

<b>VDC</b>   Vereinigung der am Drogen- und Chemikalien- Groß- und Außenhandel beteiligten Firmen (Drogen- und Chemikalienverein) e.V.		<b>Introduction</b>
	08.11.2018	Page 1 of 3
	<b>Code of Practice pyrrolizidine alkaloids</b>	

## Preface

This Code of Practice provides information about the biology of plants containing pyrrolizidine alkaloids, about the potential risk of poisoning and the control measures when planting. The focus was put on the **recognition** of the poisonous weeds. At this stage 15 fact sheets of the most important weeds were created. Further elaborations are planned.

In the introduction the current state of knowledge about these plant substances are summarized and the main minimization measures are illustrated.

## Introduction

### Summary of the current state of knowledge of these plant substances

For quite a long time it has been known, that single shoots and their species from certain plant families are able to produce so-called pyrrolizidine alkaloids (abbr.: PA). These secondary plant substances are mainly a protection against herbivores, also some butterfly caterpillars are using the poison for protection by eating the plants.

So far, there are more than 600 different PAs known. From the current 300 types of plants, different PAs have been isolated in varying concentrations. Presumably, more than 6000 different plants can produce pyrrolizidine alkaloids.

Currently about 100 of the recognized PAs are known to severely damage the liver and are cancerogenic. However not all PAs are equally toxic. To this day the extend of the toxicity for each PA cannot be exactly determined yet.

The main variety of plants, which can produce PA, are from the following families:


**Boraginaceae**  
**Asteraceae**  
**Fabaceae**

During the investigation of the PA-containing weeds, in regards to their PA-levels the following values have been determined:

Groundsel/narrow-leaved ragwort/Eastern groundsel < **1000 mg/kg**  
Strict forget-me-not/sticky groundsel ~ **100 mg/kg**  
Field forget-me-not ~ **10 mg/kg**.

Sporadically PA-producing plants may stem from different plant families, like **Crassulaceae**, **Euphorbiaceae**, **Poaceae** and 8 to 10 further families.

It is important to know, that in case of **Asteraceae**, e.g. Senecio species, the PAs are mainly produced in the roots. However, a particularly high concentration can be found in the flowers and seeds of the Asteraceae e.g. **Senecio types**.

	Vereinigung der am Drogen- und Chemikalien- Groß- und Außenhandel beteiligten Firmen (Drogen- und Chemikalienverein) e.V.	<b>Introduction</b>
	08.11.2018	Page 2 of 3
	<b>Code of Practice pyrrolizidine alkaloids</b>	

Therefore, it is of great importance, to not only completely rip out the PA plants, but to remove them from the cultivation field.

Other plants like the **Boraginaceae** (Anchusa/Myosotis/Symphytum) build the PA also in the leaves.

Meanwhile it is known that medicinal plants which are unable to produce PAs on their own are able to absorb PAs from the ground.

In this context, the main concern is harvesting PA-containing weeds. Contamination with individual PA-plants on the field can already lead to analytically measurable traces and might lead to an unusable harvest.

For you, as a grower, the following is important to know:

The growing field has to be inspected at an early growing stage and every weed, especially PA weeds have to be pulled out, hacked and removed from the field.

Permitted herbicides with an effect against dicotyledonous plants/chamomile-like weeds have to be sprayed systematically onto the weeds. Restrictions of use applicable in the country of origin as well as the import country have to be taken into account. These weeds also have to be completely removed from the field.

Medical plants like chamomile, peppermint, melissa, fennel and stinging nettle are unable to produce pyrrolizidine alkaloids. Exceptionally, some plants formerly used as medicinal drugs are known to contain PAs, e.g.:

- coltsfoot
- comfrey
- butterbur

Further species, which were known in pharmacies in Germany as **official drugs** and were sold as a medicinal drug are:

- corn gromwell
- bugloss
- houndstongue
- hemp-agrimony
- wood ragwort

The use of these five medicinal plants, which are today known as weeds, have been strictly forbidden since 1992.

Therefore, already in 1992, the former Federal Health Agency had banned certain groups of drugs, which contain PAs, from sale in pharmacies (Graduated plan; see above).

For **coltsfoot, comfrey and butterbur** the usage was **strongly restricted** and the maximum daily application of PAs was limited.

Since then drugs such as coltsfoot and comfrey are analyzed in special laboratories and are only released in charges where the PA-levels comply with the specification.

