

Risk Assessment on Pyrrolizidine Alkaloids in CO₂-Extracts

Pyrrolizidine alkaloids (PAs) are secondary metabolites with especially 1,2-unsaturated PAs being of concern because they are classified under carcinogens and toxic. PAs are produced as secondary plant compounds by a large number of plant species all over the world. The following plant families represent the main sources: Borage family (Boraginaceae: all genera), Sunflower family (Asteraceae: subtribe Senecioneae and Eupatorieae), Flowering plants (Apiales: subtribe Apiaceae and Umbelliferae) and Legume family (Fabaceae: subtribe Crotalariae).

Currently there are no legal values of PAs in the EU in place. They are discussed and a draft is issued but not yet finally passed to a law. However, the European Food Safety Authority (EFSA) and the German Institute for Risk Assessment (BfR) recommend that the PA levels in plant food and feed be minimized to the current acute reference dose below 0.1 µg/kg bw/day. <https://mobil.bfr.bund.de/cm/343/pyrrolizidinalkaloidgehalt-in-getrockneten-und-tiefgefrorenen-gewuerzen-und-kraeutern-zu-hoch.pdf>

Prevention of PA contamination is only possible on the field during cultivation, harvesting and post harvesting processes. The producer has no possibility to improve incoming materials but has checked to what extent PAs are transferred into the extract during CO₂ extraction. In order to assess the solubility of the PAs in CO₂, both the extract and the raw material were analyzed by accredited laboratory Eurofins.

The results of detected PAs are shown in the following table:

1) Analytical results of PAs in *Gromwell root - raw material and extract thereof*

Pyrrolizidin alkaloid	Content in raw material in µg/kg	Content in extract in µg/kg
Echimicidine	12000	< 2
Echimicidine-NOx	68000	< 2
Intermedin	1000	< 2
Sum of Indicine-NOx + Intermedine-NOx	5500	2,0
Lasiocarpine	1,8	< 1
Lasiocarpine-NOx	4600	< 2
Senecionine-NOx	2,6	< 2
Senkirkine	9,3	< 1

2) Analytical results of PAs in *Camomile Flower - raw material, extract thereof and extraction residue*

Pyrrolizidin alkaloid	Content in raw material in µg/kg	Content in extract in µg/kg	Content in extraction residue in µg/kg
Retrosine-NOx	12	< 2	20
Seniocrine-NOx	6,1	< 2	13
Senecivemine-NOx	4,7	< 2	12

Conclusion:

Due to their chemical structure pyrrolizidine alkaloids are not easily soluble in CO₂. Therefore, CO₂ extracts contain only traces of PAs, even if the raw material is not free of pyrrolizidine alkaloids.

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