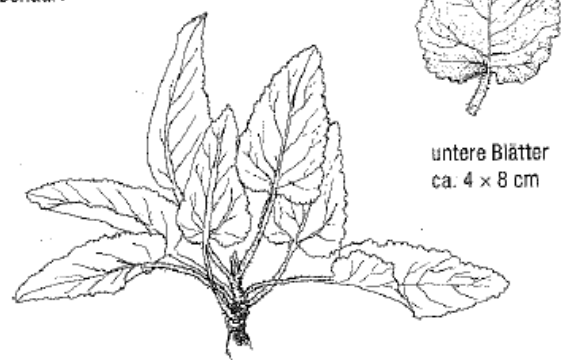
Characteristics:

- Leaves are "wrinkled"

OS runzelig, zerstreut behaart

Stängel oben dicht behaart

Stängel unten zerstreut behaart



untere Blätter  
ca. 4 x 8 cm

Grundblätter in einer dem Boden anliegenden Rosette

► *Campanula glomerata*, *Stachys alpina*

24

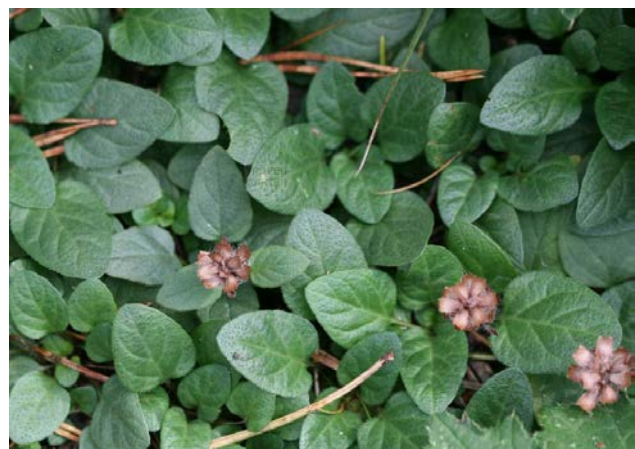


**Salvia pratensis** L. Wiesen-Salbei; 30–60 cm; kollin–montan; Halbtrockenrasen, trockene Fettwiesen (Mesobromion, Arrhenatherion); europ(mittel-süd); FH: 1633.

25



# *Prunella grandiflora*



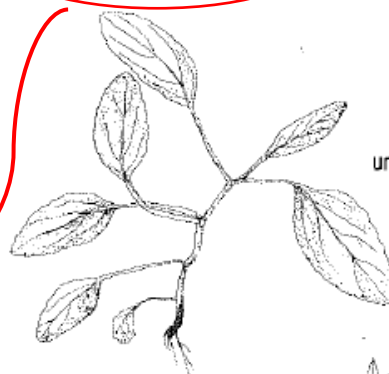
obere Kelchzähne  
deutlich 3eckig  
► *P. vulgaris*

Pflanze zerstreut behaart

Blütenstand von oberstem Blatt-  
paar mind. 1 cm abgesetzt



untere Blätter ca. 2 x 6 cm



Stängel oft leicht violett

Pflanze ohne oberirdische  
Ausläufer ► *P. vulgaris*

No aboveground runners

► *Ajuga*, *P. vulgaris*

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## Characteristics:

- The first pair of leaves at least 1cm away from the flower
- Big flowers
- Hairy leaves



***Prunella grandiflora*** Scholler. Grossblütige Brunelle; 10–20 cm; kollin–subalpin; kalkreiche Halbtrockenrasen, Wald- und Wegränder (Mesobromion, Geranion sanguinei, Erico-Pinion); eurasiat(kont); FH: 1594.