<b>VDC</b>   Vereinigung der am Drogen- und Chemikalien- Groß- und Außenhandel beteiligten Firmen (Drogen- und Chemikalienverein) e.V.		<b>Introduction</b>
	08.11.2018	Page 3 of 3
	<b>Code of Practice pyrrolizidine alkaloids</b>	

Until July 2013 there were no hints, that there may be weeds with PA-levels in customary species (collected or planted drugs).

There is **no reported case** of liver damage or cancer, which could be traced back to the regular consumption of normal tea drugs, such as peppermint, melissa, fennel or chamomile.

Under German medicinal law the maximum daily limit for medicinal herbs is **1.0 µg PA**, since the 1st of May 2016. In case of food three values are applied for risk assessment. The dose range for the acute Risk is 1-3 mg/kg body weight and day. This exposure area might cause serious injury to health after already short intake. The current toxicologic reference value for the chronic-non-carcinogenic risk is 0.1 µg/kg body weight and day. The benchmark for the chronic-carcinogenic risk is 0.0237 µg/kg body weight and day.

**Due to these facts it is necessary to prevent PA-producing plants growing on the fields.**

The annex consists of profiles of diverse PA-producing plants. These profiles can help the grower to identify PA-producing plants to completely remove them from the field.

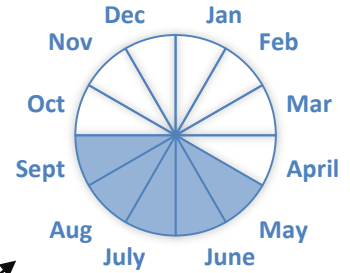
Please contact us for further information.

\*\*\*\*\*

**Pyrrolizidine alkaloids-producing plants**

Botanical name	Common name	Family
<b>ANCHUSA ARVENSIS L.</b>	<b>SMALL BUGLOSS</b>	<b>Boraginaceae</b>

<b>Occurrence</b>	Europe, North Africa, Near East
<b>Soil quality</b>	nitrogenous, lime- and alkaline-poor; sandy soils also
<b>Plant height</b>	15 to 40 cm
<b>Flowering period</b>	May until September
<b>Generation cycle</b>	annual until winter annual
<b>Characteristics</b>	although in some other cultivations



**Control measures**

- Weeding/chopping/digging, together with the roots!
- Prevention of seed formation and soil damage
- Authorized herbicides with effects against dicotyledonous
- Remove plants of the field, thoroughly clean the working tools
- Plough dormant fields several times

**Small Bugloss (*Anchusa arvensis* L.)**

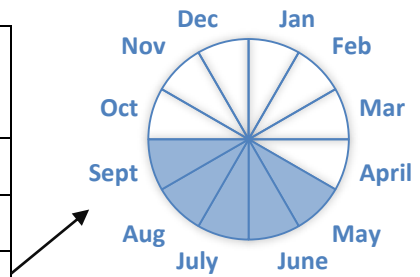




**Pyrrolizidine alkaloids-producing plants**

Botanical name	Common name	Family
<b>ANCHUSA OFFICINALIS L.</b>	<b>COMMON BUGLOSS</b>	<b>Boraginaceae</b>

<b>Occurrence</b>	East and Middle Europe, Ukraine until Baltics
<b>Soil quality</b>	dry until sandy soils, calcifuge
<b>Plant height</b>	30 to 80 cm
<b>Flowering period</b>	May until September
<b>Generation cycle</b>	biennial until perennial
<b>Characteristics</b>	although in some other cultures



**Control measures**

- Weeding/chopping/digging, together with the roots!
- Prevention of seed formation and soil damage
- Authorized herbicides with effects against dicotyledonous
- Remove plants of the field, thoroughly clean the working tools
- Plough dormant fields several times

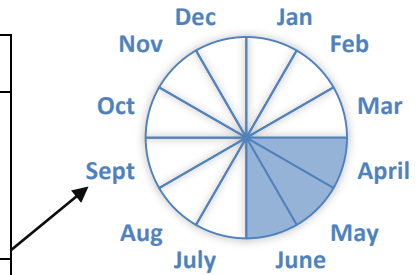
**Common Bugloss (*Anchusa officinalis* L.)**



**Pyrrolizidine alkaloids-producing plants**

Botanical name	Common name	Family
<b>BUGLOSSOIDES ARVENSIS</b>	<b>CORN GROMWELL</b>	<b>Boraginaceae</b>

<b>Occurrence</b>	Europe, West Asia, Africa
<b>Soil quality</b>	alkaline-rich, nutritious, humus-poor, loam and clay soils, calcicoles
<b>Plant height</b>	10 to 50 cm
<b>Flowering period</b>	April until June
<b>Generation cycle</b>	annual until winter annual
<b>Germination capacity</b>	germ as of 10°C soil temperature



**Note:** In parts of Germany an endangered species!  
Blossoms/seeds PA-rich!

**Control measures**

- Weeding/chopping/digging, together with the roots!
- Prevention of seed formation and soil damage
- Authorized herbicides with effects against dicotyledonous
- Remove plants of the field, thoroughly clean the working tools
- Plough dormant fields several times

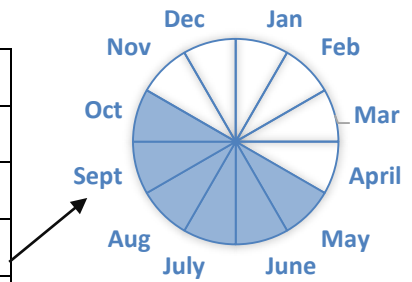
**Corn Gromwell (*Buglossoides arvensis* L.)**



**Pyrrolizidine alkaloids-producing plants**

Botanical name	Common name	Family
<b>ECHIAM VULGARE L.</b>	<b>VIPER'S BUGLOSS</b>	<b>Boraginaceae</b>

<b>Occurrence</b>	Europe and Asia
<b>Soil quality</b>	(semi-)dry, modest
<b>Plant height</b>	25 to 100 cm
<b>Flowering period</b>	May until October
<b>Generation cycle</b>	biennial, semi-rosette shrub
<b>Characteristics</b>	widespread on sandy soils



**Note:** Up to 2000 long-lasting seeds!

<b>Control measures</b>	<p>Weeding/chopping/digging, together with the roots!</p> <p>Prevention of seed formation and soil damage</p> <p>Authorized herbicides with effects against dicotyledonous</p> <p>Remove plants of the field, thoroughly clean the working tools</p> <p>Plough dormant fields several times</p>
-------------------------	---

**Viper's Bugloss (*Echium vulgare L.*)**

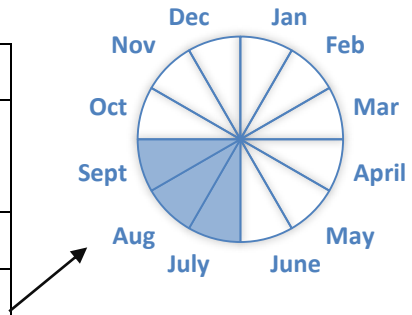




**Pyrrolizidine alkaloids-producing plants**

Botanical name	Common name	Family
<b>HELIOTROPIUM EUROPAEUM L.</b>	<b>EUROPEAN TURN-SOLE</b>	<b>Boraginaceae</b>

<b>Occurrence</b>	Middle-Europe and Asia
<b>Soil quality</b>	loose, nutritious, very thermophilic
<b>Plant height</b>	up to 50 cm
<b>Flowering period</b>	July until September
<b>Generation cycle</b>	annual
<b>Germination capacity</b>	seeds germinate in spring, spreading through seeds



**Control measures**

- Weeding/chopping/digging, together with the roots!
- Prevention of seed formation and soil damage
- Authorized herbicides with effects against dicotyledonous
- Remove plants of the field, thoroughly clean the working tools
- Plough dormant fields several times

**European turn-sole (*Heliotropium europaeum* L.)**

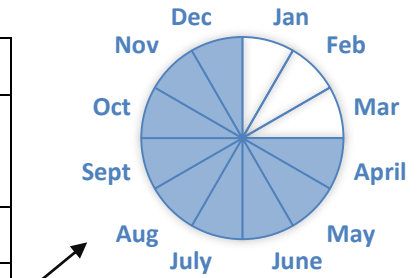




**Pyrrolizidine alkaloids-producing plants**

Botanical name	Common name	Family
<b>MYOSOTIS ARVENSIS L.</b>	<b>FIELD FORGET-ME-NOT</b>	<b>Boraginaceae</b>

<b>Occurrence</b>	Middle-Europe and Asia
<b>Soil quality</b>	aerated, humid, sandy clay soils
<b>Plant height</b>	up to 40 cm
<b>Flowering period</b>	April until December
<b>Generation cycle</b>	annual until winter annual
<b>Germination capacity</b>	seeds germinable for years