Red circles: compare with *Prunella vulgaris*, which we have quite often as weed

# Invaders that look like *Prunella grandiflora*

*Prunella vulgaris*



Characteristics:

- First pair of leaves close to the flower
- Has smaller flowers than *Prunella grandiflora*

obere Kelchzähne  
undeutlich, gestutzt  
► *P. grandiflora*

Pflanze zerstreut behaart

Stängelblätter ganzrandig  
oder kurz gezähnt

Blütenstand dem obersten  
Stängelblattpaar aufsitzend



untere Blätter  
ca. 1 x 4 cm



Pflanze mit oberirdisch kriechenden Ausläufern  
► *P. grandiflora*

► *Ajuga*, *P. grandiflora*

Creeping aboveground runners

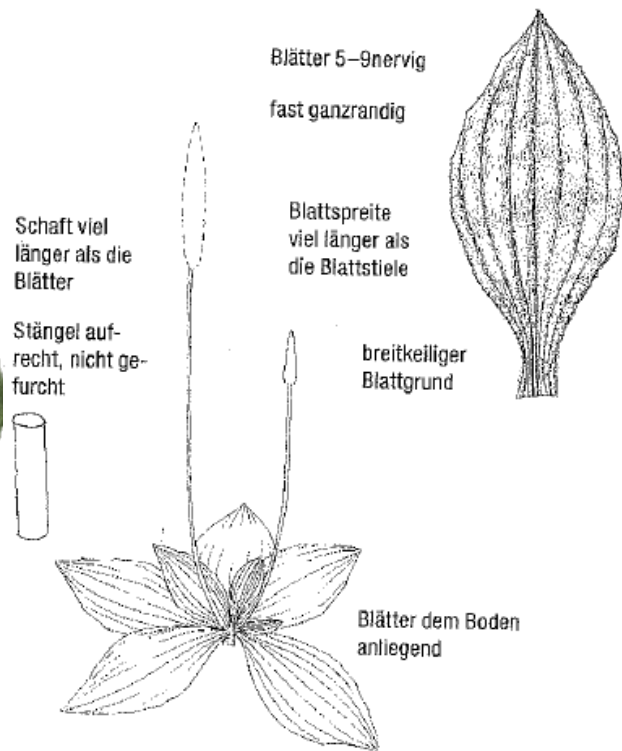
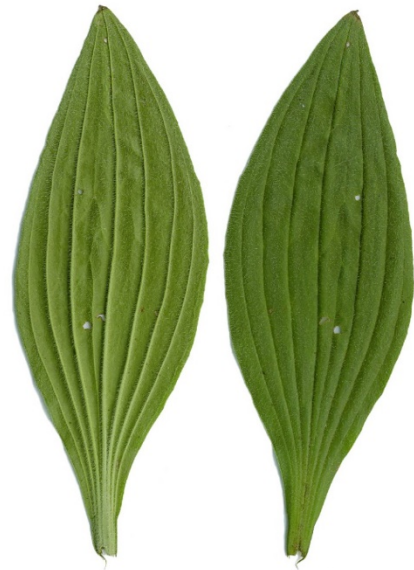
24



***Prunella vulgaris* L.** Gemeine Brunelle;  
10–20 cm; kollin–subalpin; Fettweiden und  
-wiesen, Moorwiesen, Ufer (Cynosurion,  
Aegopodion, Agropyro-Rumicion); eurasiat;  
FH: 1595.