**Note:** Large amount of seeds with high values of PA!

**Control measures**

- Weeding/chopping/digging, together with the roots!
- Prevention of seed formation and soil damage
- Authorized herbicides with effects against dicotyledonous
- Remove plants of the field, thoroughly clean the working tools
- Plough dormant fields several times

**Field forget-me-not (*Myosotis arvensis* L.)**



Source: Flora-de.de Thomas Meyer

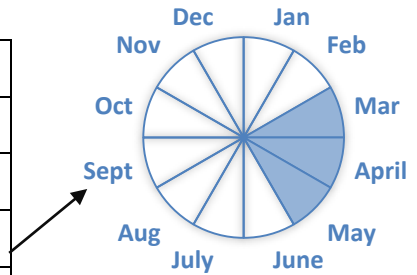


Source: Flora-de.de Thomas Meyer

**Pyrrolizidine alkaloids-producing plants**

Botanical name	Common name	Family
<b>MYOSOTIS STRICTA L.</b>	<b>STRICT FORGET-ME-NOT</b>	<b>Boraginaceae</b>

<b>Occurrence</b>	Middle-Europe, Asia, Africa
<b>Soil quality</b>	sandy
<b>Plant height</b>	5 to 20 cm
<b>Flowering period</b>	March until May
<b>Generation cycle</b>	annual until winter annual
<b>Germination capacity</b>	long-lasting seeds



**Control measures**

- Weeding/chopping/digging, together with the roots!
- Prevention of seed formation and soil damage
- Authorized herbicides with effects against dicotyledonous
- Remove plants of the field, thoroughly clean the working tools
- Plough dormant fields several times

**Strict forget-me-not (*Myosotis stricta* L.)**



Source: Wikipedia



Source: Wikipedia

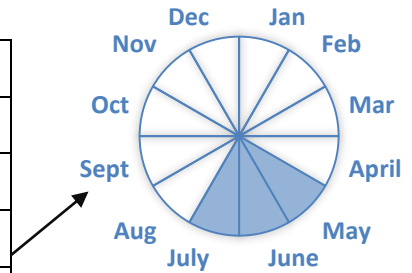


Source: Wikipedia

**Pyrrolizidine alkaloids-producing plants**

Botanical name	Common name	Family
<b>SYMPHYTUM OFFICINALE</b>	<b>COMMON COMFREY</b>	<b>Boraginaceae</b>

<b>Occurrence</b>	Europe and Asia
<b>Soil quality</b>	nitrogenous, humid, nutritious
<b>Plant height</b>	30 to 100 cm
<b>Flowering period</b>	May until July
<b>Generation cycle</b>	perennial
<b>Germination capacity</b>	germination through seeds and roots



**Note:** Smallest root parts will sprout again!

<b>Control measures</b>	<p>Weeding/chopping/digging, together with the roots!</p> <p>Prevention of seed formation and soil damage</p> <p>Authorized herbicides with effects against dicotyledonous</p> <p>Remove plants of the field, thoroughly clean the working tools</p> <p>Plough dormant fields several times</p>
-------------------------	---

**Common comfrey (*Symphytum officinale* L.)**

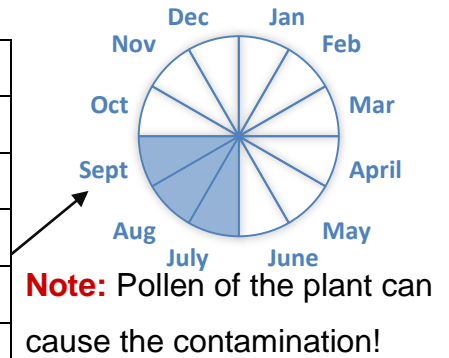




**Pyrrolizidine alkaloids-producing plants**

Botanical name	Common name	Family
<b>EUPATORIUM CANNABINUM L.</b>	<b>HEMP-AGRIMONY</b>	<b>Asteraceae</b>

<b>Occurrence</b>	Europe, North-America, Asia
<b>Soil quality</b>	humid, nutritious
<b>Plant height</b>	50 to 150 cm
<b>Flowering period</b>	July until September
<b>Generation cycle</b>	perennial
<b>Characteristics</b>	spreads quickly



**Control measures**

- Weeding/chopping/digging, together with the roots!
- Prevention of seed formation and soil damage
- Authorized herbicides with effects against Asteraceae
- Remove plants of the field, thoroughly clean the working tools
- Plough dormant fields several times

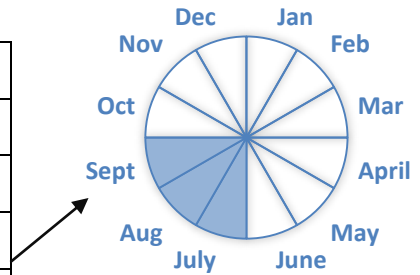
**Hemp-Agrimony (*Eupatorium cannabinum* L.)**



**Pyrrolizidine alkaloids-producing plants**

Botanical name	Common name	Family
<b>SENECIO ERUCIFOLIUS L.</b>	<b>HOARY RAGWORT</b>	<b>Asteraceae</b>

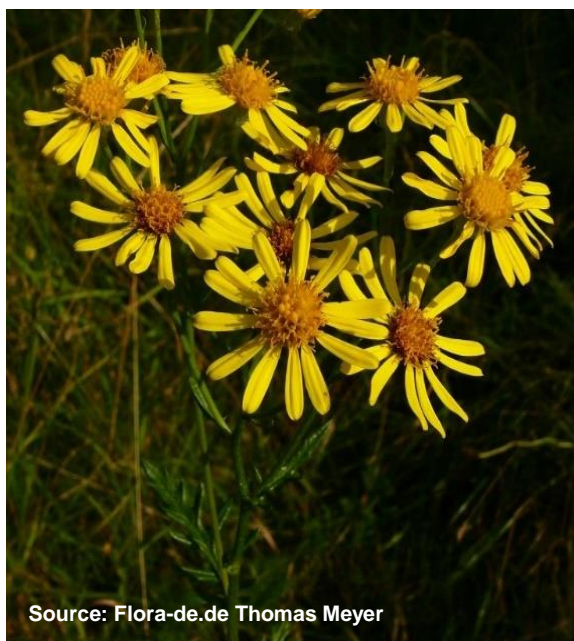
<b>Occurrence</b>	Europe and Asia
<b>Soil quality</b>	almost all soil types
<b>Plant height</b>	30 to 125 cm
<b>Flowering period</b>	July until September
<b>Generation cycle</b>	perennial
<b>Characteristics</b>	high amount of PAs in flowers and seeds



**Note:** In parts of Germany an endangered species!

<b>Control measures</b>	<p>Weeding/chopping/digging, together with the roots!</p> <p>Prevention of seed formation and soil damage</p> <p>Authorized herbicides with effects against Asteraceae</p> <p>Remove plants of the field, thoroughly clean the working tools</p> <p>Plough dormant fields several times</p>
-------------------------	---

**Hoary ragwort (*Senecio erucifolius* L.)**



Source: Flora-de.de Thomas Meyer



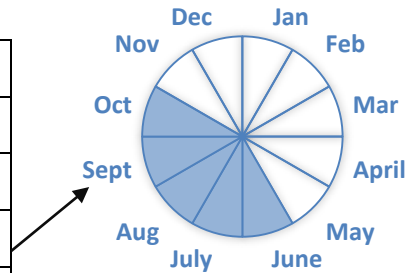
Source: Flora-de.de Thomas Meyer



**Pyrrolizidine alkaloids-producing plants**

Botanical name	Common name	Family
<b>SENECIO JACOBAEA L.</b>	<b>Common ragwort</b>	<b>Asteraceae</b>

<b>Occurrence</b>	Europe, Asia, North-Africa
<b>Soil quality</b>	almost all soil types
<b>Plant height</b>	30 to 100 cm
<b>Flowering period</b>	June until October
<b>Generation cycle</b>	biennial until perennial germination – first year leaf rosette – second year inflorescence
<b>Characteristics</b>	seeds immediately germinable; especially toxic for horses



**Note:** Up to 140 000 seeds per plant! Widespread willow weeds!

**Control measures**

- Weeding/chopping/digging, together with the roots!
- Prevention of seed formation and soil damage
- Authorized herbicides with effects against Asteraceae
- Remove plants of the field, thoroughly clean the working tools
- Plough dormant fields several times

**Common ragwort (*Senecio jacobaea L.*)**

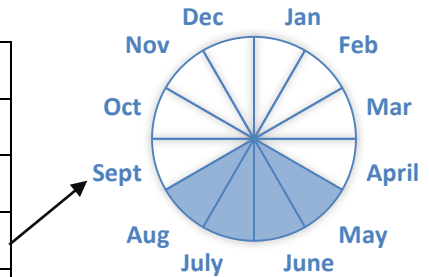




**Pyrrolizidine alkaloids-producing plants**

Botanical name	Common name	Family
<b>SENECIO VERNALIS L.</b>	<b>EASTERN GROUNDSEL</b>	<b>Asteraceae</b>