# *Plantago media*



## Characteristics:

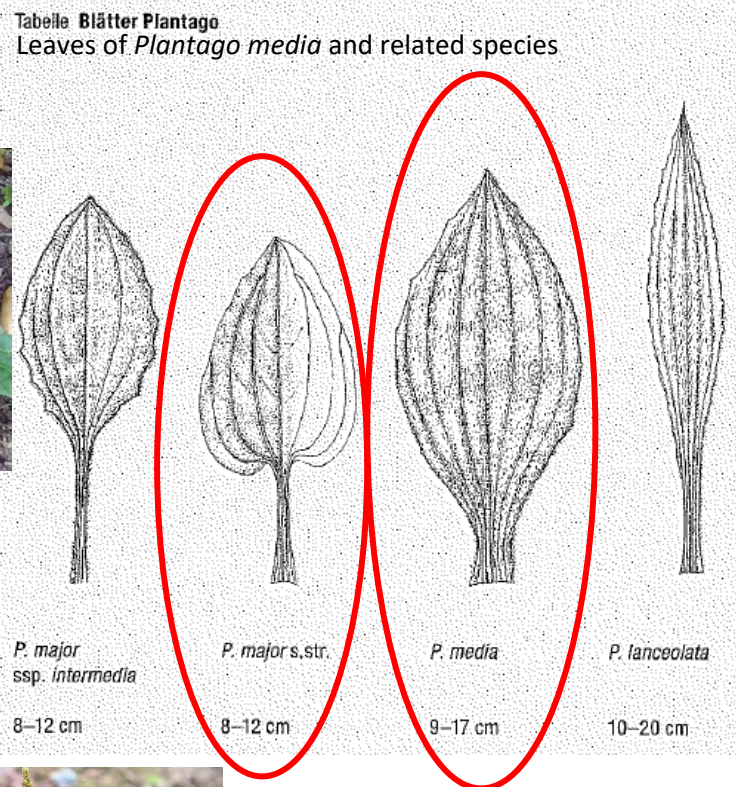
- Leaf blade much longer than stalk
- Leaves on the ground



**Plantago media** L. Mittlerer Wegerich; 20–40 cm; kollin–montan; Magerwiesen, Halbtrockenrasen, meist auf Kalk (Mesobromion, magere Arrhenatherion und Cynosurion); eurosib; FH: 1647.

## Invaders that look like *Plantago media*

*Plantago major*



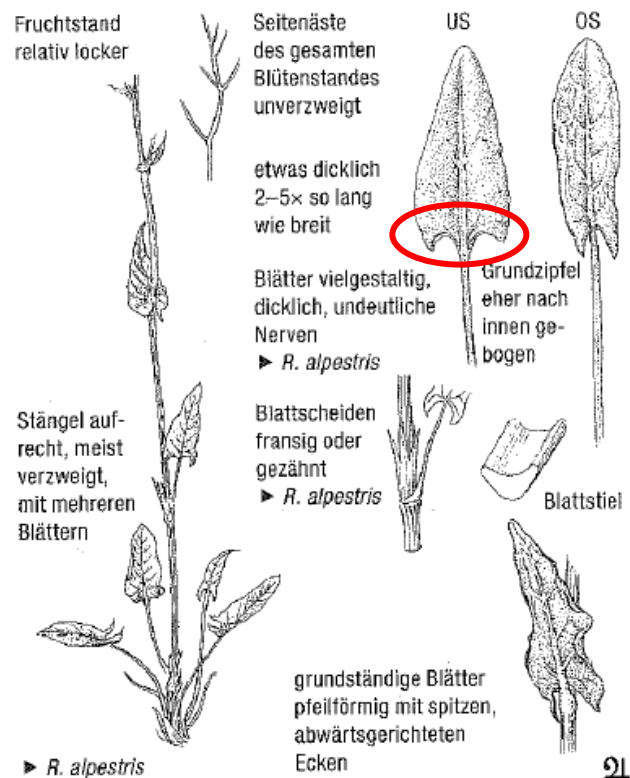


# Rumex acetosa



## Characteristics:

- Arrow-shaped leaves



**Rumex acetosa** L. Wiesen-Sauerampfer; 30–100 cm; kollin–subalpin; Fettwiesen und -weiden, Nasswiesen (Arrhenatherion, Molinion); Stickstoffzeiger; eurasiat; FH: 1289.