<b>Occurrence</b>	Europe and Asia
<b>Soil quality</b>	nutritious
<b>Plant height</b>	0.2 to 60 cm
<b>Flowering period</b>	May until August
<b>Generation cycle</b>	perennial
<b>Germination capacity</b>	long-lasting seeds



**Control measures**

- Weeding/chopping/digging, together with the roots!
- Prevention of seed formation and soil damage
- Authorized herbicides with effects against Asteraceae
- Remove plants of the field, thoroughly clean the working tools
- Plough dormant fields several times

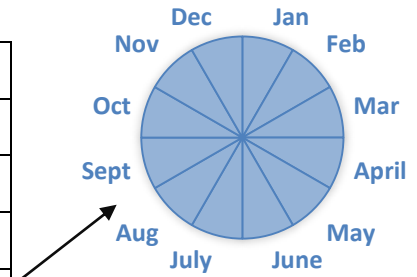
**Eastern groundsel (*Senecio vernalis* L.)**



**Pyrrolizidine alkaloids-producing plants**

Botanical name	Common name	Family
<b>SENECIO VULGARIS L.</b>	<b>GORUNDSEL</b>	<b>Asteraceae</b>

<b>Occurrence</b>	worldwide
<b>Soil quality</b>	almost all soil types
<b>Plant height</b>	10 to 40 cm
<b>Flowering period</b>	January until December
<b>Generation cycle</b>	5 to 6 weeks
<b>Characteristics</b>	seeds immediately germinable; fast growing plant



**Note:** Up to 12 000 long-lasting seeds per plant!

**Control measures**

- Weeding/chopping/digging, together with the roots!
- Prevention of seed formation and soil damage
- Authorized herbicides with effects against Asteraceae
- Remove plants of the field, thoroughly clean the working tools
- Plough dormant fields several times

**Groundsel (*Senecio vulgaris* L.)**

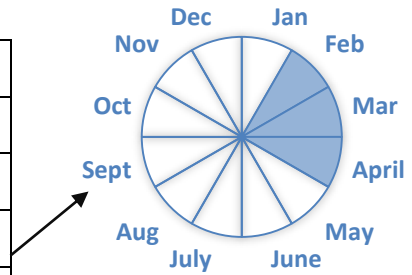




**Pyrrolizidine alkaloids-producing plants**

Botanical name	Common name	Family
<b>TUSSILAGO FARFARA L.</b>	<b>COLTSFOOT</b>	<b>Asteraceae</b>

<b>Occurrence</b>	Europa, Asia, Africa
<b>Soil quality</b>	humid, calcicole
<b>Plant height</b>	10 to 30 cm
<b>Flowering period</b>	February until April
<b>Generation cycle</b>	perennial
<b>Germination capacity</b>	seeds short-lived, light-dependent germination



**Control measures**

- Weeding/chopping/digging, together with the roots!
- Prevention of seed formation and soil damage
- Authorized herbicides with effects against Asteraceae
- Remove plants of the field, thoroughly clean the working tools
- Plough dormant fields several times

**Coltsfoot (Tussilago Farfara L.)**

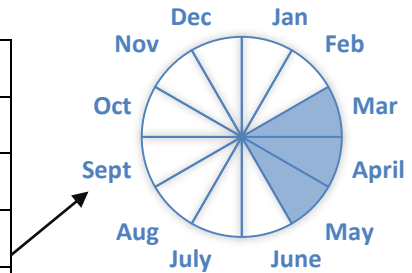




**Pyrrolizidine alkaloids-producing plants**

Botanical name	Common name	Family
<b>Petasites hybridus L.</b>	<b>BUTTERBUR</b>	<b>Asteraceae</b>

<b>Occurrence</b>	Europe, Asia, Africa
<b>Soil quality</b>	humid, nutritious
<b>Plant height</b>	10 to 40 cm
<b>Flowering period</b>	March until May
<b>Generation cycle</b>	perennial
<b>Germination capacity</b>	seeds short-lived



**Control measures**

- Weeding/chopping/digging, together with the roots!
- Prevention of seed formation and soil damage
- Authorized herbicides with effects against Asteraceae
- Remove plants of the field, thoroughly clean the working tools
- Plough dormant fields several times

**Butterbur (Petasites hybridus L.)**



**Code of Practice pyrrolizidine alkaloids**

**Pyrrolizidine alkaloids-producing plants**

Botanical name	Common name	Family
<b>Crotalaria spp.</b>	<b>RATTLEPOD</b>	<b>Fabaceae</b>

<b>Occurrence</b>	Asia, Africa, South-America (tropical)
<b>Soil quality</b>	humid, nutritious
<b>Critical use</b>	as green fertilizer (!)
<b>Application</b>	few species used as legumes in tropical Africa; Crotalaria juncea as ayurvedic medicine in India
<b>Generation cycle</b>	annual until perennial
<b>Toxicity</b>	completely different toxicity by humans and animals



**Control measures**


Weeding/chopping/digging, together with the roots!

**Don't use plants as green fertilizer! Ground transport of PAs into cultivated plants is scientifically proven!**

Remove plants of the field, thoroughly clean the working tools

**RATTLEPOD (Crotalaria spp.)**



 Vereinigung der am Drogen- und Chemikalien- Groß- und Außenhandel beteiligten Firmen (Drogen- und Chemikalienverein) e.V.		<b>References</b>
		08.11.2018
		<b>Code of Practice pyrrolizidine alkaloids</b>

**References:**

Rothmaler – Exkursionsflora von Deutschland; Ekehart J. Jäger, 20. Auflage (2011)  
 Biogene Gifte, Eberhard Teuscher, 2. Auflage (1992)  
<http://www.luontoportti.com/suomi/de/kukkakasvit/gemeine-ochsenzunge>, LuonttoPortii, access: 23.01.2018  
<http://www2.ufz.de/biolflor/index.jsp>, UFZ-Umweltforschungszentrum Leipzig-Halle GmbH, access: 23.01.2018

**Images sources:**

Heinrich Klenk GmbH & Co KG; Robert Parzinger

<http://www.blumeninschwaben.de/index.htm>; Thomas Meyer, access: 23.01.2018

<https://plants.usda.gov/core/profile?symbol=buar3>, Steve Hurst (hosted by USDA-NRCS PLANTS Database), access: 23.01.2018

Wikipedia:

*Anchusa officinalis* L.

[https://commons.wikimedia.org/wiki/File:Anchusa\\_officinalis\\_16-06-2006\\_19.45.34.JPG](https://commons.wikimedia.org/wiki/File:Anchusa_officinalis_16-06-2006_19.45.34.JPG), TeunSpaans, access: 23.01.2018

[https://commons.wikimedia.org/wiki/File:Anchusa\\_officinalis\\_1.jpg](https://commons.wikimedia.org/wiki/File:Anchusa_officinalis_1.jpg), Franz Xaver, access: 23.01.2018

*Petasites hybridus* L.

[https://de.wikipedia.org/wiki/Datei:Gewoehnliche\\_Pestwurz\\_Common\\_Butterbur\\_\(Petasites\\_hybridus\).jpg](https://de.wikipedia.org/wiki/Datei:Gewoehnliche_Pestwurz_Common_Butterbur_(Petasites_hybridus).jpg); Richard Bartz, access: 23.01.2018

[https://de.wikipedia.org/wiki/Datei:Petasites\\_hybridus\\_sl21.jpg](https://de.wikipedia.org/wiki/Datei:Petasites_hybridus_sl21.jpg), Stefan.lefnaer, access: 23.01.2018

[https://commons.wikimedia.org/wiki/File:Petasites\\_hybridus\\_\(Flower\\_Closeup\)\\_1.jpg](https://commons.wikimedia.org/wiki/File:Petasites_hybridus_(Flower_Closeup)_1.jpg), Christian Hummert, access: 23.01.2018

*Crotalaria* spp.

[https://commons.wikimedia.org/wiki/File:Starr\\_070206-4171\\_Crotalaria\\_pallida.jpg](https://commons.wikimedia.org/wiki/File:Starr_070206-4171_Crotalaria_pallida.jpg), Forest & Kim Starr, access: 23.01.2018

[https://commons.wikimedia.org/wiki/File:Crotalaria\\_agatiflora\\_\(18258347709\).jpg](https://commons.wikimedia.org/wiki/File:Crotalaria_agatiflora_(18258347709).jpg), Dick Culbert, access: 23.01.2018

*Myositis stricta* L.