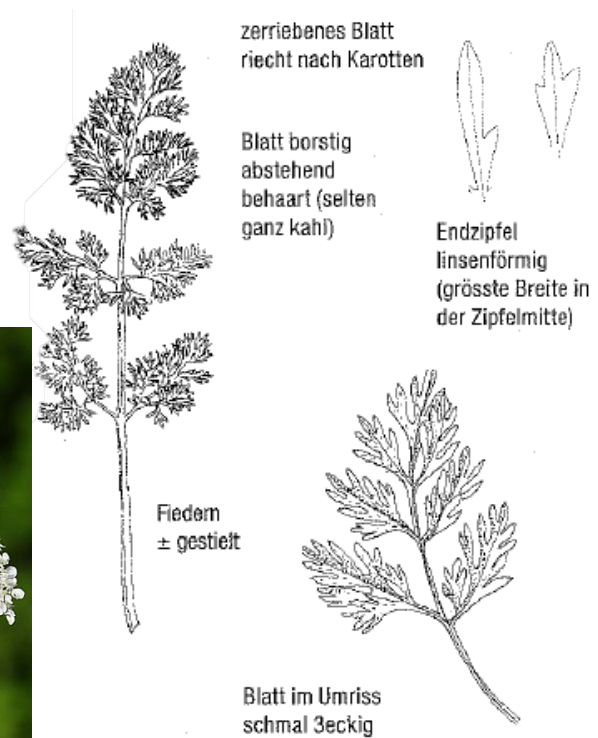
## Invaders that look like *Rumex acetosa*

*Rumex obtusifolius*





# *Daucus carota*



► Carum, Seseli, Orlaya



## Characteristics:

- Smells like carrot, if you crush a little of the leave

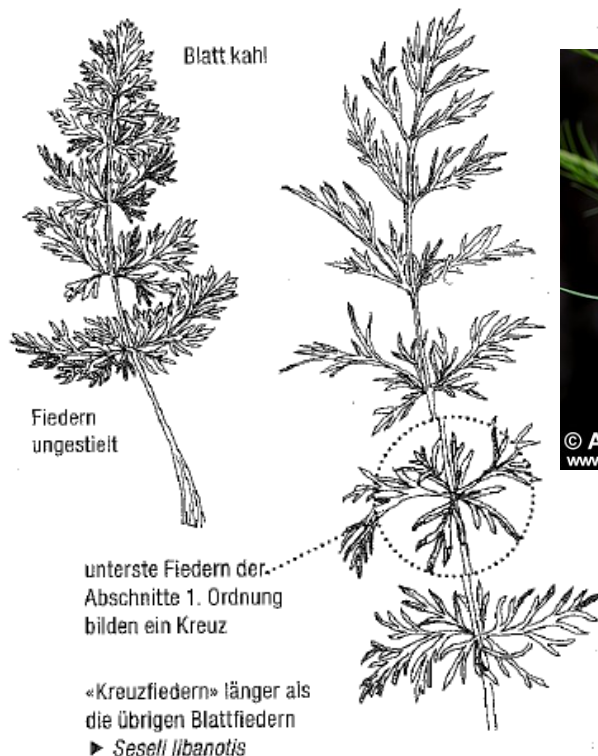


**Daucus carota** L. Möhre; 30–60 cm; kollin–montan; magere Wiesen und Weiden, ruderales Pioniergesellschaften (Dauco-Melilotion, Mesobromion); formenreich; urspr. mediterran; FH: 1917.



# Invaders that look like *Daucus carota*

*Carum carvi*



► *Daucus*, *Ligusticum*, *Seseli*

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***Carum carvi* L.** Wiesen-Kümmel; 30–50 cm;  
kollin–subalpin; Bergfettwiesen und -weiden  
(Polygono-Trisetion, Cynosurion);  
Nährstoffzeiger, sehr trittfest; eurasiat;  
FH: 1879.



*Tripleurospermum inodorum*



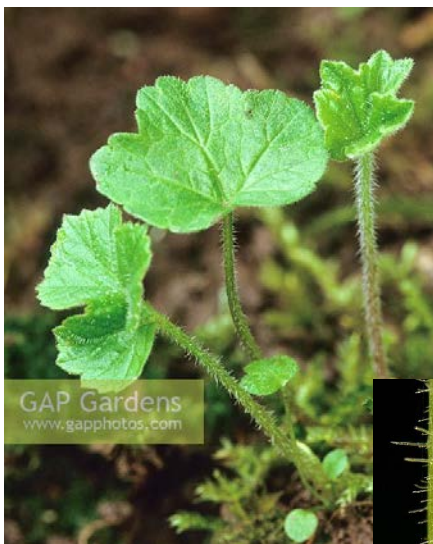
Characteristics:

- Leaves much finer than in *Daucus carota*



# Heracleum sphondylium

Do not touch without gloves!