[https://commons.wikimedia.org/wiki/File:Myosotis\\_stricta\\_sl25.jpg](https://commons.wikimedia.org/wiki/File:Myosotis_stricta_sl25.jpg), Stefan.lefnaer, access: 23.01.2018

[https://commons.wikimedia.org/wiki/File:Myosotis\\_stricta\\_sl18.jpg](https://commons.wikimedia.org/wiki/File:Myosotis_stricta_sl18.jpg), Stefan.lefnaer, access: 23.01.2018

[https://commons.wikimedia.org/wiki/File:Myosotis\\_stricta5\\_W.jpg](https://commons.wikimedia.org/wiki/File:Myosotis_stricta5_W.jpg), Fornax, access: 23.01.2018

*Senecio vernalis* L.

[https://de.wikipedia.org/wiki/Datei:Fr%C3%BChlings-Greiskraut\\_\(Senecio\\_vernalis\)\\_2.jpg](https://de.wikipedia.org/wiki/Datei:Fr%C3%BChlings-Greiskraut_(Senecio_vernalis)_2.jpg), Darkone, access: 23.01.2018

[https://commons.wikimedia.org/wiki/File:Senecio\\_vernalis\\_sl5.jpg](https://commons.wikimedia.org/wiki/File:Senecio_vernalis_sl5.jpg), Stefan.lefnaer, access: 23.01.2018

[https://commons.wikimedia.org/wiki/File:Senecio\\_vernalis\\_sl7.jpg](https://commons.wikimedia.org/wiki/File:Senecio_vernalis_sl7.jpg), Stefan.lefnaer, access: 23.01.2018



Code of Practice pyrrolizidine alkaloids

Botanical name	Deutsch	English	Français	Русский язык	Español
<i>Anchusa arvensis</i> L.	Acker Ochsenzunge	Small bugloss	Buglosse des champs	Воловик полевой	Buglosa/lengua de buey
<i>Anchusa officinalis</i> L.	Gemeine Ochsenzunge	Common bugloss	Buglosse officinale	Воловик лекарственный	Argamala
<i>Buglossoides arvensis</i> L.	Acker-Steinsame	Corn gromwell	Grémil des champs	Буглоссоидес полевой	Abremanos
<i>Crotalaria</i> ssp.	Klapperhülse	Rattlepod/sunn hemp	Crotalaire	Кроталярия	Crotalaria
<i>Echium vulgare</i> L.	Gewöhnlicher Natternkopf	Viper's bugloss/blueweed	Vipérine commune	Синяк обыкновенный	Buglosa salvaje
<i>Eupatorium cannabinum</i> L.	Gewöhnlicher Wasserdost	Hemp-agrimony/holy rope	Eupatoire chanvrine	Посконник коноплевый	Eupatorio de los árabes
<i>Heliotropium europaeum</i> L.	Europäische Sonnenwende	European turn-sole	Héliotrope d'Europe	Гелиотроп европейский	Heliotropio común
<i>Myosotis arvensis</i> L.	Ackervergissmeinnicht	Field forget-me-not	Myosotis des champs	Незабудка альпийская	Nomeolvides
<i>Myosotis stricta</i> L.	Sandvergissmeinnicht	Strict forget-me-not	Myosotis raide	Незабудка болотная	Nomeolvides
<i>Petasites hybridus</i> L.	Pestwurz	Butterbur	Grand pétasite	Белокопытник	Petasites
<i>Senecio erucifolius</i> L.	Raukenblättriges Kreuzkraut	Hoary ragwort	Séneçon à feuilles de roquette	Крестовник эруколистный	Sacapeos
<i>Senecio jacobaea</i> L.	Jacobs-Kreuzkraut	Common ragwort/St. James-wort	Séneçon de Jacob	Якобея обыкновенная	Afrentaquinteros
<i>Senecio vernalis</i> L.	Frühlings-Kreuzkraut	Eastern groundsel	Séneçon printanier	Крестовник весенний	Ambrosia vernal
<i>Senecio vulgaris</i> L.	Gemeines Kreuzkraut	Groundsel	Séneçon commun	Крестовник обыкновенный	Amargaza amarilla
<i>Symphytum officinale</i> L.	Echter Beinwell	Common comfrey	Consoude officinale	Окопник лекарственный	Consuelda
<i>Tussilago Farfara</i> L.	Huflattich	Coltsfoot	Tussilage/pas-d'âne	Мать-и-мачеха	Uña de caballo