## Characteristics:

- Hairs growing horizontally
- Sturdy plant



seitliche Abschnitte verwachsen, Mittellappen viel grösser als Seitenlappen

grössere Stängelblätter 3zählig, nie 5zählig  
► *H. sphondylium* s.str.



Grundblätter fiederlappig, aber meist nicht geteilt

auf US nur auf den Nerven wenig behaart

24



***Heracleum sphondylium* ssp. *elegans*** Schübl. & G. Martens (*H. montanum*); Berg-Bärenklau; 50–120 cm; subalpin; Hochstaudenfluren und Rostseggenhalden (Adenostyllion, Caricion ferrugineae); europ(mittel-süd); FH: 1903.



## Invaders that look like *Heracleum sphondylium*

*Ranunculus acris*



### Characteristics:

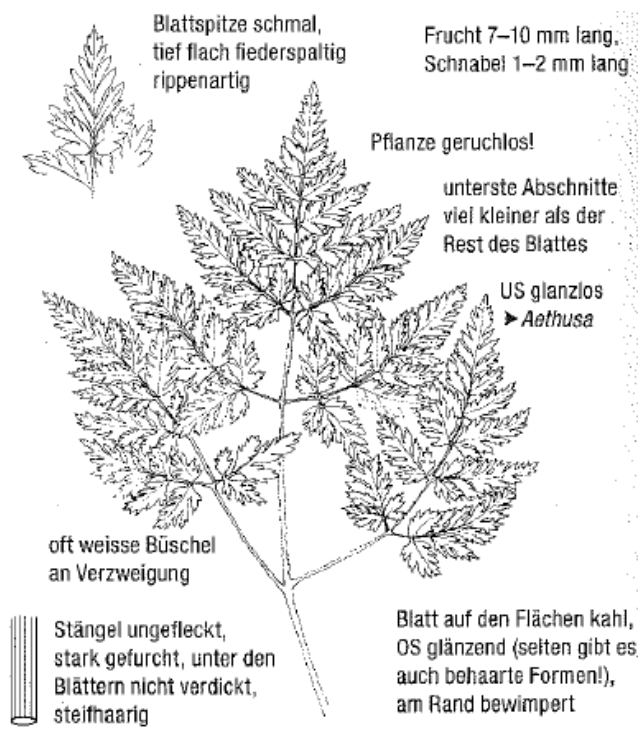
- Hairs growing upwards

*Geranium sp.*





# *Anthriscus sylvestris*



## Characteristics:

- Triangular leaves



► *Chaerophyllum*, *Aethusa*, *Conium*

24



***Anthriscus sylvestris* Hoffm.** (*Chaerophyllum sylvestris*); Wiesen-Kerbel; 60–120 cm; kollin-subalpin; Fettwiesen, Hecken, Wegränder (Arrhenatherion, Aegopodion); europ; FH: 1831.

## The most frequent invaders

*Chenopodium polyspermum*



*Chenopodium album*



Fun fact: tastes good







*Polygonum sp.*



*Myosotis sp.*



*Cerastium fontanum*





*Conyza canadensis*



Fun fact:  
originally from  
North America



*Erigeron annuus*



Fun fact: originally from North America, invasive neophyte





Fun fact: tastes good



*Capsella bursa-pastoris*



*Barbarea vulgaris*



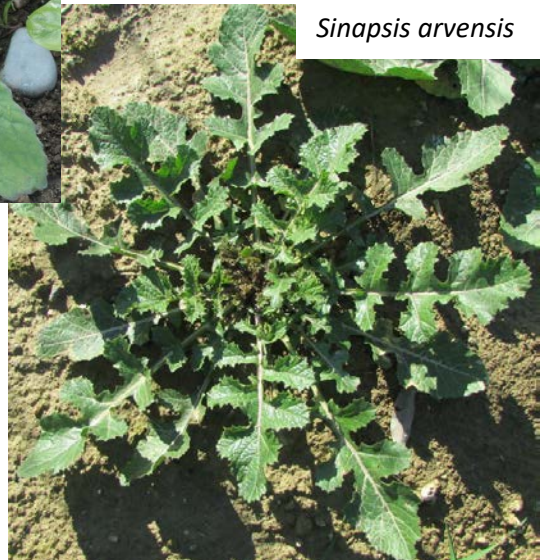
*Brassica napus*



Fun fact: young shoots can be used like broccoli



*Sinapis arvensis*







*Trifolium* sp.



Fun fact: edible but not very tasty

*Medicago lupulina*





*Veronica sp.*



Fun fact:  
edible but  
not very  
tasty

*Lamium purpureum*



*Papaver sp.*





*Leucanthemum vulgare*



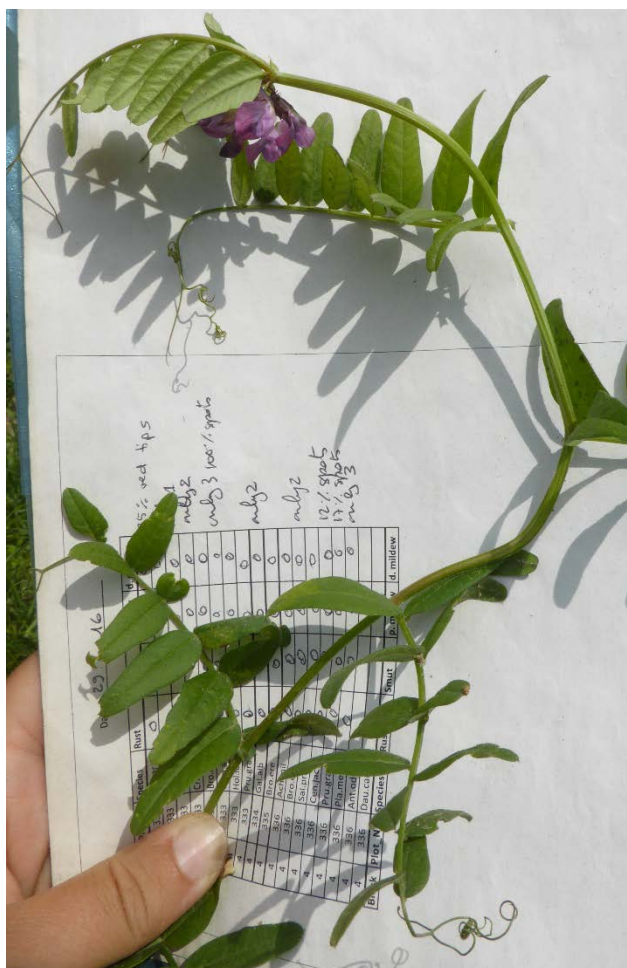
*Viola sp.*



Fun fact: tasty  
flowers, we can  
make candy out of it



*Vicia sepium*



Characteristics:

- Very long roots, make sure to remove everything with the help of a knife!

Fun fact: young shoots taste good

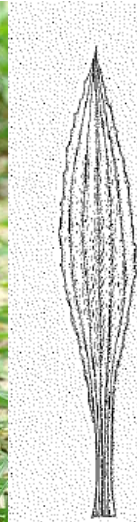
*Lotus corniculatus*





### *Plantago lanceolata*

Fun fact: can be used in teas against coughing, the plant sap is good to put on itchy mosquito bites



*P. lanceolata*

10–20 cm



#### Characteristics:

- Sometimes young seedlings can be mixed with grasses

### *Tragopogon pratensis*



Fun fact: flower buds taste good, but it has become a bit rare, so don't harvest it excessively



#### Characteristics:

- Grass like leaves
- White midrib



*Echinochloa crus-galli*



*Setaria viridis*



*Alopecurus pratensis*



*Phleum pratense*





*Silene vulgaris*



Fun fact: young plants and flowers taste good



*Rhinanthus alectorolophus*



Fun fact: half parasite on grasses



*Sanguisorba minor*



Salad Burnet (*Sanguisorba minor*)

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Fun fact: tastes really good